DEPARTMENT OF ARCHITECTURE AND BUILDING SCIENCE
UNIVERSITY OF STRATHCLYDE

ECOLOGY, SUSTAINABILITY AND THE CITY

Towards an Ecological Approach to Environmental Sustainability: with a case study on Arcosanti in Arizona

Volume One: Environmental Problems and Sustainability

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Abstract

As the world population moves toward 10 billion people over the next 50 years environmental decline seems inevitable unless changes are implemented. Issues of *ecology, sustainability and the city* are now being recognised as critical. The systemic and holistic nature of the problem means that sustainable policies must address a wide range of social issues, political attitudes, economic practices and technological methods. *Volume One* offers a wide-ranging and comprehensive review of *Environmental Problems and Sustainability* and seeks to map out both the historical and contemporary basis for a widespread transition towards a more sustainable society.

The world's cities now offer the critical context within which sustainable strategies can be developed and tested. Much current academic and policy literature describes a range of sustainable development models representing radically different views of how the processes leading towards the planning and implementation of cities needs to be realised. *Volume Two* describes Paolo Soleri's *Arcology Model and the Arcosanti Laboratory* as a relevant methodology and case study. The arcology model attempts to address issues of sustainability by advocating a balanced relationship between urban morphology and performance within cities designed to conform to the complexity - miniaturization - duration (CMD) paradigm. The methodology recognises the need for the radical reorganisation of urban sprawl into dense, integrated compact urban structures in which material recycling, waste reduction and the use of renewable energy sources are part of a sustainable strategy aimed at reducing the flow of resources and products through the urban system.

As governments, eager to deliver major environmental improvements, press on with, as yet, untried and untested 'centrist' urban policies, there is a need to research relevant models of compaction. Over the last ten years, as the criteria of urban sustainability have become more widely accepted and understood the relevance of the Soleri's model has become clearer. Arcosanti in Arizona , begun in 1970, offers a laboratory for testing the validity of the theory. Volume Two concludes by critically reviewing arcology and Arcosanti in the context of the discourse on sustainability offered in Volume One. Since the energy crisis of the mid-1970s efforts at Arcosanti have been directed toward the definition and testing of various architectural effects that, when combined, could offer a response to many of today's environmental problems. But today progress is painstakingly slow. Lacking the level of funding and resources that would enable it to be convincing, it now represents not so much a specific prototypical solution but an activist engaged strategy that advocates the possibility of building our dreams and visions. In a world plagued by so many problems, and so few alternatives, it continues to offer a beacon of hope for a sustainable future.

Aim and structure of the thesis

The aim of this thesis is to firstly appraise the notion of ecological limits to population, economic and urban growth and to examine the implications of exceeding growth limits, both on a global scale and in relation to generic problems associated with local urban environments, in developed and developing nations. An analysis of social, political, economic and technological aspects of sustainability will provide the context for a review of contemporary sustainable urban planning and development issues and for a synopsis of the current debate on urban compaction versus decentralisation. In the final part of the work the aim is to locate the arcology theory, as an alternative model of urban development, and the laboratory at Arcosanti in Arizona, within the context of the current debate on urban sustainability and to describe and critically review its theoretical and practical response to today's social, ecological and environmental problems.

Having lived, worked and studied at Arcosanti for a few years in the late 1980s, and having then researched and taught ecological aspects of architecture and urban sustainability at Strathclyde University during the 1990s, it seems appropriate to draw the strands of my own experience together with the growing theoretical body of knowledge in the area of environmental studies. The work is structured into two volumes encompassing nine chapters.

Volume One — Environment Problems and Sustainability

Part 1 — The Global Environment

Part 1 reviews various historical and contemporary accounts of global environmental limits to population, economic and urban growth and examines the implications of going beyond such limits.

A mismatch currently exists between the global *green agenda* on the one hand, relating to world wide problems of resource depletion, loss of biodiversity, accelerating pollution, and global warming, and the urban *brown agenda* on the other, involving social and environmental problems within growing cities. The approach taken here is to distinguish between them for the purposes of study, while recognising that they are essentially interrelated and inseparable. Ultimately by focusing more on the urban environment the argument is not for less attention to be paid to global concerns, but for the recognition that urban and global concerns are inter-related, and planning and policy measures aimed towards sustainability must, of necessity, address both.

Chapter 1 - focuses on issues relating to maintaining the balance and integrity of the biosphere, while highlighting the scale and extent of specific green agenda problems.
Chapter 2 - looks in more detail at the Limits to Growth *thesis and examines its implications in both the developed and developing nations of the world.*

Part 2 The Urban Environment

Part 2 focuses on the scale and character of contemporary urbanisation and the rapid growth of cities, particularly within the developing nations, and examines associated urban environmental problems.

Historical and current patterns of rural-urban migration and urban demographics are discussed within the present context of the emergence of huge mega-cities and the economic, political, and socio-cultural re-structuring of modern life implied by the phenomenon of globalisation. The question arises as to whether an urban revolution of such scale and celerity is sustainable, particularly in the context of urban convergence theory suggesting that globally cities are becoming more alike in their most problematic characteristics. Along with the current pattern of growth of large cities has come a whole host of *brown agenda* problems relating to issues of human health and well being and environmental degradation, such as unemployment and poverty, inadequate shelter, sanitation and water supplies, congestion, and increased air pollution. Urban lifestyles and consumption patterns within today's cities account for the majority of the world's energy burden and natural resource depletion.

Chapter 3 - focuses on the process of urbanisation and urban growth.
Chapter 4 examines some of the social and environmental problems associated with current urban development patterns.

Part 3 Sustainability

Part 3 reviews the growth of ecologism and the ecological paradigm as a response to global and urban social and environmental problems and describes recent proposals, planning objectives and policy measures aimed at achieving sustainability at both the global and urban scales.

We, in the developed world, continue to grow at the cost of others' ability to develop. Sustainable development policies, in recognising that the world's problems are interconnected and interdependent, must be implemented in a holistic process that addresses simultaneously the social, political, economic and technological aspects of sustainability. Building an urban culture of sustainability that will promote environmental (and economic) stability and ecological sanity and, at the same time, emphasise the well-being of people throughout the world and their long term needs is a fundamental challenge of the twenty-first century. Human self-interest demands that sustainable relationships between the city and the biosphere are established. But this will not happen unless we make profound changes to the value systems underpinning our cities, including adopting new political attitudes, economic practices and technological methods within a social milieu that promotes spiritual and ethical growth, and values quality over quantity.

Chapter 5 - investigates the emergence of ecologism and traces the ideology's historical and modern roots.
Chapter 6 examines the social, political, economic, and technological aspects of the ecological paradigm for a sustainable society.
Chapter 7 reviews recent frameworks, planning strategies, and alternative models for sustainable urban development.

Volume 2 The Arcology Model and the Arcosanti Laboratory

Volume2 examines arcology (architecture and ecology) as a relevant methodology and Arcosanti as an urban laboratory that attempts to confront the most critical areas of sustainability.

By advocating an urban system and structure that adopts a balanced relationship between its morphology and performance *arcology* offers a theoretical response to problems of population expansion, scarcity of land resources and energy, pollution, technological mindlessness, waste, greed, cultural, social and spiritual deprivation. The arcological model of sustainable urban development sees, in the contraction and greater sophistication of the city (including all its equipment, machinery, infrastructure, services, etc.), both the efficient possibility of achieving more with less and the chance of reaching new levels of spiritual development. Such transformation involves a radical revision of the current social, cultural, political and economic structure. The systemic nature and complexity of the sustainability imperative requires that we explore alternatives that might offer a community-wide holistic response to ecological, social and environmental problems. At the urban laboratory at *Arcosanti*, in Arizona, Paolo Soleri has been exploring such an alternative since 1970, by attempting to build and operate a working prototype arcology. Volume 2 concludes by critically reviewing Soleri's model in the context of the discourse on sustainability offered in Volume One.

Chapter 8 examines the arcology model, traces its 20th century genealogy and describes its subsequent evolution.
Chapter 9 relates the history, development and current status of the Arcosanti project.

Vol. 1

Environmental Problems and Sustainability

Volume One offers a wide-ranging and comprehensive review of ecological limits to growth, describes global and urban environmental problems, and seeks to map out both the historical and contemporary basis for a widespread transition towards a more sustainable society.

Part 1

The Global Environment

Part One reviews various historical and contemporary accounts of global environmental limits to population, economic and urban growth and examines the implications of going beyond such limits.

Figure (a) Repairing the Earth

Chapter 1 - focuses on issues relating to maintaining the balance and integrity of the biosphere, while highlighting the scale and extent of specific **Green Agenda** *problems.*
Chapter 2 - looks in more detail at the **Limits to Growth** *thesis and examines its implications in both the developed and developing nations of the world.*

Introduction to Part One

The Global Environment

> At 1.24 am, New York time on October 12 the United Nations Secretary-General will declare that there are 6 billion people alive.[1]

India has now joined China as an official member of the "one billion club". Demographers estimate that today in India a baby is born every two seconds, making it virtually impossible to say with any certainty where, or when, the billionth birth actually took place.[2] But the exactitude of the timing of Kofi Annan's statement to the world press was intentionally dramatic. It took almost all of human history for the global population to reach 1 billion, sometime around the turn of the nineteenth century. While it took well over another century to increase to 2 billion (1927), succeeding increments of 1 billion have been added in only 33 years (1960), 14 years

[1] J. Vidal, 'Overcrowded world faces battle for scarce resources', *The Guardian* (August 14 1999), p 3
[2] UN Population Division (UNPD), *World Population Estimates and Projections, 1998 Revision* (UN, New York, 1998). The UNPD and Washington based Worldwatch Institute give August 15 as the date. India's Health Ministry suggests September 1999. The US Census Commissioner gives a date of May 11 2000

(1974) and 13 years (1987) respectively.[3] The five billionth human has only recently become a teenager.

Historically there have been three main waves of *population growth*, all of them coinciding with the introduction of new technology and science. The first began around a million years ago when humans discovered tool making, triggering an increase in world population from a few hundred thousand individuals to 5 million. The second revolution, which began about 10,000 years ago, came with the discovery of agriculture and the domestication of animals and plants. This time the population grew to 500 million. The third period of rapid population expansion is attributed to the Industrial Revolution. From the middle of the eighteenth century to the beginning of the twentieth global population increased by around by about one billion (1,000 million) people.

These 'explosions' are mere blips, however, when compared with the scale of growth experienced during the twentieth century. The world population is currently growing at 1.3 percent each year, representing an annual net addition of around 78 million people (which is more than the entire population of the United Kingdom [58 million] and Australia [18 million] or equivalent to a new Scotland [5 million] each month). The United Nations Population Division (UNPD) estimates that rapid population growth will gradually slow down reaching 7 billion in 2011, 8 billion in 2025, 9 billion in 2041, and 10 billion in 2071. Eventually it may level off at around 12 billion sometime in the twenty-second century.[4]

The doubling of the global population during the last 40 years has been deeply and unequally divided. Today 8 out of every 10 people live in the , so-called , 'developing world' and because of the high birth rates in these nations, 95 out of every 100 births occurs in the underdeveloped nations of Africa, Asia, and Latin America. If this trend continues these regions will comprise 84 percent of the total global population by 2025.

According to the U.S. Bureau of Census, China contained around 21 percent of the world population in 1996. China's 1996 population of 1.2 billion, combined with India's (at 952 million in 1996) easily makes Asia the most populous region of the world, home to 3.3 billion people in total and 57 percent of the global population. More than half of the world's population (51 percent) lives in only six countries - China, India, the United States, Indonesia, Brazil, and Russia. Given that the population of India is expected to increase by more than 300 million over the next 25 years, against an increase of some 200 million predicted for China, India's population

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[3] Based on data from the United Nations Population Division's Department of Economic and Social Information and Policy Analysis, *World Population From Year 0 to Stabilization.*

will approach China's by 2025, and is expected to surpass it by 2040. Africa has the highest projected population growth rate during the next twenty-five years when its population is expected to increase from 600 million to almost 1 billion.

In addition to "natural increase" through *demographic transition* (ongoing changes in fertility and mortality rates), migration is a significant factor in determining a nation's population. In general, population growth is largely determined by natural increase in the developing nations, while international migration plays a significant role in increasing populations within the developing nations. The United States remains the world's favoured destination for immigrants, having received around 6 million since 1990.

According to its government China's population at the end of 1996 was 1.2 billion people meaning that almost one in every four humans on Earth live in China. In that same year the Chinese economy was the seventh largest in the world. Some analysts predict that it will outperform the United States to become the largest economy by 2010.[5] Incomes in China have doubled since Deng Xiaoping introduced market reforms in 1979 and, in the period since, the environmental effects have been devastating. Americans today have more of an impact on the environment as a result of simply living their daily lives than have any other society in history. As more of the world's population tries to emulate the Western pattern of consumption the prospect of environmental nemesis becomes more real. If the emerging economic success of China alone was translated into the same level of hyper-consumption 'enjoyed' by typical Americans today, ecological collapse would be all but guaranteed.[6]

Five of the world's ten most polluted cities are in China. Sixty to ninety per cent of the rainfalls in the southern province of Guangdong at the centre of China's economic boom, are acid rain. Since almost all of China's petrol is leaded and around 80 per cent of its coal is not "washed" before burning a huge volume and variety of poisons find their way into people's lungs and nervous system. According to the World Bank water and air pollution are killing more than two million people each year. Lung disease accounts for one in every four deaths among the Chinese. Together with soil erosion, suburban sprawl claimed thirty-five million hectares of farmland between 1950 and 1990 (equivalent to all the total amount of farmland in Germany, France, and the United Kingdom). These losses have raised questions regarding China's ability

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[4] UNPD, (1998). A total of 8.9 billion people is thought most likely although some forecasters have predicted 12 billion by the year 2050[4]

[5] J. P. Quinlan and K. L. Stevens, *101 Trends Every Investor Should Know About the Global Economy* (Contemporary Books, Chicago, 1998)

[6] P. Kennedy, *Preparing for the 21st Century* (Random House, New York, 1993), p. 33

to feed its population in the coming years, particularly as raising incomes lead towards more meat-intensive diets.

China's new found wealth is whetting its population's appetite for more. The Chinese are flocking to swell the ranks of the rapidly growing global middle class. They want to buy cars, to refrigerate their food, to live with air conditioning, to watch television, to travel by air. Consumer demand is already causing chronic electricity shortages. The Chinese government plan to build one hundred new power stations by 2006, adding 18,000 megawatts of capacity every year. Their coal consumption is projected to double (if not triple) by 2025. This situation will not only worsen the country's own environmental problems by increasing acid rain and air pollution but it will also endanger the global population by accelerating ozone depletion and global warming.

Today few issues attract more controversy than the question of the impact of population growth on the environment and human well being. Debate revolves around two key questions: Is population growth threatening to overwhelm the Earth's capacity to sustain life? Or will human ingenuity overcome the resources shortages, environmental degradation, and other problems that come about through population growth and development? It has long been accepted rapid population and economic growth and the associated per capita increases in resource use and pollution levels, contribute directly or indirectly to many serious global environmental problems including global warming, ozone layer depletion, deforestation, exhaustion of non–renewable resources, and the loss of biodiversity. Now there is also a great deal of evidence that environmental problems are linked to the persistence of mass poverty and large-scale rural-urban migrations. We now know that the physical urban problems of air and water pollution, inadequate waste management, the lack of basic services and green areas, declining infrastructure, and poor housing conditions, relate directly to the social issues of health, crime, violence, and exclusion.

The starting point for contemporary thoughts about *sustainable society* is that aspirations of ever-increasing growth and consumption cannot be realised because to spread Western consumption levels to the rest of the world's expanding numbers is impossible. Today environmentalists argue that the concept of scarcity is rooted in the realities of a finite planet, which is ruled and limited by entropy and ecology. *Ecologism* links itself to the idea of limits to

growth because of the fundamental message it contains; that present industrial practices are "programmed to collapse by virtue of their internal logic".[7]

The infinite pursuit of material wealth through industrial expansion and economic growth is incompatible with the Earth's finite resource base. In recognising this the 1972 *Limits to Growth* report from the Club of Rome argued that if the trends in world population, industrialisation, pollution, food production, and resource use continued the planet's carrying capacity would be exceeded within one hundred years. This in turn would trigger a situation of 'overshoot and collapse' leading to 'eco-catastrophe', famines, and wars. According to the *Limits* thesis the fundamental problem, is that global growth in resource use, industrial output, population and pollution is exponential.

Those who seek to create a sustainable, environmentally sound, society generally start from the Malthusian premise founded on a fundamental commitment to the principle of *scarcity* as an insurmountable fact of life, and the consequent limits to growth imposed by a finite system. Malthus believed that populations expand just far enough to consume the resources that are available and that growth was therefore controlled primarily by the limited amount of food available. A balance between a population and food supply was maintained, he said, either through 'positive checks' such as famine, disease and violence, or by 'preventative checks' such as late marriage, moral restraint and chastity. Modern population specialists hold that the world population is now held in check through a process of *demographic transition* involving changes in levels of fertility and mortality. They point out that as countries develop, their population numbers tend to stabilise. Although many question inherent scarcity and the idea of there being limits to growth, there are others who point to crowded living conditions, shortages of food, widespread famine, exhaustion of natural resources, and life threatening pollution as evidence that while he may have been wrong in detail, the thrust of Malthus' argument remains intact. Predictions of incredibly high future populations are rightly viewed today with scepticism but it is true that there are now more people in the world than ever before and they are consuming more resources than ever before. Global consumption has expanded at an unprecedented pace over the twentieth century. Today's higher levels of consumption are undermining the environmental resource base and exacerbating human inequalities as the dynamics of the *population - economy - environment nexus* accelerate.

In what some argue is an unhappy vindication of Malthusian doctrine, overpopulation, famine, pestilence and war, continue to ravage underdeveloped countries. Here the global successes mask urgent, sometimes worsening, problems at the local or regional level. While

[7] A. Dobson, *Green Political Thought,* 2nd Edition (Routledge, London, 1995), p. 79

some countries are moving towards population stability others are still growing rapidly.[8] In Africa, Asia and Latin America this rapid population growth is fuelling urban environmental problems that threaten to overwhelm the capacity of municipal authorities to provide even basic services. These people have not shared in the economic and social progress experienced by the majority and still live in poverty. And their numbers are growing.

The future of human population growth has been determined, and is now largely being decided, in the world's less developed nations. The youthful age structure of these countries means that their absolute populations will continue to grow even when the rate of increase has declined significantly. The United Nations (UN) predicts that around another 3 billion people will be added over the next 50 years. The total world population was around 800 million at the time of Malthus. Today it is estimated that there are more people than this (about 840 million) who are chronically hungry. Although his views have been much maligned, Malthus' ideas have renewed relevance within the current sustainability debate.

Richard Douthwaite (1992) asks how we could have progressed along the path of economic growth, technical innovation and increasing efficiency for so long and yet end up with massive unemployment, wide spread poverty and the fear of economic collapse. His answer is that "economic growth has enriched the few, impoverished the many, and endangered the planet".[9] He argues that as economic growth continues it takes more and more resources to achieve additional increments of growth. The whole process, in effect, becomes progressively more inefficient.

Increasingly today people are becoming suspicious of economic totalitarianism. In *Blueprint for a Green Economy* (1989), Pearce *et al* suggest that green economics, starts from the assumption that scarcity exists, sustainability is an imperative and that economic development should be about human fulfilment, involving all round development, not just material growth. Conventional economic growth, they argue, is not the ultimate good. Economics should be redefined within a sustainable society that seeks more than the bottom line mentality. Pigou's (1920), concept of *negative external effects* looked at environmental problems from an economic point of view before they emerged as a critical societal problem. He refuted Smith's 'invisible hand' theory believing it necessary that "an authority of wider reach should intervene". Influenced by Pigou, Mishan, Daly and others have criticised traditional economies for their ignorance of environmental issues and denounced conventional economic growth policies based

[8] United Nations Population Fund (UNFPA), *The State of World Population 1995* (UNFPA, New York, 1995), p.16
[9] R. Douthwaite, *The Growth Illusion* (Council Oak Books, Oklahoma, 1992)

on easily measurable parameters such as employment levels, income levels, public debt, the exchange rate, and so on. These, they argue, make it easier to overlook and neglect other relevant, but less obvious, issues. The *Limits to Growth* theory applies thermodynamic laws to economics, after economist Georgescu-Roegen. These imply that all production that uses material and energy eventually transforms them into a more random, chaotic, or disordered, state. A contemporary exponent of this perspective, Herman Daly advocates that there is a limit to the use we can make of scarce resources. Waste, he says, is an inevitable by-product of the extraction and use of resources. Economic growth in the conventional sense is more of a problem than a solution because it damages the environment and leads to social injustice. But the idea that we need to abandon the constant craving for material wealth and redefine our notion of growth is an anathema to many. Modern environmentalists nevertheless argue for the necessity of an ecological society based on a comprehensive set of sustainable policy objectives that cover all aspects of our lives; economic, social, cultural, political, technological and environmental. Such a society will be constructed on the basis that there are ecological limits to material growth.

1

The Biosphere

Chapter 1

1.0 THE BIOSPHERE

The Age of Nations is past.
The task before us now,
if we would not perish,
is to build the earth.[1]



Figure 1.1 Earth from Space: the biosphere

[1] P. Teilhard de Chardin, *Building the Earth* (Geoffrey Chapman, London, 1965), p. 16

1.1 The biosphere and the noosphere

The term *biosphere* was coined by Jesuit priest and palaeontologist Pierre Teilhard de Chardin (1881-1955) to describe the relatively thin film of earth, water, and air which envelopes the Earth, and which is humanity's present and, as far as we are able to predict, future habitat. De Chardin used the word to help explain his idealistic conception of the universe, in which the Earth is also surrounded by a *noosphere,* or realm of mental and spiritual connections. In 1947 de Chardin described the noosphere as:

> ...nothing less than the manifestation of a particular kind of super-Brain, capable of attaining mastery over some super-sphere in the universe and in the realm of thought...Something is purposefully stirring, as in a living being. No one can deny that a network (a world network) of economic and psychic affiliations is being woven at ever-increasing speed, which envelops and constantly penetrates more deeply within each of us.[2]

He believed that the "transformative power of love", through *noogenesis* (the concentration and collective march forward of human thought), is pushing human consciousness to reach up and achieve a new level at "Omega point" and was convinced that humankind had embarked on "the greatest period of change the world has ever known".

> The ills from which we are suffering have had their seat in the very foundations of human thought. Today something is happening to the whole structure of human consciousness. A fresh kind of life is starting.[3]

Following Hegel's view of history as a process of emerging world spirit, de Chardin saw humankind as the culmination of the whole movement of matter and life. Unlike the medieval cosmology, which had located man at the static geometric centre of the universe, his worldview saw the "human phenomenon" as passionate, dynamic and ceaselessly moving, the "supremely characteristic form of the cosmic phenomenon". His famous dictum is unequivocal in this regard:

> Man is the ascending arrow of a great biological synthesis.[4]

De Chardin's monistic Christianity told the story of creation in such away as to dispense with dualisms between mind and matter, and the spiritual and the material, so that the inner spiritual nature of things evolved intimately with their material aspects. For him everything had intrinsic value regardless of its value to humans and yet his assertion presents us simultaneously with the view that we are both part of, and distinct from, the rest of nature. Within this new paradigm

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[2] P. Teilhard de Chardin, *The Future of Man* (Collins, London, 1964)
[3] Teilhard de Chardin (1965), p. 23

"Man, the finished prototype whose perfection makes everything prior to him seem like a rough sketch" is better placed to understand his title to the "sovereignty of the Universe". This view of our place in relation to nature has immense moral significance. Our values may be transformed because of it. De Chardin described the critical world events prior to the outbreak of World War II as marking "a turning point" as well as "a crisis in our understanding of progress".[5]

The *noosphere* (system of conscious minds) has evolved from the *biosphere* (material living matter) that, in turn, had evolved from the *geosphere* (non-living matter). To de Chardin human progress was primarily about constructing the noosphere, an activity that he believed would lead to progress for the whole of nature. During the latter half of the twentieth century, however, the biosphere, has been put under increasing pressure from forces of 'progress' in the form of exponential population and economic growth. It is becoming apparent that within a finite system, like the Earth's ecosystem, there are ecological limits to material growth. Our planet is now being stretched to its limits by a rampant form of materialism that continues to waste resources and pollute the Earth. More and more people are realising that the way we live modern lives is unsustainable.

1.2 A small and finite Earth

Among the most significant characteristics of the biosphere are its relative smallness, and the limited nature of the resources it has to offer. Its thickness, at less than 20 miles, is minute relative to the radius of the Earth (around 4,000 miles at the equator). The Earth, in turn, is a relatively small planet in our solar system. At its centre, the Sun has a radius of approximately 430,000 miles and an 'atmosphere' consisting of a 'chromosphere' which extends to about 6,000 miles above its surface. Our planet is around 95 million miles from the Sun.

There is no real way that the human mind can comprehend the dimensions of the universe. The Sun is just one star among a vast number (around 100 billion) existing in our galaxy, the Milky Way. And the Milky Way is only one cluster of stars floating in a vast universe consisting of 100 billion to a trillion 'known' galaxies. Light takes 2 million years to reach us from our nearest neighbouring galaxies, M33 and M31.[6]

Our solar system is around four and a half billion years old. The biosphere, the only one in the solar system, having come into existence when Earth's crust cooled allowing its gaseous components to liquefy and solidify, is much younger. It is possible that other suns have planets

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[4] *Ibid.*, p. 9
[5] *Ibid.*, p. 25
[6] J. Gribbon, *In Search of the Big Bang* (Penguin, London, 1998), p. 67

which, like ours orbit their sun at a distance, which allows them too grow biospheres around their surface but we have yet to discover one.

1.3 Fossil fuel, ozone depletion, and global warming

Limited in its volume the biosphere contains a limited stock of resources on which various species, including humans, draw in order to survive. Some of these resources are renewable, for example, timber, while others are non-renewable, for example, coal, oil, and natural gas. Any species that overdraws on its renewable resources, or exhausts its non-renewable resources condemns itself to extinction. There are three distinct components of the biosphere:[7]

- matter that has not yet come to life through acquiring an organic structure;
- living organic matter;
- matter that was once alive and still retains some organic qualities and powers.

The film that is now the biosphere once consisted entirely, like the majority of the Earth, of completely inanimate and unconscious matter. This non-organic component is massive and has provided us with an invaluable resource for the maintenance of human life. Coal is a carbon based mineral, the product of the compaction of partially decomposed plants and trees. Oil and natural gas are also ex-organic matter deriving from hydrogen and carbon. Collectively we describe these as *fossil fuels*.

The Earth has an atmosphere containing around 78 percent nitrogen and 21 percent oxygen at an average temperature of 15 °C (59 °F). Oceans cover two thirds of its surface. Contained in the oceans and air are simple chemicals like ammonia, hydrogen, methane and water which, under certain atmospheric conditions, like the build up of heat and pressure and lightening, combine to form chemical compounds such as amino acids, one of the primary constituents of single cell organisms. The material constituents of the biosphere are spatially redistributed and chemically reconfigured as a result of the interaction of these living organisms with inorganic matter. Some of these primitive organisms constitute a filter through which the radiation that is constantly bombarding the biosphere (from the Sun and elsewhere) is reduced to levels, that are not only tolerable, but also conducive to 'higher' life forms, like ourselves.

Though the biosphere is finite it is not self-sufficient. Life is created through a cosmic process whereby physical energy, in the form of radiation, is transmitted from the Sun (and to a much lesser degree from other stars) to the receptive biosphere. Among other things this energy is used by green plants to create complex substances from CO_2 and water via photosynthesis. As

long as there is no change in either the source of radiation or the filtering characteristic of the biosphere the process will continue. But our Sun, like every other in the dynamic universe is changing constantly. It is conceivable that at some point in the future that these changes will alter the amount of radiation being transmitted to the extent that the biosphere will become uninhabitable.

Such a catastrophic event should it ever happen, would be beyond our control, and (probably) beyond our ability to provide a counteractive technological response. Nevertheless our own material power is now considerable and has reached a level that could, without any external influence, render the biosphere uninhabitable. Human activity has always imposed burdens on the Earth's ecosystems but as Bookchin (1980) points out:

> The power of this society to destroy has reached a scale unprecedented in the history of humanity – and this power is being used, almost systematically, to work an insensate havoc upon the entire world of life and its material base.[8]

At the end of the twentieth century we humans can now destroy ourselves, in one of two ways. We can do it quickly through nuclear weapons, or slowly through environmental degradation. For many of my own generation our psychological and emotional lives have been defined by the constant threat of nuclear war during the 1960s, 70s and 80s. While in the post-Cold War years we may have become more optimistic that we can avoid nuclear annihilation, the threat posed by global warming, excessive population growth and other forms of environmental destruction have replaced the old fear. Environmental problems, because they are tied to population and economic growth, and technological choices that have positive as well as negative aspects, seem somehow more complex and much more difficult to solve.

The explosion of the Soviet Union's Chernobyl nuclear power plant in 1986 was arguably the most significant and destructive accident in industrial history. The fallout from the blast left the surrounding countryside uninhabitable for decades and brought death and disease to thousands of people. The fact that changing wind patterns could send most of the radiation across western Europe attracted a lot of concern and brought the environment into sharp focus. Public opinion changed and people began to take environmental issues more seriously. Chernobyl made clear the irrelevance of national borders to modern environmental problems, a theme embedded in Pigou's (1920) concept of *negative external effects* and underlined by other key developments of the 1980s. Since 1974 scientists had suspected that the stratospheric *ozone layer* a thin life-

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[7] A. Toynbee, *Mankind and Mother Earth* (Oxford University Press, London, 1976), p. 10
[8] M. Bookchin, *Toward an Ecological Society* (Black Rose Books, Montréal, 1980), p. 35

protecting layer fifteen miles above the Earth's surface which absorbs harmful ultraviolet radiation, was being damaged by man-made chemicals.

The discovery, in 1985, that there was a huge hole opening up in the layer over Antarctica caused great international concern. Satellite information has confirmed that ozone levels were also dropping ominously over the Northern Hemisphere by almost 1 percent per year in some areas. Epidemics of skin cancer and weakened immune systems are among the potential consequences of ozone layer destruction.[9] It could also results in the withering of important food crops and the deaths of animals crucial to the food chain.

When scientists finally proved that chlorofluorocarbons (CFCs), commonly used as a refrigerant, posed a clear and immediate danger to the ozone layer, thirty-one nations signed the Montreal Protocol on ozone depletion in 1987, a historic agreement, aimed at phasing out CFCs and other ozone-destroying chemicals entirely by the year 2000. Despite the mandate and the fact that the use of ozone-depleting substances has been reduced been by around 70 percent since 1987 the hole in the ozone layer above Antarctica has grown to around the size of the United States (in 1997). The reason is that with ozone depletion, as with population growth and other environmental problems such as climate change and global warming, there is a long lag time between cause and effect. Problems like these can acquire such a momentum that they cannot be halted, let alone reversed quickly. CFCs remain in the atmosphere for decades. Assuming everyone obeys the protocol, it will be the middle of the twenty-first century before atmospheric concentrations of CFCs return to the levels of the late 1970s. Meanwhile the ozone layer is still not safe and the phase out of CFCs and other ozone-destroying chemicals is far from complete. There is also evidence that a significant black market in illegal CFCs has sprung up, endangering some of the gains already made.

Global energy use, which has increased nearly 70 percent since 1971, is projected to increase at more than 2 percent annually for the next 15 years.[10] This increase will bring more energy services such as refrigeration and transportation to people but it will also raise greenhouse gas emissions about 50 percent higher than current levels unless a concerted effort takes place to increase energy efficiency and move away from today's heavy reliance on fossil fuels.[11] The low price and familiarity of fossil fuels mitigates against the switch to renewable energy sources,

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[9] The U.S. Environmental Protection Agency estimated in 1991 that some 12 million Americans would develop skin cancer over the next 50 years.

[10] International Energy Agency, *World Energy Outlook, 1995* (OECD, Paris, 1995), pp. 35-9

[11] World Resource Institute (WRI), *World Resources: A Guide to the Global Environment* (Oxford University Press, New York, 1996)

such as wind, solar, geothermal, hydro, and others, but these 'clean' energy sources are nonetheless undergoing considerable expansion and technical progress.

In a paper written in 1896 the Swedish chemist Svante August Arrhenius correctly theorised that the carbon dioxide (CO_2) released when fossil fuels were burned could have a warming effect on the planet's atmosphere.[12] Like glass in a greenhouse CO_2 traps heat from the Sun that would otherwise reflect off the Earth and back into space. Arrhenius considered *global warming* a positive effect, which might produce "more equitable and better climates" but modern science has disproved this part of his theory.[13]

Scientists have shown that higher global temperatures could melt glaciers and expand oceans, causing sea levels to rise and flooding low-lying areas. The threat of global warming was clearly laid out in the UN's 1995 Intergovernmental Panel on Climate Change (IPCC), representing the authority of 2,000 scientists from around the world. The report presented a grim tale of planetary collapse if CO_2 levels continue to rise and the chances of severe climate change are increased: one-third to one-half of the world's mountain glaciers could melt, one-third of all ecosystems could be radically disrupted, sea-levels could rise by 15 to 90 centimetres by 2100, 92 million people in coastal areas would be at risk. Millions could die as malaria and other diseases spread and starvation could be widespread as agricultural areas turn into dustbowls and deserts.

Since many nations are heavily dependent on oil and coal, CO_2 levels (already the highest in 150,000 years) will continue to rise steadily well into the twenty-first century. Although scientists now almost universally believe that the *greenhouse effect* can raise global temperatures to dangerous levels in the short-to-medium term, nations continue to drag their feet on CO_2 reductions.

Millions of years of evolution have left humans capable of responding to immediate environmental threats - as when the rustling of leaves signals the approach of a predator - but we are less inclined to react to a continuous threat, particularly one which spells danger in the distant future. The more time that passes without taking sufficient action against environmental hazards like global warming and ozone depletion the more difficult it will be to change our course towards a sustainable path. In *The Naked Ape* (1967) Desmond Morris observed that humans "suffer from a strange complacency that...we are somehow above biological control"[14] and that our role as Earth's dominant species is therefore assured. This complacency as Morris

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[12] Cited in M. Hertsgaard, *Earth Odyssey: Around the World in Search of our Environmental Future* (Abacus, London, 1999), p. 10

[13] Intergovernmental Panel on Climate Change, *Climate Change 1995* (Cambridge University Press, Cambridge, 1999)

[14] D. Morris, *The Naked Ape* (McGraw Hill, New York, 1967), p. 240

pointed out flies in the face of our knowledge of the natural world. The biological essence of life involves ceaseless competition - against the elements and between and among species. In the history of life on Earth ninety nine per cent of species have been unable to survive such competition and have ended in extinction. *Homo sapiens* are among the millions of species that have survived so far against the odds. But survival is a constant struggle. Sceptics and defenders of the status quo discount environmental warnings as overwrought and unproven. They have argued that the approach of the new century has stirred up millenarian apocalyptic prophecies. And there are those who perhaps take the warnings more seriously but question the findings and predictions of scientists whose analytical tools, of necessity, contain uncertainties. But uncertainty can work both ways. We have accumulated an impressive body of knowledge about the environmental crisis but there is a lot more that we do not know. Hubert Reeves, the director of research at the French government's main science institute, the Centre National de la Recherche Scientifique warns that like the wizard's assistant who borrows the master's tricks only to make a mess and end up fleeing for his life:

> ... We are playing the sorcerer's apprentice with the planet...There are those who point to the uncertainties to argue against taking action, but this, I think, is a dangerous approach. If you smell smoke you don't wait until your house is on fire to look for the reason.[15]

When global warming begins visibly to disrupt the world's weather and ecology it seems likely that currently reluctant countries (like the United States) will become concerned enough to take action, by, for example, levying a "carbon tax", or completely phasing out the burning of fossil fuels.

1.4 The rise of the 'human empire'

In evolutionary time the rise of the "Human Empire" has been, like the origin of the Universe, instantaneous and spectacular. If the four and a half billion years of this planet's evolution were compressed into one week, then at the very beginning of the week cosmic dust and hot gases would have condensed to molten rock, which as it cooled, would become enveloped in a thin film of air, soil and water. This is the cosmological soup, we know as the biosphere but it would take two more days (around a billion years) for the first signs of life to appear. Eventually some species of the original sulphur-based single cell organisms would begin to give off oxygen and make it possible for air-breathers to develop. A number of these primary bacteria would evolve into plants and then, towards the end of the week, fish would appear.

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[15] Hertsgaard (1999), p. 14

In this compressed view, it would take another five days, for pre-humans to diverge from the great apes and thus pave the way for the arrival of the conscious human being. And all that's happened in recorded history would have taken place in the last few seconds. The twentieth century would have come and gone in a fraction of a second and, now, a full week later, in the blink of an eye, the human species would have become "masters and possessors" of nature.

The competition and conflict that have characterised the progression of life have caused the extinction of around one million species of living beings. Humans have been the most successful of all the species in mastering the other constituents, both animate and inanimate, of the biosphere. By a process of selective domestication of certain plants and animals and the destruction of many others deemed of little practical use (or through ignorance) we have substituted a form of human selection for natural selection and, in so doing, drastically reduced the number of surviving species. We must assume that, all things being equal, nature will eventually extinguish the human line. It is, therefore, in our self-interest to learn how to prevent extinction; eventually we might need such knowledge to save ourselves.

1.5 Loss of biodiversity

Life on Earth has been differentiated into a number of distinct genera and species, and each species is represented by a number of specimens. The abundance and diversity of life has been the precondition for 'the chase of the organism' in the progression of life from 'simple and weak' to 'complex and potent' organisms. This progression has at best been parasitic (animals on vegetables; humans on animals; humans on vegetables) and at worst predatory (animals on animals; animals on humans; humans on animals; humans on humans) The price of progress has been competition and disharmony. Throughout the history of life the various battles for the biosphere's resources have been waged both *between* different species and *within* species among different specimens. Humans though are the only species that fight each other to the death and commit the kind of atrocities witnessed in war.

Toynbee (1976) argues that the progression of life in the biosphere reveals itself in two ways that are hostile and contrary to one another and that this is expressed in good and evil acts. Evil and goodness are exclusively human concepts but, he argues, because we are part of the biosphere - one of the products of life's progress - our consciousness, ethics and morality are also part of its reality. De Chardin believed that "the consciousness of the Universe" resides in the human being. If we assess ascent in terms of power, the progression of life has produced an ascending series of species with humankind as the most potent. But as far as we know humans are unique in that we are the only species capable of being both good and evil. This is because,

again as far as we know, we are the only species conscious of our actions and thus able to make deliberate choices.

> Tyger! Tyger! Burning bright
> In the forests of the night,
> What immortal hand or eye
> Could frame thy fearful symmetry?

William Blake was horrified at God's creation of the tiger. But, unlike a human being, the tiger is 'innocent'. When it satisfies its hunger by killing and eating its victim it feels no remorse. But it would have been an evil act if God had created the tiger to prey on the lamb, and the human being to kill the tiger. The biosphere exists and survives through a delicate self-regulating and self-maintaining balance of animate and inanimate matter. The constituents of the biosphere are interdependent and, in this regard, we humans are no exception. Through our thought processes we might distinguish ourselves from our fellow humans, and from the rest of nature, but our human nature, including human consciousness, is located within the biosphere.[16]

Although, in 1758 the Swedish botanist, Carolus Linnaeus (1707- 1778) estimated global species to number around 9,000 we now know that this figure was wildly inaccurate. To date around 1.4 million species have been described and it is estimate that there could be up to 30 million different species, as yet unidentified. It has been suggested that we humans rely upon approximately 10 million other species for our continued survival and well being.[17] Ecosystem and species diversity serves as a vital reservoir of genetic material for the future development of agriculture, forestry, and pharmaceutical products. Around the world, for example, a large proportion (around one third) of the world's food supply relies either directly or indirectly on effective insect pollination.[18] Yet with each passing day many species are eliminated because of increasing human activities and population, including deforestation, soil and water pollution, pesticide use, urbanisation, and industrialisation.[19]

In the recent past, the level of biological diversity was the highest the world has ever seen. It has taken around three and a half billion years for this biodiversity to evolve but in one human life span we are rapidly destroying it. Whereas the natural rate of extinction is estimated at

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[16] There is no scientific evidence to suggest that humans have lived, or can ever exist, beyond the biosphere. As far as we know if our habitat could no longer support life we would suffer the same fate as other life forms by becoming extinct.

[17] M. Sagoff, 'Carrying Capacity and Ecological Economics' in *BioScience* 45 (9), (1995), p. 610-620

[18] C. O'Toole, 'Diversity of Native Bees and Agroecosystems' in J. LaSalle and I.D. Gault (eds.), *Biodiversity* (CAB International, Oxford, 1993)

[19] E. O. Wilson , *The Diversity of Life* (Harvard University Press, Cambridge, MA., 1992), p. 132

around 1 species per year, the actual rate has been estimated at around 1 species becoming extinct per hour.[20]

"Of the species living now, very few will transmit progeny to a far distant future".[21] The reasons for extinction have changed greatly since Darwin wrote *Origin of Species*. In prehistoric times, natural disasters and competition between species were the main causes. Later overexploitation and the introduction of exotic species caused further disappearances but, in more recent times, the main causes have been the destruction of habitat and pollution. Almost all of the losses are now caused by human activities, primarily through the destruction of tropical forests. Due to the 'slash and burn' policies of some developing nations these are being destroyed at a rate of 40,000 square miles per year (smoke from the forest fires in Indonesia is visible from space).[22] Other habitats – temperate forests, deserts, wetlands, and coral reefs - are also being destroyed at alarming rates, either for profit or to make room for housing, agriculture and other human activities. A 1995 study commissioned by the UN found that 25 percent of mammal and amphibian species, 11percent of birds, 20 percent of reptiles and 34 percent of fish species are threatened. Estimates suggest that we have lost 1 million species and many millions more will become extinct in the first few decades of the twenty-first century.[23] Whereas other environmental problems could conceivably be repaired in a matter of generations, the loss of biodiversity on this scale could take millions of years to correct. Some therefore argue that it is the single most important problem now facing the world.[24]

1.6 Consumption of natural resources

Consumption of the biosphere's natural resources by modern industrial economies is very high - in the range of 45 to 85 metric tons per person annually when all materials (including soil erosion, mining wastes, and other ancillary materials) are counted. It currently requires about 300 kilograms of natural resources to generate US$100 of income in the world's most advanced economies. Given the size of these economies, this volume of materials represents a truly massive scale of environmental alteration. For this reason, extending this kind of resource-

[20] R.S Kellert and E.O Wilson, *The Biophilia Hypothesis* (Island Press, Washington DC, 1993)
[21] Charles Darwin, *The Origin of Species,* sixth edition (Murray, London, 1885)
[22] S. Schwartzman, *Fires in the Amazon: An Analysis of Satellite Data, 1996-97* (Environmental Defence Fund, 1997)
[23] R. T. Watson *et al*, *Global Biodiversity Assessment* (UNEP and Cambridge University Press, Cambridge, 1995)
[24] E. O. Wilson, *Naturalist* (Island Press, Washington, DC, 1994), p. 355

intensive economic model to developing nations as is now occurring around the world is not viable in environmental terms.[25]

1.7 Deforestation

Deforestation continues to shrink and degrade world forests, with deforestation rates in most countries surveyed increasing from 1990 to 1995 despite a surge of public awareness about the loss of forests, especially in the tropics. Deforestation in the Amazon doubled from 1994 to 1995 before declining in 1996, and forest fires in both Indonesia and the Amazon took a heavy toll in 1997. The world has lost half its forests over the past 8,000 years through conversion to farms, pastures, and human settlements or commercial sites. [26] According to data from the U.S. National Aeronautics and Space Administration (NASA) from 1997, around 55 percent is caused by 'slash and burn' agriculture, while logging accounts for 20 percent, roads and infrastructure construction for 15 percent, and cattle ranching some 10 percent.[27] The main impetus for deforestation is not too many people but inequality. Land-hungry peasants migrate to the rainforests because land is not available elsewhere. In Brazil, for example, 1 percent of the landowners occupy around 40 percent of the land. So ninety percent of the farmers have to make do with 10 percent of the land.[28]

The burning of the rainforests intensifies the greenhouse effect by adding carbon to the atmosphere and by eliminating the counterbalances to the build up of greenhouse gases. Deforestation accounts for around 25 percent of all global CO_2[29] emissions and an estimated extinction rate of twenty seven thousand species every year.[30]

1.8 Food and agriculture

Although global food production is generally adequate to meet human nutritional needs, problems with distribution mean that currently global food shortages are critical, with more than 2 billion people undernourished - the largest number ever recorded.[31] In 1992 the World Health Organisation estimated that 40,000 children were dying each day from diseases involved with

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[25] WRI (1996)
[26] *Ibid*
[27] Schwartzman (1997)
[28] M. C. Eakin, *Brazil : The Once and Future Country* (St. Martins, New York, 1997), p. 106
[29] N. Myers, 'Tropical Forests: The Main Deforestation Fronts' in *Environmental Conservation* 20 (Spring 1993)
[30] Wilson (1992), p. 197
[31] World Health Organisation (WHO), *Bridging the Gaps* (WHO, Geneva, 1995)

malnutrition.[32] These problems have intensified as more people compete for a finite resource base. World food production is still rising, but several trends will make it more challenging to feed an additional 3 billion people over the next 30 years. Yields of the major grain crops are rising more slowly now than in the past, and post-harvest losses remain high. Soil degradation from erosion and poor irrigation practices continues to harm agricultural lands, jeopardising production in some regions. In general, without a transition to more resource-efficient and less toxic farming methods, it will be difficult to meet world food needs in the future without increasing agriculture's environmental burden.[33]

1.9 Water

There is no more fresh water on the planet than there was 2,000 years ago when the world population was less than 3 percent of its current size. Humanity's use of water quadrupled between 1940 and 1990. Today global water consumption is still rising rapidly, and the availability (or scarcity) of water is likely to become one of the most pressing and contentious resource issues of the twenty-first century. One third of the world's population lives in countries already experiencing some form of water stress. Some 1.3 billion people have no access to clean water. Some predict that almost 3 billion people will be severely short of water within the next 50 years.[34] Of course although supplies of land and water might not expand, more efficient use of these resources could have the practical result of expanding supply.

1.10 The future of the biosphere and ecosystems

These trends paint a troubling picture of the future of the biosphere. Accumulating environmental harm ultimately puts at risk the ecosystems and environmental processes such as climate that form the basis of human health and wellbeing. Yet, since they differ greatly in terms of scale, effect, and the time frame in which they operate, environmental trends are not always easy to interpret and establishing priorities for action requires care. There are differences in the nature of the response needed to address the local and immediate threats of deforestation and the global-scale, long-acting threats such as climate change. We can, however draw some important conclusions from the trends sketched above:

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[32] World Health Organization (WHO), *Our Planet, Our Health: Report of the WHO Commission on Health and Environment* (WHO, Geneva, 1992)
[33] WRI (1996)
[34] R. Engelman and P. LeRoy, *Sustaining Water: Population and the Future of Renewable Water Supplies* (Population Action International, Washington, DC, 1993)

- Changes to natural ecosystems and the biosphere are occurring on a larger scale than ever before, involving entire landscapes. Such large-scale landscape changes - through deforestation, expansion of agricultural land, and urban and suburban growth - is likely to dictate the physical condition and extent of terrestrial ecosystems in the coming decades. The progressive fragmentation of the world's remaining forests; build up in coastal areas; and the sprawl of cities, suburbs, and attendant roads and infrastructure over once-rural areas will do much to degrade the habitat and watershed values of these areas.
- The scale of these changes, as well as the increasing intensity of industrial and agricultural processes, are inducing changes in the global systems and cycles - such as the atmosphere and the nitrogen cycle - that underpin the functioning of ecosystems and the life-giving qualities of the biosphere. These changes in what are called the "global commons" represent long-term environmental threats of a profound and far-reaching nature. Global warming from the build up of greenhouse gases is the best-known example, with the potential for large-scale disruption of natural ecosystems, agriculture, and human settlements due to changes in rainfall and temperature patterns and rising sea levels (the recent flooding in Mozambique is a tragic example). Disruption of the global nitrogen cycle through extensive use of fertilisers, the burning of fossil fuels, and other activities also has the potential to change the structure and composition of terrestrial and aquatic ecosystems.
- Threats to biodiversity from all sources are quickly reaching a critical level that may precipitate widespread changes in the number and distribution of species, as well as the functioning of ecosystems. Current extinction rates are 100 to 1,000 times higher than pre-human levels, and projected losses of habitat from land conversion, as well as increasing competition from non-native species, will probably push this rate higher still.

1.11 The high frontier?

Boulding, in describing *The Economics of the Coming Spaceship Earth* (1973), suggests that we are in the middle of a long process in which our self-image and our idea of our environment is slowly changing. Primitive humans and those in early civilisations imagined themselves to be living on a virtually infinite plane. There was always somewhere beyond the known limits of human habitation and for most of human history there has existed the notion of the 'frontier' as a place to go when things got too difficult at home (either through environmental or social problems).[35]

[35] K.E. Boulding, 'The Economics of the Coming Spaceship Earth', in H. E. Daly (ed.), *Toward a Steady-State Economy* (W. E. Freeman and Company, San Francisco, 1973), pp. 121-32

Boulding presents the image of the frontier as one of the oldest of mankind's history and one that we find difficult to shake off. Throughout the twentieth century there have been those who have considered the possibility of life beyond the Earth's boundary (for example, Tsiolkovsky 1923, Bernal, 1929; Dyson, 1971; Bond, 1973; and O'Neill, 1977). In the context of the recent discourse on sustainability and on the limits of the Earth's carrying capacity, ideas on the feasibility of exploring the *high frontier* in space have re-emerged. A recent analysis conducted in Canada reviewed the concept of carrying capacity and demonstrated that, based on the consumption rates of the Canadian population, the area of productive land needed to maintain the world population is three times the current capacity of our planet.

> The implication is that it would require an additional Earth or two with existing technology to provide for the present world population at Canada's ecological standard of living.[36]

When we consider that the UN Population Division does not forecast a levelling off of the global population until it reaches 12 billion sometime in the in the twenty-second century then our need for more resource rich planets is more acute.[37] But when we think that the nearest potential biosphere to our own may be hundreds of millions of light-years away, the idea that we might discover one such planet (let alone four), transport people there and then efficiently mine its resources is unthinkable. And yet there are those who refuse to give up on the possibility.

The Moon, our nearest satellite is relatively close at 'only' 250, 000 miles away but it took the huge and magnificent scientific, technological and social effort of thousands of people to land a few men the Moon. Even if it had proved to be rich in resources, the mining of them would have been economically prohibitive. Because the physical structure of the human body is designed for the gravitational pull of Earth's mass and the specific pressure of its air, and we need food in the form of organic substances the long-term colonisation of the Moon by humans is not practical. In fact the Moon is not habitable for any form of life. Its inanimate matter, which could be a resource would have to be mined in extremely inhospitable conditions and then transported back to Earth. Although the Moon and the other planets in our solar system are unsuitable for inhabitants of our biosphere it is possible that other suns in other galaxies, have other planets that would be able to sustain our kind of life.

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[36] W. E. Rees, 'Ecological Footprints and Appropriated Carrying Capacity: What Urban Economics Leaves Out', in *Environment and Urbanization* 4, no. 2 (October 1992), p. 129
[37] UNPD (1998)

J. Desmond Bernal was a scientific polymath who believed that nature needed to be "attacked from many and unexpected sides".[38] In *The World, the Flesh and the Devil* (1929) he wrote about the colonisation of space and the restoration of Earth to a more natural state. He saw humanity's emancipation from the Earth arising from a self-directed evolution, where the majority of people would live in man-made globes (initially hollowed out asteroids), 10 miles in diameter containing around 25, 000 people, which would orbit the Sun, living off its wasted solar energy.

Early twentieth century science-fiction writers had anticipated Bernal's visions, notably the Russian Konstantin Tsiolkovsky (1903) who, in *Nauchnoe Obozrenie* described the probing of space by liquid-fuelled jet devices. By 1920 he had outlined the construction of a large manned space station which would rotate to create artificial gravity by centrifugal force and within which undiluted sunlight would be harnessed for factory processes, including the growing of plants for food.[39] Tsiolkovsky's ideas influenced the novelist Alexsei Tolstoy's *Aelita* (1923) which placed a Red Army man on Mars to bring about a revolution against a decadent society there.

Freeman Dyson, is best known for his idea of building an artificial biosphere around the Sun. Expanding on Bernal's 'solar' theme the proposal for the *Dyson Sphere* consisted of a large number of artificial space cities each pursuing an independent orbit around the parent star. Together they would exploit virtually all of the Sun's available radiant energy. In one sense construction on the sphere has already begun with the launching of artificial satellites and space probes powered by in-built solar collecting panels. As for a habitable Dyson Sphere, his own view was that it would not begin with a big architectural design but would evolve by a slow accretion. He said,

> We will go into space, as I hope, in large or small groups in different kinds of structures. Some of us will colonise asteroids, some of us will colonise planets, some of us may colonise comets. And so we will gradually distribute ourselves in more and more places...One has to envisage some kinds of traffic laws – streaming of artificial space cities with orbits co-ordinated so they don't bump into each other.[40]

In the early 1970s a group of scientists and engineers led by Alan Bond of the British Interplanetary Society completed a five year research project aimed at designing a craft they called *Daedalus*,[41] 'populated' by computers and robots, which would journey beyond our Solar

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[38] More specifically he was the founder of X-ray crystallography. Bernal also made the first X-ray analyses of biochemical crystals and viruses opening the road to the advent of molecular biology.
[39] K.E. Tsiolkovsky, 'Beyond the Atmosphere: A 1923 Essay', *Spaceflight*, 9 (1967), p 9-11
[40] Freeman Dyson cited in N. Calder (ed.), *Spaceships of the Mind* (BBC, London, 1978), p. 22
[41] J.B.S. Haldane wrote *Daedalus, or Science and the Future* (1923), one of a commissioned series of eighty-six volumes which exhaled such scientific optimism that Betrand Russell countered it with *Icarus, or the Future of Science* (1925). In Greek mythology Icarus, the offspring of Daedalus, in escaping from

System travelling at speeds of up to 24,000 miles per second, to visit the planets of nearby stars. Launched by thermonuclear explosions produced by compressing and heating pellets of heavy hydrogen (deuterium) and light helium (helium-3) Daedalus, was viewed as a prototype of a craft which one day contain human travellers. It was to be a structure comparable in size and mass with an ocean liner – 600 feet long and 54, 000 tons – but looking "more like a Byzantine Church". Most of the bulk was to consist of the pellets of thermonuclear fuel and the payload of around 400 tons (plus the energy expended in dispatching it) would be the equivalent of four years' production of energy by the entire human population in 1970.

In 1977 in *The High Frontier* Gerard O'Neill proposed a concept for hollow spinning space settlement called *Bernal Sphere* inside which 50,000 people would live with their feet pointing outwards away from the axis. Looking up in this inverted world they would see the roofs of the houses on other side of the settlement some 1,600 feet overhead. A system of mirrors would guide sunlight in past cosmic ray shields causing it to fall with suitable intensity on the living areas. The darkness of night was to be simulated by adjusting the mirrors. O'Neill used fictional letters written by an imaginary inhabitant to describe life in a comparatively modest settlement to be built for the early stages of manufacturing in space:

> We live in Bernal Alpha, a sphere about five hundred metres in diameter, with a circumference inside its 'equator' of nearly a mile...Our apartment is about the same size as our old house on Earth and it has a garden...Ballet in 1/10 gravity is beautiful to watch: dreamlike and very graceful... There are almost as many different kinds of local government as there are national styles within the colonies: ours happens to be a town-meeting style...fresh vegetable and fruit are in season all the time.[42]

O'Neill, whose work was heavily influenced by science fiction, was the first scientist to suggest that space settlements were a feasible project for his own generation and then try to describe engineering methods for their construction but not the first to propose building habitats in space. One of the twentieth century's chief exponents of science fiction, Ray Bradbury, presented the imperative for space colonisation in an interview in 1978:

> ...Don't let us forget this: that the Earth can die, explode, the Sun can go out, will go out. And if the Sun dies, if the Earth dies, if our race dies, then so will everything die that we have done up to that moment. Homer will die, Michelangelo will die, Galileo, Leonardo, Shakespeare, Einstein will die, all those will die who are not dead because we are alive, we are thinking of them, we are carrying them with us. And then every single thing, every memory, will hurtle into the void with us. So let us save them, let us save ourselves. Let us prepare ourselves to escape, to continue life and rebuild our cities on other planets: we shall not be long of this Earth: And if we really fear the darkness, if we really

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Crete flew so high that the Sun melted the wax with which his wings were fastened to his body. Although Russell agreed that 'science offers the possibility of far greater well-being for the human race than it has ever known before', he insisted that this could only be brought about by the even distribution of ultimate power, the abolition of war, and the limitation of population growth (Armytage, 1968).

[42] G. O'Neill, *The High Frontier: Human Colonies in Space* (Corgi, London, 1977)

> fight against it, then, for the good of all, let us take our rockets, let us get well used to the great cold and heat, the no water, the no oxygen.[43]

But even if we could find a habitable planet it seems unlikely that we could ever reach it. If either the *Bernal Sphere*, or the *Dyson Sphere*, or *Daedalus* could be built, the distances are so great, that generations would need to survive the physical and psychological harshness of space, over a period of many decades or centuries. They would need to be stocked with so much air, food, and water to keep them alive on their long journey that it is doubtful that they could escape the Earth's gravitational pull, let alone be propelled through space. Even if it were possible, for those who survived the trip and finally arrived on another planet, in another biosphere, there would be no assurance that they would find air to breathe, water to drink and food to eat, nor a favourable gravitational pull, and a suitable pressure of air, that would make life bearable.

Since it seems improbable that although they may exist we can ever reach or colonise other biospheres, we must conclude that our present one is the only physical habitat we are likely to have and therefore we need to concentrate our thoughts and efforts on its continued habitability. We need to consider its past, forecast its future prospects and do everything in our power to maintain its life giving qualities until these qualities are diminished by cosmic forces outwith our control.

Boulding described how it was that a few ancient Greeks perceived that the Earth was a sphere but it took the circumnavigation and geographical explorations of the fifteenth and sixteenth centuries for the fact to be widely known and accepted. Similarly he argues that we are far from making the moral, political and psychological adjustments implied in the idea that the Earth is not an infinite plane but a "closed sphere of human activity".[44]

1.12 The turning point

We can no longer underestimate our social or technological achievements, or our ability to destroy the biosphere. Although we share the same Earth with millions of different kinds of living creatures, we also inhabit a world to which no other species has access. Consciousness and the development of language and technology have assured us our unique position in the web of life.

It may be, as Toynbee (1976) suggests, that we became social animals in the act of shifting our habitat from the security of the trees to the relative danger of the open plains, where safety in numbers may have increased our chances of survival. Certainly our social evolution would have

[43] Ray Bradbury cited in Calder (1978), p. 141

prefigured the development of language. Our ability to communicate symbolically through language, and to inhabit a shared virtual world full of abstractions, stories and memories, separates us from other species. Terence Deacon (1997) suggests that this divergence can be traced to events that took place within the last two million years. In discussing the evolution of language Deacon suggests that the idea of progress in evolution is clouded by seeing the world in terms of some grand *design* and reflects an over attachment to the model of technological progress in Western societies. Technological change has been a cumulative process of adding "more and more titbits of know-how to the growing mass of devices, practices, and records" on a regular basis.[45]

Biological evolution is not additive. Although we humans are at the upper limit of species' body and brain sizes this is not because new organs have been added, but rather existing ones have been modified and enlarged. Evolution involves an increasing diversification and distribution. Like entropy, it is about spreading out to whatever possibilities, or niches, are unoccupied and within reach of a little more variation. This diversification happens in all directions but there are more options available in some directions than in others. Like the Arctic fish with anti-freeze in its blood or the electric eel that uses electricity to sense its way through the muddy Amazonian water, the human evolutionary direction is toward niches where doing a lot of information processing is an efficient way of passing on our genes.[46]

We humans are also unique in the sense that we are the only species we know of that has acquired the power to destroy the biosphere and annihilate ourselves. In the two hundred and fifty years since the outbreak of the Industrial Revolution the systematic pursuit of scientific research and its application in the advancement of technology, and our ability to harness latent physical energy from the Earth's natural resources have been responsible for a significant increase in our power to affect the biosphere. We now stand at a *turning point* in the long history of the biosphere, and the relatively shorter history of humankind.

The biosphere has existed thus far as a life giving entity because of a self-regulating association of mutually interdependent components. Historically the biosphere was the most potent force on Earth and no single component, until now, has ever been powerful enough to disturb its equilibrium. Pre-human species of life that went against this balance (through incompetence or aggression) became extinct long before they came anywhere near to threatening the rhythm on which the life of all other species depended. But collectively the human species is

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[44] K.E. Boulding, in Daly, (1973), pp. 121-32
[45] T. Deacon, *The Symbolic Species* (Penguin, London, 1997), p. 29
[46] *Ibid*, p. 30

now more powerful than the biosphere. Consciousness, language and technology have provided human beings with an armoury of self-defence to be deployed against the liquidating threat of a nature "red in tooth and claw". They have, at the same time, offered us the ability to make choices. We can survive until we have completely destroyed the biosphere although if this is the path we choose we cannot escape its nemesis. We will be destroying ourselves and most probably denying the future possibility of any form of life on Earth.

In the biosphere we are sentient beings in a world that is material and finite. On the physical plane of our modern existence our aim has been to master the non-human world. In this regard we have been highly successful, although it may prove to be a hollow success. But there is another world that we humans occupy that is non-material and infinite, and where our aim is not to take possession of nature but to take spiritual possession of ourselves. Living simultaneously as we do in the physical world of biosphere and the spiritual world of the noosphere we are amphibious' creatures whose allegiance is divided between two realms with different objectives. If the aims prove to be mutually exclusive, and we can only, in Heidegger's terminology, "live authentically" by given primacy to one of them, which of the two alternatives is to be chosen?

Passmore's (1980) reading of the Old Testament suggests that everything exists to serve humanity. The Book of Genesis, issues the classic and unambiguous directive to humans to be fruitful, multiply, subdue the Earth, and rule over "the fish of the sea and the birds of the air...and over all the creatures that move along the ground" (Genesis 1:24). But the conflicting objective in the realm of the spirit is just as clearly stated in the New Testament book of Mark when Jesus proclaims the imperative of self-denial and asks what is to gained if we possess the whole world yet lose our own soul? (Mark 8: 34-7). Jesus was predicting his own death in the midst of an "adulterous and sinful generation" but he was also describing the essence of humanity as an awareness of the spiritual realm that lies behind the physical world. If we lose our soul we stop being human.

The spirit of the New Testament was expressed by the sixth century Chinese philosopher, Lao-Tzu, in the *Tao-Tê-Ching.* Lao-Tzu presented a view of the Universe as having an ultimate wholeness. The Tao ('the Way') was the reality underlying surface appearance, which was ceaselessly moving, expanding and contracting. What appeared to be opposites were (like male and female, Heaven and Earth, cold and hot) simply different facets of the same thing, as in *ying* and *yang,* that needed to be in balance.[47] According to this perspective our social and technological achievements are a trap:

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[47]D. Pepper, *Modern Environmentalism* (Routledge, London and New York, 1996), p. 23

The more sharp weapons there are,
The more benighted will the land grow.
The more cunning craftsmen there are,
The more pernicious contrivances will be invented.
The more laws are promulgated,
The more thieves and bandits there will be.[48]

Lao-Tzu's *Tao-Tê-Ching* constitutes perhaps the first great rebellion of thought against the civilised order. It saw in a pre-civilised world a realm of the self and the community that had escaped the "system of domination".[49] Clark (1993) has described the book as the original Utopia of Freedom, "the most dialectical and poetic of all the classics of world literature". It depicts and Empire in which all sentient beings are allowed to follow their *Tao* or 'natural' course of development and results in a world in which society is in harmony with the rest of nature. The Taoist Utopia is to be achieved through an "ontology of unity-in-difference" that rejects the hierarchies of Civilisation (reason over desire, form over substance, soul over body, male over female, adult over child, humanity over nature, civilised man over primitive man) and replaces these with a form of unity-in-diversity in which self-realisation is paramount.[50]

1.13 Council of perfection?

The debate over which of the antithetical positions to adopt, has probably been implicit throughout the history of humanity but it was explicit in India during Buddha's generation around 500 BC and in the West in the generation of St. Francis of Assisi during the thirteenth century.[51] Toynbee (1976) describes how the choice for our generation has become one that society as a whole must make.

The 'cyberspace revolution' has created a new economy via advances in telecommunications, the Internet and the World Wide Web. This is currently generating new wealth that, in turn, is financing a new wave of materialism, thanks to the ongoing process of production and consumption. Paradoxically the noosphere may be in danger of authoring the nemesis of the biosphere.[52] Architect and visionary Paolo Soleri (1996), founder and designer of Arcosanti, warns that there is a potentially dark side to cyberspace in which "Homo Carbonis might be engaged in self-extinction via the Homo Siliconis he is inventing".[53] He sees that there is a

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[48] Lao-Tzu, *Tao-Tê-Ching* , Ch. 57, in A. Waley (trans.), *The Way and its Power* (Allen and Unwin, London, 1934), p. 211
[49] J. Clark, 'Utopian Dreams and Nightmares', in L. Sekelj (ed.), *Anarchism: Community and Utopia* (Filosoficky ústav, Prague, 1993), p. 16
[50] *Ibid*, p. 19
[51] Toynbee (1976), p. 19
[52] P. Soleri, 'Six Paradoxes of the Silicon Cyberspace Revolution', (Cosanti Foundation, Scottsdale, 1996)
[53] *Ibid*

danger in putting all our passion and creativity into cyberspace if we "turn our back the real world, where your body must live in the coming millennium".[54] In an age in which the Earth's ecological limits are being stretched by patterns of production and consumption that assume a limitless supply of cheap resources, Soleri argues that new meanings need to be assigned to the concepts of 'development' and 'progress'. He also suggests that certain core objectives, which have hitherto appeared to give structure and meaning to our lives and society, need to change. Instead of looking for "more" we need to search for "better", to seek out quality, instead of quantity. At Arcosanti he promotes the idea that what we need is a lean alternative.

Our generation's mastery over the biosphere now threatens to defeat our objectives in both the physical realm and the spiritual world by destroying our habitat and along with it the potential for life on Earth. Francesco Bernardone was the thirteenth century saint who gave up his lucrative family business to follow a spiritual path and a life of asceticism and frugality. But since the Industrial Revolution our modern society has relentlessly pursued the objectives set out in the Book of Genesis. As long as we continue to hold to the maxim that 'greed is good', and that, for economic necessity, "fair is foul and foul is fair"[55] our current plight will continue. If we choose to try to turn things around there are many fundamental questions that will need to be asked, for example: Can society direct itself towards a more sustainable way of life? And can we undergo a collective change of heart towards a more frugal and spiritual existence of the sort preached and practised by people like St. Francis, and which until now have been regarded as utopian councils of perfection? If we cannot it seems our ecological nemesis is assured. Teilhard de Chardin, who has had a major influence on Paolo Soleri's *arcology theory,* understood that ultimately the nature of the problem is such that it can only be intellectualised up to a point.

> We hold the Earth's future in our hands. What shall we decide? A common body of knowledge brings together nothing but the geometrical point of intelligences. A common aspiration, no matter how ardent, can only touch individuals indirectly and in an impersonal way that is depersonalizing in itself. It is not a *tête-à-tête* or a *corps-à-corps* that we need; it is a heart-to-heart. This being so, the more I consider the fundamental question of the future of the Earth, the more it appears to me that the generative principle of its unification is finally to be sought, not in the sole contemplation of a single Truth or in the desire for a single Thing, but in the common attraction exercised by a single *Being.* [emphasis in original] [56]

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[54] P. Soleri, cited in L. Miller, 'A city where the Net meets the future', *USA Today* (22 September 1999)
[55] Lord Keynes, 1930, cited in E. Schumacher, *Small is Beautiful: A Study of Economics As If People Mattered* (Sphere Books, London, 1973, p. 19
[56] P. Teilhard de Chardin 'Thoughts on Progress', extracts from a lecture given at the embassy in Peking, 30 March 1941. Translation first published in *The Future of Man* (London, Collins, 1964)

2

Limits to Growth

Chapter 2

2.0 LIMITS TO GROWTH

Since we are moving towards 10 billion people we had better think of what that might mean to a culture based on the private home, and the American Dream. We find that this is a catastrophe.[2]

We are convinced that realisation of the quantitative restraints of the world environment and of the tragic consequences of an overshoot is essential to the initiation of new forms of thinking that will lead to a fundamental revision of human behaviour and, by implication, of the entire fabric of present day society.[3]



Figure 2 .1 People, pollution and waste

[2] D. S. Mayne (ed.), *Soleri's Cities: Architecture for the Planet Earth and Beyond* (Public Media Incorporated, Home Vision Video Production, 1993)

2.1 Scarcity and desire in a finite system

The principle of *carrying capacity* establishes that there are limits to population, economic and technological growth. This is premised on the fact that, within a *finite system*, *scarcity* is a fact of life. In *The Adventurer* (1753), discussing "the plenty and ease of a great city", Samuel Johnson (1708-84) recounts Socrates' walk through the streets of Athens and raises the question that many others have asked in the centuries that followed.

> As Socrates was passing through the fair at Athens, and casting his eyes over the shops and customers, 'how many things are here', says he, 'that I do not want![3]

Johnson, like Adam Smith twenty years later, 'sensibly' answers the question in favour of a civilised society, in which the poorest citizen can be better provided for than "many an African king, the absolute master of the lives and liberties of ten thousand naked savages".[4] This moved against the then fashionable idea presented by Jean-Jacques Rousseau (1712-78) that civilisation is a fall from nature, and that expansion of human desire is a loss not a gain, since it removes the possibility of satisfaction. In *On the Origin of Inequality Among Men* (1754) Rousseau expanded his idea and went on to attack the whole fabric of civilisation as a monstrous distortion of nature. In so doing he established a precedent for many revolutionary ideas that followed and set down some of the Romantic roots of modern green thinking. Uncorrupted by the complications of civilised life and within a 'new social contract', 'natural man' could be 'free' to develop a renewed love of nature – of mountains, deserts, woods, lochs, the sea, and the solitude in which to rediscover his own inner life undisturbed by human society.

One of the starting points for contemporary thoughts about the ecological society is that aspirations of ever-increasing growth and consumption cannot be fulfilled. This is because as, Irvine and Ponton (1988) have pointed out, "to spread such [American] consumption levels to the rest of the world's expanding numbers would require over 130 times the world output of 1979".[5] They argue that the concept of scarcity is rooted in the biophysical realities of a finite planet, ruled and limited by entropy and ecology.[6] Dobson (1995) argues that radical green thinking rightly links itself to the idea of *limits to growth* because of the fundamental message it contains; that present industrial practices are "programmed to collapse by virtue of their internal

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[2] D. H. Meadows *et all*, *The Limits to Growth* (Earth Island, London, 1974), p. 190
[3] Dr. S. Johnson, 'The Plenty and Ease of a Great City', in *The Adventurer,* No. 67 (26 June, 1753) cited in A. Clayre (ed.), *Nature and Industrialization* (Oxford University Press, Oxford, 1977), pp. 3-7
[4] A. Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations,* E. Cannan (ed.) (Methuan, 1904)
[5] S. Irvine and A. Ponton, *A Green Manifesto: Policies for a Green Future* (Macdonald Optima, London, 1988), pp. 24-5

logic".[7] Buttressed by this 'scientific' element, the green position moves beyond Rousseau's 'noble savage' and the Romantic response to the challenges of industrial society. It recognises that the pursuit of wealth through industrial expansion and economic growth is ultimately incompatible with the Earth's finite resource base. Central to this approach is the view that the Earth's resources should be used as capital rather than as income, otherwise humankind is merely consuming what rightly belongs to future generations.[8] This, in turn, involves the concept of "right livelihood", wherein consumption is based on human need rather than human greed.[9]

2.2 The *Limits to Growth* thesis

The 1960s and 1970s were marked by an intensification of concern about pollution and an awareness that environmental problems arise within the context of a complex interrelationship between humans, their resource base, and the social and physical environments.[10] Consequentially questions about the objectives and strategies of conventional growth policies were brought to the forefront of public debate.

Initially this was followed by a call for zero-growth economic strategies inspired by nineteenth-century liberal philosopher John Stuart Mill, who proposed the idea of the 'stationary state' as a counterpoint to the relentless selfish and competitive drives at the heart of capitalism.[11] Mill's critique of the capitalist system, anticipating green sentiments, was argued in terms of its effects on nature and the alienation of humans from the natural world.

> Stretch a bow to the very full,
> And you will wish that you had stopped in time.[12]

An important modern inspiration for the zero-growth argument was the 1972 publication of the Club of Rome (the name given to an 'invisible college' of scientists, researchers, industrialists who conducted the research) report, *The Limits to Growth*, outlining the

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[6] *Ibid*
[7] A. Dobson, *Green Political Thought* 2nd Edition (Routledge, London & New York, 1995), p. 79
[8] E. F. Schumacher, *Small is Beautiful: A Study of Economics As If People Mattered* (Abacus, London, 1973), p. 12-14
[9] D. Richardson, 'The politics of sustainable development', in Baker *et al* (eds.) *The Politics of Sustainable Development* (Routledge, London and New York, 1997), p. 45
[10] R. K. Turner, *Sustainable Environmental Management: Principles and Practice* (Belhaven, London, 1988)
[11] H. E. Daly, "The Steady-state Economy: What, Why, and How" in Pirages (ed.) *The Sustainable Society* (Praeger, New York, 1977)
[12] Lao-Tzu, 'Tao-Tê-Ching' in A. Waley's translation of *The Way and its Power* (Allen and Unwin, London, 1934), p. 152

"predicament of mankind".[13] In neo-Malthusian fashion the report argued that if present growth trends in world population, industrialisation, pollution, food production, and resource use continued, then the planet's carrying capacity would be exceeded within a hundred years, bringing about a disastrous 'overshoot and collapse' leading to 'eco-catastrophe', famines, and wars. The researchers created a computerised world model of the variables associated with the concern, i.e. industrial output per capita, population, food per capita, resources and pollution; and programmed the computer to output images of various scenarios given changes in the variables. Anticipating future criticisms of inaccuracy and incompleteness the report admitted that the model was "imperfect, oversimplified, and unfinished".[14] Several scenarios were developed feeding different assumptions into the model, each time the world model adapted to respond to the immediate cause of the previous collapse:

- *Business as usual* - the first computer run assumed there to be "no major change in the physical, economic, or social relationships that have historically governed the development of the world system". In this case the limits to growth were reached "because of non-renewable resource depletion".[15]
- *Doubling the amount of resources economically available* – although the resource depletion problem was 'solved', collapse occurred again because of excessive pollution brought about by the rapid industrialisation that resulted from the availability of new resources. Here the group concluded "the economic impetus that such resource availability provides must be accompanied by curbs on pollution if a collapse of the world system is to be avoided" .[16]
- *Technological strategies* – the next run involved not only a doubling of resources but also a series of technological strategies to reduce the levels of pollution to one-quarter of its pre-1970 level. This time the limits to growth are reached because of a food shortage produced by the pressure on arable land overtaken for "urban-industrial use". [17]

The model was progressed by developing technological responses in all areas of concern. Eventually they were all filled in:

> The model system is producing nuclear power, recycling resources, and mining the most remote-reserves; withholding as many pollutants as possible; pushing yields from the land to undreamed-of heights; and producing only children who are actively wanted by their parents.[18]

But even this does not solve the problem of overshoot and collapse:

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[13] Meadows *et al.* (1974)
[14] *Ibid,* p. 21
[15] *Ibid*, p. 124-125
[16] *Ibid*, p. 133
[17] *Ibid*, p. 136-137

> The result is still an end to growth before the year 2100. In this case growth is stopped by three simultaneous crises. Overuse of land leads to erosion and food production drops. Resources are severely depleted by a prosperous world population (but not as prosperous as the present [1970] US population). Pollution rises, drops then rises again dramatically, causing a further decrease in food production and a sudden rise in the death rate.[19]

The fundamental problem according to the *Limits* thesis, is that global growth in resource use, industrial output, population and pollution is exponential. The report explained that "A quantity exhibits *exponential* growth when it increases by a constant percentage of the whole in a constant time period".[20] This kind of growth (like Davis's attenuated 'S' curve for urbanisation [3.1.2]), displays a gentle and gradual curve for a long time but then rapidly shoots up in a very short period. Translated to the arena of industrial production, resource depletion, and pollution, what seems an innocuous rate of use and waste disposal can quickly result in dangerously low levels of available resources and dangerously high levels of pollution.

Environmentalists have pointed to the rapid growth in industrial production during the twentieth century and asked whether this can be sustained. A similar question is being asked of the current process of urbanisation and urban sprawl. The *Limits* report refers to a relevant French riddle for school children, which states:

> Suppose you own a pond on which a water lily is growing. The lily plant doubles in size each day. If the lily were allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. For a long time the lily plants seems small, and so you decide not to worry about cutting it back until it covers half the pond. On what day will that be? On the twenty-ninth day, of course. You have one day to save your pond.[21]

2.3 Population growth limits

The roots of the modern limits to growth argument lie with the economist Thomas Robert Malthus (1766-1834). Malthus's main contribution to human thought lies in his attempt to be specific and mathematical about the dilemma of population expansion. What were unprecedented in his argument were "the ironclad ratios and his warnings of impending national apocalypse".[22] His principle states that there is a tendency for populations to increase at a geometric rate whilst food supply can only increase at an arithmetic rate. He said that human population:

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[18] *Ibid,* p. 141
[19] Meadows *et al* (1974), p. 141.
[20] *Ibid,* p. 27
[21] *Ibid,* p. 29
[22] D. Worster, *Nature's Economy: a history of ecological ideas* (Cambridge University Press, Cambridge, 1985), p. 152

> when unchecked, goes on doubling itself every twenty five years, or increases in geometrical ratio...and the food to support the increase...will by no means be obtained with the same facility. Man is necessarily confined in room when acre has been added to acre till all the fertile land is occupied, the yearly increase of food must depend on the melioration of the land already in possession. This is a fund, which, from the nature of all soils, instead of increasing must be gradually diminishing. But population, could it be supplied with food, would go on with unexhausted vigour; and the increase of one period would furnish the power of a greater increase of the next, and this without any limit.[23]

2.3.1 Principles of population

Malthus argued that a balance between a population and food supply is maintained, either through 'positive checks' such as famine, disease and violence or by 'preventative checks' such as late marriage, moral restraint and chastity. *An Essay on the Principle of Population* (1798) was written at the end of the eighteenth century and has its roots in the agricultural society of the time and the Parliamentary Act facilitating the enclosure of the commons by landed nobility. In the second half of the eighteenth century England's population rose dramatically. Corn production did not, however increase in volume. This led to rising prices and, consequently starvation for a large part of the growing population. Malthus believed that this agricultural development was relevant to all sectors of society. His conclusion was based on the Law of Diminishing Returns - if there are no checks on birth rates, the human population will increase beyond the point of starvation.

His pessimism also seems to stem from contemporary accounts from travellers and explorers of an Earth, teeming with a rich variety of life. The diversity of living organisms was deemed to be so great and the numbers so abundant there developed a fear that a single species could multiply indefinitely and eventually cover the entire earth. In *Principles of Political Economy* he put forward the view that humans could theoretically fill, not only earth, but all the planets in our solar system. That this had not already happened, he reasoned, was due to populations being held in check by wars, famines, disease, and poverty, and by competition between and *within* species.

Population expansion became a key ingredient in Charles Darwin's (1809-1882) *theory of evolution*. Before Darwin, others had realised that there is competition in nature, but they had considered the struggle to be between different species competing with one another. Darwin's insight, inspired by Malthus, was to see that the struggle was actually between different individual members of the *same* species, competing for resources in the same ecological niche. On the day that he read Malthus' *Essay*, Darwin wrote in his own 'Notebook on Transmutation of Species',

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[23] T. R. Malthus, *An Essay on the Principle of Population*, seventh edition, Book I, Chapter 1 (Dent, London, 1872)

> On an average every species must have same number killed year by year with hawks, by cold, &c. – even one species of hawk decreasing in number must affect instantaneously all the rest. The final cause of all this wedging must be to sort out proper structure...there is a force like a hundred thousand wedges trying to force every kind of adapted structure into the gaps in the economy of nature, or rather forming gaps by thrusting out weaker ones.[24]

Darwin's theories started a scientific revolution and laid the foundation for evolutionary biology and ecology. He provided an insight into how certain plant and animal species have adapted over time, and how vulnerable ecosystems are. It is only during the second half of the twentieth century that we have begun to understand the importance of these relationships and their influence on the entire ecological system.

Malthus wrote his *Essay* when industrial capitalism, fuelled by science and technology, was beginning to predominate. The debate about the nature of progress and the underlying philosophical questions regarding free will and determinism was already well under way. For many his advocacy of setting limits to growth in human populations and material wealth, placed him as a pessimist among the growing ranks of technological optimists like William Godwin (1756-1836) who believed in unrelenting social progress via the reform of human institutions. Expressing the revolutionary spirit of the times, Godwin's *Enquiry Concerning the Principles of Political Justice* held that our technological skills and foresight would ensure that 'overpopulation' could never threaten progress.

Along with John Stuart Mill (1806-73), who would write about the "evil of overpopulation" in 1852[25], Malthus was one of the 'pessimistic economists' associated with turning economic thought into a 'dismal science' and became renowned for their morbid predictions regarding the future of humanity. Disputing ideas of human perfectibility Malthus predicted that the human population would grow to the point where it would impoverish itself and eventually starve. His dark predictions were the result of debate carried on at the time about whether Britain's population was increasing or decreasing and had a significant influence on economic and social policy, particularly in the first half of the nineteenth century. The political implications of his philosophy were that systems of poverty relief were ineffective, and that the poor should be responsible for themselves. A modern parallel can be seen in the critique of modernisation within dependency theory [6.5.1].

In an Enlightenment challenge to the dominant Christian beliefs of the time, Malthus placed birth control as a form of self-determination at the core of his argument. Scarcity of resources in

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[24] From 'Darwin's Notebooks on Transmutation of Species', *Bulletin of the British Museum (Natural History)* (Historical Series 2, 1960) quoted in M. White & J. Gribbon, *Darwin: A Life in Science* (Simon & Schuster, London, 1995), p. 200.

the economic process and the inability of technological developments to make more resources available were main ingredients in his predominantly negative view. His approach in this respect is static. He mistakenly assumed that advances in technology would only have a modest influence on levels of production. Of course he could not foresee the rapid advances that would result from the use of steam engines and the availability of steel and coal.

2.3.2 The population bomb?

The rapid growth of the human population has concerned critics for over two centuries. But the idea that human reproduction is ominously out of control and humans, by virtue of sheer numbers have become a massive problem that needs to be contained, has become more pronounced over the past 30 years or so. In 1965 a report was published in the scientific journal *Life* suggesting that it would take less than 1,000 years to reach the "ultimate terrestrial limit" of 60 million billion humans. These people would be jammed together so tightly that the Earth would "glow orange from the heat".[26] This scenario, horrific as it seems, appears almost benign when set against the apocalyptic vision presented in *Newsweek* a few years earlier,

> The current rate of growth, continued in 600 years, would leave every inhabitant of the world with only 1 square yard to live on. By the year 3500, the weight of human bodies on the earth's surface would equal the weight of the world itself. By the year 6000, the solid mass of humanity would be expanding outward into space at the speed of light.[27]

Appalled by such predictions, advocates of population control measures have for the last 30 years been calling for a reduction in the size of the human population; often adopting emotive terms such as; 'plague', 'blight', 'disease', 'bomb' and 'explosion' to highlight the nature of the perceived problem. The implication of some of the literature, particularly in the 1970s, was that the backward "Third World" was "teeming" with unnecessary lives and that population reduction through sterilisation programmes and contraceptive education should be enforced within the undeveloped world. Such a programme was controversially implemented in India in the 1970s, around the time that demographer Kingsley Davis was describing population growth as a "blight on history".

> In subsequent history the 20th century may be called either the century of world wars or the century of the population plague.[28]

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[25] J. S. Mill, *The Principles of Political Economy,* Book IV, Chapter 7 (1852) (Routledge, London and New York, 1968)
[26] 'Population Explosion and "Anti-Babyism"', *Life* (Vol. 58, no. 16, April 23 1965), p. 6
[27] 'How Many Babies is Too Many?', *Newsweek,* 4 (July 23 1962), p. 27
[28] K. Davis, 'The Climax of Population Growth: Past and Future Perspective', *California Medicine* (Vol. 113, no. 5, 1970) p. 33

In 1968, in *The Population Bomb*, biologist Paul Ehrlich warned that "the cancer of population growth must be cut out" or "we will breed ourselves into oblivion".[29] Around the same time a group of researchers and scientists at the Club of Rome produced a report called *The Limits to Growth* (1974) that described how humans would eventually "run out of resources".[30] The *Limits* report contained the results of a computer simulation of world economic trends showing that rapid economic and population growth would cause exponential resource decline. It attempted to demonstrate that if growth trends in world population, industrialisation, pollution, food production and resource use continued, the planet's carrying capacity would be exceeded within 100 years. The suggestion was that, because resources are deemed to be finite, when population overshoots earth's carrying capacity it collapses into starvation. This 'overshoot and collapse', according to Ehrlich, would inevitably lead to 'eco-catastrophe', famines and wars.[31] However, the report concluded, that if the signals of impending danger were heeded and behaviour altered accordingly then a stunted (sigmoid) growth curve could bring stabilisation below carrying capacity. But Worldwatch Institute president Lester Brown argues that this will not happen until we have grasped the true nature of exponential population growth:

> ... Probably not two political leaders in a hundred understand that a three- percent annual rate of population growth means a twenty-fold population increase in a century.[32]

Brown points out that if the current population growth rate were to continue for 100 years, the world's population would grow from 6 billion to almost 30 billion. The implication is that an indefinite rapid population growth would very quickly lead to a crowded world. Clearly the earth cannot continue indefinitely to sustain population growth at the current rate. Population levels lower than the current level are central to the green view of a sustainable society, although there is disagreement about what levels would actually be sustainable. Some believe the current total of 6 billion is already well beyond the earth's carrying capacity. Irvine and Ponton (1988)[33] put the level for the U.K. at around 30 million (about half of the current total). Bunyard and Morgan-Grenville (1987)[34] have suggested that Britain could sustain its current level of population, but only if we could "all first be converted to vegetarianism". Edward Goldsmith put the global

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[29] P. Ehrlich, *The Population Bomb* (Ballantine, New York, 1968)
[30] Meadows *et al.* (1974)
[31] P. Ehlrich, 'Eco-catastrophe' in *Ramparts*, 8(3), p. 24-28.
[32] L. Brown, 'Reinventing Malthus for the 21st Century: A Bicentennial Event on Malthus' Original Population Essay'. A presentation sponsored by Negative Population Growth (NPG) and The Federation for American Immigration Reform (FAIR) held at National Press Club, Washington, DC, July 14, 1997
[33] Irvine and Ponton (1988), p. 22
[34] P. Bunyard and F. Morgan-Grenville (eds.), *The Green Alternative* (Methuen, London, 1987), pp. 94-6

sustainability figure at around 3.5 billion in 1972, which means that we have, in Ehrlich's terms, a 2.5 billion 'overshoot'.[35] For many greens the reduction of material consumption is at the core of the sustainability debate, and involves issues of population reduction.[36]

Certain extreme views advanced by those on the fringes of the environmental movement have hampered attempts to get green population policies taken seriously. The Earth First! group in the United States, for example, have suggested that epidemics such as HIV/AIDS should be allowed to run their course so as to rid us of excess population. The less draconian, mainstream green view is that population control and reduction, although considered necessary, are a matter for negotiation rather than imposition. The *Green Party (EWNI) Manifesto*, for example, rejects "repressive and coercive population control measures".[37] Jonathon Porrit has similarly described coercive population control measures as "an unacceptable and morally repugnant infringement of human rights".[38] This had led to a general recognition within the green movement that reaching a sustainable population "might take hundreds of years".[39]

> …what are the kinds of restraint, and the forms of premature death, which keep the population down to the means of subsistence?[40]

In the nineteenth Malthus asked why the human population, although it was growing, was not expanding exponentially? He suggested that the answer lay in the fact that populations expand just far enough to consume the resources that are available and that growth was controlled by war, disease, and famine but primarily by the limited amount of food available.

In 1650 the world population stood at somewhere around 500 million. By the middle of the eighteenth century it had risen to almost 800 million. The bigger the population the shorter time it takes to double in size.[41] Whereas the pre-seventeenth century world population took about 35, 000 years or 1,400 generations to double, at the present rate it will double in just one generation. If current trends hold, the years to 2012 would see a total world population increase of 2 billion, which would be twice the 1980 population of China and represent the largest increase ever recorded over a 20-year period.

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[35] E. Goldsmith, *A Blueprint for Survival* (Tom Stacey, London, 1972), p. 57
[36] W. Lutz (ed.), *The Future Population of the World: What Can We Assume Today?* (Earthscan, London, 1994), p. 465
[37] Green Party, *Green Party (EWNI) Manifesto* (Green Party, London, 1994) p. 27
[38] J. Porrit, *Seeing Green: The Politics of Ecology Explained* (Basil Blackwell, London, 1984) p. 193
[39] A view expressed by the founder of the deep ecology movement, Arne Naess in his Schumacher Lecture in 1987
[40] T. R. Malthus, *An Essay on the Principle of Population*, seventh edition, Book I, Chapter 1 (Dent, London, 1872)
[41] F. Braudel, *Civilization and Capitalism15th – 18th Century*, 3 vols. Volume 1: *The Structure of Everyday Life: The Limits of the Possible*, trans., S. Reynolds (Harper & Row, New York, 1985), p. 43

2.3.3 Population and wealth

At the beginning of the eighteenth century, poverty and misery characterised an agrarian society in which the average life expectancy was low and infant and child mortality was very high. Although the impoverished circumstances didn't stop people from having lots of children – "a half-starved Highland woman frequently bears more than twenty children"[42] – few of them survived to adulthood. In *The Wealth of Nations* Adam Smith (1723–90) put forward his view of the connection between economic and population growth:

> The liberal reward of labour...as it is the effect of increasing wealth, so it is the cause of increasing population.[43]

By the time Smith had completed *Wealth of Nations* in 1776 rapid economic and population growth was well under way in Britain. By the close of the century, in the midst of the Industrial Revolution, a widespread increase in family incomes had seen circumstances improve and death rates fall dramatically. People were living longer and birth rates were up as fewer children died in infancy. Industrialisation was affecting the lives of everyone, not just the élite, and population was growing rapidly.

Before 1751 the largest percentage population increase over a ten-year period was 3 percent. But for each of the next three decades the increase was 6 percent; then between 1781 and 1791 it was 9 percent; between 1791 and 1801, 11percent; between 1801 and 1811, 14 percent; between 1811 and 1821, it reached its peak of 18 percent.[44]

In Europe as a whole, improvements in nutrition, a growing resistance to disease, and a reduction in the effects of epidemics, contributed to a population growth from 118 million in 1700 to around 140 million in 1750, and about 187 million in 1800.[45] England and Wales, with around 5 million people in the reign of Queen Anne, grew to nearly 9 million by the end of the century. France went from 18 million at the death of Louis XIV to 26 million in 1789. In Italy it rose from 11 million in 1700 to 16 million in 1770. Spain increased from 5-6 million to 11million. Russia's population grew from 18 to 27 million. In Sweden, Turkey and Poland the story of unprecedented growth, particularly in cities, was the same.[46]

A primary cause was the rapid drop in mortality rates as a result of improvements in nutrition and sanitation, and advancements in public healthcare. These trends occurred in developed

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[42] A. Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776) cited in A. Clayre, *Nature and Industrialization* (Oxford University Press, Oxford, 1983), p. 190.
[43] *Ibid*, p. 190.
[44] M. S. Anderson, *Europe in the Eighteenth Century* (Longmans, London, 1961), p. 48-49
[45] *Ibid*
[46] *Ibid*

countries in Western Europe during the late eighteenth and early nineteenth centuries. Although there are notable exceptions, these are the sort of improvements that have generally taken place in Third World countries since World War II.

2.3.4 Demographic transition

Today population specialists hold that the world is in the midst of a long period of *demographic transition,* which has its roots in late eighteenth century industrialisation. Demographic transition involves the changes in levels of fertility and mortality accompanying industrialisation which cause one form population equilibrium (a characteristic of pre-industrial societies) to be replaced by another (a characteristic of mature industrial societies). The transition is held to involve three phases:

- a pre-industrial phase, a situation in which high birth rates are balanced by high death rates, resulting in a position of rough equilibrium;
- an intermediate phase, in which death rates fall but birth rates remain high, a phase of rapid population growth;
- a concluding phase, in which birth rates fall, leading to a new equilibrium.

Improvements in public health in phase 2, followed by changes in economic and cultural orientations in phase 3, tend to lead to a reduction in preferred family size. The question arises; if this pattern of demographic change can be seen to characterise the classic historical process of industrialisation, is it likely to be repeated in newly industrialising societies, or societies undergoing modernisation?

In many transitional[47] (or developing) societies rates of population growth and levels of social disruption have been greater than in the intermediate phase in earlier European patterns of demographic transition. In some countries economic growth has proved almost impossible and population growth has not been associated with improvements in living standards. According to *dependency theory* these countries cannot repeat the experiences of their advanced counterparts because their starting point is different. Proponents of this theory argue that Europe and the United States have, in large part created the problems of Third World countries through colonialism and trade domination. Their economies have been shaped by the advanced nations' need for resources and for new markets to sell their manufactured goods. These 'developing' societies have contributed to the economic growth of Europe and the United States, but in so

[47] There is no formal definition here but the term is taken to include the successor states of the former Soviet Union and the countries of Central Europe (Albania, Bulgaria, the Czech Republic, Hungary, Poland, Romania, and the Slovak Republic)

doing have developed internal structures which make industrialisation (and economic growth) virtually impossible. It remains to be seen whether a new population equilibrium can be established under these very different circumstances.

2.3.5 The growth of the "MTV generation"

One of the world's most significant global demographic trends concerns young people in the developing nations. Half of the population in the developing world is under the age of 23, which is why many multinational corporations are targeting the young as the last big commercial frontier. According to the World Bank the global "MTV Generation" now numbers over 1.6 billion. By far the largest concentration of youths is in Asia. The desires, tastes, and spending habits of Asia's youths are crucial, not only for the long-term prospects of many multinationals like McDonalds and General Electric, but also to the ecological wellbeing of the whole planet. Today's MTV Generation are growing up in an entirely different era, and under largely different social paradigm, than did their parents and grandparents. Rebuilding war-torn nations after the destruction of World War II required a generation committed to building, one that largely valued production over consumption. But in an era of relative prosperity such as ours, children in the developing nations have become predominantly consumers, more attuned to Western goods and Western norms defining leisure time, convenience, individualism, and spending. The new generation are better educated and more willing and able to travel abroad. In China and India, the number of people aged 10 - 24 is over 300 million, a figure greater than the total population of the United States, where around 20 percent of the population are within the MTV age group. By 2050, if current trends hold, Africa will be the youngest region of the world, with twice as many children as elderly.

2.3.6 Global greying

But overall the fastest growing segment of the world's population, in both the developed and developing nations, is not the young but the old. Over the next 25 years, the age structure of world population will continue to shift, with older age groups making up an increasingly larger share of the total world population. For example, during the 1998-2025 period, the world's elderly population (ages 65 and above) will more than double while the world's youth (population under age 15) will grow by only 6percent. As a result, the world population will become progressively older into the twenty-first century.

In 1996 the median age of the world population was 26. By 2025 it is expected to have risen to 31.[48] While "global greying" is an indication of progress in medical science it also represents one of the most important challenges for societies around the world. Because of population ageing, old-age dependency ratios will rise in every major world region during the next 25 years. And the world community as a whole will face an elderly support burden nearly 50 percent larger in 2025 than in 1998.[49] Preparing for older populations has become one of the most pressing issues that confronts the world economy with Europe set to continue to be the region most affected by ageing. The Population Institute forecasts that by 2050 1 in 3 people in Europe will be over 60 years of age.

World population now at 6 billion is growing more slowly than experts predicted just a few years ago but is still expected to increase substantially before stabilising. Nearly all of this growth is expected in the developing world. The Club of Rome's *Beyond the Limits* (1992) report argues that human use of natural resources and pollution generation have surpassed rates that are "physically sustainable". Without significant reductions they have predicted an "uncontrollable decline" in food production, energy use, and industrial pollution. In their *Green Manifesto,* Irvine and Ponton (1988) clearly stated the green position on population growth and sustainability, "the only long-term way to reduce consumption is to stabilise and then reduce the numbers of consumers, The best resource policies are doomed to failure if not linked to population policy."[50] The general green view that the present population levels, let alone projected future levels, are unsustainable is still unpopular and the population reduction option remains contentious. The fact that some countries consume much more than others suggests that arguments for across the board reductions are too simplistic.

2.3.7 Life and death in the third world

> ...India's population is growing faster than the demographers can count it: 15.5 million babies born every year, or one every two seconds. That adds up to a colossal failure of the first family planning programme in the developing world.[51]

The United Nations Children's Fund (UNICEF) *Progress of Nations Report* for 1998 concluded that approximately 40 million births per year (about a third of all births) go

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[48] OECD Social Policy Studies, *Ageing in OECD Countries: A Critical Policy Challenge* 20 (OECD, October 1996)
[49] The Population Institute (TPI), *1998 World Population Overview and Outlook 1999* (TPI, December 1998)
[50] Irvine and Ponton (1988), p. 29
[51] S. Goldenberg, 'Where a baby is born every two seconds', *The Guardian* (August 14 1999), p 3

unregistered. It is hardly surprising that no one, not even the UN secretary general, can say exactly what the global population is at any particular time, let alone what it will be in the future. Demographers though can tell us, with some certainty, that somewhere in India a child is born every two seconds.[52] If it survives it will join 1 billion people in a country where half of all adults are illiterate, more than half of the children are undernourished, and more than a third of the population live below the poverty line.[53] By the time it celebrates its first birthday, another 15.5 million babies will join the 338 million children currently under the age of 15 already in the country.[54] Although generations of children have grown up with the mantra of family planning, *Hum do, hamare do* (We are two, we have two), India's population is increasing by 1.6 percent per year. China, which hit the 1 billion mark in 1980 has a growth rate of 0.9 percent. Between them they account for one third of the world's population. By the year 2050, UN demographers project that India will have added another 530 million people to make a total of 1.5 billion.[55] If it continues on the demographic path as predicted it will overtake China by 2045, becoming the world's most populous country.[56]

Well before it had reached the 1 billion mark, India's shrinking forests, deteriorating rangelands, and falling water tables were indications that the demands of the expanding population had overwhelmed its natural resource base. Grainland productivity has slowed during the nineties threatening food security, as the amount of cropland per person continues to shrink. Of India's 3,119 towns and cities, only 8 have full wastewater treatment facilities. [57] The International Water Management Institute estimates that withdrawals of underground water are double the recharge rate. These falling water tables are set to reduce future grain harvest by 25 percent, further threatening the countries food production and perhaps leading to the kind of rising grain prices that could not only destabilise the market but possibly the government itself.

By trying to provide education for all the new children of school age, finding employment for all those now entering the job market, and dealing with environmental problems such as deforestation and soil erosion, human and economic resources in India are being stretched to the limit. After many years of rapid population growth, some suggest that the government is suffering from "demographic fatigue"[58]; when a new threat occurs, the authorities are unable to respond effectively. Some also see evidence of this syndrome in the rising death rates in Africa,

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[52] TPI, (1998)
[53] The World Bank, *World Development Indicators 1997* (The World Bank, Washington, D.C., 1997
[54] UNFPA, (1995)
[55] UNPD, (1998)
[56] *Ibid*
[57] WHO, (1992)
[58] Vidal, (1999), p 3

where governments, overwhelmed by several decades of population growth, have not been able to respond to the HIV epidemic. Some forecasters predict that a rise in the death rate in India, due to a decrease in water supply and a resultant drop in food production, is imminent.

It is has been estimated that more than one third of India's population, more people than were in the entire country in 1947 when it achieved independence, are too poor to buy basic foods. 390 million people are barely surviving on less than 2,444 rupees (£35) a year, or less than 68 pence a week. It has the largest population of illiterates in the world today, where some 465 million people, the vast majority women, cannot read. Nearly 700 million people live in homes without a toilet, and over 900 million do not have a television. Such social statistics can be viewed politically, not as evidence of the failure of successive governments to look after their people, but as a brake on prosperity and a blight on India's international image. Poverty, it might be argued, is the result of the poor having too many children, rather than the failure of social policy. But experience tends to suggest that the link between population growth rates and overall economic performance is a weak one. Several countries in East Asia and Latin America have managed to reduce poverty and develop strong industry despite historically high birth rates.

2.3.8 Population control

The modern push for reducing population growth began in the 1950s and 60s. In his best selling book from the 50s, *Road to Survival,* William Vogt attributed Asia's population growth to "untrammelled copulation" by the "backward billion".[59] A few years later, in an article published in the *Journal of the American Medical Association*, A.J. Carlson warned that, "if we breed like rabbits, in the long run we have to live and die like rabbits".[60] The idea that human beings could be likened to a plague, and that the poorer parts of the world were dragging down the richer parts was also at the root of the 1959 book *Too Many Asians* in which John Robbins states:

> It is easy to imagine the United States or Canada or Brazil...supporting twice its 1960 population on a reasonably decent standard of living. But how can twice as many Asians hope to live on even today's miserable scale?[61]

In the 1950s, due to a naturally high birth-rate and the massive influx of refugees from the Chinese civil war (1946–49), the density of Hong Kong had rapidly expanded to 2,000 people per acre, and these people were reportedly all living in single storey huts without sanitation. An

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[59] Cited in W. McGurn, 'Population and the Wealth of Nations' in *First Things 68* (December 1996)
[60] *Ibid*
[61] *Ibid*

American newspaper at the time proclaimed that the colony was "dying" and the government were in despair. The government's annual report in 1954 put every problem facing the administration down to this rapidly increasing population. They described the living conditions that these people were moving into:

> Virtually every sizeable vacant site . . . was occupied, and when there was no flat land remaining, [people] moved up to the hillsides and colonized the ravines and slopes which were too steep for normal development. The huts were constructed of such material as they could lay hands on at little or no cost flattened sheets of tin, wooden boarding, cardboard, sacking slung on frames. . . . Land was scarce even for the squatters and the huts were packed like dense honeycombs or irregular warrens at different levels, with little ventilation and no regular access. The shacks themselves were crowded beyond endurance. . . .[62]

Robbins and other observers forecast that the state of "super-saturation" in Hong Kong was a sign of things to come throughout Asia. But the predicted apocalypse never came. Instead Hong Kong witnessed the greatest economic boom of its history and now boasts a population of around 6 million – around five times what the government in 1954 declared to be the country's 'carrying capacity'. As it turned out the doubling of the Asian population sparked a new industrial revolution whose impact on human life proved radical by virtually any measure of infant mortality, literacy and life expectancy. Real income per capita quadrupled in Japan and the Four Tigers (Hong Kong, Singapore, Taiwan, and South Korea) from 1960 to 1985. In *Asia Rising* the economist Jim Rohwer points out that, from 1970 to 1990, the number of East Asians living in poverty, fell from 400 million to 180 million, even while the population in these countries was growing by 425 million. The World Bank refers to this as the "East Asian Economic Miracle".

The nature of the relationship between people and wealth that this suggests is equally as applicable to modern China as it was to the emerging Western industrial nations of the 18th century. In two hundred years the West's population has quadrupled and per capita income has increased five-fold. The biggest economic story of the 1990s has been the emergence of Mainland China, the world's most populous country, as one of the most dynamic economies, not only of Asia, but also of the world. Since 1979, following its turn toward the West, China has seen its economy rise by almost 9 percent per year. Per capita incomes, while still low, have nearly quadrupled in the past 15 years and some suggest that China is on course to emerge as the largest economy in the world by the middle of the next century.

Wars, famines and epidemics have occurred throughout the world and throughout history and the modern world is no different. The recent wars in Rwanda, Liberia, Burundi and Iraq have

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[62] *Ibid*

contributed to an increased mortality rate in the less developed regions of the world but globally the main cause of death is disease. In 1992 the World Health Organization (WHO) warned that combined population growth and environmental degradation was resulting in increasing serious infectious diseases like AIDS and cholera.[63]

The spread of the human immunodeficiency virus / acquired immunodeficiency disease (HIV/AIDS) epidemic continues to be an important cause of death in several less developed countries and the decline in life expectancy caused by AIDS is projected to continue through the year 2000.[64] About 4 million people in India are now estimated to be living with HIV, making it the country with the largest number of infected people in the world. The spread of AIDS, particularly in sub-Saharan Africa has been so vast and rapid that the UNPD has now lowered its medium-variant population projection for the world for the year 2050 from 9.4 billion to 8.9 billion.[65]

HIV/AIDS has had, and continues to have, substantial and sometimes dramatic impacts on mortality levels in countries most seriously affected. However, AIDS will not overcome the momentum of population growth at the regional level, even in Africa. This will be true particularly if changes in behaviour, already observed in some settings, bring about an early curtailment of HIV infections in affected countries. As dramatic as the effects of the disease have been, it has not had a significant impact on population growth in overall terms. It has been calculated that all the national and regional disasters on record since 1850, as devastating as they have been, have delayed the growth in world population by no more than about ten years.[66] In other words had there been no wars, famines or epidemics since 1850, the world's population might have been 6 billion in 1989 instead of 1999.

2.3.9 Human rights

While a reduction in population levels remains an important principle for many this has become one of the most controversial areas of debate within the environmental movement. The emphasis on the 'evils of overpopulation' has been challenged by development specialists who argue that rising levels of population in the world's less developed countries are not the cause of environmental degradation and social squalor but the consequences of these factors. In many countries, producing a large family has become a rational, economic strategy to increase income. Some argue that, rather than proposing a reduction in population levels, greens should campaign

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[63] WHO, (1992)
[64] World Health Organization (WHO), *Report on the Global HIV/AIDS Epidemic* (WHO, Geneva, 1998)
[65] UNPD (1998)

against the vast inequalities that exist between the developed and the non-developed worlds and within developing nations.

1998 was the *International Year of Human Rights* and the 50th anniversary of the Universal Declaration. It carried the motto, "all human rights for all". During the previous year, however, U.S. AID gave Kenya $13.5 million to promote family planning compared to $4 million in humanitarian assistance. Today some critics argue that by making humanitarian assistance to developing countries conditional on population control measures, the Western aid agencies may be in breach of articles 16(1) and 16(3) of the declaration on human rights, namely that:

> Men and women of full age, without any limitation due to race, nationality or religion, have the right to marry and to found a family.
>
> And
>
> The family is the natural and fundamental group unit of society and is entitled to protection by society and the State.

The ability to impose its will on undeveloped nations by controlling aid and its application is a power which Western nations misuse at their own peril. To avoid arousing resistance, advocates of population planning have tended to adopt their own set of justifications suggesting, for example, that sex education will overcome 'ignorance' and 'fears and anxieties', and that the adolescent programmes will in turn 'reduce teenage pregnancy and prevent abortion'. Jacqueline Kasun (1988) suggests that the truth behind these family planning programmes, frankly admitted, is "the limitation of population". And yet the results of government programmes, as she points out, show no improvement in the psychological well-being or physical health of the young, and there has been no reduction in pregnancies, abortions or fertility rates.

> What the programs have achieved, and to a frightening degree, is the power and influence of the clique advocating government family planning, which it well understands is an essential step toward comprehensive population control.[67]

2.3.10 Is the global population imploding?

An emerging concept in the mix of divergent views on global population growth is that of "population implosion," modelled on the sustained low fertility of some European countries. Several analysts and journalists cite the UN low variant projections as evidence of "alarming

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[66] *Ibid*

[67] J. Kasun, *The War Against Population: The Economics and Ideology of Population Control* (Ignatius Press, San Francisco, 1988), p. 206.

declines" in global population beginning around 2040. In a recent article entitled *The Population Explosion is Over*, Ben Wattenburg (1997) talks about the "birth dearth" and asks whether the rest of America will soon resemble Manhattan. At 48 percent it has the greatest concentration of people living alone, "except for a former leper colony in Hawaii".

> Never have birth rates fallen so far, so fast, so low, for so long around the world. The potential implications – environmental, economic, geopolitical and personal are both unclear and clearly monumental, for good and ill.[68]

Demeny (1986) describes the current 'demographic transition' as involving the move "from high fertility and high mortality to low fertility and low mortality, with lots of complicated and contradictory things going on in the middle".[69] Among the factors identified as helping the transition towards modernisation are,

> ...more education for women, legal abortion, higher incomes, unemployment yielding lower incomes, greater acceptance of homosexuality, new aspirations for women, better contraception, (including "morning-after pills", endorsed by new Food and Drug guidelines), later marriage, difficulty conceiving at older ages, more divorce and vastly lower infant mortality rates. When parents know there children will survive, fertility rates plummet.[70]

In 32 countries, including Britain, France, Japan, and Spain, population growth is at or near zero. The populations of Germany, Italy, Russia, Hungary and Ukraine are actually shrinking. Another 39 countries, including China and the United States, have average families of fewer than two children, but will go on growing for another few decades because they have many young people about to enter their reproductive years. Some forecasters predict that in 50 years time Europe's population will have decreased by 25 percent and in Japan there will be 21 million fewer people.[71]

Wattenburg (1997) also sees in declining birth rates and the eventual levelling-off of the global population the prospect of an emptier planet creating its own set of economic and geopolitical problems. With the world community facing an elderly support burden set to increase by nearly 50 percent over the next 25 years, by having fewer children today, he argues, we are eroding the population base that should pay for our pensions in old age.

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[68] B.J. Wattenburg, 'The Population Explosion is Over', *The New York Times* (23 November 1997)
[69] P. Demeny, 'The World Demographic Situation', in *World Population and U.S. Policy: The Choice Ahead*, ed. J. Menken (W.W. Norton, New York, 1986), pp. 22-66
[70] Wattenburg, (1997)
[71] J. Coleman, 'WANTED: Children. Japan Worries About Birth Dearth', *Associated Press Release* (August 2, 1998)

Similarly government officials in Japan today fear that with fewer babies being born now it will mean a less prosperous, more troubled and lonelier people in the future. The Health and Welfare Ministry announced in June that the birth rate, at 1.39 births per woman, is far below what is needed to keep the population stable. The number of children 14 or under – 19.2 million – is at its lowest since 1920. Within a decade it is expected that the total population will begin to fall. The trend will mean a shortage of workers to power the economy and a dearth of taxpayers to finance the staggering pension and health care bills of the future. The cost of those and other social services could quadruple by the year 2025. Today the Japanese are already paying taxes imposed by leaders worried about their greying society.

> In an apocalyptic projection illustrating the sense of crisis the government feels, a recent Health Ministry report estimates that if the current birth trends hold up, the Japanese population could disappear sometimes around 3500.[72]

2.3.11 The consumption bomb

The claim that population growth is no longer of major concern has led some journalists to call for reductions in financial support for family planning programs. Critics of this view, however, argue that, these authors are misrepresenting UN data, by focusing on the lowest variant projection in a broad range of possibilities. They point out that even with declining birth rates, by the middle of the next century at least two billion people will live in countries where water shortages may constrain food production and economic development. Continued population growth will also create pressure on land, jobs, health, and education. Continuing to slow population growth, they argue, is essential to ensure a reasonable quality of life for future generations.

With more than 100 million married women in the less developed countries having expressed an unmet need for family planning, and the number of young women entering their childbearing years increasing at a more rapid rate than world population, it has been argued that now more than ever we need to strengthen our commitment to international family planning programs. Issues of crowded living conditions, shortages of food, widespread famine, exhaustion of natural resources, and life threatening pollution, are prominent on social and political agendas throughout the world. Forecasts that have ignored demographic transition and predicted incredibly high future populations are rightly viewed today with some scepticism but it is nevertheless true that there are now more people in the world than ever before and they are consuming more resources than ever before.

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[72] *Ibid*

According to the 1998 United Nations Development Program (UNDP) Human Development Report, world consumption has expanded at an unprecedented pace over the twentieth century, with private and public consumption expenditures reaching $24 trillion in 1998 - twice the level of 1975 and six times that of 1950. Today's higher levels of consumption are undermining the environmental resource base and exacerbating human inequalities as the dynamics of the population - economy - environment nexus accelerate.

Many underdeveloped nations have not adopted improved farming techniques or new methods of contraception. In what some argue is an unhappy vindication of Malthusian doctrine, overpopulation, famine, pestilence and war, continue to ravage these countries. Here the global successes mask urgent, sometimes worsening, problems at the local or regional level among developing countries where, it has been argued, around two-thirds of humanity is chillingly close to proving Malthus right.[73] These are the countries where virtually all population growth is now happening. They point out that, although there is some convergence of death rates between developed and developing countries, there is still a substantial difference in fertility rates.

While some developing countries are moving towards population stability[74] others are still growing rapidly. In Africa, Asia and Latin America this expansion is usually associated with problems of poverty and limited progress for women, and by large-scale internal and international migration. Rapid population growth is also fuelling problems in many cities, where it can overwhelm the capacity of municipal authorities to provide even basic services. These people have not shared in the economic and social progress experienced by the majority and still live in poverty.

And their numbers are growing. The future of human population growth has been determined, and is now largely being decided, in the world's less developed nations where 95 percent of world population increase – the difference between the number of births and the number of deaths - now occurs, within the regions of Africa, Asia and Latin America. The youthful age structure of these countries means that their absolute populations continue to grow even where the rate of increase has declined significantly. Some regions are therefore closer than others to completing the demographic transition - the point at which death rates and birth rates are approximately equal and population growth levels off – but overall the UN expects another 2.9 billion people to be added over the next 50 years.

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[73]Figures from the UN Population 1996 Revision stated that 4.59 billion people - 80 % of the world population - lived in the less developed regions and 1.18 billion people lived in the more developed regions.

[74] UNFPA (1995), p.16

US government projections indicate that early in the next century, death rates will exceed birth rates for the world's more developed countries and the difference – natural increase - will be negative. At this point, international migration will become the critical variable determining whether the total population of today's developed countries increases or decreases. These projections show negative natural increase offset by net international immigration through 2019 but, if present trends continue, the population of the world's developed countries will slowly begin to decrease from the year 2025. As the growth rate in the world's more affluent nations becomes negative, all of the net annual gain in global population will, in effect, come from the world's developing countries.

The total world population was around 800 million at the time of Thomas Malthus. Today it is estimated that there are about 840 million people who are chronically hungry. Tragically every day 19,000 people die from malnutrition, most of them children. Two hundred years ago Malthus wrote something that has a ring of truth about it today in the context of the population - economy - environment nexus and the problems related to global growth and environmental decline:

> The pressure arising from the difficulty of procuring subsistence is not to be considered as a remote one which will be felt only when the earth refuses to produce any more, but as one which actually exists at present over the greatest part of the globe.[75]

2.4 Economic growth limits

Malthus argued that population increase would lead to a glut in the supply of labour and hence a fall in wages. At the same time, the growing demand for food and other provisions would inevitably raise the cost of survival. Eventually, he said, population growth would stop due to the increased price of supporting a family. The population would then remain stagnant until enough forest was converted into farmland. He described a cyclic process where improved conditions would lead to an increase in numbers that in turn would nullify any improvements already made.

Although greens tend to hold onto it, history seems to have disproved this part of Malthus' thesis. It has been shown that along with economic growth in the West has come increased contraception and population stabilisation. Demographers tell us that, as a nation's wealth and standard of living increases and death rates fall, birth rates also fall.

To Marx, Malthus' ideological message - that because of the 'scientific' principle of population any attempts to improve the economic status of the poor are doomed to failure - was

"a libel on the human race". Marxists have contested the notion of scarcity and the finite nature of the earth's resources suggesting that starvation is mostly caused by the uneven distribution of resources rather than by their absolute scarcity. They also hold that the green focus on attacking industrialism obscures the fact that the real problem is capitalism in all its forms. Marxist critics seek to diffuse the scarcity argument through deployment of the sense of a *dialectic* relationship between human beings and the 'natural' world. The view derives from their belief that there is no such thing as a 'nature' that is unmediated by human beings. David Harvey (1993), for example, sees the idea of natural limits as too simplistic and insufficiently dialectical. He suggests that:

> If we view 'natural resources' in the rather traditional geographical manner, as 'cultural, technological and economic appraisals of elements residing in nature and mobilised for particular social ends'...then 'ecoscarcity' means that we have not the will, wit, or capacity to change our social goals, cultural modes, our technological mixes, or our form of economy and that we are powerless to modify 'nature' according to human requirements. [76]

However, other socialists accept the ecological position that the impact of the ecological crisis is such that it will require us to make changes in production and consumption of a kind, and a scale, which will entail a break with the lifestyles and expectations that have become habitual in industrialised nations. Raymond Williams (1986) identifies the central problem in the capitalist mode of production that seeks "an effective infinity of expansion in a physically finite world"[77]and suggests that "the orthodox abstraction of indefinitely expanded production – its version of growth – has to be considered again from the beginning".[78] Williams asks that Marxists reconsider the nature of socialism on the basis of the "certainty that many of the resources at their present levels of use are going to run out".[79] He is in no doubt that the "pressure point on the whole existing capitalist mode of production" is "the problem of resources".[80]

Malthus had directed his enquiries, not to the causes of wealth but to the causes of poverty, and he found them in a theory that explained the connection between overpopulation and misery.[81] Smith wrote a lucid and largely optimistic account of work and the economy of the day, before industrialisation had really begun to encroach on the world. He focussed on the

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[75] Malthus (1872)
[76] D. Harvey, 'The Nature of Environment: the Dialectics of Social and Environmental Change', in *The Socialist Register* (1993)
[77] R. Williams, *Towards 2000* (Pelican, Harmondsworth, 1986) , p. 214
[78] *Ibid,* p. 215
[79] R. Williams, *Socialism and Ecology* , p. 15 cited in Dobson (1995)
[80] *Ibid,* p. 16
[81] Malthus (1872)

production of wealth rather than human welfare believing that, "the great object of the political economy of every country is to increase the riches and power of that country".[82]

Adam Smith's *Wealth of Nations* (1776) and John Stuart Mill's *Principles of Political Economy* (1848) defined the 'classical' period in economics, which advocated a free-market (*'laissez faire'*) approach. Smith provided a seminal account of the division of labour and then described how the aggregate effect of individuals seeking to maximise their personal welfare through market mechanisms was to bring the greatest material benefit to society as a whole, as if by an 'invisible hand'.

As a leading member of the Scottish Enlightenment Smith wrote on many topics in addition to economics, including politics and morality. In 1779 in *The Theory of Moral Sentiments* he suggested that ethical judgements depend on imagining oneself in the position of others. Smith was critical of the stultifying and dehumanising effect of the division of labour on workers so much so that he suggested people should look to limit them. In reality though he recognised that governments were more likely to be driven by narrow interests.

Mill, extended the work of his father, James (1773-1836) and his godfather Jeremy Bentham (1748-1832), in his contribution to utilitarianism. Like them he made judgements of right and wrong a matter of the 'pleasure principle' - the degree to which particular actions or social arrangements increase, or reduce overall 'happiness'. But he differed from them in insisting that a distinction should be drawn between higher and lower forms of pleasure. Although he held an idealistic view of the potential of private property he was against capitalism and is still considered by many as a leading nineteenth century exponent of liberalism. But he seems to have presented the case for socialism or communism, so eloquently that he converted the highly influential thinker, William Morris, to socialism. His views on the 'stationary state' were used to legitimate the call for zero-growth policies from the radical left within the environmental movement of the 1970s and 80s. In 1848 he wrote:

> Nor is there much satisfaction in contemplating the world with nothing left to the spontaneous activity of nature: with every rood of land brought into cultivation, which is capable of growing food for human beings; every flower waste or natural pasture ploughed up; all quadrupeds or birds which are not domesticated for man's use exterminated as his rivals for food, every hedgerow or superfluous tree rooted out, and scarcely a place left where a wild shrub could grow without being eradicated as a weed in the name of improved agriculture. If the earth must loose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not a better or a happier population, I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compels them to it.[83]

[82] Smith (1776)

2.4.1 *Five phases in global economic growth during the 20th century*

There have been five distinct phases in global economic growth and development during the twentieth century:

1. *Global interdependence (1900 – 13).*

Period of accelerating global interdependence which had its roots in the Industrial Revolution of the mid-nineteenth century. This period of buoyant world trade, robust flows of capital, and large international migration saw the share of exports in world output rising to 11.9 percent by 1913, a level not reached again until 1970. The period also saw world GDP growth expanded by an annual average rate of 2.8 percent and the emergence of the United States as the most dynamic market and among the fastest growing economies of the world. This growth, however, slowed in the second distinct period of the century.

2. *The dark age (1913 – 50).*

A period marred by two world wars, a world depression, and a general collapse in the world trading system. The outbreak of World War I, and its aftermath, destroyed the productive capacity of Europe, led to an estimated 25 million deaths, and triggered a series of quantitative restrictions on trade and capital. In an unsuccessful attempt to curb rampant inflation a gold exchange standard was reinstated in 1925. As a result of the 1929 – 32 the world economic depression the output in the industrialised countries dropped by an average of 18 percent. In the mid-1930s the U.S. passed a tariff, which raised duties on imports by 23 percent. When other nations retaliated with their own tariffs and controls global trade and growth plummeted.

3. *The golden age (1950 – 73).*

This represents the high-point of the century. Governments had to spend money, and encourage investment on the rebuilding of Europe and Asia after the devastation of World War II. The emergence of multilateral institutions and the steady flow of capital to the developing nations further bolstered growth.

4. *The energy crisis (1973 – 87).*

The good times came to an end in the early seventies. The system, which had provided a stable international fixed currency exchange rate throughout the post-war years, collapsed in

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[83] J. S. Mill, 'Principles of Political Economy with some of their Applications to Social Philosophy' (1848) in Eccleshall *et al.*, *Political Ideologies* (Routledge, London and New York, 1994), p. 227.

August 1971. The sudden and dramatic rise in oil prices during 1973 then triggered a marked deceleration in growth and a sharp acceleration in inflation within the industrialised nations, during the fourth economic phase. This was a sign of the so-called 'energy crisis' which was to follow. Higher oil prices led to higher levels of external debt for oil importers as currency volatility increased and balance-of-payments difficulties emerged in various nations around the world.

5. Towards a globalised economy (1987 – today).

The fifth phase started in the late 1980s and continues today. In some respects the current stage in global growth resembles the first – global economic interdependence has rapidly accelerated over the last ten years and the level of trade to GDP continues to climb, rising to 21 percent in 1996. The post-Cold War economic climate is one in which more countries and more people are participating in the global economy. Trade and investment liberalisation are now the norm and the flow of capital to the emerging markets has soared, facilitated by new advances in technology.

Just as new transport technologies, in roads, railways and steamships helped promote global economic integration and interdependence in the industrial era, so too, developing information technologies, through the world-wide use of computers and advanced telecommunication systems, has brought the world economy into a new global era. Among the most dynamic and fastest growing economies in this new age are those of the developing nations, and in particular, parts of Asia.

2.4.2 The shape of the world economy

Following the end of World War II the global economic supremacy of the United States was unchallenged. The industrial base of Europe and Japan had been devastated and America accounted for around one half of total world output. Although it still maintains the top ranking today, the United States' share of the world economic pie, at around 20 percent in 1997, is significantly less than it was during its peak in the 1950s.

Global economic power is more dispersed today. After decades of rapid growth and the development of a number of transnational industries Japan has emerged as the second largest economy in the world with around 8 percent of total world output. The aggregate output of the European Union is roughly equal to that of the United States. Together, the United States, the

European Union (EU)[84], and Japan account for almost 50 percent of the total world output. Of the world's 20 largest economies, eight are from the developing world (Table 2.1).

TABLE 2.1

THE WORLD'S LARGEST ECONOMIES, 1997
(GDP)

Rank	Country	£ Billions
1	United States	4,894.6
2	Japan	3432.8
3	Germany	1576.4
4	France	1022.4
5	United Kingdom	768
6	Italy	760.3
7	China	604
8	Brazil	473.3
9	Canada	380
10	Spain	357.5
11	South Korea	322
12	Netherlands	268.4
13	Australia	245.2
14	India	238.5
15	Russia	237.3
16	Mexico	227.8
17	Switzerland	209.1
18	Argentina	196.7
19	Taiwan	182.7
20	Belgium	176.7

Source: National sources; World Bank.

Asia is the undisputed giant among the developing regions of the world, accounting for 23.1 percent of world output. China is the largest economy in Asia and, after Japan, ranks number seven in the world. In the aftermath of World War II Japan and virtually all of Asia lay in ruins. Over the past 50 years, however, parts of Asia have risen dramatically, now accounting for over 30 percent of total world output, well ahead of Europe and the United States. [85]

[84] The European Union (EU) is made up of a number of institutions and consultative bodies, the most important being the European Commission, the Council of Ministers and European Parliament. It was established on 1 November 1993 following the ratification of the Maastricht Treaty, and expressed a desire for 'an ever closer union among the people of Europe'. Member countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

2.4.3 Developing nations as new growth engines

In the second half of the twentieth century the world economy experienced an unprecedented rate of increase, having grown approximately fivefold since 1950. Although the industrialised economies still dominate economic activity a remarkable trend over the past 25 years has been the burgeoning role played by developing countries, in particular the populous economies of developing Asia.

Prior to the 1990s, economic growth in the developing nations was closely aligned with that of the industrialised nations. Domestic demand in the industrialised nations helped promote export growth in less developed areas of the world, which in turn stoked the 'economic engine' of nations such as South Korea, Singapore, Taiwan, and Chile. Today, the United States, along with Europe and Japan, remain key markets to the developing nations, as well as important sources of finance and technology. Yet, increasingly during the last decade, the developing nations have been striking out on their own, becoming more discrete as separate economic entities leading some to suggest that they have become the 'new engine of global economic growth' during the nineties.

The importance of the developing nations to the world economy has grown during the 1990s and will have an even greater significance in the years ahead. Their share of world output, at 45-47 percent is much higher than most people realise. Their relative economic strength is due to a numbers of factors, including rising per-capita incomes and the steady rise and formation of a middle class in many countries. Free-market reforms and the introduction of more realistic trade and investment policies have helped fuel growth. As well as the massive flow of private–capital into developing countries there has been a large increase in trade between regions within Asia, Latin America, Africa, and Central Europe, a trend that has not only helped to promote export growth, but also reduced dependence on richer nations.

For most of the last thirty years, the developing nations of Asia have led the world in terms of growth. Asia is the fastest growing region with seven out of the top ten fastest growing economies. Its economic rise is due to a number of factors including outward-looking trade policies, high rates of savings and investment, and a strong emphasis on education in many countries. Some experts suggest that these are the attributes that will help the region recover from the financial crisis of 1997.[86]

But globally, although global economic output has steadily expanded over the past decades, the current level of expansion is not particularly high. The relatively sluggish performance

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[85] Quinlan and Stevens, (1998)
[86] *Ibid*

reflects many variables in the global economy including lingering structural problems in Japan, weak levels of growth and high levels of unemployment in Europe throughout most of the nineties, and the poor performance of the U.S. economy compared with other periods of expansion. The decade started with the United Kingdom, the United States, and Canada slipping into recession. As these countries started to recover, others – France, Germany, Italy, Japan – started to slide as the world economy lost momentum. In the industrialised nations government policy shifted emphasis from growth to price stability.

For most of this decade the weak performance of the industrialised nations has been offset by the robust growth in the developing nations, which on average have grown two or three times faster. This has prevented a sharp deceleration in the world economy during the nineties.

2.4.4 The poverty of nations

Despite major reductions over the past 50 years poverty remains an enormous problem throughout the world. Within the developing countries, about one third of the population lives on less than a dollar a day – the common international poverty line. By this measure, although the percentage of the world's population living in poverty declined slightly between 1987 and 1993 (from 30.1 percent to 29.4 percent)[87], the absolute number of people living in poverty increased from 1.2 billion to 1.3 billion people.[88]

The poorest people in the world live in Africa, which given the region's wealth of natural resources is one of the cruel ironies of global economics. It is common knowledge that Africa lags behind the rest of the world in terms of development, but this was not always the case. In the 1950s the African states were on par economically with many counties in Asia. During succeeding decades, while Asian nations have largely thrived in spite of a relative dearth of natural resources, Africa has floundered.

The disparity is due to a number of reasons, ranging from rapid population growth in Africa to higher education and literacy rates in Asia. While Asia has also been promoting domestic savings, attracting foreign investment, and encouraging external trade, Africa has largely ignored (or been ignored by) foreign trade and investment (FDI). The result has been chronic trade deficits in many countries and the ongoing need to borrow money from abroad or seek financial help from the industrialised nations. This has led to the accumulation foreign debts on a huge

[87] The World Bank, *World Development Indicators 1998* (The World Bank, Washington, DC, 1998), p. 31
[88] *Ibid*

scale. Some 100 countries have experienced economic decline or stagnation during the 1990s; in 70 of these countries, average incomes are lower today than they were in 1980.[89]

The net result is that more than 3.8 billion people have seen their incomes rise by 3 percent or more from 1980 levels, but some 1 billion others—more than one fifth of the world's population—are worse off.[90]

In the developing countries as a whole, broad-based, balanced economic growth has enabled progress in key indicators of human development since 1960: infant mortality rates have been reduced by one half and adult illiteracy rates by nearly one half. Since 1975, the rate of underweight children under 5 years of age declined by almost one half. At the same time, whole regions remain sunk in poverty; they are sidelined from the global economy and are in danger of falling further behind in coming decades.[91]

Although some Asian countries, such as Indonesia, have made considerable progress in reducing poverty, in south Asia, progress has been slow. Although the proportion of those living in poverty in Asia continues to decline the sheer number of people living on less than a dollar a day is staggering. According to figures from the World Bank almost 515 million people in South Asia lived below the poverty line in 1993. Another 445 were considered impoverished in East Asia.

Using the common international poverty line, around 60 percent of the world's poor live in just two nations – India and China - this despite these two nations appearing in the top 15 of the world's largest economies. A dozen countries, each with over 10 million people living in poverty, account for 80 percent of the world's poor. In addition to India and China, this includes Brazil, Ethiopia, Indonesia, Kenya, Mexico, Nepal, Nigeria, Pakistan, the Philippines, and Peru.

Poverty can also be defined more broadly than by income alone. Health problems compound the problems of the poor nations. Malnutrition, particularly among women and children, is common in many parts of Africa, where there remains a lack of doctors, clean drinking water, medicines, and electricity. The HIV/AIDS pandemic is a huge impediment to development. The Human Poverty Index, developed recently by the United Nations Development Programme (UNDP), is an aggregate index that measures other forms of deprivation, including low life expectancy, illiteracy, and measures of access to health services, safe water, and adequate nutrition. More than one quarter of the world's population lives in this condition of 'human

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[89] UN Development Programme (UNDP), *Human Development Report 1996* (UNDP, New York, 1996), p. 1.

[90] The World Bank, *World Development Indicators 1996* (The World Bank, Washington, DC, 1996), pp. 11-12

poverty'. Both types of poverty - income and human - usually coincide, but not always. Human poverty is most widespread in sub-Saharan Africa and south Asia. By contrast, in Latin America and the Caribbean, income poverty remains at 24 percent, but human poverty is significantly lower, at 15 percent. That means, in brief, that the poor are better off, thanks to expanding choices and opportunities - especially access to basic education and health services.[92]

Perhaps the most glaring economic trend to emerge in recent years is the growing gap between rich and poor. Disparities have widened at the international level, despite a boom in much of the developing world. The difference between average per capita income in the industrialised and developing countries tripled between 1960 and 1993.[93] The poorest 20 percent of the world's population now command just 1.1 percent of global income, while the richest 20 percent claims 86 percent. Between 1960 and 1994, the ratio of the income of the richest 20 percent to the poorest 20 percent increased from 30:1 to 78:1.[94]

2.4.5 The growth illusion

> The world economy is in crisis...Orthodox economists, however, are powerless to assist...Economics...has developed enormously over the past decade, particularly in its mathematical sophistication, yet its understanding of the world is similar to that of the physical sciences in the Middle Ages...an intellectual orthodoxy has emerged, based on an idealised, mechanistic view of the world. Standard textbooks for economics degrees increasingly resemble engineering texts.[95]

In *The Growth Illusion* (1992), Richard Douthwaite asks how it is that we could have progressed along the path of economic growth, technical innovation and increasing efficiency for so long and yet end up with massive unemployment, wide spread poverty and the fear of economic collapse. His survey of economic history supported by a seemingly inexhaustible array of facts and figures provides a straightforward but nonetheless profound answer; "economic growth has enriched the few, impoverished the many, and endangered the planet".[96]

Neoclassical economics provides the basis of the conventional view of how economics operates in a capitalist society. It describes extensions and refinements of the

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[91] UN Development Programme (UNDP), *Human Development Report 1997* (UNDP, New York, 1997), pp. 28-29
[92] *Ibid,* p. 23
[93] U N Development Programme (UNPD), *Human Development Report 1996* (UNPD, New York, 1996), p. 2
[94] *Ibid*
[95] P. Ormerod, *The Death of Economics* (Faber and Faber, London,1994)
[96] Douthwaite, (1992)

classical phase of economics as an academic discipline championed by Adam Smith and later Malthus, and Jeremy Bentham (1748-1832).[97] Adam Smith had delayed the publication of *The Wealth of Nations* (1776) by a number of years as he tried in vain to come up with a different end result. Inevitably though he was forced to conclude that, if each individual sought his own personal advantage he was,

> led by an invisible hand to promote an end which was no part of his intention, and as a result did more to promote the interests of society than if he had deliberately set out to do so.[98]

In spite of Smith's reluctance to endorse a shallow excuse for selfishness and greed, his 'invisible hand' theory underpins orthodox thinking about commercial behaviour today and lies at the root of most of our economic and environmental problems.

Douthwaite (1992) argues that as economic growth continues it takes more and more resources to achieve additional increments of growth. The whole process, in effect, becomes progressively more inefficient. While society criticises neoclassical economics for failing to solve today's problems of unemployment and poverty, ecocentrics are also critical of the anthropocentric position inherent in an orthodoxy that believes that the *value* of something is entirely dependant on consumer preference. They consider this to be incompatible with the green theory of intrinsic value in nature, by which goods and services would be devalued in proportion to their impact on the environment.

More and more people are becoming suspicious of economic totalitarianism. In *Blueprint for a Green Economy* (1989), Pearce *et al* suggest that green economics, derived from the neoclassical school, seeks to incorporate the methods of environment and resource economics within a wider framework of analysis and ideas. It starts from the assumption that scarcity exists and that sustainability is imperative and holds that economic development is for human fulfilment, involving holistic development, not just material growth. And that this applies to all humans (Ekins, 1992). Others, in contrast, see green economics as derived from an approach which is peripheral to most Western political economy, in its incorporation of discussions on spirit and conscience, moral purpose and the meaning of life (Lutz, 1992).

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[97] Educated from an early age by his father, a London attorney, Bentham later went to Westminster and Queens College, Oxford. He wrote about the principles of legislation and moral philosophy, and researched the founding of new government institutions, attacking all forms of government and law founded merely on authority and tradition. He formed utilitarian ideas derived from Helvétius and Hume, and the 'greatest happiness' principle. Bentham held that acts should be judged by their consequences, and that the criterion of a right action should be that it promoted the greatest happiness of the greatest number.

[98] Smith (1776)

Conventional economic growth is not the ultimate good. Economics needs to be redefined within a sustainable society that seeks more than the bottom line. The global economy is made up of discrete elements, which combine to present a singular concept, a form of economic ecology, with its own sense of equilibrium. This point was brutally driven home in 1997 when a currency crisis in Thailand sparked a global sell-off in the world financial markets and precipitated a slowdown in world growth. Asia's economic pain was felt all over the world.

The accelerating rate of global economic and financial integration means that no nation, even the United States, the richest in the world, is economically autonomous. The food we now eat, the cars we drive, the money we borrow, the clothes we wear, the streets we walk along and the air we breathe – all of these are increasingly shaped and driven by external forces, or an "invisible hand". The reality of our time is that, whether we like it or not, whether we realise it or not, we are all of us part of the digital generation, living in a "global village" in which ecological principles underscore our experiences. This is a world in which a currency debacle half way round the world reverberates into our living rooms.

The shape of this global economic world is changing rapidly. The United States, while still the undisputed champion, no longer completely dominates the world economy, its economic weight having been diminished by the rebuilding of Europe and the industrial rise of Japan. And although the industrial nations still account for the majority of global output, we are now witnessing the persistent rise of the developing and transitional[99] nations, led by Asia, which over the last decade have been growing two or three times faster than the industrialised nations. China, Malaysia, Thailand, Poland, Chile, the Czech Republic, and Turkey have been at the forefront of growth among these nations. The developing and transitional nations now account for more than 45 percent of world gross domestic product (GDP) and it seems likely that they will account for more than half in the not-too-distant future. Given these faster growth rates, absolute economic size, which remains in favour of the industrialised nations, seems certain to shift towards the developing countries in the near future.

For the moment, however, global wealth is still concentrated in the industrialised nations, while the countries of Africa remain the poorest of the poor. In this era of rapid globalisation, some transnational companies now generate more in sales each year than the total output of many countries.[100]

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[99] There is no formal definition here but the term is taken to include the successor states of the former Soviet Union and the countries of Central Europe (Albania, Bulgaria, the Czech Republic, Hungary, Poland, Romania, and the Slovak Republic)

[100] The net sales of Ford (around £100 billion), for example, are greater than the nominal Gross Domestic Product (GDP) of South Africa (around £83 billion)

2.4.6 *The real cost of growth*

In *The Economics of Welfare* (1920), Pigou raises fundamental questions regarding welfare, national product (dividend), and the distribution of wealth.[101] Although he was not dealing specifically with environmental issues, these were imbedded in the general framework that he was concerned with regarding the measurement of wealth. The significance of Pigou is in his early recognition of the shortcomings of a market economy with respect to particular issues. His concept of negative external effects meant that it was possible to consider environmental problems from an economic point of view before they emerged as a critical societal problem.

> Smoke in large towns inflicts a heavy uncharged loss on the community, in injury to buildings and vegetables, expenses for washing clothes and cleaning rooms, expenses for the provision of extra artificial light, and in many other ways.[102]

The idea of negative external effects led Pigou to refute Smith's 'invisible hand' theory believing it necessary that "an authority of wider reach should intervene" to tackle the collective problems of "air and light" as well as "beauty". This led him to the advocacy of building control legislation and to his support for the Planning Act. He wrote:

> It is as idle to expect a well planned town from the independent activities of isolated speculators as it would be to expect a satisfactory picture to result if each separate square inch were painted by an independent artist.[103]

In *The Costs of Economic Growth* (1967) Mishan, influenced by Pigou, attacks traditional economies for their ignorance of environmental issues. Economic growth based on easily measurable economic parameters such as employment levels, income levels, public debt, the exchange rate, etc. was criticised since it makes it easier to overlook and neglect other relevant, but less obvious, economic issues. As a well-known economist Mishan's approach reinstated the measure of economic value, particularly relating environmental issues, at the core of the economic debate. His criticism of economic growth, based on Pigou's concept of externalities, rested on the following arguments:

- that environmental costs must be included in the price of any product;
- if an increase in production creates a more than proportional increase in negative external effects (e.g. pollution), a decrease of welfare will result (e.g. illness);

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[101] Pigou cites the Interim Report of the Departmental Committee on Smoke and Noxious Vapours Abatement from 1920 which described an investigation by investigation by engineers, architects and scientists in Pittsburgh USA in 1912 which estimated the local cost of smoke nuisance at approximately £4 per head per annum

[102] A. C. Pigou, *The Economics of Welfare* (MacMillan, London, 1920), pp 183-4

[103] *Ibid*

- welfare could thus be increased by lowering levels of production.

This, of course, was completely at odds with the main aim of conventional economics in the continued expansion of the GNP and society's belief that economic growth would remedy all social evils. Mishan's arguments were considered progressive and were used by environmental groups to validate their critique of the well-established economic forces in society. On the other hand the polemic character of his argument and his description of the ills of modern society and call for a return to better times contained a strong reactionary and conservative element.

While the economic fortunes of a number of developing nations have risen steadily in the past two decades (although the recent downturn in Asian economies shows this growth may be fragile), many other nations have experienced economic decline and falling per capita incomes since 1980. The disparity in incomes between the rich and poor within nations and between wealthy and poorer nations in general continues to widen, meaning that a relatively small percentage of the world's people and nations control most of the world's economic and natural resources.

The *Limits to Growth* theory applies thermodynamic laws to economics, after Georgescu-Roegen.[104] These imply that all production that uses material and energy eventually transforms them into a more random, that is, chaotic, or disordered, state. Disorder is termed 'entropy', and the second law of thermodynamics says that entropy increases with time. New energy from the sun slows down the process of disorder, but eventually this will run down and the solar system will die. Industrial production, because of its intensive use of energy and materials speeds up the process of decay. Passive solar energy-based production, in combination with recycling, helps to delay it but the best approach is to reduce the demand for resources. Anna Bramwell (1989) cites Wilhelm Ostwald (1911) who wrote that "the free energy accessible can only decrease but not increase".[105]The most influential contemporary exponent of this perspective is Herman Daly, who holds that Green economics are rooted in our ecological circumstances in a very fundamental way where:

> ...our dependence on the natural world takes two forms – that of a source of low-entropy inputs and that of a sink of high-entropy waste outputs.[106]

Daly notes that the second law has it that "our rearrangement implies a continual reduction in potential for further use in the system as a whole".[107] The implication is that there is a limit to the

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[104] N. Georgescu-Roegen, *The Entrophy Law and Economic Process* (Harvard University Press, Cambridge, Mass., 1971)
[105] A. Bramwell, *Ecology in the Twentieth Century* (Yale University Press, London, 1989) p. 64
[106] H. E. Daly, *Steady-state Economics,* 2nd edition (Earthscan, London, 1992), p. 34

use we can make (or re-use) of scarce resources and waste (high-entropy) is an inevitable by-product of the extraction and use of resources (low-entropy). In pragmatic terms this is why greens argue for the necessity of a sustainable society.[108]

It is becoming more widely accepted that economic growth in the conventional sense is more of a problem than a solution; "its pursuit damages the environment, leads to social injustice".[109] Smith *et al* (1998) in *The Greening of the Built Environment* suggest that economic growth as an objective needs to give way to the concept of sustainability and the notion of 'economic *development*' - one of a set of sustainable policy objectives across all areas, economic, social, and environmental and include environmental protection, physical and mental health, and social cohesion.[110] In *Steady-state Economics* Daly (1992) argues that:

> Economics must henceforth incorporate environmental criteria in measuring value, efficiency and the costs and benefits of development. And all development must be *sustainable,* that is, it must not reduce environmental and economic options open to future generations.[111]

2.5 Urban growth limits

The UN report on the State of World Population was published to coincide with the opening of the Habitat II conference in Istanbul in 1996. Representatives from the world's nations were asked to act on the report's findings and steer development programmes towards urban education and health projects, especially for women, to improve the upward mobility of shanty town dwellers. The UN Secretary General called for efforts to control the 'inevitable' march of the city. The UN is still currently pushing for the development of a large number of manageable, medium-sized cities rather than a few, uncontrollable 'mega-cities'.

The main report, by the UN Population Fund, stressed the potential benefits, as well as the menaces, presented by the urban explosion. It pointed to the hopeful signs in some less developed cities of the world. One example is in Bombay where progress has been made in replacing squatter homes with new dwellings. But at the other end of the scale there are, especially in Africa, almost wholly dysfunctional cities, which have become nightmarish agglomerations of unsanitary homes, ruined roads, abandoned services and crime.

The urban environment is now firmly driving the environmental crisis. Cities consume most of the world's natural resources and cause most of the pollution and waste. In developing countries recent industrialisation has led to urban health problems on an unprecedented scale.

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[107] Daly in Pirages, (1977)
[108] Dobson, (1995) p. 80
[109] M. Smith *et al, Greening of the Built Environment* (Earthscan, London, 1998) p 211
[110] *Ibid,* pp 211-212

China, for example, has reported 3 million deaths from urban air pollution over two years between 1994 and 1996. And in the cities of the developed world excessive consumption of natural resources is dramatically reducing the global 'commons'. The cities of the world affect not just the health of their own citizens but the health of the entire planet. Although they take up just 2 percent of the Earth's surface they account for roughly 78 percent of the carbon emissions from human activities, 76 percent of industrial wood use, and 60 percent of the water tapped for use by people.[112]

2.5.1 Ecological footprints of cities

One of the reasons why cities have emerged as the dominant form of settlement is that they have allowed goods and services to be centralised and have thus intensified trade and promoted economic growth. But over the past 20 years a better understanding of the effects of changing environments and ecosystems has been developed which tells us that many of the environmental problems we currently face are directly or indirectly related to issues of urban lifestyles and consumption patterns. These are seen to have far-reaching and long-term effects, not only within the city's own boundaries, but on the entire surrounding region. The complex interrelationship and interdependence of urban areas and their surrounding hinterland has been examined recently by Rees *et al* (1994, 1996). The term used to collectively define these relationships is the *ecological footprint* of cities. [113]

These footprints define the city's source of resources and its sites for waste disposal and pollution. For example the land mass that generates the resources necessary to sustain the population of London (with food and timber) is only slightly less than the entire land area of United Kingdom. According to the Earth Council's report, "Ecological Footprints of Nations" Japanese lifestyles generate a demand for 6.25 hectare per capita (for resources such as energy, arable land, pasture, forest, built-up area, etc.) but the supply has been only 1.88 hectare per capita. This leaves a 'ecological deficit' of 4.37 hectare per person that has to be met from outside the country. Tokyo had a 1995 population of 26.8 million. For Tokyo alone, this ecological deficit is equal to 116,242,000 hectares or 3.07 times the total land area of Japan. This becomes 9.2 times the land area of Japan if only habitable land is taken into account (excluding mountains, water bodies etc.)

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[111] Daly (1992) p. 36

[112] L. Brown *et al* , 'Winning or Losing The Environmental Battle: Cities Hold the Key to Planetary Health', Press Release (Worldwatch Institute, Washington, DC, June 19, 1999)

[113] W. E. Rees *et al*, *Our Ecological Footprint: Reducing the Human Impact on the Earth* (New Society Press, London, 1994)

Today the effects of urban activities have, in many cases, outweighed the relative advantages of agglomeration and centrality that they offer and the ecological footprints of existing cities cover almost the entire planet. It has been estimated that meeting the needs of the current global population in the same way as those of Western urban inhabitants are met would require a few more planets with the same resources as earth.[114] As urban populations and cities expand competition for these dwindling areas of resource is growing while, simultaneously, areas of fertile land and rain forests are rapidly disappearing. Given the clear physical limitations, urban ecological footprints need to have defined limits. In the first instance they must be radically reduced.

2.5.2 Barometers of progress

From ancient Rome to nineteenth-century New York or Manchester, cities have always been ambiguous institutions. They have been sinks of crime, depravity, oppression, poverty and suffering. But they have also been crucibles of personal enrichment, civilisation, culture and political rights. The UN says the vast urbanisation in progress has, similarly, a potential for immense social progress and economic advance and a capacity for disaster and human degradation on an unimaginable scale.[115]

Into the twenty-first century cities have become barometers of our progress. In an urbanising world they hold the key to achieving a sustainable balance between the Earth's resource base and human energy. As Molly O'Meara (1999) author of *Reinventing Cities for People and the Planet* has noted, figures such as these suggest that:

> ...the struggle to achieve an environmentally sustainable economy will be won or lost in the world's urban areas.[116]

O'Meara suggests that urban systems are undermining the planet's health and failing to provide decent living conditions for millions of people. She quotes some powerful statistics in support of her argument. For example, today more than 600 million people in the undeveloped world are living in cities without adequate shelter. And in 1995 polluted air in 36 cities in India alone killed some 52 000 people, representing a 28 percent increase from the early 1990s.

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[114] Rees, (1992), p. 129

[115] The UN report on the State of World Population was published to coincide with the opening of the Habitat II conference in Istanbul

2.5.3 Urban environmental problems

We are beginning to understand that along with the benefits of urbanisation have come environmental and social problems of staggering proportions (Chapter 4). Although these urban problems are difficult to isolate and categorise they are being grouped into two broad classes: those associated with poverty and those associated with economic growth or affluence. Often these co-exist within the same city but some of the worst problems, in terms of human suffering, are occurring in the poorest cities in the developing world, particularly where population growth is rapid and local government are unable to meet even the basic needs of their citizens. Throughout the developing world people live in life threatening conditions. At least 220 million of the urban poor lack any access to clean drinking water and more than 420 million do not have the simplest latrines. Between one and two thirds of the solid waste generated in these cities is left to pile up in streets and drains, contributing to flooding and the spread of disease.[117] This is adding to an enormous toll of largely preventable deaths.

Environmental problems are also severe in those developing world cities experiencing rapid economic growth. Of course economic growth brings much needed revenues to cities but, all too often, growth occurs at the expense of environmental quality, while huge populations of the urban poor are excluded from any benefits of it. 1.1 billion people live in urban areas where air pollution exceeds health limits. Many of these live in vast squatter settlements, exposed to the hazards of the industrial emissions, which have accompanied growth. Environmental problems in the wealthiest cities of the developed world are related, not so much to growth as to profligate resource consumption. A New York city dweller consumes about three times more water and generates around eight times as much waste as a resident of Bombay.[118] The energy demand of these cities contributes a major share of greenhouse gas emissions.

All available statistics tell us that our future will be an urban one and yet the cities of the world may have reached a stage, where in their current state, they are largely *unsustainable*. Some critics have suggested that they are set to disappear as culturally significant physical (see, for example, Frampton, 1980; Davis, 1992; and Virilio, 1991) symbolic (Soja, 1996) and political institutions (Bookchin, 1995). Attempting to accurately pinpoint the intellectual genesis of ideas like these is difficult and, in any case, seems now to be largely after the fact.

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[116] M. O'Meara *Reinventing Cities for People and the Planet* (Worldwatch Institute, Washington, DC, 1999)

[117] J. E. Hardoy, D. Mitlin, and D. Satterthwaite, *Environmental Problems in Third World Cities* (Earthscan, London, 1992), p. 58

[118] World Resource Institute, *The 1994 Information Please Environmental Almanac* (Houghton Mifflin, Boston, 1994), p. 205

Confirmation of the unstable condition of today's cities can be found in an increasing number of global forums and publications from the last two decades - e.g. The World Commission on Environment and Development (WCED) *Brundtland Report* (1987), The Commission of European Communities (CEC) *Green Paper on Urban Environment* (1990), The UN Conference on Environment and Development (UNCED), popularly referred to as the 'Earth Summit' (1992), The UN Conference on Human Settlements (Habitat II) (1996) and The Kyoto Climate Summit (1997). Recently, in June 1999, the British Government's Urban Task Force published its report *Towards an Urban Renaissance* which acknowledged that urban decline was a very real part of British society today. It reported that,

> One in four people living in urban neighbourhoods think their area has got worse in recent years, compared with only one in ten who think it has got better.[119]

The condition of the urban environment was a major focus of the Habitat II conference held in Istanbul, Turkey in June 1996. Urban environmental conditions were seen as important to the health and quality of life of a city's inhabitants and significant to economic and social development. Paragraph 4 of the *Declaration on Human Settlements* states that,

> To improve the quality of life within human settlements, we must combat the deterioration of conditions that in most cases, particularly in developing countries, have reached crisis proportions. To this end, we must address comprehensively, inter alia, unsustainable consumption and production patterns, particularly in industrialized countries; unsustainable population changes, including changes in structure and distribution, giving priority consideration to the tendency towards excessive population concentration; homelessness; increasing poverty; unemployment; social exclusion; family instability; inadequate resources; lack of basic infrastructure and services; lack of adequate planning; growing insecurity and violence; environmental degradation; and increased vulnerability to disasters.[120]

2.6 Beyond the limits

The Club of Rome's 1972 report adopted a pessimistic neo-Malthusian view of environmental prospects basing its arguments on the concepts of exponential growth and doubling time. These views were reinforced in *Beyond the Limits* in 1992 which is no less important but much less read:

> In the global system population, food production, industrial production, consumption of resources, and pollution are all growing. There increase follows a pattern that mathematicians call exponential

[119]Department of the Environment, Transport and the Regions, *Urban Task Force, Towards an Urban Renaissance* (E & F Spon, London, 1999)
[120] UN Conference on Human Settlements (Habitat II), *The Habitat Agenda: Istanbul Declaration on Human Settlements* (1996), paragraph 4

> growth...Exponential growth is the driving force causing the human economy to approach the physical limits of the earth. [121]

The new report illustrates present global development showing an increase in CO2 emissions and ozone defects in the atmosphere as well as an undeniable increase in soil erosion and decrease in arable land and forests. The conclusions of the study are that human use of many essential resources has already surpassed sustainable rates, and without significant reductions in material and energy flows in the coming decades an uncontrollable decline in per capita food output and consumption and a rise in pollution will ensue.

The study stresses that its conclusions constitute a conditional warning and no longer suggests that resource exhaustion is imminent. It concedes that reserves of non-renewable fuels have not depleted, as the 1972 report suggested, but have in fact increased. However it insists that this does not invalidate the general conclusions. As the world moves towards a global population of ten billion during this century, as cities expand and car ownership spreads, more people consume fuel and more pollution is produced. More capital is needed for cleaning up the mess and finding more resources and less is available for relieving poverty.

The report recognises that environmental impact is a function of population numbers, affluence levels, and access to environmentally benign technology. The political-economic ramifications of this analysis are clear. In this formulation reducing impact is politically problematic for the world's less developed countries where almost all of the population growth is occurring. In a fundamental challenge to political and economic orthodoxy *Limits* urges 'distributional and institutional change' in the belief that a sustainable economy is still achievable.

2.6.1 Carrying capacity

In *System of Nature* (1735) Linnaeus discussed the tendency for species' expansion when parents produce more than two offspring and subsequently Linnaeans proposed that there were limits to the *carrying capacity* of an area. Traditionally the *carrying capacity* of a population is represented as the population size which an environment's resource can maintain without a tendency to either increase or decrease (Begon *et al,* 1986). More recently Dashefsky (1993) has redefined this as the maximum number of organisms that a habitat can support and sustain without degrading each organism's environment. Wagner (1974) points out that this

[121] Meadows *et al, Beyond the Limits: Global Collapse or a Sustainable Future* (Earthscan, London, 1992), pp. xv-xvi

ecological rule of balance applies to humans and describes a relationship with the environment, which is seen to have passed through successive stages:

> In the beginning, man was shaped by an environment, which acted as selecting agent and controlled the evolution of his present features. Throughout this period, man, like other animals remained in equilibrium with his environment. But then man developed culture and thereby shattered this equilibrium. From that time on man has exerted an increasing influence on his environment...Finally, man's rampant technology has placed him, once again, under the direct selective influence of an environment of his own making: the city.[122]

Wagner argues that we humans have manipulated our environment until it has now reached, what he sees as, a "dangerous point of disequilibrium".[123]

2.7 Questioning Limits

The *Limits* model of the world system holds that exponential population and economic growth cause exponential resource decline. The suggestion is that trends which are, in the early stages, almost imperceptible, become overwhelming in the later stages and can only be checked by natural limits such as lack of land, exhaustion of resources and pollution resulting in famine, disease and death ("preventive checks" in Malthus's terminology). Because resources are (deemed to be) finite, when population overshoots earth's carrying capacity, it collapses into mass starvation. Underpinning this is the profound belief that there *are* limits to growth. This argument has been challenged on two basic grounds:

- There is little evidence that all resources are becoming scarce. In fact some argue that the resource base has *increased* in response to economic growth. Even non-renewable resources are said to have expanded through new discoveries, substitution and better utilisation;
- There is no reason to believe that the future will behave in the same way as the past. The 1972 *Limits* report suggested that all trends must inevitably be in the adverse direction but there is evidence that, in some parts of the world, population growth is slowing, agricultural land has increased and pollution has diminished.

Simon and Khan (1984) in *The Resourceful Earth* question the accuracy of the *Limits* data and the usefulness of the reports methods. They argue (correctly) that general economic activity was becoming more energy efficient, and that resource prices are falling. But their assumption that conventional economic markets take a long-term (one hundred years) perspective on resource

[122] R. Wagner, *Environment and Man* (WW Norton & Co., New York, 1974), p. xiii
[123] *Ibid,* p. 508

availability and reflect this in today's prices has been proved wrong. There is as much evidence to suggest that we are heading for disaster as there is to support the view that we can avert it.

The consumption of natural resources by modern industrial economies remains very high and represents a truly massive scale of environmental alteration. The extension of the resource-intensive economic model to developing nations as is now occurring around the world is not environmentally viable. Global warming and the depletion of the ozone layer are evidence that "catastrophic consequences for human society may result within the next one or two generations " (Blowers, 1993). The possibility of resource conflicts involving nuclear war cannot be ignored. One of the authors of the 1974 *Limits to Growth* report has recently pointed put that, although his views have been much maligned, Malthus' ideas have renewed relevance within the current sustainability debate:

> Malthus has been buried again. This is the 200th year in which that redoubtable economist has been interred. We may take it as certain that anyone who has to be buried 200 times cannot be wholly dead.[124]

As Ekins (1993) has pointed out even resource optimists now accept that there are limits of some immediate relevance.[125] At the same time pronouncements by resource pessimists are tempered with caution. For example, rather than absolute population increases, population densities and the displacement of poor people from their land are described as the main problems, and it is 'waste-generating' and 'resource-consuming' growth rather than growth *per se* (i.e. in human development terms) that is described as unsustainable.[126] While the doom-laden predictions of neo-Malthusians like Ehrlich, Brown, and the Club of Rome are not inevitable, a sustainable future depends on taking action now.

But as the environmental movement has become more popular, its task has become harder as the opposition to change, intent on upholding traditional social and economic values and practices, has become much more powerfully entrenched in a system of globalised capital. With little scope for achieving progress through consensus, those who uphold 'green' values have "inevitably been forced into the politics of conflict, shifting from reform to radical challenge".[127] Now a huge gulf exists between green goals and values and those of society in general, such that

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[124] D. Meadows, '200 Years Since Malthus and We Still Haven't Proved Him Wrong', *The Global Citizen* (October 8, 1998)

[125] P. Ekins, '"Limits to growth" and "sustainable development': grappling with ecological realities', in *Ecological Economics,* 8(3), (1993), 269-288

[126] For elaboration see P. Ekins, *Wealth Beyond Measure; atlas of new economics* (Gaia Books, London, 1992) and P. Ekins, 'Environmental sustainability of economic processes: a framework for analysis' in J. Bergh *et al.*, (eds.), *Concepts, Methods and Policy for Sustainable Developments* (Island Press, Washington, D. C., 1994) pp. 25-55

there are two totally different worldviews at work. What seems rational in one world is irrational in the other. From the green perspective all 'advanced' industrial nations are pursuing an unsustainable path. If our main goal lies in maximising economic output as a way of keeping people happy, then things like the increasing consumption of natural resources and energy use, increasing pollution, deforestation and the loss of biodiversirty, along with nuclear power, genetic engineering, built-in obsolescence, and the arms trade can all seem 'rational'. If, however, our goal is a more convivial and sustainable society then these things appear senseless and damaging.

[127] Porrit (1984), p. 4

Part 2

The Urban Environment

Part Two focuses on the scale and character of contemporary urbanisation and the rapid growth of cities, particularly within the developing nations and examines associated urban environmental problems.

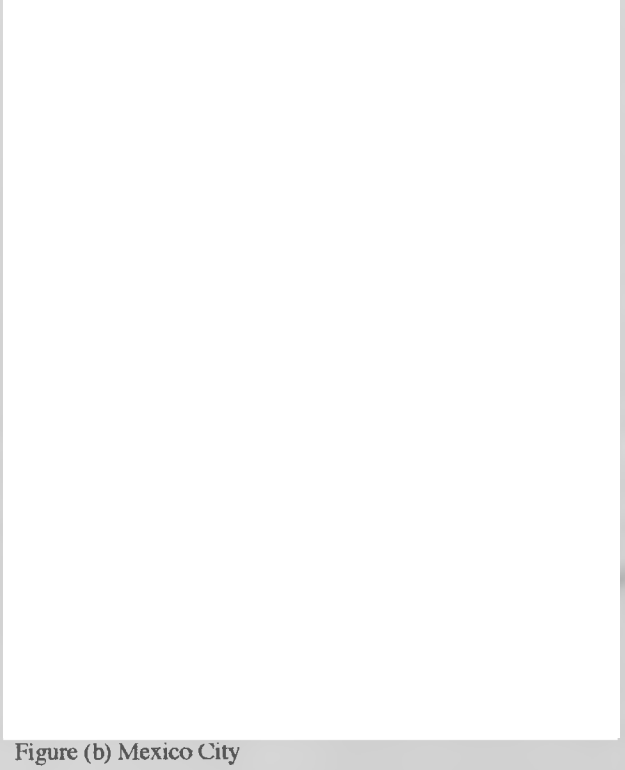


Figure (b) Mexico City

Chapter 3 - focuses on the process of **urbanisation** *and* **urban growth.**
Chapter 4 examines some of the **social and environmental problems** *associated with current urban development patterns.*

Introduction to Part Two

Introduction to Part Two

The urban environment

The urban environment is now firmly driving the environmental crisis. Although they take up just 2 percent of the Earth's surface, cities consume most of the world's natural resources and cause most of the pollution and waste. Particularly in the cities of the developed world excessive consumption of natural resources is dramatically reducing the global resource base and is leading to urban health problems on an unprecedented scale. Sustainability in practice involves establishing alternatives to current urban development patterns.

Demographer Kingsley Davis (1965), presented a framework for understanding population dynamics and urban growth, defining the process of 'urbanisation' as, "the switch from a spread out pattern of human settlement to one of concentration in urban centres".[1] Although this transformation process has occurred at varying rates throughout human history, our own particular place in the history of the city is unique. Since the middle of the twentieth century the

population of the world's cities has soared from 200 million to almost 3 billion. This process is set reach a significant stage by 2006, when for the first time in human history, one half of the global population (an estimated 3.3 billion) will live in and around cities.[2]

Historically *urbanisation* (as the rate of change in the proportion of the population that is urban as opposed to rural) and *urban growth* (the rate of change in the urban population) have occurred together and the future will undoubtedly be an urban one. The United Nations estimate that by 2025 there will be around 5 billion people living in urban areas, more than the total world population 15 years ago. Currently, the developed nations are the most urbanised with, on average around three-quarters of their population living in cities but this is changing as the less developed countries of the world experience massive urbanisation and urban growth. By 2025 some 4.4 billion will be living in towns and cities in developing nations. Because of increased levels of economic growth, of migration, of population expansion and, in some cases, of unprecedented industrial growth, Asia and Africa will be the regions most radically affected by urban development, over the next twenty-five years. China's urban population is expected to reach 1 billion and India's some 740 million by then. In these countries 'hyper-urbanisation' will increasingly concentrate both population and economic growth in cities, thus intensifying the problems of the urban environment.

Almost all of global urban growth over the coming decades will occur in the developing world, where it is already proving almost impossible to create the services and infrastructure needed to support the swelling urban masses and expand agricultural land and capital fast enough to accommodate the huge natural population increase in rural areas. There is no historical precedent for changes of this scale and speed and there is little guidance as to the magnitude of problems that such growth might pose. Developing countries are spawning large cities at the rate of 10 per year and are now growing five times faster than those in the developed world. Cities are growing in number and size because they provide, on average, greater social and economic benefits than rural areas. By 2015 it is expected that there will be 33 mega-cities (a city with a population exceeding 8 million) in the world, twenty-seven of these being in the developing nations. Only one European City, Paris, will be in the world's top 30. Lagos, in Nigeria, is expected to be the third largest city in the world.

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[1] Kingsley Davis, 'The Urbanization of the Population' in, *Scientific American* (September 1965)
[2] United Nations Population Division (UNPD), *World Urbanization Prospects: The 1994 Revision* (U.N., New York, 1995)

Large cities of the developing countries lack both the human and technical resources necessary to deal with the full range of urban development needs. Rapid population growth has increased the tendency of cities in developing countries to outgrow the resources of the economies they are supposed to nourish and support. The traditional range of public services, utilities and welfare taken for granted in cities of developed countries are simply not generally available to the inhabitants of most of the cities of the developing countries, which suffer from a lack of finance, infrastructure and skills at all levels.

The environmental by products of large and concentrated poor urban populations pose direct threats to health and to the quality of city life, caused by problems such as air pollution, and ozone build-up. In some cities, such as Bangkok and Paris, the scale of these problems has led to restrictions on driving and industrial activity to help clear the air.

The interaction between population dynamics and environmental and social problems is an important factor for the growing proportion of the world's people who live in and around cities. For many cities of the underdeveloped nations, whose governments are already suffering from *demographic fatigue*, the sort of adaptations that continued population growth would require are hard to imagine. And yet, against a backdrop of expanding population and economic growth, urban growth is altering the condition of humanity and changing the face of the earth. A hundred years ago only 13 percent of the total world population were classified as urban. Now around 49 percent, or about 3 billion people, live in or around cities. The transition to an urbanised world has profound implications with respect to the physical arrangement of cities, their resource consumption and their environmental impact.

Questions arise as to whether urban development of this magnitude can be sustained. Given the current pressures on resources and the environment, it is difficult to see how urban populations can double over the next twenty-five years without economic or ecological collapse. How will urban populations be fed? How will their energy requirements be provided for? How will the demand for increased transportation be met? What effects will this mass concentration of population have on the biosphere and on local ecosystems?

Increasing debate on issues of urban sustainability has led to the consolidation of urban environmental agendas and the definition of a specific body of problems and policy issues. There is very real concern for the sustainability of cities on two levels. The first is global and involves, what is referred to as the *green agenda* problems such as global warming, ozone-layer depletion, loss of bio-diversity, deforestation, and the exhaustion of non-renewable resources. Cities of the world affect not just the health of their own citizens but the health of the planet. It is clear that the world's cities will not prosper if collectively their impact on the planet is unsustainable.

Governments and environmentalist groups from the advanced nations considered the green agenda problems to be a priority, so the "Earth Summit" in 1992 focused on these issues. But, for the developing world global environmental problems are less critical than the need to resolve the immediate and acute problems that relate to poverty. They are more concerned with the so-called *brown agenda* problems of air and water pollution, inadequate waste management, the lack of basic services and green areas, declining infrastructure, and poor housing conditions, as well as issues of health, crime, violence, and social exclusion. In other words, social and physical urban environmental problems mainly associated with poverty. Among developing countries it is a commonly held belief in that the green agenda cannot be addressed until the urgent problems of urban social deprivation and inequalities are resolved.[3]

Many of the environmental problems we currently face are directly or indirectly related to issues of urban lifestyles and consumption patterns, which have far-reaching and long-term effects, not only within the city's own boundaries, but on the entire surrounding region. The collective term used to define these relationships refers to the *ecological footprint* of cities. Today the effects of urban activities have, in many cases, outweighed the relative advantages of agglomeration and centrality that they otherwise offer, and the ecological footprints of existing cities cover almost the entire planet. Meeting the needs of the current global population in the same way that those of Western urban inhabitants are currently met would require a few more planets with the same resources as earth. As urban populations and cities expand, competition for these dwindling areas of resource is growing while, simultaneously, areas of fertile land and rain forests are rapidly disappearing. As a result, throughout the underdeveloped world populations are being forced onto marginal lands, generally ill suited to agriculture due to adverse climatic and topographical conditions. Urban systems are undermining the planet's health and failing to provide decent living conditions for millions of people. Given the clear physical limitations urban ecological footprints should themselves have defined limits. But, in the first instance, they need be reduced from their current levels. London's ecological footprint extends to around 125 times its surface area, or nearly 20 million hectares. With 12 percent of Britain's population it requires the equivalent of Britain's entire productive land.[4]

Along with the benefits of urbanisation have come environmental and social problems of staggering proportions. Environmental problems are most severe in those developing world cities experiencing rapid economic growth. Many people in these cities live in life threatening

[3] R. Stren, R. White, and J Whitney (eds.), *Sustainable Cities: Urbanization and the Environment in International Perspective* (Westview Press, Boulder, Colorado, 1992)
[4] H. Girardet, *Getting London in Shape for 2000* (London First, London, 1996)

conditions. In 1995 polluted air in 36 cities in India alone killed some 52, 000 people, representing a 28 percent increase from the early 1990s. Today more than 600 million people in the undeveloped world are living in cities without adequate shelter. At least 220 million of the urban poor lack any access to clean drinking water and more than 420 million do not have the simplest latrines. Between one and two thirds of the solid waste generated in these cities is left to pile up in streets and drains, contributing to flooding and the spread of disease, adding to an enormous toll of largely preventable deaths. 1.1 billion people live in urban areas where air pollution exceeds health limits.

In aiming towards the definition of a *sustainable society* based on *sustainable cities* modern environmentalists have attempted to separate surface symptoms from the root causes of our growing problems. In so doing they have highlighted the direction society must take if it wants a sustainable and satisfying future. This involves a population size within the environment's long-term carrying capacity, and one that is in partnership with the rest of nature. It also involves the use of 'soft technology' and 'steady-state' economics, establishing and promoting human-scale environments and institutions, and creating an urban setting that helps maintain a healthy relationship with the biosphere while promoting human development, not just in the already advanced nations, but throughout the world.

3

Urbanisation

Chapter 3

3.0 URBANISATION

...rapid urbanisation, the concentration of the urban population in large cities, the sprawl of cities into wider geographical areas and the rapid growth of mega-cities are among the most significant transformations of human settlements... Urban areas will strongly influence the world of the twenty-first century, and urban and rural populations will be increasingly interdependent for their economic, environmental and social well being.[4]

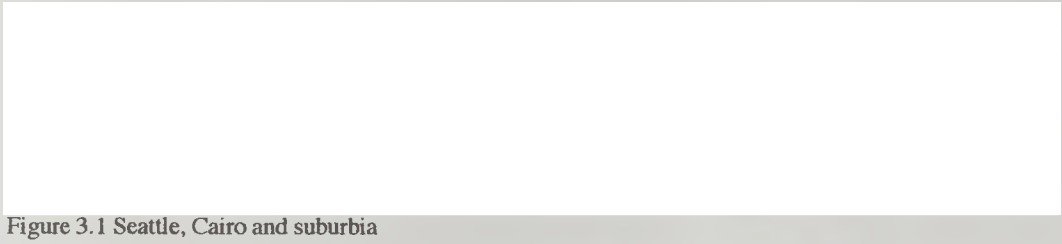


Figure 3.1 Seattle, Cairo and suburbia

[4] UN Conference on Human Settlements (Habitat II), *The Habitat Agenda: Istanbul Declaration on Human Settlements* (1996)

3.1 Urban and rural boundaries

Today the boundaries between the concepts of the 'urban' and the 'rural' are becoming blurred by the nature of sprawl, global communications, and the fusion of historically disparate occupations. In 1992 the European Community commissioned a study into the statistical idea of the town in Europe which confirmed that definitions of what is urban vary from one member state to another.[2] The study observed that,

> ...the city walls which were once tangible evidence of municipal status have disappeared: statistically speaking, there is not only no break in the distribution of population aggregates; instead we have a rural urban continuum.[3]

Although much of what constitutes urban growth takes place within existing cities, a lot spills out beyond traditional boundaries. Whether through urbanisation or the expansion of towns and cities, a lot of growth, often spontaneous and unplanned occurs on the periphery of existing urban areas. In many cities in less developed countries one-quarter to one-third of the population live in slums or squatter settlements [4.8.2].

In the two most populous countries in the world, India and China, the definitions of what are urban are entirely different. In India all places that have a municipality, or a town committee are urban. In China, on the other hand, there are at least three official sets of figures:

- people living within the boundaries of its 517 cities (746 million);
- the census count (324 million);
- people with valid non-agricultural residence permits (164 million).[4]

In its earliest usage the term 'urbanise' meant 'to make urbane', to render something or someone polished or refined. The modern sense of 'to develop an urban character' or 'make into a city' emerged in the second half of the nineteenth century. This is when the city became a specific object of study within the social sciences, particularly among those who were concerned about the social consequences of the growth of the industrial cities. The relevance of the older usage is that in many ways it influenced the way in which thinkers conceptualised the 'rural' and the 'urban' and reinforced two contrasting sets of images:

(i) the city as the place of civilisation, refinement, excitement, freedom and change, in contrast to what Marx called 'rural idiocy';

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[2] K.C. Sivaramakrishnan, 'Urban Governance: Changing Realities' in *Preparing for the Urban Future* (The Woodrow Wilson Centre Press, Washington, DC, 1996), pp. 225-241

[3] Network on Urban Research in the European Community, *The Statistical Concept of the Town in Europe* (Duisburg, Germany, 1992)

[4] Depending on which figures you choose China's urban population is 64, 28, or 14 percent of its total population

(ii) the country as the home of truth and of sharing in 'knowable communities' united by common values, in contrast to the alienation of the city.

3.1.1 The urban revolution

> Urbanized societies, in which the majority of people live crowded together in towns and cities, represent a new and fundamental step in man's social evolution. Although cities themselves first appeared some 5,500 years ago, they were small and surrounded by an overwhelming majority of rural people…The urbanized societies of today, in contrast, not only have urban agglomerations of a size never before attained but also a have a high proportion of their population concentrated in such agglomerations.[5]

In *The Urbanization of the Human Population* (1965) Kingsley Davis, presents a clear framework for understanding population dynamics and urban growth, defining the process of 'urbanisation' as, "the switch from a spread out pattern of human settlement to one of concentration in urban centres"[6]. Although this process of rural-urban transformation has occurred throughout the world, at varying rates during all of human history, it seems that our own particular place in the history of the city is unique. According to a recent address by Klaus Toepfer from the UN Centre for Human Settlements (Habitat) we are in the midst an unprecedented "urban revolution":[7]

> In less than a year, at the dawn of the new millennium, an urban revolution is set to take place: for the first time in human history, one half of the world's population will be urban. This urban revolution will escalate over the next three decades when urban populations will grow to twice the size of rural populations. The bulk of this new urban population will be African and Asian, joining the vast pool of urban citizens in Europe, North America and Latin America, where three-quarters of the population is already urbanised. Africa, currently the least urbanised continent, will have two-thirds of its population living in cities by the year 2020. And the biggest, most densely populated mega-cities with populations of over 10 million will be located in the South, not the North.[8]

The 'revolution' has been some time in the making. Historically the process of urbanisation has gone through three major sociological stages:[9]

- The first extends from the time when people started to live in towns up until the beginning of the Industrial Revolution. During this stage few urban areas had more than 100, 000 people.
- The second involves the rapid growth in size and number of cities contingent on the process of industrialisation.

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[5] Davis, (1965)
[6] *Ibid*
[7] Klaus Toepfer, *Urban Revolution*, Under-Secretary-General and Acting Executive Director, U.N. Centre for Human Settlements (Habitat)
[8] *Ibid*
[9] G. Hurd *et al., Human Societies: an Introduction to Sociology* (Routledge & Kegan Paul, London, 1973)

- The third stage involves the centralisation of people and wealth and of society's political, economic and cultural institutions.[10]

Thousands of years elapsed between the first appearance of small cities to the emergence of urbanised societies in the late eighteenth/ early nineteenth century. During this time the proportion of the population which was urban rather than rural changed very slowly. But, as the effects of the Industrial Revolution took hold in England, rapid population growth, combined with rural-urban shifts, changed both the proportion people living in cities and city size very quickly[11]. Davis argues that this process is best understood in terms of its connection with economic growth. His examination of trends in advanced nations allows him to conclude that urbanisation is a finite process, "a cycle through which nations go in their transition from agrarian to industrial society"[12] and that European urbanisation was driven by rural-urban migration rather than demographic transition.

Since the middle of the twentieth century the population of the world's cities has soared from 200 million to almost 3 billion. This growth is set reach a significant stage in the next few years when, for the first time in human history, one half of the global population, an estimated 3.3 billion, will live in and around cities.[13] In 1965 Davis wrote "Clearly the world as a whole is not fully urbanised, but it soon will be".[14]

The tumultuous change is set to intensify over the next few decades as urban populations continue to grow rapidly and large cities become the principle form of human habitat. Today the sheer scale of the change; the number of countries undergoing rapid urbanisation, the number of cities that are growing so quickly, and the vast number of people involved, is difficult to comprehend. Current predictions suggest that it will be well into the twenty-first century before urban population significantly slows down.[15] In stressing the impact of 'excessive' population growth on world urbanisation, Davis predicted that the less developed countries would eventually be unable to sustain their populations. He concluded that there would be an end to urbanisation but not necessarily to absolute population growth, economic development, the physical size of cities, or the absolute number they might contain. The "end of urbanisation", he said, occurs in industrialised countries when:

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[10] See, for example, Peter Hall, *World Cities* (Weidenfeld & Nicolson, 3rd edn., London, 1984)
[11] Davis, (1965)
[12] *Ibid*
[13] UNPD, (1995)
[14] Davis, (1965)
[15] Nick Devas and Carole Rakodi (eds.), 'The Urban Challenge' in *Managing Fast Growing Cities* (Longman Group, London, 1993)

- there is no longer a large enough rural population to create a significant migration to cities, or;
- the suburban population begins to increase as fast as the urban population.

Davis, however, recognised that pushing the definition of 'urban' away from the notion of dense settlement towards sprawl means, in a sense, that the slowing down of urbanisation is more apparent than real; in effect an increasing number of urbanites simply become suburbanised. In this way, he saw the boundaries of urban places within developed countries become enlarged; as a society becomes advanced enough to be highly urbanised the whole "concept of urbanisation becomes ambiguous".[16]

Historically urbanisation and the growth of cities have occurred together but although today cities in many developing countries are growing rapidly, we should not confuse overall 'urban growth' with the pace of 'urbanisation'. Urban growth is the rate of change in the urban population; the pace of urbanisation is best measured by the rate of change in the proportion of the population that is urban (percentage urban).[17]

3.1.2 The cycle of urbanisation

Davis (1965) theorised that the cycle of urbanisation follows an attenuated S curve in which countries urbanise very slowly at the long bottom of the S, shoot up at the middle section, and then level off at the top part of the S. He considered that the advanced industrialised nations have reached the top of the S, that the rapidly urbanising are at the steep middle of the S, and that the less developed countries are moving along the long, slow rising bottom of the S. Hank Savitch (1996) has recently used a similar method of tripartite classification to distinguish between cities in a global era based on economic performance.[18] Table 3.1 combines these two approaches.

In the developed world, the fastest urban growth took place over a century ago and although growth continues today (at less than 1 percent per year) it is at a much slower rate than it has been in previous decades. By 1995, over 70 percent of the population in both Europe and North America were living in urban areas.[19] The majority of the population shift occurring in developed countries now involves movement away from concentrated urban centres to either vast, sprawling metropolitan regions (suburbs) or to smaller cities. Among the world's fastest

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[16] Davis, (1965)
[17] Michael J. White, "Urbanization and Population Dynamics" in M. A. Cohen *et al* (eds.), *Preparing For the Urban Future* (Woodrow Wilson Centre, Washington, D.C., 1996), pp. 157-70
[18] H. V. Savitch, "Cities in the Global Era" in M. A. Cohen *et al* (eds.), *Preparing For the Urban Future* (Woodrow Wilson Centre, Washington, D.C., 1996), pp. 39-65

growing cities are in the American Southwest (Phoenix, Los Angeles, San Diego) – but since this growth involves urban-to-urban migration, the overall level of urbanisation is unaffected.

In the developing world, Latin America, Southeast Asia and the Caribbean are the most urbanised with a similar percentage urban to Europe and North America. Small and intermediate-size cities continue to grow rapidly in these regions.[20] Growth rates are extremely high in the rapidly industrialising cities of Southeast Asia and Latin America. Cities in these regions offer many advantages over rural villages, having more employment opportunities and superior infrastructure and living conditions. Even so, infrastructure facilities, such as road networks and wastewater treatment plants lag far behind what is needed. The result is among other city-wide problems congested city streets, and mounting air and water pollution. Although many people live in the relative comfort of highly serviced homes huge numbers of poor people live in 'shantytowns', illegal settlements with conditions almost as bad as those in the poorest cities. People in these cities are confronted with the "worst of both worlds"; the environmental problems associated with economic growth and the yet unsolved problems of sanitation.[21]

By far the most rapid and significant change is now taking place in the less developed countries of the world. Currently, the developed nations are the most urbanised with, on average around three-quarters of their population living in cities (United Kingdom is 89%, France 76%, Germany 85%, Italy 67%, United States 76%, Canada 77%, Japan 77%, Australia 85%). Africa and Asia are currently only 35 percent urban but it is in these regions that the most explosive growth is taking place and urban populations are growing at around 4 percent annually.[22] In Sub-Saharan Africa alone the urban population growth rate averages an annual 8.5 percent in the 35 major capitals, which are doubling their inhabitants every nine years.[23]

Cities in these nations will absorb a disproportionate share of urban growth in the decades to come. Africa, currently the least urbanised continent, is about to experience an unprecedented level of urban expansion which will result in around two-thirds of its population living in cities by the year 2025.[24]

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[19] UNPD, (1995)
[20] UNPD, (1998)
[21] A. Rossi-Espagnet *et al*, 'Urbanization and Health in Developing Countries: A Challenge for Health for All' in *World Health Statistics Quarterly,* Vol. 44, No. 4 (1991)
[22] UNPD, (1998)
[23] Mega-City Growth and the Future (Brennan, Ellen, et al, 1993)
[24] UNPD, (1998)

TABLE 3.1

GLOBAL CITIES IN DEVELOPED (TOP OF THE *S*), RISING (MIDDLE OF THE *S*) AND LESS-DEVELOPED ECONOMIES (BOTTOM OF THE *S*)

Developed Economies *Prosperous and Distressed Cities* *Top of the S*	*Rising Economies* *Transitional Cities* *Middle of the S*	*Less-Developed Economies* *Impacted Cities* *Bottom of the S*
Amsterdam	Bangkok	Abidjan
Chicago	Beijing	Accra
Detroit	Bombay	Algiers
Frankfurt	Buenos Aires	Baghdad (*)
Glasgow	Guangzhou	Bangalore
Hamburg	Hong Kong	Bogota (*)
Houston	Istanbul	Cairo
Liverpool	Jakarta	Calcutta
London (*)	Johannesburg	Casablanca
Los Angeles	Kuala Lumpur	Dakar
Madrid	Leningrad	Dar es Salaam
Marseilles	Manila	Dhaka
Milan	Mexico City	Kinshasa
Naples	Moscow	Lagos
New York (*)	Nanjing	Lima
Paris	New Delhi	Nairobi
Philadelphia	Rio de Janeiro (*)	
Rome	Sao Paolo	
San Francisco	Seoul	
Stockholm	Shanghai	
Sydney	Singapore	
Tel Aviv	Taipei	
Tokyo		
Toronto		
Washington		
Zurich		

Sources: H. V. Savitch, "Cities in the Global Era" in M.A. Cohen et al (eds.), Preparing For the Urban Future (Woodrow Wilson Centre, Washington, D.C., 1996 and Kingsley Davis, "The Urbanization of the Population" in, Scientific American (September 1965)
Note: Those cities Davis referred to specifically are marked (*)

Because of increased levels of economic growth, of migration, of population expansion and, in some cases of unprecedented industrial growth, the bulk of the new urban population in the twenty-first century will be made up of African and Asian people. There is no precedent in history for increases of this order of magnitude. The rate of urbanisation (percentage urban) that results, relative to the level of economic or industrial development that exists, is so excessive that it is often referred to as 'hyper-urbanisation' or 'over-urbanisation'. In these countries the rapid urbanisation now under way will increasingly concentrate both population and economic growth in cities, intensifying the problems of the urban environment.

3.1.3 *Historical and contemporary patterns*

If current trends hold, the years to 2012 would see a total world population increase of 2 billion, which would be twice the 1992 population of China and represent the largest population increase ever recorded over a 20-year period.[25] Almost all of this increase will occur in the developing world, where it is already proving almost impossible to create the services and infrastructure needed to support the swelling urban masses and expand agricultural land and capital fast enough to accommodate the huge natural increase in rural areas. Since there is no historical precedent for the scale and speed of urban population increase today there is little guidance to predict the magnitude of problems this might pose.

Although the shift of jobs from agriculture to industry and the concentration of economic opportunities in urban areas, is a recurring pattern[26] with regard to the wider forces of economic development and levels of industrialisation the less developed countries are "definitely not recreating past history".[27] Among the ways that their course differs from the previous pattern of urbanisation is that:

- urbanisation is proceeding more rapidly now than the industrial nations did historically during their greatest period of growth;
- cities are growing much faster than they ever have, even in the industrialising boom of the nineteenth century;
- the total population growth, urban as well as rural, is far greater in the less developed nations than in industrialised countries. Since 1940 the population has been growing more than twice as fast;
- the rural population of less develop countries continues to grow as they urbanise, unlike the developing nineteenth century European cities where industrialisation led to the depopulation of rural areas.

The agglomeration effect of urbanisation inevitably concentrates pollutants, which in a more dispersed form would cause few problems. In recent years high birth rates and the rapid drop in mortality rates, coupled with rural-to-urban migration, have ensured that the global urban populations have expanded dramatically. Although similar trends occurred in Europe and North America 100 years ago, the pattern of urbanisation based on industrialisation has resulted in the intensification of urban environmental problems - e.g. contaminated water supplies, inadequate waste management, air pollution etc. - well beyond those experienced previously. The various

[25] UNPD, (1998)
[26] UN (Habitat), (1997)
[27] Davis, (1965)

accounts we have of the conditions of nineteenth century cities like, Manchester, London, Leeds, and Newcastle, and from others in the United States indicate health and sanitary conditions as bad as, if not worse, than those found in the poorest cities of the South today.[28] In the developed nations, mostly due to the efforts of social movements, campaigners and pressure groups, environmental problems have largely become socially and politically unacceptable. This is not yet the case in the undeveloped world. Atkinson (1996) warns us that we need to keep in mind both how long it took to achieve the relatively sanitary cities we have in Europe today and that this is as much a cultural and political issue as a technical one.

> A superficial view of the cities of the South is that they are simply repeating the urbanisation process we witnessed in the industrialised countries 100 years ago , with the implication that we need simply to transfer our technologies and forms of urban management to the South to solve the problems. Whilst there are clearly certain similarities, in practice, the differences are great, and these differences must be taken into consideration in any attempt to intervene.[29]

Perhaps the most significant difference between the historical process of urbanisation in the developed nations and the current pattern in the developing world involves the distinction between urbanisation and urban growth. Historically they occurred together. The growth of cities arose from and contributed to economic advancement. Painful as it was the rapid growth of cities in the industrialising countries during the nineteenth century dealt with the problem of what to do about the rural population.

> Cities took surplus manpower from the countryside and put it to work producing goods and services that in turn helped modernise agriculture.[30]

Today the less developed countries are experiencing an even more rapid urban growth but urbanisation is failing to solve their rural problems. As populations continue to expand rapidly the historical tie that existed between economic advancement and urban growth is being, if not unhinged, certainly transformed, as in the global age the growth of cities becomes detached from the historical process of urbanisation.

> Cities in the developing countries are already faced by enormous backlogs in shelter, infrastructure and services and confronted with increasingly overcrowded transportation systems, insufficient water supply, deteriorating sanitation and environmental pollution. Among the economic and social factors influencing this process are population growth and voluntary and involuntary migration, real and

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[28] As well as Friedrich Engel's *The Condition of the Working Class in England* (1845) see Charles Booth's *Conditions and Occupation of the People in East London and Hackney* (1887), Jack London's *People and the Abyss* (1903). In the United States Jacob Riis's *How the Other Half Lives* (1903) and reports on the conditions of life in the African-American ghettos such as W.E.B. Dubois's *The Philadelphia Negro* (1899)

[29] Adrian Atkinson, "Sustainable Cities: Dilemmas and Options" in *City 3-4* (June 1996), pp. 5-11

[30] Davis, (1965)

perceived employment opportunities, cultural expectations, changing consumption and production patterns and disparities among regions.[31]

The problems of the large cities of the developing countries are due largely to the fact that they have materialised ahead of any systematic movement towards modernisation. Many of these cities formed transmission points from which raw materials and food were sent to the metropolises of Europe and North America, and to which manufactured goods returned. Lacking is the human and technical resources necessary to deal with the full range of urban development needs, also hampered by the dense "forest" of vertical and horizontal separations within often unmanageable national bureaucracies. Rapid population growth has increased the tendency of cities in developing countries to outgrow the resources of the economies they are supposed to nourish and support. The traditional range of public services, utilities and welfare services taken for granted in the cities of developed countries are not generally available to the inhabitants of most of the cities of developing countries; even less so in the rural areas. Lack of finance, infrastructure and skills at all levels contribute to this situation.

One of the overriding influences is at the policy-making level, where the application of priorities, based on the experiences of developed countries, has led to a misunderstanding of the urbanisation process. Indeed, neither the historically conventional European City, nor the colonial city, which has been the main focus of large-scale urbanisation in the rest of the world, is really well adapted to developing countries at the present time. Nor can the largest industrial cities, for all their success in other spheres, be accepted as socially or culturally desirable models, most having conspicuously failed to adapt to modern conditions and frequently having become sprawling industrial centres of dreary anonymity. The city throughout the developing world is in a sense the sign and symbol of a development process that could break down completely in the near future. Life in the city is failing to make good deficiencies in literacy and job skills or to provide work which the illiterate and unskilled can do.

3.1.4 Rural - urban migration and natural population increase

The world's urban population is currently growing at four times the rate of the rural population. While in 1975 only 37.8 percent of humanity lived in towns and cities recent estimations show urbanisation level of 61.1 percent for the year 2030.[32] Recent figures indicate that between 40 to 60 percent of annual urban population growth in the developing world is due

[31] UN Conference on Human Settlements (1996), Paragraph 99
[32] U N (Habitat), (1999)

to rural-urban migration.[33] In the less developed countries with large poor rural populations, like Africa, and parts of Asia, migration is expected to become a major factor in the coming years.

Major economic and demographic forces underlie urbanisation. Millions of young people today (half of the population in the developing nations is under the age of 23) are leaving the farms in Africa and Asia for the same reasons people migrated to cities in Northern Europe and the United States more than a hundred years ago. To the "MTV Generation" the lure of the city lies mainly in the potential of higher wages, job opportunities, and access to material goods not readily available in rural areas.

However the factors driving rural-to-urban migration in the developing world are complex; people are not only attracted to cities by employment prospects and higher wages. They are also repelled from rural areas by poverty, decline in agricultural work, famine, drought, disease, and war.

Migration is not always permanent; some migrants continuously move between their urban and rural homes. Some studies have suggested that most migrants feel their situation to have been improved, albeit marginally, by moving to the city. In New Delhi, India, a survey found that incomes for poor migrant workers from rural areas were 2.5 times greater in the city, because they could work around twice as long.[34]

A report by the UN Population Division Fund (1996) identified three factors that contribute to the rapid growth of city populations. There is the migration into town of impoverished country dwellers. There is a colonisation of outlying villages by urban conglomerations. But the largest factor is the population explosion among slum-dwelling citizens themselves. Despite the appallingly unhealthy conditions endured by people in the slums of places like Lagos and Kinshasa, the urban birth rate invariably outpaces the death rate. Population growth fuels the growth of urban areas:

- as "natural increase", stemming from high birth rates within urban areas:
- as migration from outlying rural areas, where the labour force tends to grow more rapidly than employment.

Another UN agency, the International Labour Organisation (ILO), has called for redoubled efforts by wealthy countries and poor countries alike to create jobs for the urban poor. Otherwise the number of city dwellers living in poverty will soon exceed 1billion. Today almost one half of humanity lives and works in cities, with developing countries accounting for the major share of

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[33] World Resources Institute, *World Resources 1996-97* (Oxford University Press, New York, 1996)
[34] Mike Parnwell, *Population Movements and the Third World* (Routledge, London, 1993)

the world's new urban population. These people need jobs if the new cities are to develop as centres of economic opportunity and civilisation rather than zones of inequality and misery.

Unemployment is a significant problem for governments in most cities of developing countries because of their inability to absorb the enormous influx of migrants within their formal economies. Unable to pay for their basic needs of food and shelter, many simply swell the ranks of the urban poor, and make their living through subsistence activities and informal jobs, like rubbish collection, domestic help, and fast food and clothes retailing. This production and exchange economy, which exits outside the formal market, accounts for around 75 percent of urban employment in many countries in sub-Saharan Africa, and about 40 percent in Latin America.[35] Until recently this informal economy was seen as disconnected from the 'real' economy of a city, but there is now evidence that informal jobs are well integrated and contribute directly to the urban economy as a whole.[36] But these jobs are poorly paid, the average income being generally well below official poverty lines, and have no security or benefits attached.

The availability of land is also becoming a major problem within cities of the developing countries. People move to cities in an attempt to improve their economic opportunities and quality of life, and urban migrants have often managed to adapt to the inherent stresses of city life. But, as a recent UN report on urban areas noted:

> ...the situation is rapidly changing. Options previously available to low-income urban populations, such as that of settling unused public land and low-density central city neighborhoods, are rapidly disappearing. While the demand for land is growing (indeed, it has been calculated that rapid urbanization is likely to lead to a doubling in size of built-up urban areas in most developing countries over the next15 to 20 years) the supply...is both genuinely and artificially limited.[37]

In the first wave of industrialisation during the nineteenth century rapid urban growth was mostly the result of rural-to-urban migration. But today, in the developing nations, the natural increase of the urban population is at least as important as migration.[38] Despite the dual role many countries still view rapid urban growth as a "problem" of migration alone. Concerned about the unsustainable nature of burgeoning urban populations, a number of governments in both the developed and developing world have adopted policies to curb migration, generally without success.

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[35] The World Bank (WB), *World Development Report 1995: Workers in an Integrated World* (WB, Washington, D. C., 1995)
[36] WRI, (1996)
[37] United Nations Population Division (UNPD), *The Challenge of Urbanization: The World's Large Cities* (United Nations, New York, 1995)

Population growth and environmental degradation can contribute both to migration pressures and to the potential for civil conflict. The environmental by products of large and concentrated urban populations pose direct threats to health and to the quality of city life. In Mexico City, considered home to the world's worst air pollution, most children who are tested have elevated lead levels. Ozone pollution, with concentrations that are often three times as high as the World Health Organization's safety standard for ozone have been recorded.[39] The scale of the problem has led the city's government to curtail driving and industrial activity to help clear the air. A recent scientific study suggested that the primary culprit for the city's air pollution may be the combustion of liquefied petroleum gas, which is used to heat homes and cook food throughout the city.[40] At the same time, the need to provide fresh water to a growing population of about16 million in an arid mountain valley has forced Mexico City to overdraw its underground supplies of fresh water and pipe water from across the surrounding mountains, at a high and growing cost in electricity. The level of the city's aquifer is sinking by more than three feet per year, causing land to subside and structures to buckle in the city's centre.[41]

The interaction between population dynamics and environmental and social problems is an important factor for the growing proportion of the world's people who live in and around cities. Urban areas are continuously being reworked but in many cities that are already suffering from demographic fatigue the sort of adaptations that continued population growth would require are hard to imagine. Increasingly, though, we see how people are taking matters into their own hands:

> In Cairo, a city of around 10 million people, space in public parks is in such demand that many charge admission so the grassy central reservation of the road between the city and airport has become a place for of families to hold picnics, with cars whizzing by a few yards away.[42]

3.2 Urban Growth

> At the end of 1997, we shared the Earth with 80 million more people than a year earlier, adding nearly another Sweden each month. Of this total nearly 50 million were added in Asia, the region that is home to more than half of humanity. And cities are growing faster than ever.[43]

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[38] United Nations Centre for Human Settlements (Habitat), *An Urbanizing World: Global Report on Human Settlement 1996* (Oxford University Press, Oxford, 1997)
[39] "Mexico City Sets Pollution Record," Reuters wire service release in *The Washington Post*, 16 March 1992
[40] Anthony DePalma, "Cooking Gas, Not Cars, May Cause Mexico City Smog" in *The New York Times*, 18 August 1995
[41] WRI, (1996)
[42] John Lancaster, "In Cairo, Its Not Easy Being Green," in *The Washington Post*, 20 May 1996
[43] Worldwatch Institute, *Vital Signs 1998: The Environmental Trends That Are Shaping Our Future* (WW Norton & Co, New York, 1998)

The world population reached 6 billion in 1999. It took more than a century to grow from 1 billion to 2 billion people; more than 30 years to reach 3 billion; 15 years for the next billion; and 12 years to grow from 4 billion to 5 billion. At the current rate of growth the world will have 7 billion people soon after the year 2010. By far the overwhelming share of growth is taking place in developing countries.[44] The population in Africa, Asia, the Middle East and Latin America has more than doubled in recent years, having grown from 1.89 billion in 1955 to 4.13 billion in 1990.[45] Some of these countries, particularly in Asia, now also lead the world in terms of economic growth.[46]

Against this backdrop of expanding population and economic growth, urban growth is altering the condition of humanity and changing the face of the Earth. During this century global urban populations have expanded dramatically. A hundred years ago only 13 percent of the total world population lived in urban areas. Now around 48 percent, or nearly 3 billion people, live in or around cities. Within the next few years, by 2006, every second human being is expected to live in urban settlements. This transition not only holds demographic and socio-cultural significance, (as the 'rural half of humanity' will be increasingly dependant on 'the urban half' for their economic survival) but will have profound implications with respect to the physical arrangement of cities, their resource consumption and their environmental impact. According to UN estimates, by 2025 60 percent of the global population will live in urban areas.[47] A report from the World Resources Institute, the UN Environment Programme, the UN Development Programme, and the World Bank predicts that "more people will live in cities by 2025 than occupied the whole planet ten years ago".[48]

In a recent publication, Herbert Girardet (1999) lists the main factors contributing to urban growth as:[49]

- national economic development;
- urban accumulation of political and financial power;
- import substitution;
- economic globalisation;
- access to global food resources;

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[44] The share of world population growth was 89.9 % in 1970-80; 92.2 % in 1980-90, 95.2% in 1990-2000; 97.6% in 2000-10; and 98.4% in 2010-20. Source: Habitat, *Global Trends* (1999)
[45] UNPD, (1998)
[46] In fact the top 20 fastest growing economies in the world between 1965 and 1996 are developing nations. Source: World Bank, *World Development Indicators, 1998.*
[47] UNPD, (1998)
[48] WRI, (1996)

- technological development;
- cheap energy supplies;
- expansion of urban-centred transport systems;
- migration from rural areas;
- reproduction of urban populations.

TABLE 3. 2

THE WORLD'S LARGEST CITIES, 1950 and 2000
(By Population Size, in Millions of People)

Rank	City	Country	1950	City	Country	2000
1	New York	United States	12.3	Tokyo	Japan	28.0
2	London	United Kingdom	8.7	Mexico City	Mexico	18.1
3	Tokyo	Japan	6.9	Bombay	India	18.0
4	Paris	France	5.4	Sao Paolo	Brazil	17.7
5	Moscow	Russia Federation	5.4	New York	United States	16.6
6	Shanghai	China	5.3	Shanghai	China	14.2
7	Essen	Germany	5.3	Lagos	Nigeria	13.5
8	Buenos Aires	Argentina	5.0	Los Angeles	United States	13.1
9	Chicago	United States	4.9	Calcutta	India	12.9
10	Calcutta	India	4.4	Buenos Aires	Argentina	12.4
11	Osaka	Japan	4.1	Seoul	Rep. of Korea	12.2
12	Los Angeles	United States	4.0	Beijing	China	12.0
13	Beijing	China	3.9	Karachi	Pakistan	11.8
14	Milan	Italy	3.6	Delhi	India	11.7
15	Berlin	Germany	3.3	Dhaka	Bangladesh	11.0
16	Philadelphia	United States	2.9	Metro Manila	Philippines	10.8
17	Saint Petersburg	Russia Federation	2.9	Cairo	Egypt	10.8
18	Bombay	India	2.9	Osaka	Japan	10.6
19	Mexico City	Mexico	2.9	Rio de Janeiro	Brazil	10.6
20	Rio de Janeiro	Brazil	2.9	Tianjin	China	10.2

Source: U. N. Population Division, "World Urbanization Prospects: The 1996 Revision".

As shown in Table 3.2 New York was the largest city in the world in 1950, with a population of 12.3 million people. At that time no other city had a population greater than 10 million. Today, however, there are 20 cities of at least this size, mostly in Asia. Many are much larger.

Currently, the developed nations are the most urbanised with, on average around three-quarters of their population living in cities. However countries in the South, which are spawning large cities at the rate of 10 per year, are now growing five times faster than those in the North. Almost all of the world's urban population growth over the next fifty years will be in the South.

[49] Herbert Girardet, *Creating Sustainable Cities*, (Green Books, Devon, 1999), pp. 20-22

Cities are growing in number and size because they provide, on average, greater social and economic benefits than rural areas. The higher capital investment secured through urbanisation brings with it health and social benefits that could only be achieved in rural areas at far greater costs.

Over the next twenty years the fastest rate of urban growth will occur in Asia and Africa, whose current rates of urbanisation at approximately 35 percent are well below the world average (45.2%). Asia, in particular is about to go urban in a big way. Its urban population is expected to increase by a staggering I billion people over the next twenty years[50]. It is expected that around 250 million people (roughly the entire population of the United States) will be added every five years until 2020. By the year 2015, 12 of the world's 15 largest cities will be in Asia; only one - New York - will be in North America; none will be in Europe.

3.2.1 Million+ cities

"A principal culmination of five thousand years of human history is a world of giant cities".[51] More and more of us are now living in cities of populations greater than 1 million (about the size of Glasgow or Birmingham). In 1800 London and Peking were the only two cities in the world with more than 1 million inhabitants. At the beginning of the twentieth century there were five; by 1950 there were 78; by 1985 there were 258. Today there are more than 350 cities with at least a million people, and more than 20 of these have populations greater than 10 million. The UN estimate that there will be more than 500 cities with more than a million people by 2010, and 640 by 2025.[52]

In the developed countries 26 percent of us lived in these huge cities in 1990, compared with 19 percent thirty years earlier. The million+ city is no longer a Western phenomenon. In the developing world the proportion of such cities more than doubled from 5 percent in 1960 to 12 percent in 1990. In the 1970s the developing world had about the same number of cities as the developed world. But soon there will be twice as many cities in the South. Since the first U. N. Conference on Human Settlements (Habitat 1) in 1976 India and China have added 14 and 25 million+ cities respectively. Africa has increased its number from 5 to 16. Despite severe poverty cities like Luanda, Kinshasa, Douala, and Addis Ababa (in Africa) and (elsewhere) Hanoi, Ho Chi Minh City, Kabul, and Port-au-Prince have steadily grown in population.[53]

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[50] United Nations, *Human Development Report, 1997*
[51] M.J. Dear, *The Postmodern Urban Condition* (Blackwell, Oxford & Malden, Mass., 1999)
[52] UNPD (1998)
[53] Sivaramakrishnan, (1996)

By the year 2015, it is expected that 22 percent of the world's total population and 41 percent of the world's urban population will live in million+ cities.

3.2.2 Mega-cities (8 million+)

One commonly used metric for measuring urban growth is the 'mega-city' defined as a city with a population exceeding 8 million. In 1950 New York (with 12.3 million) and London (with 8.7 million) were the only two mega-cities in the world. By 1990 there were 21, sixteen of them in the developing world, where migration and natural growth have carried many of the large cities to mega-city proportions. By 2015 it is expected that there will be 33 mega-cities in the world, twenty-seven of these being in the developing nations. Early in the twenty-first century, only one European City, Paris, will be in the world's top 30. Lagos, in Nigeria, is expected to be the third largest city in the world (see Table 3.3).

Giant cities are the result of the transformative experience of industrialisation, colonialism and the extension of the 'global economic system'. But there are differences between cities in industrialised countries and those in the developing world. The former are stabilising in terms of size or even shrinking, but continuing to increase in per capita wealth, while the latter are growing rapidly as their per capita wealth falls steadily. Table 3.3 indicates that the majority of the world's largest cities are transitional or impacted cities which are either at the start or are in the middle of the urbanisation process. If the UN projections hold for 2015 then the third largest city in the world will also be one of the poorest, Lagos. Of the ten largest cities in the world in 2015, four will have emerged from the less-developed economies.

In the developed world the apparent slowing down of urbanisation through urban sprawl (Davis, 1965) is now compounded by information and telecommunications technologies. What have historically been 'urban' functions are no longer tied into an agglomeration economy since, not only motor cars and piped water and energy supplies, but now computers and telecommunications extend far into rural areas, in effect enlarging the boundaries of urban place. As developed society has become highly urbanised (and suburbanised) the whole concept of urbanisation has become ambiguous.

Cities like Jakarta, Mexico City, Sao Paolo, and Lagos in the developing world, on the other hand, still represent cores of economic investment and activity in the midst of fairly traditional rural economies. As the traditional population is increasingly excluded from the centres of the cities by the operation of the formal commercial sector and land market, infrastructure and services are being forced out into the immediate landscape, through a process of 'densification' in informal settlements and shantytowns.

TABLE 3.3

EXPECTED GROWTH IN CITIES WITH POPULATIONS OF 8 MILLION OR MORE, 1995 and 2015
(By Population Size, in Millions of People)

CITY	1995	2015	*Rising Economies Transitional Cities Middle of the S*	*Less-Developed Economies Impacted Cities Bottom of the S*
Tokyo, Japan	26.96	28.89	-	-
Mexico City, Mexico	16.56	19.18	Yes	-
São Paulo, Brazil	16.53	20.32	Yes	-
New York, US	16.33	17.60	-	-
Bombay, India*	15.14	26.22	Yes	-
Shanghai, China	13.58	17.97	Yes	-
Los Angeles, US	12.41	14.22	-	-
Calcutta, India	11.92	17.31	-	Yes
Buenos Aires, Argentina	11.80	13.86	Yes	-
Seoul, Korea, Rep.	11.61	12.98	Yes	-
Beijing, China	11.30	15.57	Yes	-
Osaka, Japan	10.61	10.61	-	-
Lagos, Nigeria *	10.29	24.61	-	Yes
Rio de Janeiro, Brazil	10.18	11.86	Yes	-
Delhi, India *	9.95	16.86	Yes	-
Karachi, Pakistan *	9.73	19.38	-	Yes
Cairo, Egypt	9.69	14.42		Yes
Paris, France	9.52	9.69	-	-
Tianjin, China	9.42	13.53	Yes	-
Metro Manila, Philip *	9.29	14.66	Yes	-
Moscow, Russian Fed	9.27	9.30	Yes	-
Jakarta, Indonesia *	8.62	13.92	Yes	-
Dhaka, Bangladesh	8.55	19.49	-	Yes

*Source: U. N. Population Division, Urban Agglomerations, 1950-2015 (The 1996 Revision), Note: * Cities expected to grow by >50% by 2015*

A UN report on the *State of World Population* , was published to coincide with the opening of the Habitat II conference in Istanbul in June 1996. Representatives from the world's nations were asked to act on the report's findings and steer development programmes towards urban education and health projects, especially for women, to improve the upward mobility of shantytown dwellers. The UN Secretary -General called for efforts to control the 'inevitable' march of the city. The UN is still currently pushing for the development of a large number of manageable, medium-sized cities rather than a few, uncontrollable mega-cities.[54]

[54] J. Lichfield, "Super-cities threaten to swallow humanity. Developing world hosts explosive urban growth", *The Independent, May 1997*

3.3 The global city

Historically cities have been places where most economic activity has occurred and where great wealth has been generated as a result. Global economic growth today is closely associated with the process of urbanisation and it is becoming generally accepted that the struggle to achieve an environmentally sustainable economy will be won or lost in the world's cities:

> During the course of history, urbanization has been associated with economic and social progress, the promotion of literacy and education, the improvement of the general state of health, greater access to social services, and cultural, political and religious participation. Democratisation has enhanced such access and meaningful participation and involvement for civil society actors, for public-private partnerships, and for decentralised, participatory planning and management, which are important features of a successful urban future. Cities and towns have been engines of growth and incubators of civilization and have facilitated the evolution of knowledge, culture and tradition, as well as of industry and commerce.[55]

Most countries of the developing world with high rates of urbanisation in the last decade also experienced higher economic growth. This is shown in, among others, higher life expectancy, lower infant mortality, higher literacy, and increased participation of disadvantaged groups.

> The steady increase in the level of urbanisation since 1950 reflects the fact that the size of the world's economy has grown many times since then...[56]

But although the world has witnessed economic and social progress during recent decades economic and social gains have been unequally distributed. In 1960, the 20 per cent of the world's population living in countries with the highest per capita income had incomes 30 times greater than the world's poorest 20 per cent; by 1990, the richest 20 per cent were getting 60 times more.

The steady increase in the level of urbanisation world wide since the 1950s reflects the enormous changes over recent decades in the nature and scale of global economic activity. It has been argued that the process of urbanisation must be understood as a basic condition for, and as a functional consequence of economic, social and technological development. Agglomeration economies accelerate growth, access to markets being the most significant benefit of concentration. Some believe that indiscriminate efforts to avoid urbanisation may only serve to delay development.

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[55] United Nations Conference on Human Settlements (1996)
[56] David Satterthwaite in *An Urbanizing World* (Oxford University Press, Oxford, 1996)

Urban growth is inextricably linked with economic growth. Although it is unclear exactly which of these is the driving agent the World Bank claims that both aggregate and per capita incomes are higher in the more urbanised regions of the world.[57] Cities provide a focus for economic growth, which due to economies of scale, act as extraordinarily efficient points of convergence for concentrations of commerce and industry.

> They optimise the use of human and mechanical energy; they allow for fast, cheap transportation; and they provide flexible, highly productive labour markets. In addition cities facilitate a diffusion of products, ideas, and human resources between urban, suburban, exurban, and rural spaces.[58]

In a self –perpetuating cycle of interdependence commerce and industry attract the ancillary services needed to support them. This in turn makes urban areas more attractive and gives them a competitive edge. Few industries can survive elsewhere.

The restructuring of the world economy during the past twenty years is one of the most powerful forces in the continuing evolution of cities and has enormous implications for the structure of the global system of cities, the functions cities perform and the nature of social life within them. Globalisation of both economy and communications is in the process of sweeping away all previous conceptions of economic development and shaping economic entities that regard every region of the world either as a source of raw materials, a production centre, or an emerging market. As an incomplete, contradictory and highly mediated process, it has become the object of different and conflicting interpretations, not least regarding its significance for cities and their future. But although its exact nature and implications remain an area of debate and controversy it has an important role in the process of urbanisation.

3.3.1 Global countries

Since the Second World War, international trade has grown consistently faster than output and now accounts for approximately 25 percent of world GDP. Other measures of globalisation include; the enormous expansion of international financial markets; the spread of new technologies that have revolutionised international communications and encouraged the development of transnational patterns of production and consumption; and the fourfold increase in foreign direct investment (FDI) flowing to developing and transition economies over the past decade.[59]

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[57] The World Bank (WB), *Urban Policy and Economic Development: An Agenda for the 1990s* (WB, Washington, D.C., 1991)
[58] Savitch, (1996), pp. 39-65
[59] WB, (1997), p. 289

Economic globalisation represents the accelerating pace of international integration and interdependence through rising cross-border transactions in goods, capital, services, and labour. Like the first decade of the twentieth century the last ten years has witnessed a sharp rise in this form of global trade and investment. The economic benefits of making active links with other nations and promoting economic and financial collaboration include better resource allocation, economies of scale, technology transfer, and greater availability of capital.

In general Central European nations and developing countries in Asia have higher levels of trade openness than those in Latin America. There is a large contrast in both trade and investment openness between China and India. China's level of trade openness at 40 percent, is up from 25 percent in 1985 and just 9 percent in 1978. It also had, next to Hungary, the highest level of investment openness in 1995, the last year of available data. India on the other hand, at 3.6 percent, remains more reluctant to trade with the rest of the world.

3.3.2 Globalism and cities

Globalism is an economic, political and socio-cultural phenomenon, which rapidly accelerated during the 1980s and 1990s. It consists of a batch of interrelated ideas:

- It refers to the changing nature of economic relationships, involving the integration of national economies, and the notion that capital, products and services, transcend national boundaries. An increasing reliance on global standards is indicative of the growing universality;
- It indicates an intensification of interaction and interconnection between states, localities, and societies across the world. This can be seen in the rise of multilateral organisations, regional pacts, and discussions of a borderless world. Old boundaries are obliterated and the seemingly contradictory stimuli of co-operation and competition are prevalent;
- It conveys the idea of an open and multicultural society[60]. Immigrant and ethnic cultures are now said to thrive in "transnational space" in which language, habit, and tradition continue regardless of geography. Transnational space has also been made possible by the communications revolution. Electronic communication has penetrated entertainment and information monopolies with everything from DVD players to CNN newscasts and Internet services.

> ...[C]ities are of great importance to the dominant economic sectors. Large cities in the highly

[60] Richard Knight and Gary Gappert, eds., *Cities in a Global Society* (Newbury Park, California, 1993)

developed world are the places where the globalization process assume concrete localized forms. These localized forms are, in good part, what globalization is about[61].

The agglomerative features of cities make them natural centres for co-ordination and direction. In effect they have become the essential nodes through which the new economy can be planned and facilitated. Cities have several advantages in planning terms:

- they provide the important spaces needed to organise a huge array of functions;
- they contain the infrastructure needed to support millions of white collar workers;
- they allow for the mobilisation of goods, money and information.

Money has always played an important part in urban life, but now it drives everything else. Cities facilitate this process since they offer:

- the ability to process capital through "trade centres" or "smart buildings";
- the availability of financial and business services;
- access to capital markets;
- proximity to sources of information and investment.

3.3.3 A new geography

Saskia Sassen (1994) has argued that certain leading cities have emerged as strategic sites in the world economy, where decisions made in London, New York or Tokyo affect jobs, wages and the general economic well-being of places as remote as Kuala Lumpur, Malaysia, or Santiago, in Chile.[62] Transnational corporations, centred in developed countries, need new markets for their products and technological advancements allow them to operate in any geographical region that would maximise efficiency: [63]

In the global era some cities are international growth machines of the new economy. Over the last twenty years their pace has accelerated and, as they get better at what they do their inherent efficiency translates into gains in productivity. The most powerful cities are to be found in the developed economies of North America, western Europe and Japan. Rising cities also exist in the transitional economies of East Asia and Latin America, whereas the least powerful cities are located in the less developed economies of Africa and parts of Latin America.[64]

In 1970 44.5 percent of the population within cities such as Barcelona, Chicago, Frankfurt, Glasgow, Hong Kong, London, Los Angeles, New York, Singapore, Sydney and Tokyo were

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[61] Saskia Sassen, *Cities in the World Economy* (Pine Forge Press, Thousand Oaks, California, 1994)
[62] *Ibid*
[63] M.E. Ducci, 'The Politics of Urban Sustainability', in *Preparing for the Urban Future: Global Pressures and Local Forces* (Woodrow Wilson Centre, Washington, 1996), pp. 264-297
[64] Savitch, (1996), pp. 39-65

part of the labour force. By 1990 that figure had risen to 59.7 percent.[65] Today in these cities we have an advanced, high-tech, high-density society in which over 60 percent of a well-educated population is gainfully employed.

Much of this productivity has been directed back into the cities, the most prosperous of which, now boast new skylines, converted waterfronts and regenerated residential areas filled with a new urban middle class trained in high technology. The key to survival for these cities in the developed economies has been the successful management of a conversion from an earlier industrial base (manufacturing, processing, shipping, or warehousing) to what has been called "post-industrial employment" (finance, services, and information processing). Successful cities follow a pattern of economic diversity, promoting mixed land use, and supporting synergies between traditional manufacture, high technology, and research information, thus indicating that the conversion to post-industrialism need not be total.

Despite earlier predictions that cities would be rendered obsolete by advances in global telecommunications and information technologies in an increasingly interconnected world economy, this is not what has happened so far. In fact some argue that the economic changes are giving rise to a new class of powerful 'global cities', centres of banking, finance, corporate planning, and management.[66] London, Los Angeles, New York, Paris, Tokyo, these are the new global command centres of the world economy and research indicates that in recent years these cities have become more, not less, dense and their wealth and power is growing, not declining.[67] And these traditionally prosperous cities are being joined by a new elite; cities as diverse as Berlin, Sao Paulo, Beijing, Bangkok, Mexico City, and Budapest are emerging as world powers in their own right, transformed into "transnational spaces for economic activity".[68] Today these 'global cities' have more in common with one another than with other cities within their own regions or nations, contributing to a new geography of centrality and marginality.[69]

While these globalising trends can bring enormous prosperity to some cities, they can also give rise to social and economic inequities in others. The pressures acting upon cities is unevenly spread reflecting an increasingly polarised global society. Sassen (1994) highlights the increasing economic stratification of those cities at the centre of the world economy contributing to a new geography of inclusions and exclusions emerging – at local, regional and international level – which cuts across some old divisions of core and periphery. By forging direct links to the

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[65] *Ibid*
[66] Sassen, (1994)
[67] *Ibid*
[68] *Ibid*
[69] *Ibid*

international system cities are changing their social and spatial configurations. The new geography assumes many forms and operates in many terrains, from the distribution of telecommunication facilities to the structure of the economy and of employment.

Cities, and in particular the large metropolitan centres of the world, have grown more complex and diverse in the context of international economic restructuring, while often becoming more socially divided and physically fragmented. Globalism produces different impacts within cities. Even the most powerful cities of the developed economies are blighted by unemployment, poor quality housing stock, and as disparities widen among the incomes of high- and low- wage workers, a growing underclass is emerging. The information revolution, the growing mobility of capital and people, and an emerging video culture seem set to undermine the long standing importance of place as well as those social and cultural characteristics tied to a specific community in a particular setting. At the heart of these issues is the question of identity.

Another flip side to urban productivity is the relentless pace of competition and the disparities that follow. In the global marketplace cities have become independent actors that must compete with one another for investment and capital in order to create employment opportunities for their citizens. The success of a city is then a function of its ability to integrate itself in the global society, as much as it is a measure of its ability to develop links to the nation or its immediate hinterland or region. Some cities have simply been swept aside by the tide:

> Global cities become the sites of immense concentrations of economic power, while cities that were once major manufacturing centres suffer inordinate declines; highly educated workers see their incomes rise to unusually high levels, while low or medium-skilled workers see theirs sink. Financial services produce super profits while industrial services barely survive.[70]

Increasingly over the last twenty years as manufacturing has become dispersed around the globe, cities which have historically served as manufacturing centres in Europe, North America and Australia are experiencing economic decline, or 'distress', as manufacturing, shifts to Asia, South and Central America and elsewhere in the developing world. Often termed as 'rust belts', many of these are former sites of heavy manufacture, or have ports that are no longer in use. These distressed cities in the developed world include Belfast, Detroit, Liverpool, and Naples.

There are significant environmental implications inherent in these economic changes. As cities compete with one another to attract manufacturing and other services, the bargaining chips are sometimes cheap labour and lax environmental concerns. Globalisation and economic

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[70] *Ibid*

reforms may well lead to greater environmental deterioration and aggravate existing inequities of income and access to basic services.[71]

3.4 Urban convergence and the deteriorating environment

> A recent survey of 150 mayors from around the world revealed that all of them listed the most serious problems affecting their city was unemployment.[72]

The hypothesis has recently been put forward that in the global era cities in the North and South are becoming more alike in their most important characteristics of growing unemployment, declining infrastructure, deteriorating environment, collapsing social impact, and institutional weakness.[73] Although the degrees of similarity and the meanings of these shared features differ between any two cities and between northern and southern cities, the argument states that a common set problems beset urban areas regardless of the level of national development. For example, while the causes of urban unemployment in cities in the North and South are certainly different, their manifestations and consequences are similar, if not identical; including homelessness, and the growing social problems of crime and drug abuse. Health profiles in some cities also seem to be convergent. In cities as diverse as Accra, Ghana; Cape Town, South Africa; Sao Paolo, Brazil heart disease and cancer are now leading causes of death, just as they are in Glasgow, London and Washington.[74] Violence has now reached 'epidemic' proportions in some urban centres in both South and North America.

3.4.1 Unemployment

While the causes of unemployment in the developed and developing world are clearly different, their consequences are the same:

- increasing numbers of low income earners in the service sector facing rising prices for urban services and basic needs;
- homelessness;
- youth unemployment;
- increasing crime and violence;
- drug and alcohol abuse.

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[71] Sivaramakrishnan, (1996), pp. 225-41

[72] *New York Times*, August 19, 1994

[73] Michael Cohen, "The Hypothesis of Urban Convergence: Are Cities in the North and South Becoming More Alike in the Age of Globalization", in *Preparing for the Urban Future* (The Woodrow Wilson Center Press, Washington, D.C., 1996), pp. 25-38

3.4.2 *Declining urban infrastructure*

In recent years in North America and to a lesser extent Europe there has been an ongoing debate as to whether there is an *infrastructure crisis* with respect to public investment in roads, water supply, sanitation, liquid waste treatment, solid waste collection and disposal, electricity, and telecommunications.[75] The increasing number of problems experienced by the public, although discernible, are perhaps of less concern. The high financial and environmental costs of an infrastructure investment, which more and more seems out of step with the needs and preferences of urban communities. NIMBY (Not in My Back Yard!) and BANANA (Build Absolutely Nothing Anywhere Near Anybody!) reactions are part of a growing mistrust of local and regional government's motivation as well as a growing fear of environmental degradation.

In the South the lack of clean water supply, urban sanitation, and the high cost (both financial and environmental) of urban transportation are clear indications of failings in infrastructure.

In the cities of the North and the South, with sharply contrasting levels of income and resources, the same argument is being used to justify expenditure on airports, bridges, and tunnels rather than road repair, sewage treatment, or infrastructure enlargement. In the end the result is the same; the needs of the poor are not served.

3.4.3 *The deteriorating environment*

In the industrialised world, in recent decades, there has been an increasing amount of attention focused on the urban environment, leading to various efforts to reduce pollution and preserve fragile ecosystems. Although there have a few notable successes, in general terms the absolute quality of the urban environment continues to deteriorate in terms of pollution, natural resource depletion, and the lack of political consensus. Almost all cities in the developed world consume inordinately high levels of water and energy that are not sustainable over time[76], and yet serious measures to reduce consumption are not on the political agenda of any of the major parties. In this sense there is a prevailing weakness of environmental governance.

The environmental debate is only just beginning in the developing nations were rapid population and urban growth is beginning to place huge pressures on environmental resources, and the inadequate infrastructure is causing severe pollution and sanitation problems. Even if meaningful (attainable) standards for environmental protection could be agreed there is no

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[74] Pan American Health Organization (PAHO), *Health Conditions in the Americas,* Vol. 2 (PAHO, Washington, DC, 1994)

[75] National Academy of Sciences, *In My Own Backyard: Principles for Effective Improvement of the Nation's Infrastructure* (National Academy Press, Washington, D. C., 1993)

mechanism of enforcement, or people monitoring standards in most communities in the developing nations. The prospects for improving the urban environment in the urban South, without environmental governance, are limited.

3.4.4 A collapsing social compact

The problems of unemployment, declining infrastructure and the deteriorating environment have contributed to social conflict in urban areas of both developed and developing countries. The proliferation of squatter settlements in most cities of the developing world means that a large part of the global urban population is excluded from the formal management system of urban governments. Authorities are increasingly dealing with those who are fighting eviction, stealing electricity or water, or resisting regulations or taxes.

The emergence of gated communities over the last twenty years, predominantly in the United States, has added to the lack of social cohesion. The loss of connection between those in privatised and traditional communities has reduced social contact and weakened, already fragile, bonds of mutual aid and responsibility.

In Europe and the United States, new migrant entrants into the labour force bring increasing competition for jobs and housing, and often engender xenophobic behaviour among existing urban residents. Similar problems are experienced in southern cities, where ethnic and class violence among the poor is considered as normal social behaviour in a climate of economic crisis. African cities commonly expel migrants from neighbouring countries when their economies shrink. Similarly, as economic opportunities have diminished in Indian cities, caste differences have come sharply into focus.[77]

3.4.5 Institutional weakness

Michael Cohen (1996) argues that the set of problems outlined above; growing unemployment; declining infrastructure; deteriorating environment; and collapsing social impact result from the weakness of urban (and national) institutions. Furthermore the impact of these problems on the ability of local authorities to carry out any remedial action is profound. Cohen (1996) raises a major question as to whether globally national governments continue to be relevant to urban problems.

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[76] L. R. Brown, N. Lenssen, and H. Kane, *Vital Signs 1995* (Worldwatch Institute, Washington, D C, 1995)

[77] Michael Cohen, (1996), pp. 25-38

Clearly there are differences in the capacity of nations to address and resolve these problems but the notion of urban convergence is nonetheless a radical departure from the common-sense perception of the great differences that existed in the 1960s and 1970s. It is now being recognised that cities around the world now face common dilemmas and that there may be shared sources of experience and learning in cities from various parts of the world.

Of course this raises the issue of objective conditions and the perceived meanings of these conditions in a local sense. Alice Coleman (1985) in *Utopia on Trial* and Richard Sennett (1990) in *The Consciousness of the Eye*, both reinforced the importance of the local and subjective perspective when trying to understand the social context of cities. The specificity of place, landscape and culture of urban places - these local dimensions are increasingly recognised as involving those qualities which make urban life worth living. Things viewed from afar look quite different when seen close up. This global/local phenomenon is part of the "urban paradox"; as objective conditions are becoming more similar and shared at a global level, their meanings are becoming more local and subjective.[78]

[78] *Ibid*

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Urban Environmental Problems

Chapter 4

4.0 URBAN ENVIRONMENTAL PROBLEMS

Accompanying the explosive growth of large cities has been a plethora of problems of seemingly unmanageable proportions. These include, among others, high rates of unemployment and underemployment...soaring urban poverty, insufficient shelter, inadequate sanitation, inadequate or contaminated water supplies, serious air pollution and other forms of environmental degradation, congested streets, overloaded public transport systems, and municipal budget crisis.[5]

Figure 4.1 Car s, Santiago, and air pollution

[5] WRI, (1996)

4.1 Urbanisation, urban growth and environmental problems

It has become widely accepted that the emergence of the environment as a main policy issue represents an increasingly important characteristic within contemporary planning practice (see, for example, Marshall, 1994[2]; Hall, 1995[3]; Burgess *et al.*, 1997[4]; Blowers, 1997[5]). In recent years environmental concern in general has centred on issues of urbanisation and urban growth.

4.2 The brown agenda

Increasing debate on issues of urban sustainability has led to the consolidation of urban environmental agendas and the definition of a specific body of problems and policy issues. The *brown agenda* presents a renewed challenge to the planning and management of cities. It is concerned with social and physical urban environmental problems mainly associated with poverty including problems of air and water pollution, inadequate waste management, the lack of basic services and green areas, declining infrastructure, and poor housing conditions, as well as issues of health, crime, violence, and social exclusion. Although the majority of the global population will soon be living in the cities of the developing world, urban environmental problems have often been absent from the global environmental agenda. This is because in over the last few decades attention has shifted from local and regional problems like air pollution and inadequate water supplies to the vast global concerns such as ozone depletion, climate change and the loss of bio-diversity.

Aware of the mismatch between the *global green agenda* and the problems confronting cities, researchers and non-governmental organisations (NGOs) have more recently been advocating a renewed focus on the brown agenda and particularly the problems of pollution, poverty, and environmental hazards in cities.[6] The argument is not for less attention to be paid to

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[1] WRI, (1996)

[2] T. Marshall, 'British planning and the new environmentalism' in *Planning Practice and Research,* 9(1), (1994), pp. 21-30

[3] P. Hall, 'Towards a general urban theory' in J. Brotchie *et al* (eds.), *Cities in Competition: Productive and Sustainable Cities for the 21st Century* (Longman, Melbourne, 1995)

[4] R. Burgess *et al* , *The Challenge of Sustainable Cities* (Zed Books, London, 1997)

[5] A. Blowers (ed.), *Town Planning into the 21st Century* (Routledge, London, 1997)

[6] Some of the international organisations working on the brown agenda are The World Bank, the United Nations Centre for Human Settlements (Habitat), and the U.S. Agency for International Development. There are many research institutions involved with this work including those at the Department of City and Regional Planning, University of Cardiff; the Centre for Urban and Community Studies at the University of Toronto, and the National Institute of Urban Affairs, New Delhi, India. A listing of some of the non-governmental organisations working on the brown agenda is available from the United Nations Centre for Human Settlements (Habitat), *Directory of Non-Governmental Organizations in the Field of Human Settlements* (Habitat, Nairobi, Kenya, 1993).

global concerns but for a recognition that urban and global concerns are inter-related and must both be addressed:

> The adverse effect household airborne and water-carried wastes on child mortality and female life expectancy are of no less global proportion than, say, the destruction of the tropical rain forest, and in immediate human terms, they may be the most urgent of all world-wide environmental problems.[7]

4.3 Brown agenda determinants

Brown agenda environmental problems arise directly from urbanisation through the agency of the city. Urban areas generate environmental problems over a range of scales, from the very local to the global, and these problems create a variety of social impacts. They can impair health, affect economic or social well-being, or damage the ecosystem on which urban and rural areas depend. Most urban environmental problems encompass all three, e.g., urban air pollution, affects human health, which in turn has a bearing on the incidence of respiratory disease. Economic impact is mostly indirect, and mainly arises from the loss of productivity due to illness among the urban workforce.[8]

Within the natural sciences a growing understanding of the way in which ecosystems work has lead some researchers to liken cities to assemblies of organisms which have a definable metabolism, consisting of the flow of resources and products through the urban system for the benefit of urban populations.[9] But, unlike nature's own ecosystems, which have an essentially circular metabolism (wherein an organism's discharged output becomes an input, which renews and sustains the environment of which it is a part), the metabolism of most modern cities is essentially linear. Resources in cities are 'pumped' through the urban system without necessarily considering their origin or the destination of wastes. Input and output are considered as largely unconnected. Food is imported, consumed and discharged as sewage into rivers, lakes, and coastal waters. Raw materials are extracted from nature and transformed into consumer goods that ultimately end up as solid waste. This is either left to gather causing health hazards and pollution, or put into landfill sites where poisonous residues combine with organic material. This linear model of urban production, consumption, and disposal is considered unsustainable, undermining the ecological viability of cities and leading to a host of urban environmental

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[7] T. Campbell, "Environmental Dilemmas and the Urban Poor", in H. J. Leonard (ed.), *Environment and the Poor :Development Strategies for a Common Agenda* (Overseas Development Council, Washington, DC, 1989)

[8] Carlos A. Linares, Daniel A. Seligman, and Daniel B. Tunstall, *Developing Urban Environmental Indicators in Third World Countries* , a report for the U.S. Agency for International Development (World Resources Institute, Washington, D.C., 1993), p. 5

[9] H. Girardet, *The Gaia Atlas of Cities* (Gaia Books Limited, London, 1992)

problems. These urban environmental problems vary on a city wide and regional basis and are influenced by variables such as:

- city size and rate of growth;
- income levels;
- local geography and climate;
- water and sanitation services;
- air quality;
- solid and hazardous waste generation and disposal.

Maria Elena Ducci's (1996) review of studies dealing with urban environmental problems in Latin America[10], reveals that the most urgent environmental problems from the inhabitants point of view are those listed in Table 4.1.[11]

TABLE 4.1

URBAN ENVIRONMENTAL PROBLEMS

- Public transportation, traffic congestion
- Air pollution
- Violence
- Solid waste management (litter)
- Lack of basic infrastructure (potable water and wastewater systems)
- Liquid waste management (lack of water treatment plants)
- Low-quality housing (slums)
- Noise pollution
- Lack of green areas (parks)
- Floods
- Ecological degradation (erosion, deterioration of green areas, water pollution)

Source: M. A. Ducci, "The Politics of Urban Sustainability", in Preparing for the Urban Future (The Woodrow Wilson Center Press, Washington, D.C., 1996)

[10] Based on Ducci's reviews of Pedro Braile, "NGO Strategies for Urban Development in Rio de Janeiro Metropolitan Region: The View of the NGOs", in *Towards a Sustainable Urban Development: The Rio de Janeiro Study,* ed. Alcira Kleimer et al. (World Bank discussion paper 195, Washington, D.C., 1993); Jabobi, "Households and Environments in the City", *New Partnerships in the Americas* (World Resource Institute, Washington, D.C.); Elsa Dawson, "District Planning with Community Participation in Peru: the Work of the Institute of Local Democracy", IPADEL, *Environment and Urbanization* 4, No. 2 (October 1992); Lair Espinosa and Oscar Lopez, "UNICEF's Urban Basic Service Programme in Illegal Settlements in Guatemala City"; *Medio Ambiente y Gestion Urbana: Procesos Participativos en Problemas Ambientales: Taller de Experiencias,* (CEDUAM, CENVI, FOSOVI, GEA, PDP, Mexico, 1994); Martha Schteingart, "The Environmental Problems Associated with Urban Development in Mexico City", *Environment and Urbanization* 1 (April 1989)

4.4 Differences in income levels and environmental degradation

One of the most important determinants of a city's urban environmental problems is its income level. As the wealth of a city increases, many forms of environmental degradation become more prevalent before eventually diminishing. In this transitional process those in developing countries have a far greater burden of premature death and disease than their counterparts in the cities of the developed world.

In the poorest areas of the impacted cities with less developed economies the most threatening environmental problems are those closest to home, and those most in danger are women and children.[12] In these cities the fact that there is no household water supply is more of a problem than the polluted waterways. Exposure to air pollution in unventilated kitchens is more of a danger than carbon dioxide emissions outside, and the accumulation of uncollected household waste, more of a health hazard than the waste in the city dumps. The lack of revenue-generating capacity of local governments, and their inability or unwillingness to provide the basic services for their citizens, as well as the lack of access to suitable land, are a few of the prime causes of these problems.

As income increases, urban households and, on a wider scale, cities in developed world in general, consume more resources, such as energy, water, and building materials and produce more of certain types of waste. But part of the wealth generated is directed towards measures that protect the more affluent from environmental hazards. Problems close to home are resolved first, generally because they are most threatening and require the least amount of co-operation. Although these improvements reduce personal exposure they often simply shift the problem elsewhere. Waterborne sewage systems can reduce personal exposure to hazardous waste but, if the sewage is discharged without treatment, a city's water supply can be affected. Electric power plants generate clean energy where it is used but can be a source of ambient air pollution. So even as household environmental problems recede from prominence for a growing number, city wide and regional problems, such as hazardous waste generation, and air and water pollution, may increase. These problems tend to more severe in the rapidly industrialising cities of the developing world and in the transitional economies of Central and Eastern Europe, where industrial activity occurs without adequate environmental considerations.

In the high-income cities of Europe and North America, the allocation of public funds toward programmes of regulation and improvement means that many city wide environmental problems,

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[11] Ducci, (1996), pp. 264-98

[12] G. McGranahan, "Household Environmental Problems in Low-Income Cities: An Overview of Problems and Prospects for Improvement", in *Habitat International,* 17 (2), (1993), p. 105

and associated health hazards, have been resolved. But while the immediate ambient environment in these cities is less polluted, the vast resources consumed within them, and the volume of greenhouse gases discharged, ensures that urban areas of the developed world exert a far greater toll on the regional and global environment than their counterparts in the less developed nations. The largest per capita urban contributors to global environmental problems are the wealthy living in urban areas of the developed world.[13] Being distanced from the impact of their activities on the global environment, affluent cities and countries tend to have fewer direct incentives to address them. Yet there are also problems with the urban social environment that development seems, so far, unable to cure which appear much more immediate to urban residents in advanced nations - such as crime, violence, social isolation, psychological stress associated with poor quality housing and the degradation of inner cities.

Broadly though the transition as described, from the very local problems of impacted cities to the wider global problems of prosperous cities, implies a direct correlation between a city's wealth, its environment and the health of its citizens.

4.5 Health and the city

Urbanisation brings about fundamental changes in the way people live and work, how they relate with one another, in the quality of the water they drink, the air they breathe, and increasingly in the transformation of their habitat. These changes have profound implications - both positive and negative - for the health of those who live in cities.

In Europe a hundred and fifty years ago the chances of living long and being healthy were better in the country rather than in the city.[14] The urban disadvantage was blamed on a host of environmental health hazards, collectively termed "bad sanitation". As the scientists of the day studied sanitary conditions and health, the experts in cities around the world discussed the technical and moral aspects of urban sanitary reform. In many ways, the so-called 'sanitary revolution' was the nineteenth century equivalent of today's environmental movement. And just as it is now, one of the most contentious issues involved the appropriate role of government, and whether attempts at reform constituted an infringement, on what we now know as the 'private sector'. The reformers eventually won. Not because their arguments were more cogent, or their evidence unequivocal (which was true), but because, although the health problems were bad in poor areas, the wealthy were also at risk. Moreover politicians were concerned that their nation's

[13] WRI, 'Cities and the Environment' in *World Resources 1996-97* (1996)
[14] Paul Bairoch, *Cities and Economic Development: From the Dawn of History to the Present* (Mansell Publishing, London, 1988)

military capability was being compromised by urban health problems.[15] Those with political and economic power were forced to accept that urban environmental problems represented a real threat, which required a public response.

Urbanisation, through economic development and environmental reforms, has since brought considerable improvements in health. In the more urbanised countries statistics indicate that people have longer life expectancies and children under 5 have lower rates of mortality.[16] Since the middle of the nineteenth century improvements in urban water and waste technology have helped reduce the burden of communicable diseases - like cholera and diphtheria - which have steadily declined in the developed world. The major causes of death are now chronic and degenerative diseases - primarily heart disease and cancer - associated with such social factors as diet, stress, and lifestyle. This *health transition*, which is not unique to urban areas but occurs first and fastest in cities, relates to:[17]

- exposure to risk factors for disease (which change as countries urbanise and develop);
- access to effective health services;
- population ageing (since the incidence of chronic and degenerative disease typically increases with age).

4.5.1 The physical urban environment

Deficiencies in the physical environment often provide the most obvious manifestations of urban environmental health problems. The evidence connecting ill health with inadequacies in the physical environment is well documented and seems unequivocal (see, for example, Hardoy *et al* [1992][18]; World Health Organisation [1992][19]; United Nations Children's Fund [1992][20]; and Philips and Verhassellt [1994][21]).

For an increasing number of people urban growth is synonymous with urban poverty, and a dysfunctional urban environment. Although signs of this health transition are now becoming

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[15] A.-L. Shapiro, *Housing the Poor of Paris, 1850 - 1902* (University of Wisconsin Press, Madison, Wisconsin, 1985)
[16] D. R. Philips and Y. Verhassellt (eds.), *Health and Development* (Routledge, London & New York, 1994)
[17] National Research Council, *The Epidemiological Transition: Policy and Planning Implications for Developing Countries* (National Academy Press, Washington, D.C., 1993), pp. 1-5
[18] J. E. Hardoy *et al*, *Environmental Problems in Third World Cities* (Earthscan, London, 1992)
[19] World Health Organization (WHO), Commission on Health and Environment, *Report of the Panel on Urbanization* (WHO, Geneva, 1992)
[20] United Nations Children's Fund (UNICEF), *Environment, Development and the Child* (UNICEF, New York, 1992)

apparent in cities throughout the developing world many are still struggling with high incidences of both types of disease. In fact the sparse health data available shows that an increasing number of people in these cities are facing environmental conditions similar to those that shocked the bourgeoisie in the nineteenth century. Rossi-Espagnet, Goldstein, and Tabibzadeh (1991) suggest they are suffering "the worst of both worlds" - the risk of communicable diseases related to poverty is added to the risk of chronic diseases relate to social factors, creating a double burden of ill health. [22]

Although urbanisation is still viewed as a consistently positive force for improved health, evidence suggests that in many cities in developing countries health conditions for the urban poor are often worse than they are for their rural counterparts.[23] And even among the poor, there are certain groups more susceptible to biological and social problems than others. Infants and children in poor settlements are particularly vulnerable to a deadly cocktail of malnutrition, infectious diseases, and exposure to chemical pollutants. The United Nations Children's Fund (UNICEF) reports that, of the 5 million children who are estimated to die every year of diarrhoeal diseases, the vast majority come from poor urban families.[24] Two main contributors to respiratory infections (the second most common cause of child mortality in the developing world) are overcrowding and air pollution - both of which are more prevalent in urban settings. Malveaux and Fletcher-Vincent (1995), for example, have shown that urban environmental factors associated with lower-income settings can aggravate, and perhaps even initiate, childhood asthma. These factors include indoor pollutants from cooking fires, coal-fired heaters, the effects of passive smoking, as well as allergens associated with dust mites and cockroaches.[25]

Largely because of their social and economic roles, which expose them to greater numbers of environmental hazards - like nursing sick children, obtaining water and washing laundry were water supplies are contaminated, exposure to high levels of smoke from household stoves - urban women also face increased urban health risks. The kind of work that woman in developing countries tend to do, often has a bearing on this. Many work in small-scale industries where toxic chemicals are used with few safeguards. Even in modern urban industries, such as microelectronics and large-scale clothes manufacturing, women - who make up a high percentage of the work force - are subject to high risk of chemical exposure and repetitive stress

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[21]Philips and Verhassellt, (1994)
[22] Rossi-Espagnet (1991), p. 208
[23] World Health Organisation (WHO), Commission on Health and Environment, *Report of the Panel on Urbanization* (WHO, Geneva, 1992), pp 51-54
[24] UNICEF, (1992), pp. 19-44
[25] F. Malveaux and S. Fletcher-Vincent, 'Environmental Risk Factors of Childhood Asthma in Urban Centres', *Environmental Health Perspectives,* 103 (6), (1995), pp. 59-61

disorders. Prostitution, with its particularly urban focus, carries a host of health risks, from sexually transmitted diseases such as AIDS, to physical abuse. Physiological differences play another part too. During pregnancy increased vulnerability to chemical toxins and susceptibility to certain diseases such as malaria mean that women are more at risk.[26]

4.5.2 The social urban environment

Increasingly, in the developed world where many of the physical risks have been largely addressed, attention is now being focussed on the contribution of the urban social environment on ill health. Clearly the urban social and physical environments are interconnected.

Socio-economic status plays a significant part in determining exposure to risk, particularly in less developed nations were typically access to sanitation and running water is closely related to income and education levels. Stephens *et al* (1994) reports that districts with the lowest incomes and literacy rates in Sao Paolo, Brazil, had five times lower per capita consumption of water than districts with the highest income and literacy rates.[27] The general pattern - that the more socially deprived groups are more exposed to poor urban social environments - also applies to the developed world. Researching the effects of dampness in housing on health in England, for example, Packer, Stewart-Browne, and Fowle (1994) found that the proportion of households reporting damp spots and mould, both of which can cause asthma in children, relates strongly to social class.[28]

There are other, less obvious, environmental factors affecting the higher rates of socially related health conditions among the urban disadvantaged. Urban violence has now reached epidemic proportions in some cities in both South America and North America[29]. Adolescents seem to be particularly affected, and among older children in certain urban environments, violence now overshadows infectious disease as the main cause of death. Stephens *et al* (1994) cite the example of Sao Paolo in 1992, where violence - mostly murders - accounted for 86 percent of all deaths of boys aged between 15 and 19, more than half of all deaths among 5 to 14 year olds.[30]

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[26] J. Sims (ed.), *Women, Health, and Environment: and Anthology* (WHO, Geneva, 1994), pp. 24-6

[27] C. Stephens *et al., Environments and Health in Developing Countries: An Analysis of Intra-Urban Differentials Using Existing Data* (London School of Hygiene & Tropical Medicine, London, 1994), p. 57, cited in WRI, (1996)

[28] C. N. Packer *et al* , 'Damp Housing and Adult Health: Results from a Lifestyle Study in Worcester, England', *Journal of Epidemiology and Community Health,* 48 (6), (1994), pp. 555-9, cited in WRI, (1996)

[29] P. Pinheiro, 'Reflections on Urban Violence' in *The Urban Age* , 1 (4), (1993), p. 3

4.5.3 Marginalisation and social exclusion

Diversity is also a factor in determining the quality of the urban social environment. The interaction and interdependence of ethnically, culturally, and economically diverse groups within cities can enhance social cohesion. Conversely this diversity in urban populations can contribute to social marginalisation - where some groups are alienated and can become disenfranchised. Often economic factors and cultural differences combine to disadvantage particular urban groups in terms of access to education and jobs. In turn, this marginalisation, is believed to affect health, by encouraging stress related risk behaviours such as smoking, alcohol and drug abuse, among individuals.

In the United Kingdom, rates of smoking and drinking, and in some cases, drug abuse - risk behaviours increasingly attributed to social or economic stress - are higher among unemployed adults, and contribute to the higher rate of heart disease among the unemployed.[31]

Both heart disease and cancer, because they have been linked to factors typically associate with the wealthy - like a sedentary lifestyle, high levels of stress, and diets high in fat and sodium - were once considered disease of affluence. This appears no longer to be the case. Feachem *et al* (1992), in examining the levels, patterns and causes of adult mortality, found that deaths from chronic disease in both developing and developed nations are highest among the poor.[32]

The distribution of, and access to, physical and social resources (or benefits) of a city is determined by the political and economic structures that exist. The poorest citizens within a city have no political or economic power, and so face the greatest exposure to social environmental threats while having the least access to protective measures. Health can be affected either indirectly through changes in behaviour, or directly through threats such as urban violence, alcoholism, drug abuse, depression and other psychosocial illnesses. These types of problem are of increasing importance in cities throughout the world. Although, as is the case with physical risks, the poorer groups are the most severely affected, prosperous cities are not immune. While physical threats in the developed world have largely receded, these social factors are emerging as the greatest threat to public health. Some believe they now threaten "the very cohesion of society".[33]

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[30] C. Stephens *et al* (1994), p. 54, cited in WRI, (1996)
[31] M. Landon, "Intra-Urban Health Differentials in London", Master's thesis, (London School of Hygiene & Tropical Medicine, London, 1994), pp. 1-33, cited in WRI, (1996)
[32] R. Feachem *et al* (eds.), 'Adult Mortality: Levels, Patterns and Causes', in *The Health of Adults in the Developing World* (WB, Washington, DC, 1992)
[33] 'The Declaration on Action for the Environment and Health in Europe', adopted by the Second European Conference on Environment and Health, Helsinki, Finland (June 20 - 22, 1994)

Although absolute poverty obviously affects a person's access to better health measures there is increasing evidence to suggest that relative poverty or 'relative inequality' may be just as important. Relative inequality or, 'social exclusion', is more broadly defined than absolute poverty, encompassing not only the lack of economic resources but also the inability to get access to amenities and services that are available to other, more privileged members of society. It involves identity issues, concerning how a person sees themselves in relation to others, and implies that the social meanings attached to urban life are just as important as the physical environment. Supporting the notion of relative inequality as a major determinant of health Wilkinson (1994) suggests that it is countries with the narrowest gap between rich and poor that enjoy the best national health - not those that spend most money per capita on health in absolute terms.[34]

4.6 Urban transportation

> In 1992 I was told that the average Bangkok commuter spent three hours travelling to and from work. By August 1996, the standard commute was five hours, according to a report broadcast on CNN that showed the children of one family breakfasting in the backseat in predawn darkness. Their father explained that this was the only way to get them to school on time. With a tired sigh, he added that the car not only sapped his time and energy but 30 percent of his income; the only reason he did not leave Bangkok was that he wanted his children to get a good education. CNN did not mention Bangkok's new auto accessory of choice: the portable toilet. Leaving home without one could be risky, especially at peak travel times.[35]

As the world becomes increasingly urbanised, not only will more people live and work in cities but more people and goods will be transported more often, and over larger distances than ever before. How today's cities - and particularly the rapidly growing cities in the developing world - deal with the expanding demand for urban transportation will have a significant bearing on their economies, on the environment and, in large part, will determine the quality of life for their inhabitants. The car is the epitome of twentieth-century production and consumption. Car's consume one-third of the world's oil output. Assuming that it travels a total of one hundred thousand miles at 27.5 miles per gallon of fuel (minimum statutory requirement) an average car emits nearly 35 tons of CO_2. The Intergovernmental Panel on Climate Change (IPCC) projects that, with traffic expected to increase by some 60 percent over the next twenty years or so, by 2025 developing countries could be emitting four times as much CO_2 as the

[34] R. G. Wilkinson, 'The Epidemiological Transition: From Material Scarcity to Social Disadvantage?' *Daedalus:Journal of the American Academy of the Arts and Sciences*, 123 (4), (1994), pp. 67-8
[35] Hertsgaard, (1999), p. 89

industrialised countries do today.[36] In addition to contributing to climate change cars are also the world's single biggest cause of air pollution.[37] Manufacturing cars requires huge amounts of steel, iron, aluminium, and plastic. Eventually they must be disposed of, which involves further contamination of soil, water and air.

4.6.1 Car ownership rates and income levels

World wide the number of motor vehicles is expected to grow to 816 million over the next 10 years (In 1990 there were 580 million).[38] The forces driving this level of growth involve:

- demographic factors (urbanisation, increasing population, and smaller family sizes);
- economic factors (higher incomes and declining car prices);
- social factors (increased leisure time and social status);
- political factors (powerful lobbies and governments promoting the car manufacturing industry's role in national economic growth).

Although most of the world's cars are now concentrated in world's wealthier regions - member countries of the Organisation for Economic Co-operation and Development (OCED)[39] had 70 percent of the world total in 1993 - ownership rates are expected to increase significantly in urban areas of the developing world.[40] Income levels typically affect the method of transport that people use and how often they use them. In Nairobi, in Kenya, for example, because of the prohibitive cost of public transport the vast majority of people walk around the city. Only the highest earners (about 10 percent of the population) can afford to travel by car. In general as incomes rise car ownership increases.[41] In turn, as ownership increases, the number of trips taken increases, with a resulting drop in the use of public transport. Increasing wealth also results in more car usage in the form of new trips and longer journeys.[42]

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[36] J. T. Haughton *et al* (eds.) *Climate Change 1995: The Science of Climate Change, Contribution of Working Group 1 to the Second Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, New York, 1996)

[37] World Resource Institute (WRI) and the UN Development Program (UNDP), *World Resources 1992-93* (Oxford University Press, New York, 1992), p. 203

[38] WRI, 'Urban Transportation Trends', (1996)

[39] Founded in 1961 the OCED aims to encourage and develop economic and social welfare in member nations. Member countries are Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

[40] WRI, 'Urban Transportation Trends' (1996)

[41] The World Bank (WB), *Urban Transport* (WB, Washington, DC, 1986), p. viii

[42] Organisation for Economic Co-operation and Development (OCED) and the European Conference of Ministers of Transport (ECMT), *Urban Travel and Sustainable Development* (OECD and ECMT, Paris, 1995), p. 31

4.6.2 Transportation technologies

The traditional response to the burgeoning demand in the cities of the developed world has been to expand the supply. During the last two hundred years this has involved building new roads and infrastructure to accommodate a succession of emerging transportation technologies.[43] New transportation systems such as steam trains (1765); electric underground trains (1863); suburban railways (1879); trams (1880); motor cars (1885); and buses (1895) dramatically altered the distances that could be covered, and thereby helped create a new urban form - the 'sprawling metropolis'. Eventually, in 'mega-cities', they would lead to the production of the largest artificial structures ever to appear on the face of the Earth.

Decentralisation of people and activities has shortened commuter journeys, many of which now occur from suburb-to-suburb, but since most are made by privately owned car rather than public transport, and most road systems were designed to facilitate suburb-to-city traffic, many suburban roads are now just as congested as urban roadways.[44]

Now, as cities become more dispersed the construction and operating costs of public transportation systems are becoming prohibitive. In many cities in the developing world the unplanned and uncoordinated nature of the rapid expansion of the urban periphery has left poorer residents isolated in outlying areas without access to affordable and convenient public transportation. In the poorest regions improving the transport infrastructure is a key factor in providing access to jobs and establishing rural and urban trade links.[45] And yet deficient operations and poor maintenance undermine investment. The World Bank (1994) reports that in sub-Saharan Africa, for example, roads valued at more than £8.5 billion have eroded due to lack of maintenance.[46]

4.6.3 Environmental and social costs

Today's motor vehicles are faster and more convenient than ever. Although they are vital to economic growth in the early stages of development, they exact a major toll on countries throughout the world, in degrading quality of life, and undermining urban productivity.

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[43] B. H. Bunch and A. Hellemens (eds.), *The Timetables of Technology* (Touchstone, New York, 1993)
[44] P. Hall, 'Can Cities be Sustainable?', in I. Serageldin *et al* (eds.), *The Human Face of the Urban Environment, Proceedings of the Second Annual Conference on Environmentally Sustainable Development* (WB, Washington, DC, 1994), p. 34
[45] Z. Shalizi and J. C. Carbajo, 'Transport Related Air-Pollution Strategies: What Lessons for Developing Countries?' discussion paper (WB, Washington, DC, 1994), p. 16, cited in WRI, (1996)
[46] The World Bank (WB), *World Development Report 1994: Infrastructure for Development* (Oxford University Press, New York, 1994), p. 14

The financial burden of our increasing dependence on cars can be fairly easily quantified. The global environmental and social costs, although less tangible, can also be measured in the increasing levels of congestion, energy consumption, air and noise pollution, traffic accidents, and social inequalities. These problems are evident, in varying degree in cities throughout the world but now threaten to become acute in the cities of the developing world, particularly in East Asia and the Pacific where the greatest increases in motor vehicle ownership are expected.[47]

4.6.4 Congestion

When, in 1922, Le Corbusier presented his plan for "a contemporary city of three million people", laid out in a rigid grid pattern, consisting of neatly spaced rows of identical, strictly geometric skyscrapers, the de-congestion of the city centre was a key principle. In *The City of To-morrow* (1929) he wrote demanding that "the existing congestion in the centre must be eliminated".[48] Although it caught the attention of the public at the time the proposal did not lead to many urban planning commissions for one of the founding fathers of the Modernist movement. Today's congested city streets and suburban roadways are perhaps the most visible manifestation of the failure of urban transportation planning. The abnormal accumulation of traffic exacts a huge toll in terms of economic productivity and high pollution levels, as well as directly affecting the health of urban inhabitants. It also negates the main advantages of the car, in terms of easy access, speed, and convenience. In *Earth Odyssey* (1999), Mark Hertsgaard writes:

> With my own eyes, I saw terrible congestion in Bangkok, Hong Kong, Beijing, Guangzhou, Chongqing, and Xi'an. News reports and policy studies have indicated that Seoul, Jakarta, Shanghai, Manila, Kuala Lumpur. Bombay, Delhi, and Karachi, among other cities, are no less congested. Most also endure miserable air quality. Though lead is extremely toxic and known to damage children's mental development, most gasoline in Asia is leaded.[49]

In many cities in the developing world congestion is the result of a deficient road network and yet any expansion of the existing networks is often beyond a city's financial resources. And since building roads requires vacant land, in many densely populated cities such as Shanghai and Bangkok, this would mean destroying existing buildings and breaking-up informal urban settlements. More significantly perhaps, because of demographic factors, any new supply in terms of an increase in road capacity tends to be quickly swamped by the increasing demand for

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[47] The Worldwatch Institute,*Vital Signs1995: The Trends That Are Shaping Our Future* (Worldwatch Institute, Washington, DC, 1995)
[48] Le Corbusier, *The City of To-morrow and its Planning* (translated from the 8th French edition of *Urbanisme* by F. Etchells, 1929), (MIT Press, Boston, 1971)
[49] Hertsgaard, (1999), p. 97

new travel. In virtually every city in the member countries of the OECD rush hour speeds in city centres have declined since 1970. By 1990, in cities as diverse as Manchester, Milan, Utsunomiya, and Trondheim morning peak period speeds were down to 20 kilometres per hour or less.[50]

In India and China peak period traffic in city centres crawls along at less than 10 kilometres per hour. In perhaps the worst recorded example, peak period speeds fell to an average of 2 kilometres per hour in Bangkok during the last half of the 1980s, leading one researcher to comment that an average car in the city is estimated to spend the equivalent of 44 days per year stuck in traffic.[51]

4.6.5 The impact on energy consumption and pollution

The transportation of people and goods requires huge amounts of energy and results in high levels of both local and global pollution. Globally around 20 percent of all energy produced, including half of the world's oil, is consumed in the transport sector with more than two-thirds of this attributed to moving people around. On average, over the last thirty years, transportation has grown faster than any other industry or energy consuming sector of the global economy. It is expected to continue to grow in both the developed and the developing world as levels of car ownership are driven up by demographic, economic, social, and political factors.

Motor vehicles produce more air pollution than any other single human activity. Almost half of global emissions of carbon monoxide, hydrocarbon, and nitrogen oxide from fossil fuel combustion derive from petrol and diesel-powered engines. In congested city centres, traffic can account for almost all of the ambient levels of these toxins, posing a significant threat to both human health and natural resources.

In cities of the developed world car emissions pose the greatest threat to air quality. In the European Union (EU)[52] pollution control measures initiated over the last twenty-five years have failed to reduce ambient levels of nitrogen dioxide, mainly due to increased levels of car ownership during this period. In the United Kingdom, for example, average concentrations of NO2 increased by 35 percent between 1986 and 1991, mainly due to vehicle emissions.

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[50] OECD,*Urban Travel and Sustainable Development* (1995), p. 188

[51] P. Midgley, *Urban Transport in Asia: An Operational Agenda for the 1990s,* Technical Paper No. 224 (WB, Washington, DC, 1994), p. 16, cited in WRI, (1996)

[52] The European Union (EU) is made up of a number of institutions and consultative bodies, the most important being the European Commission, the Council of Ministers and European Parliament. It was established on 1 November 1993 following the ratification of the Maastricht Treaty, and expressed a desire for 'an ever closer union among the people of Europe'. Member countries are Austria, Belgium,

In the developing world air pollution due to car emissions is mostly a problem in the larger cities with high levels of traffic, such as Bangkok, Lagos, and Mexico City. Also in these cities levels of lead emissions from the combustion of leaded fuel greatly exceeds the health standard of 1 microgram per cubic metre. But even although the problem caused by motor vehicles is increasing in the developing world, industrial pollution is still the greatest threat to air quality in these regions.

The global environmental impact of the transportation sector is significant since it is the most rapidly growing source of "greenhouse gas" emissions - chemicals that have the potential to contribute to global warming such as carbon dioxide, chlorofluorocarbons (CFCs), nitrous oxide, and carbon monoxide. Although OECD countries are responsible for around 70 percent of the greenhouse gas emissions attributed to transportation, the predicted rise in vehicle ownership, along with the use of less efficient fuel-burning technologies mean that the share from developing countries is set to rise substantially in the future.

Traffic noise is extensive in cities. The acceptable limit of exposure is 55 dB(A) - anything above this is considered to be noise pollution, with the potential damage to human hearing and psychological well-being. An estimated 100 million people in OECD countries are exposed to traffic noise in excess of 65 dB (A).

4.6.6 Traffic accidents

Of the estimated 885,000 people who died in traffic accidents in a single year - (1993) - the vast majority were in the developing world, where deaths on the road is a leading cause of high mortality rates among the economically active age groups. In India, for example, where the roadway death rate (the number of people killed for every 1,000 cars on the road) is 18 times higher than Japan, deaths amount to 60,000 fatalities per year.[53]

Each year in the countries of the European Union, 55,000 people are killed, 1.7 million are injured, and 150,000 are permanently injured as a result of road traffic accidents.[54] Child pedestrians are particularly at risk in the United Kingdom. Recent research indicates that a reduction in speed by 10 mph in urban areas would reduce the number of fatalities on Britain's roads by 2,500 per year.[55]

Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Spain, and the United Kingdom.

[53] The World Bank (WB), *India Transport Sector: Long Term Issues,* Report N. 13192 - IN (Infrastructure Operations Division, Country Department II, WB, Washington, DC, 1995), p. iv cited in WRI, (1996)

[54] OECD,*Urban Travel and Sustainable Development* (1995), p. 52

[55] BBC, *Panorama* (Monday 14 February 2000)

4.6.7 Social inequities

The dispersed pattern of many of the world's cities today also contributes to social inequities. For the urban poor access to employment opportunities are becoming limited higher travel costs prohibitive.

In the United States, the flight to the suburbs has left behind the urban poor concentrated in city centre areas, far from the jobs, shops, and other services, that have also relocated to the periphery. Unable to afford their own cars, many have to rely on a public transport system, which often does not adequately extend into the suburbs. In cities like Detroit, where 40 percent of the central-city population does not own a car, and where most of the new jobs are in the outlying areas, the urban poor suffer increasing unemployment.

In squatter settlements, at the periphery of the urban area in the developing regions, similar forms of isolation and social exclusion exist, but here the pattern is reversed - opportunities for employment, education, shopping and so on, are often located in the wealthier areas in the city centre. In many Asian and African cities the vast majority of the urban poor must travel by public transportation or on foot over long distances, sometimes spending two hours or more travelling between home and work, For the poorest families, the priority for expenditure of the household budget, is on ensuring that the chief breadwinner gets to and from work. Sometimes this means that trips to school and to health centres are sacrificed. In Dar es Salaam, in Tanzania, many cannot afford bus fairs, and even a bicycle costs, on average, the equivalent of about four times the monthly minimum wage. And yet, in the United States life without a car has become unthinkable. When polsters recently asked Americans which modern invention they could least live without, the car surpassed both the light bulb and the telephone.[56] The enforced lack of alternatives in the United States, and increasingly in other developed nations, goes hand in hand with the tyranny of the car.

4.7 Urban impacts on energy, natural resources, and pollution

Around the year 2025 there will between 7 and 8 billion people living on the planet, all of them requiring land, energy, water, and food. Regardless of whether they live in the country or the city as their incomes rise they will consume more energy and resources and, in the process, generate huge amounts of waste. The global environmental impact of population and economic growth, has been a matter of debate since the effects of industrialisation were first recognised during the late eighteenth century. Now there is a new dimension to this debate. By

2025, five billion people, almost two-thirds of the world's total, are expected to live in cities. This transformation to an urbanised world will dramatically change the nature and scale of our impact on the environment.

Urban patterns of settlement put different pressures on the environment than rural ones. These differences are more pronounced in the developing world were rural settlements are still mostly traditional villages, built from local materials, and were residents are frequently dependant on local resources for their livelihood. In the modern developed world, where piped water, paved roads, gas and electricity, and telecommunications are more widely available the distinction, although blurred, nevertheless prevails. There are also variations dependant on a city's wealth and size. Relatively low per capita levels of resource consumption and waste generation among the urban poor, means that poor cities tend to pose a minimal threat to the global environment. However the impact of the local "brown agenda" problems of congestion, water and air pollution, declining infrastructure, poor housing and a lack of basic services are made all the more severe because informal settlements are often established in ecologically fragile areas. In contrast, the highest level of resource use and waste generation occurs among the most affluent groups in the wealthiest cities. While these cities have initiated policies and programmes to improve the living standards of their inhabitants with respect to local environmental problems, they contribute disproportionately to global "green agenda" problems, such as global warming, ozone-layer depletion, loss of bio-diversity, deforestation, and the exhaustion of non-renewable resources.

The UN Conference on Environment and Development (the "Earth Summit") in 1992, focused on issues of the green agenda because governments and environmentalist groups from the developed nations considered this to be a priority. However, for the developing world global environmental problems are not as important as the need to resolve the acute problems relating to poverty. It is a commonly held belief in these countries that the green agenda cannot be addressed until the urgent problems of social deprivation and inequalities within cities are resolved.[57]

Considered here are those environmental issues that arise from urbanisation through the agency of the city, rather than the broader set of pressures linked to economic growth and industrialisation which were discussed in Chapter One. However a city's environmental impacts are as much a product of human development factors as they are of urbanisation, and in reality the two cannot be detached; cities per se are not responsible for the rise in greenhouse gas

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[56] Reported by the Associated Press on December 25, 1995.
[57] R. Stren *et al,* (1992)

emissions, but urban lifestyles lead to higher patterns of consumption. Maria Elena Ducci (1996) argues that there has been inadequate recognition of the relationships between the two different agendas, and that the link needs to be understood to prevent the agencies of change in the cities of the less-developed nations from having a negative affect on global environmental problems. While it is possible, and essential to move forward on both fronts simultaneously, Ducci recognises the analytical and practical value of considering global and local (urban) problems separately. In general terms then cities affect the environment in three main ways:

- in the extraction and depletion of natural resources (the agglomeration of people and economic activity in cities requires resources far in excess of what the local area can afford, so cities must take essential supplies of food, water, and fuel from further afield);
- in the disposal of urban wastes (because of the density of people and higher levels of consumption the concentration of wastes is much higher in cities than in the countryside, and often can overtax the ability of local ecosystems to absorb them);
- in the conversion of land to urban uses (as cities expand prime agricultural land and habitats like wetlands and forests are transformed into land for housing, industry, and roads).

4.7.1 Energy production and consumption

For most of the 1990s global supply and demand for oil was in balance, resulting in relatively stable world prices. Nevertheless the potential for price fluctuations makes the world energy market one of the most dynamic and unpredictable of global industries. The long-term view focuses on three variables:

- global oil reserves;
- production;
- consumption.

Most of the world's oil reserves (around 65 percent) remain dominated by producers in the Middle East. Share of world oil production by the Organisation of Petroleum Exporting Countries (OPEC) rose from 36 to 40 percent following the Gulf War, and has stayed at the upper level since then. Non-OPEC production continues to accelerate, with growth coming from such countries as the United Kingdom, Norway, Argentina, Brazil, and Mexico. On the fringes of significant global production are Russia and the oil-rich nations of Central Asia. Whether OPEC and non-OPEC countries will collaborate in the future to control world oil supplies is a key question regarding production.

In terms of consumption, the vast majority of future growth will come from developing nations, notably China, India and the rest of Asia. In developing Asia consumption is set to rise

by more than 4 percent per year, an above-trend rate of growth, due to strong levels of industrialisation, rapid urbanisation, and greater rates of car ownership and usage. In Latin America, annual consumption growth is predicted to be more than double the level in the United States and Europe.

The bulk of the world's energy consumption is now *within* cities, and much of the rest is used for transporting goods and people *to and from* cities. Large cities, particularly in the developed world, were cars, and urban sprawl, and air travel define the urban lifestyle, are large consumers of energy. The per capita energy consumption of London is amongst the highest in Europe. London's 7 million people use 20 million tonnes of oil equivalent per year (two supertankers a week), and produce about 60 million tonnes of CO_2.[58]

The growing industrialisation of the developing world, and the increasing dependence of developed countries on imported energy supplies to fuel their economies, is reflected in the consistent rise in global commercial energy production and consumption since the 1970s. In the twenty years from 1973, world wide production rose by 40 percent and consumption by 49 percent.[59] Although their consumption has increased almost threefold during this period, and they contain a growing majority of the world's population, the developing countries have a very low per capita energy use, and account for less than one third of the world's energy consumption. On average energy use per person is nine times greater in developed countries.[60]

There is also a substantial regional variation. Because of rapid economic growth over the last twenty-five years in countries like China, India, and parts of Asia account for a large proportion of the expansion in energy demand and consume 60 percent of all energy in the developing world. Africa, on the other hand, even although it has almost tripled its consumption over the same period, accounts for only 11 percent.[61]

Producing additional energy supplies to meet a rapidly growing demand causes problems for developing nations who struggle to finance capital-intensive energy production facilities while funding other critical development needs, as well as attempting to meet huge repayment obligations on foreign debts. Rising energy consumption also leads to increased levels of pollution and other forms of environmental degradation. Policy measures to address these problems by encouraging a more efficient use of energy - developing a better infrastructure, taxing pollution, facilitating the use of best available technology and practices, and so on - can

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[58] H. Girardet, *Creating Sustainable Cities* (1999), pp. 27-31
[59] WRI, 'Energy Production and Consumption' (1996)
[60] *Ibid*
[61] Energy Information Administration, US Department of Energy, *International Energy Outlook, 1995* (US Government Printing Office, Washington, DC, 1995), p. 15

help reduce environmental burdens but they are not easy to implement. Finding both the necessary political will and the administrative know-how is the challenge that lies ahead. Even if it can be met, energy consumption in developing countries, and therefore globally, is set to rise significantly over the next few decades.[62] Projections indicate that most of the expanded production will come from fossil energy sources, namely coal, oil, and natural gas. If these estimates prove correct there will be a significant increase in greenhouse gas emissions, implying a commensurate increase in the risk and potential impact of climate change (see Chapter One). The widely held view is that a transition to renewable non-fossil energy sources, such as solar and wind power, will be needed to eliminate these risks. However, if current practices and strategies continue - in the absence of specific policies to alter market incentives - the so-called "new renewables" are expected to provide only 2 to 4 percent of global energy supplies between now and 2020.[63]

4.7.2 Depletion of natural resources

Urbanisation profoundly affects patterns of energy use and, along with economic development and industrialisation, is one of the principal forces driving the increase in global energy demand.[64]

In the developed world the energy needs of a large proportion of the urban population, particularly those in smaller cities in Africa and Asia, are still met by biomass fuels such as wood and charcoal.[65] However research has shown that as these countries become more urban in character the demand for energy increases. As urban manufacturing and industry replace traditional farming as the major source of employment; as the infrastructure to support the expanding urban population is built; as the transportation of people and goods expands and households acquire more appliances, oil and electricity become the main source of energy.[66]

The pattern is different in urban areas of the developed word where, due to agglomeration and the economies of scale that this provides, the per capita energy use tends to be lower than

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[62] Projections reported by three organisations: the World Energy Council (WEC), the International Energy Agency (IEA), and the U. S. Department of Energy (DOE), although their scenarios incorporate slightly different assumptions about economic growth and changes in energy efficiency, all show a substantial increase over the next 20 to 30 years. WEC predicts a 50 percent increase by 2020. IEA and DOE show a 34 to 44 percent rise in demand by 2010

[63] WRI, 'Projecting Future Energy Use' (1996)

[64] World Resources Institute, *World Resources 1994 - 1995* (Oxford University Press, New York, 1995)

[65] R. R. White, *Urban Environmental Management: Environmental Change and Urban Design* (John Wiley & Sons, Chichester, U. K., 1994)

[66] D. W. Jones, 'How Urbanization Affects Energy-Use in Developing Countries in *Energy Policy,* 19 (7), (1991), p. 622

rural areas. Communal housing and apartment buildings, for example, require less energy for heating and cooling, and mass transit needs less energy input than transport by individual cars. Far more energy is required to provide similar services to dispersed rural populations than to dense urban populations[67]. But although cities are more energy efficient, they require vast resources, which are far in excess of what the local area can provide, so they must take essential supplies of food, water, and fuel from distant hinterlands (their "ecological footprint"[68]). The wealthy cities of the developed world, in particular, draw on resources far from their boundaries. Increasingly this process of resource extraction has negative environmental impacts. It can alter natural habitats, increase land degradation, and cause pollution.

Although urban consumption of wood as fuel is not the primary cause of global forest loss, in the developing world, especially in small urban centres where it can account for up to 90 percent of domestic energy supply, the local impact on nearby forests can be severe. In urban areas in India, and parts of Africa, for example, the growth in demand for wood resources has caused deforestation for more than a 100 km radius around cities causing indirect environmental problems, including soil degradation, water siltation, and the loss of indigenous plant and animal species. Since forests are a renewable energy resource, however, a properly managed programme of replacement tree planting can help mitigate the impacts.

The pressure on surrounding forests, of course, eases as these countries increase their use of fossil fuels and electricity but the environmental impact of activities such as coal mining and oil and gas drilling, and associated transportation, can be severe and often occur at considerable distances from the city itself.

4.7.3 Water resources

As the number of people in cities increases so does the demand for water for domestic, industrial, and agricultural purposes. Although urban use accounts for less than 10 percent of the world's overall water use, the growing demand attributed to urbanisation contributes to water supply problems in and around cities. [69]

In many cities in the developing world, poor water systems (leaky pipes and illegal connections, etc.) waste between 20 and 50 percent of public supply.[70] Similar problems are

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[67] R. Torrie, 'Findings and Policy Implications from the CO2 Reduction Project', (The International Council for Local Environmental Initiatives, Toronto, January 1993), p. 7

[68] Rees, (1992), pp. 121-30

[69] WRI, (1995)

[70] F. L. Yok-shiu, "Urban Water Supply and Sanitation in Developing Countries", in *Metropolitan Water Use Conflicts in Asia and the Pacific*, J. E. Nickum and K. W. Easter, eds. (Westview Press, Boulder, Colorado, 1994), p. 30

being experienced in the developed world, mostly due to ageing infrastructure. Water scarcity is linked to water quality and pollution exacerbates the problem. As uncontrolled discharges of domestic sewage pollute urban lakes and rivers, cities must look for water supplies well beyond their boundaries. Parts of India, China, the Middle East, and much of sub-Saharan Africa are already struggling with the uneven distribution of water resources. As scarcity increases and demand expands - urban populations in cities such as Bombay, Lagos, Delhi, Karachi, and Jakarta are forecast to have doubled between 1995 and 2015[71] - conflicts between urban, industrial, and agricultural users could become severe. In India, where the total demand for water is expected to double by 2025, demand is growing fastest in the urban and industrial sectors. In some cities, during dry periods, the need for water for crop irrigation is in direct confrontation with the need for water within the city. Similar conflicts are emerging in China, where around 300 cities already have problems of water shortages.

4.7.4 Water pollution

Water pollution is probably as old as the city itself. Since the natural processes of water flow helps to decompose wastes and make them less harmful to us cities have, throughout history, used rivers, lakes, and coastal waters as places for diluting and dispersing human wastes. However as urban populations have grown, particularly during the last century, the rapidly increasing volume of wastes produced, has overburdened the natural recycling capabilities of urban rivers and lakes. In coastal cities, untreated sewage and industrial effluents flow into the sea and damage beaches and inshore waters. Urban-generated pollution has both localised and dispersed sources. Localised sources include:

- public sewage;
- industrial outflow;
- air emissions from power plants and heavy industry.

Dispersed sources include:

- silt from earth-moving activities;
- storm run-off from roads, home gardens, and industrial sites;
- infiltration from aquifers[72] contaminated with sewage or industrial chemicals;
- car emissions.

One of the most serious problems associated with water pollution involves the nutrient loading or eutrophication of local waters - the creation of excessive amounts of nutrients causing

[71] United Nations Population Division, *Urban Agglomerations, 1950-2015* (UN, New York, 1996)
[72] An aquifer is a water-bearing stratum of rock, gravel, or sand

radical plant growth and blocking sunlight for other organisms. As more plants die and are decomposed the dissolved oxygen level in the water is depleted, threatening fish and other aquatic life. Those that survive can suffer loss of habitat, disrupted food supply, and could be forced into shallow waters were they are more exposed to predators. The principal cause of eutrophication is human waste, which, even after treatment, is rich in nitrogen and phosphorus - the main ingredients in fertilisers.[73] Without a major restructuring of how urban wastes are handled the problems seem set to worsen as urban populations increase.

4.7.5 Urban sewage

Most of the world's sewage, even in developed countries, is released into rivers, lakes, or oceans without any kind of treatment.[74] This has had an increasingly damaging effect on fisheries and has caused major declines in fish catches, particularly in rivers and estuaries around cities in India, China, and parts of South America.[75]

Even the release of treated effluents can cause problems of eutrophication, as well as increasing the risk of chemical contamination due to toxins such as organochlorines.[76] Treatment also results in the accumulation of large quantities of sewage sludge, which often contains heavy metals, such as cadmium and lead, as well as other toxic contaminants. Urban sewage is not only the main source of nutrient enrichment affecting a decline in aquatic species. It also carries a significant risk to human health in the form of sewage-borne pathogens such as cholera, hepatitis, and salmonella.[77] For both rural and urban populations that rely on rivers as a source of drinking water and food, this poses severe health risks. The Tiete River downstream from Sao Paulo in Brazil, for example, is heavily contaminated by the city's wastes, and yet is still used as drinking water by several rural communities, and as a source of irrigation for local vegetable farms that stock the city's markets.[78]

4.7.6 Industrial pollutants

The concentration of industry in urban centres causes severe water pollution problems in most large cities. Although releases of toxins have declined recently due to pollution control

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[73] National Research Council, Committee on Wastewater Management for Coastal Urban Areas, *Managing Wastewater in Coastal Urban Areas* (National Academy Press, Washington, DC, 1993), pp. 177-9

[74] J. Briscoe, 'When the Cup is Half Full: Improving Water and Sanitation Services in the Developing World', in *Environment,* 35 (4), (1993), p. 15

[75] National Research Council, *Managing Wastewater in Coastal Urban Areas* (1993), pp. 177-9

[76] *Ibid*

[77] *Ibid*

measures effluents are still a major threat to urban waters, particularly in rapidly industrialising countries. Hertsgaard (1999) describes his visit to the Chongqing Paper Factory in the industrial centre of South Western China in 1996:

> It was the vapour we saw first - wispy white, it hung low in the air. Like tear gas. Stepping closer, we heard the sound of gushing water. Not until we were mere footsteps away, however, could we see the source of the commotion: a vast, roaring torrent of white, easily thirty yards wide, splashing down the hillside from the rear of the factory like a waterfall of boiling milk... Decades of unhindered discharge had left the rocks coated with a cream like residue, creating a perversely beautiful white-on-white effect. Above us the waterfall had bent trees sideways; below it split into five channels before pouring into the unfortunate Jailing.[79]

Similar examples of industrial pollution can be found throughout the world today. Shrimp taken from Jakarta Bay in Indonesia, for example, have levels of mercury contamination approaching those taken from Minamata Bay in Japan.[80] Some of the main chemical-intensive industrial sources of water pollution are:

- tanneries;
- metal plating operations;
- pulp mills;
- refineries;

Typical contaminants include:

- dioxins;
- pesticides;
- grease and oil from cars and shipping;
- acids and caustics;
- sewage sludge and heavy metals such as cadmium and lead.

4.7.7 Solid waste

Wealth is a key determinant of how much solid waste a city produces. Cities such as London, Los Angeles, New York, and Glasgow, are vast producers of solid waste, compared with cities such as Calcutta, in India and Accra, in Ghana where per capita solid waste generation is low.

Not only does waste generation increase as city's economies develop but the composition of wastes also changes from primarily biodegradable organic materials, to synthetic materials like

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[78] *Ibid*

[79] Hertsgaard (1999), p. 3

[80] United Nations Economic and Social Commission for Asia and the Pacific, *State of Urbanization in Asia and the Pacific, 1993* (UN, New York, 1993), p. 5-28

plastic, which take much longer to decompose. When these waste materials are allowed to collect they pollute and degrade land and water. In many developing countries, where most of the solid waste goes uncollected, these environmental impacts are often severe. Countries, like China, combine domestic and industrial wastes, disposing of them untreated in urban rivers and streams, exacerbating problems of pollution.

In Europe and the United States the disposing of solid waste in legal landfills averts many of the problems but, if they are not properly managed, runoff can contaminate surface water and groundwater supplies. The construction and operation costs of landfill also make this an increasingly expensive option. Although incineration, the next most common method of solid waste disposal in developing countries, can greatly reduce the amount of incoming waste, incineration ashes often contain hazardous materials, like heavy metals and dioxins, which add to pollution levels.[81]

4.7.8 Urban air pollution

Caring for the environment has become a significant challenge for all governments and, because economic growth and industrial development increasingly threaten the natural environment and the life-supporting properties of the biosphere on which we depend, it has serious implications for the global economy. Economic growth and industrialisation contribute directly or indirectly to many serious global environmental problems including deforestation, urban pollution, water pollution, acid rain, global warming caused by the build up of greenhouse gases, the exhaustion of non–renewable resources, and the loss of biodiversity through the destruction of species' habitat.

Scientists estimate that the earth's average surface temperature rose by between 0.5 and 1.0 °F over the twentieth century. Due to continued and increased fossil fuel usage it is estimated that the earth will continue to warm up, a prospect that could ultimately lead to substantial climatic changes around the world. At the core of the debate is the problem is the emission of carbon dioxide, the most significant greenhouse gas that is released when fossil fuels – coals, oil, and gas – are burned. The industrialised nations, primarily the United States, are the main sources of carbon dioxide.

At the UN Conference on Environment and Development (UNCED) in 1992, 116 heads of state or government pledged that by the year 2000 their CO2 emissions would be no higher than 1990 levels. Most nations, however, reneged or failed to meet their commitments, including the

[81] World Wildlife Fund (WWF) and the Conservation Foundation, *Getting at the Source: Strategies for Reducing Municipal Solid Waste* (WWF, Washington, D. C., 1991), p. 6

United States whose total in 1990 was almost 5 billion tons (more than the combined total of other high emitting nations - Japan, Germany, the United Kingdom, Canada, Italy, France, Australia, Spain, the Netherlands, and Turkey).

Another attempt to curb emissions was made at the Kyoto summit in 1997, in which a legally binding agreement was produced to cut carbon dioxide and five other greenhouse gases by 6 to 8 percent below 1990 levels over the next 15 years. The Kyoto protocol still faces opposition in the United States Senate and among special interest groups, who believe the cost of compliance is too great. The treaty includes provision for emission trading, whereby a nation such as the U.S. can purchase extra emission rights from a so-called 'emission surplus' country.

The Kyoto treaty does not legally bind developing nations to limit emission growth. Since emissions are rising most rapidly in the developing countries this means that overall emissions will continue to increase even if the aggregate level among developed nations is reduced. Greater car use, rapid urbanisation, notably in Asia, and accelerated rates of industrialisation will eventually lead to greater energy usage and rising levels of greenhouse gases in such nations as Brazil, Russia, Poland, South Africa, and other emerging markets. Of particular concern is that coal, a key source of greenhouse gases, is likely to remain a chief form of energy in two of the world's largest nation's – China and India.

It is clear that unilateral action by the industrialised nations to clean up the environment will be insufficient. Though few of their governments have either the financial resources or the political will, the developing nations must participate as well. For those living in impacted cities in less developed countries the global environmental agenda is not as important as the need to resolve the acute and immediate problems related to poverty and inequality. Within these countries it is generally believed that environmental change is not possible until these problems, particularly within cities, are resolved.

Despite the potential opportunities for energy efficiency afforded by cities, urban energy demand and fossil fuel consumption continues to grow. As a result the concentrations of airborne pollutants in and around cities is far in excess of those in rural areas. Hertsgaard (1999), again recounting his experience in China writes:

> In Beijing, Xi'an, and other cities of the north, we had walked amid air so thick with coal dust and car fumes that even sunny days looked overcast and foggy. In the bone-dry province of Shanxi, a day's journey west of Beijing, we rode by train all afternoon without seeing anything resembling woods - only a few scattered, spindly trees that looked ready to expire any minute. Everywhere, it seemed, the land had been scalped, the water poisoned, the air made toxic and dark.[82]

[82] Hertsgaard (1999),p. 4

Air pollution already exceeds health standards in many mega-cities. In the developing countries, where industries still tend to locate in urban areas, toxic emissions exact a large toll on human health and damage terrestrial and aquatic ecosystems. The combustion of fossil fuels used for urban transportation is also having an increasing impact on air quality.

Standards of air quality are understandably set with human health in mind. However recent research indicates that damage to fragile ecosystems occurs at far lower levels than are suggested by current pollution control legislation. In Most Northern European cities, for example, sulphur dioxide (SO2) concentrations rarely exceed World Health Organisation (WHO) guidelines, yet these emissions are typically of a level at which ecosystem damage can occur.[83]

In China, where the same legislation does not apply, the use of high-sulphur coal is common for cooking and heating in urban households. Emissions of sulphur dioxide - a precursor to acid rain - are set to double, or even triple, over the next twenty to thirty years. Downwind from Chongqing, 26 percent of a 65,000-hectare pine forest has died, in large part due to excessive air pollution.[84]

4.7.9 Urban ozone

Ozone (O3) is a powerful oxidising agent. Urban ozone emissions - which damage the human immune system and can cause skin cancer as well as damage to vegetation - are produced when various pollutants (nitrogen oxides, carbon monoxides, and hydrocarbons) react with sunlight. In cities the combination of cars, pollutants, and meteorological conditions unique to urban areas, is key to ground-level ozone formation. Cars are the main source of ozone forming pollutants. Others are:

- the production and use of organic chemicals;
- the use of natural gas;
- public waste disposal dumps;
- waste water treatment plants.

Most damage to ecosystems from clouds of concentrated urban ozone occurs at some distance from the city itself, often causing plant, tree, and crop damage over distances of several hundred kilometres. In the United States ozone is responsible for most of the crop yield losses from air pollutants.

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[83] WRI, 'Urban Wastes' (1996)

[84] Environmental Information Centre, *Energy Demand Forecast and Environmental Impact in China* (Environmental Information Centre, Tokyo, March 1994), p. 55

Urban ozone levels seem certain to rise as the number of cars in cities continues to rise. A marked decline in the number of trees has been recorded downwind of Los Angeles. It is predicted that without policy interventions, ozone damage will become a problem, particularly in the summer months, for almost all mid-latitude cities where car use is increasing. Already forest loss associated with ozone emissions has been recorded in Santiago and Mexico City. Similar problems are predicted downwind of Tokyo and Osaka in Japan: Beijing in China; Seoul in the Republic of Korea; Taipei in Taiwan; Delhi in India; and Karachi in Pakistan. [85]

4.7.10 *Greenhouse gas emissions*

Although urbanisation is not solely responsible for the increased consumption of fossil fuels, the agglomeration of population, industry, and energy use in cities ensures that urban areas produce most pollution and have the highest levels of greenhouse gas emissions. It has been calculated that around 40 percent of all carbon dioxide emissions in the United States come from 50 cities.[86]

In the cities of the developing world the rapid increase in energy demands, and the associated transition to fossil fuel consumption, is expected to radically increase greenhouse gas emissions and contribute to global warming. Coastal cities are seen to be most at risk from an ensuing rise in sea level.[87]

4.7.11 Land conversion

Although they only occupy around 2 percent of the planet's total land surface, the summit of five thousand years of human history is a world of giant cities that have dramatically transformed the natural landscape.

Cities may prove to be a positive force in dealing with environmental problems. By encouraging high residential densities that can reduce the pressures on land in countries experiencing rapid population growth urbanisation could reduce the scale and severity of environmental impacts. Far more natural land is lost to agriculture, forestry, and grazing than to the processes of urbanisation. However, although historically the proportion of land converted to urban uses has been small, a relatively recent, and significant, trend is emerging in both developed and developing countries around the world. Many cities are now rapidly expanding

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[85] United Nations Environment Programme and the World Health Organization, *Urban Air Pollution in Megacities of the World* (Blackwell, Oxford, UK, 1992)
[86] D. Gatlin, ed., *Climate Change Policy Workbook for Local Leaders* (The Climate Institute, Washington, D. C., 1995), pp. 9-10
[87] R. R. White, *Urban Environmental Management* (1994), pp. 35-6

outward, consuming more and more quantities of land. This urban sprawl, characterized by a patchwork of low-density development and derelict land, and leads to:

- a wasteful use of both land and resources ;
- higher infrastructure costs;
- excessive energy consumption and air pollution due to increased reliance on urban transportation;
- an increase in greenhouse gas emissions due to rising fossil fuel use (leading to global warming);
- a more rapid depletion of natural resources;
- a wider dispersal of urban sewage and industrial pollutants;
- an increase in health risks associated with higher levels of air and noise pollution;
- an increase in traffic accidents;
- an increase in social inequities (contributing to problems of marginalization and social exclusion);

Urban sprawl affects most medium and large cities and develops in a circular form around the perimeter of cities, as well as in a linear mode along major transport links. Most rail and road traffic actually occurs between cities making transport corridors the obvious locations for dispersal. Sprawl is the dominant pattern in the United States where, despite a reduction in the urban population growth rate (to 1.3 percent per year in 1994), urban development continues to encroach on surrounding lands, as inner city residents move out to the suburbs.

In the developing countries with high rates of urban growth, such as India, Pakistan, China, and parts of Africa, and South America, land pressures are even greater. The physical size of some of the cities in these developing countries has doubled in the last twenty years. In Sao Paolo, in Brazil, the urban core has grown from 180 square kilometres in 1930 to more than 900 square kilometres in 1988. The metropolitan area is now an astonishing 8,000 square kilometres.[88] In Sao Paolo prime agricultural and forestland, which include the region's last remaining reserves of natural vegetation, are being converted to urban uses.

The location of a city is also a major determinant of its environmental impact. Historically, for good reasons, cities are often located on prime agricultural land or valuable ecosystems near, rivers, lakes, or coastal waters (nearly 40 percent of cities with populations greater than 500,000 are located on the coast). In Sao Paolo, urban expansion now threatens the local watershed, as

[88] C. N. E. Oliveira and J. Leitmann, 'Sao Paolo', in *Cities,* 11 (1), (1994)

around 1 million squatters now live in informal houses and streets built over protected wetlands next to rivers.[89]

Urban encroachment into fragile ecosystems, as a result of intense land use pressures and poor planning, not only damages the local environment but can also threaten the health and well-being of residents. Because of the lack of available alternatives many squatter settlements are found on steep hillsides, which are vulnerable to landslides and soil erosion. Others are situated on land, which is subject to flooding or tidal inundation. In Rio de Janeiro, Brazil, favela dwellers who live on steep slopes surrounding the city disturb natural vegetation and destabilise the hillside soils, leading to mudslides that claim hundreds of lives and leave thousands homeless. Natural areas are regularly sacrificed to urban development in the form of housing estates, industry, and tourism. Although ecosystems serve important functions, compared with the benefits of urban development, the advantages - such as providing a habitat for a variety of species and aiding flood control - seem less tangible.

4.8 Urban Form

Population growth and the widespread use of the motor car have contributed to the phenomenon of urban sprawl, which brings about changes in the physical dimensions of cities as they spread into outlying areas. Increasingly, particularly in the United States, industrial and commercial activities are concentrated along major transport links, transforming the urban landscape into a string of "100-mile cities".[90] Regions such as Silicon Valley in California have replaced the traditional urban core.

In the developing world, many cities tend to remain compact because infrastructure and labour are still concentrated in traditional city centres and transportation and communication technologies are less developed. But cities like Sao Paolo, Mexico City, Jakarta, and Bombay are now increasingly becoming decentralised. This is partly caused by the suburban flight of higher-income groups but more commonly the high land prices in the centre are forcing the poorer residents further out.

[89] United Nations, *Population Growth and Policies in Mega-Cities: Sao Paolo* (UN, New York, 1993)
[90] D. Sudjic, *The 100 Mile City* (Harcourt Brace, San Diego, California, 1992)

4.8.1 *Urban Sprawl*

Urban sprawl is not an automatic result of population growth. Although cities such as Calcutta, Manila, and Jakarta have spread like those in America, others such as Shanghai and Seoul have remained much more compact. Densities in parts of Shanghai and Calcutta range from 800 to 1,000 people per hectare, in Bangkok and Seoul the range is between 300 and 400, as compared with 70 or less in most cities in the United States.[91]

Whereas dense urban cores, like those in many European and Japanese cities, allow residents to make a high proportion of their journeys by foot or bicycle, the dispersed urban form of cities in the United States and Australia, encourages the widespread use of the car. Data from the U.S. Bureau of the Census (1994) indicates that more trips are made by cars in sprawling cities such as Phoenix and Houston than in denser cities like New York and San Francisco.[92] Increasingly dispersion is occurring world-wide and in many different types of cities; from the dense centralised European cities like Madrid, Paris, and Zurich; to the rapidly industrialising cities such as Seoul and Buenos Aires; to those experiencing rampant urban growth like Bombay.[93] Although demographic factors play a large part, in making rapid growth feasible cars are undoubtedly agents in the expansion process.

In the more developed regions, as technological advances have made modern industry more flexible manufacturing practices have altered, and no longer depend on centralised workplaces and transportation systems. In many North American cities dominated by service and high-tech industries, the abundance of available land on the urban periphery and low transportation costs, has meant that job opportunities have shifted to the suburbs. Many historical central business districts are becoming obsolete. The US Congress Office of Technological Assessment (1994), in attempting to identify possible savings in transportation, found that by 1980 only 9 percent of the metropolitan population worked in the city centre.[94] The result is suburban expansion. The metropolis of New York (with 20 million inhabitants), for example, is rapidly expanding and now extends to 300 kilometres from north to south and from east to west.[95] Phoenix, Arizona, is the epitome of the sprawling city, extending to three times the surface area of Los Angeles

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[91] Sivaramakrishnan, 'Urban Governance' (1996), pp. 225-41
[92] U. S. Bureau of the Census, *County and City Data Book: 1994* (US Government Printing Office, Washington, D. C., 1994)
[93] *Ibid*
[94] U. S. Congress, Office of Technological Assessment (OTA), *Saving Energy in U. S. Transportation: Summary,* OTA-ETI-590 (OTA, Washington, D. C., 1994)
[95] Galia Burgel and Guy Burgel, "Global Trends and City Policies", in *Preparing for the Urban Future* (The Woodrow Wilson Centre Press, Washington, D.C., 1996, pp. 301-35

despite having a smaller population. In LA, which sprawls along the arteries of a vastly complex freeway system, 90 percent of people commute to work by car, mostly from detached suburban houses surrounded by gardens, often greater than an acre in size. LA covers an area three times larger than London, with much the same population of around 7 million. Similar patterns of dispersal can now be found in many European cities but the change is occurring at a slower pace.

Burgel and Burgel (1996) suggest that there are also disparate and contradictory forces at work in the contemporary city which are manifest in peripheral diffusion *and* a return to the centre. For them the opposing forces of centralism and diffusion (of globalisation and decentralisation) result in an "oscillation of contemporary space":

> The "forces of innovation" are driving the system toward reinforcement of centralities in all dimensions (a giant city center, large urban regions, and the richest and most industrialized countries); these forces encompass both more and less traditional reasons of economic efficiency, which seek to capitalize on the cumulative heritage and wealth of a network of dense relations, and cultural reasons linked to big-city consumption (such as museums, theaters, and people-watching). At the same time there is a diffusion and relaxation in democratic and free-enterprise societies. More and more citizens want more living space, want to be closer to nature - even man-made nature - and are willing to pay for these long commutes. Businesses, for reasons relating to the increase in property values at the center and more efficient facilities, are taking the same route. And governments, for reasons of territorial equity and social equilibrium, are putting decentralization policies into practice.[96]

In historic European cities these universal mechanisms come up against heritage, differences in chronological development, and contrasting urban cultures. In great cities such as Paris, Barcelona, and London the juxtaposition of a dense urban centre that still houses the majority of jobs, and a huge and diffused periphery of low density housing developed through forty years of the car, creates serious contradictions that threaten both the city and the natural environment. The collective transportation system, designed for the dense city, is not appropriate for the low-density periphery. Cars stream into the city causing congestion.

[96] *Ibid*

4.8.2 Squatter Settlements

Some of the most rapid urban growth is occurring in particular parts of cities. The urban fringe of Jakarta, for example, is growing much faster than the city itself.[97] Slums or squatter settlements tend also to grow at a faster rate than the rest of the city, and swell to such huge proportions that they become like cities unto themselves. Sustaining healthy environments in the urbanised world of the twenty-first century represents a major challenge for governments throughout the world. As the growth of urban areas has produced concentrations of human population of unprecedented magnitude, it has become clear that many are failing to manage the resulting environmental and social problems. In the developing world many have been ill-prepared, and have inadequate resources, to cope with rapid urbanisation. Already suffering from "demographic fatigue", these governments have been unable to anticipate, plan and prepare for urban growth on the scale now being experienced. At least 600 million urban residents in developing countries already live in housing of such poor quality and with such inadequate provision of water, sanitation and drainage that their lives and health are under continuous threat.[98]

In most cities of the developing world, a large part of the poor urban population occupies a very different kind of city than their wealthy counterparts. They live in slums or squatter settlements primarily composed of shacks and shanties, which are neither legally recognised nor serviced by the city authorities. Every day in a course of this decade, the developing countries have had to accommodate 150,000 additional urban dwellers. During the next decade this figure will grow up to 180,000 inhabitants daily or more than one million people weekly. Because this urban growth is taking place against a background of low incomes, it has outstripped these countries' abilities to provide both accommodation and services.[99]

In the developing countries the overwhelming shelter problem involves the shortage of affordable housing for the low-income majority in urban areas. This has resulted in the proliferation of squatter settlements around the perimeters of vast cities. While large cities in some developing countries have been growing at rates of up to 5 per cent per annum, slums in some of them have been growing as twice as quickly. Those who live in these settlements represent a significant proportion of the urban population in many cities, for example;

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[97] The World Bank (WB), *Indonesia Environment and Development: Challenges for the Future* (WB Washington, DC, 1994)

[98] UNDP, (1997), p. 29

[99] It has been estimated that, 17 per cent of the world's stock of housing consists of one-room shelter, of which some three-quarters are to be found in the developing countries. Some 42 per cent of rural and 35 per cent of urban dwellings in Africa are single-roomed.

- 30-40 percent in Caracas, Dakar, Dhaka, Lima, Nairobi, Madras, Manila, Rio de Janeiro, and Sao Paolo
- 40-50 percent in Calcutta, Mexico City, and Tunis
- 50-60 percent in Bogota, Bombay, Delhi, Buenos Aires, Lagos, and Lusaka
- 60-70 percent in Dar es Salaam, Kinshasa; more than 70% in Addis Ababa, Cairo, Casablanca, and Luanda.

These settlements are variously characterised as spontaneous, informal, marginal, illegal, unplanned, or unintended. Unfortunately many governments also regard them as ungovernable. Within this 'urbanisation of poverty' the informal parts of the city are excluded from many of the benefits of urban life, often including access to basic services, health care and clean running water. Residents live in constant fear of eviction and most do not have access to finance and loan schemes, which could enable them to improve their living conditions. And yet, these people have become indispensable to the economy of these cities. The black townships in Africa, like those in Soweto (10 miles SW of Johannesburg), South Africa, offer dramatic examples of such squatter settlements.

In these, so-called, 'informal cities' the pressure on shelter facilities and services has degraded the urban fabric. The housing used by the poor is decrepit and civic buildings are frequently in a state of disrepair and advanced decay. The same may be said of essential infrastructure services (transport, public conveniences, water supply, drainage, sewage). Hardoy *et al* (1992) estimate that;

- 220 million urban dwellers did not have a safe, protected water supply;
- 420 million urban dwellers lack adequate sanitation.[100]

In contrast, the 'formal' city enjoys the advantages of urban life, often at the expense of the 'informal' city. Given that squatter settlements constitute one-fourth to one-third of most cities in developing countries and account for most of the poor, a harsh reality is that, apart from being largely outside the formal management system of urban governments, their relationship is often one of "negative engagement".[101] Whether fighting eviction, stealing electricity or water, or resisting regulations or taxes, it is this negative engagement that stands out as a prominent issue for the authorities to deal with.

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[100] J. E. Hardoy *et al,* (1992), p. 58

[101] M. Halfani, P. McCartney, and A. Rodriguez, "Towards an Understanding of Governance", in *Urban Research in the Developing World*, ed. R. Stren (University of Toronto Press, Toronto, Canada, 1994)

4.8.3 Gated communities

"Even as the walls have come down in Eastern Europe, they are being erected all over Los Angeles".[102] In *City of Quartz* (1992) Mike Davis explores the dark side of the postmodern metropolis that is Los Angeles and reports on the hopelessness and despair of the postindustrial "underclass" (mostly defined by race, gender, and ethnicity). In "fortress L.A." he sees the defence of luxury lifestyles translated into "new repressions of space and movement", bolstered by the ubiquitous "armed response" warning signs erected on security walls, guarded by "private police and state-of-the-art security systems".

'Gated (or Secure) communities' have emerged in the United States recently in almost direct response to the growth of the urban slums. They are residential areas with restricted access designed to privatise normally public space and have tended to occur in both new suburban developments and in older inner city areas retrofitted to provide security. It is estimated that at least three to four million Americans are seeking this new form of refuge from the problems of urbanisation. When they first started to appear, in the late 1980s in California, Texas and Florida these gated communities were the compounds of the super rich but in recent years the phenomenon has spread to almost every state, and the majority are now middle to upper-middle class. In many, particularly those located in working-class areas in deteriorating parts of the city, and low-income housing projects where crime is acute fear of outsiders is the key motivation for the defensive fortifications. Although there is evidence that some form of crime, such as car theft, are reduced inside the gates, crime rate overall is only marginally altered. It is the reduction of the 'fear of crime' which is most widely reported.

> This obsession with physical security systems, and, collaterally, with the architectural policing of social boundaries, has become a zeitgeist of urban restructuring, a master narrative in the emerging built environment of the 1990s.[103]

Following Davis, Blakely and Snyder (1997) argue that these walled and gated communities are a dramatic manifestation of the fortress mentality growing in the United States, with enormous social and political consequences[104]. The effort of the elite to insulate themselves from the social problems of urban poverty through the privatisation of normally public space unites the cities of the North and the South. In gated communities in America, with names like *The*

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[102] M. Davis, *City of Quartz: Excavating the Future in Los Angeles* (Verso, London, 1992)
[103] *Ibid*
[104] E. J. Blakeley and M. G. Snyder, *Fortress America: Gated Communities in the United States* (Brookings Institution Press, Washington, D. C., 1997)

Sanctuary and *Brittany Village*[105] and in the 'new villages' of India and Africa, the wealthy pay heavily for the privilege of living in highly serviced and fortified urban enclaves. In Delhi, Manila, Rio de Janeiro, and Nairobi as in Houston, Los Angeles and Miami residents of such communities lock themselves in behind security gates in an attempt to escape the effects of urbanisation.

The development of gated areas is related to the current trend towards the fragmentation and privatisation of community and the narrowing of the geographic realm of social contact that this implies. Privatisation – the replacement of public government and its functions by private organisations – is promoted as the 'benefit' of gated communities, but the impacts on the broader community may be serious. By providing their own security, road maintenance, parks, recreation, waste collection and so on, they may reduce the burden on the taxpayer, but by opting out of these traditionally municipal services they may also be reducing participation in the political process, and cause the redistribution of public costs and benefits. Why should residents within the gates vote on issues that do not affect them? Why get involved in efforts to resolve wider community problems?

The loss of connection between those in privatised and traditional communities reduces social contact and weakens, already fragile, bonds of mutual aid and responsibility that are an important part of community living. When the community of responsibility stops at the gates what happens to the function and idea of democracy? Because it alienates and marginalises one part of the urban population from the other, segregation in gated communities may represents one of the greatest challenges to improving the urban social environment. The problems of urbanisation need to be confronted and resolved rather than avoided. As has been pointed out:

> middle and upper income families may flee to the suburbs but the problems of the inner cities are sure to follow them.[106]

[105] These are just two of the many gated communities currently advertised on The Prudential Florida Realty Gated Communities website at http:www.inovate.com/pbrealestate/comm.html. *The Sanctuary* is described as, "an exclusive yachting community protected by 24 hour security on land and water" and offers "a community marina, tennis courts, and pristine nature reserve". *Brittany Village* contains 74 single family residences on landscaped, cul-de-sac lots. "Homes include concrete tile roofs, a two car garage with remote control opener, volume ceilings, security system, built in plant shelves and kitchen appliances". Prices start from $118,000.

4.8.4 Are cities at an evolutionary dead-end?

K. C. Sivaramakrishnan (1996) reports that when urban and environmental ministers from over fifty countries in Asia and the Pacific gathered in Bangkok in November 1993 to discuss urbanisation, the sober conclusion was that:

> urban growth as a key aspect of economic development in this region has entailed a sharp and significant deterioration in the environment.[107]

Cities play a central role in degrading the physical environment and in distorting the social milieu in which the majority of the world's people will soon live. Expensive dysfunctional urban environments impair the kind of economic growth needed to improve living standards and create a socially just society. The rapid urban growth that has occurred throughout the last 100 years means that the developed world is now largely urbanised. The environmental impact of cities has increased dramatically during this time. In recent years it has become clear that a similar process is under way in many countries of the developing world but the pace and extent of urbanisation is now much greater and the potential for environmental damage on a massive scale is considerable. Soon half of the world (more than 3 billion people) will live in urban areas. Increasingly urbanisation will concentrate both population and economic growth in cities in the South, intensifying global and urban environmental problems.

The different patterns of economic growth between countries in the North and South have resulted in a different form of urbanisation, which brings along with it particularly acute social and physical environmental problems. Although in the 'newly industrialising countries' environmental conditions do have certain similarities to European cities of the nineteenth century and their manifestations and consequences are similar, if not identical in many respects to modern industrialised cities of the North they are problematic in different ways. The cities of sub-Saharan Africa and parts of Asia have an entirely different morphology, economy, social and political structure and orientation. Technologies and ways of organising infrastructure cannot simply be transferred from the North to the South, first there needs to be a process that gives rise to an indigenous culture. But in rapidly growing urban areas of countries in Africa and Asia, governments beleaguered by 'demographic fatigue' are finding it impossible to provide the minimum social services or to absorb an expanding labour force into struggling urban economies. It is becoming clear that, without vigorous social movements and campaigns the

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[106] H. Cisneros, in I. Serageldin *et al* (eds.), *The Human Face of the Urban Environment*, proceedings of the Second Annual Conference on Environmentally Sustainable Development (WB, Washington, DC, 1995)

worsening environmental problems of the cities of the South will not be solved. Indeed a deterioration of environmental quality seems inevitable.

Today at least 600 million city dwellers in the developing world do not have adequate shelter and 1.1 billion are choking on unhealthy air. Polluted air in 36 Indian cities killed some 52,000 people in 1995, a 28 per cent increase from the early 1990s. The Chinese government reported at least 3 million deaths from toxic urban air between 1994 and 1996.[108] In some countries, the growth of the cities is reducing land available for food production. In an average city there is no clearly recognisable structure or satisfactory layout. Most cities are built haphazardly resulting in a random character that confuses the identity of city communities, creates chaos in the pattern of land use, wastes resources and prohibits coherent patterns of any kind.

Under present conditions and levels of technology, the continued expansion of large urban centres creates risks of physical, economic and social breakdowns with the most serious political consequences. In both developing and developed countries, urban growth has been accompanied by social and economic problems, likely to worsen as overall population growth is accompanied by the trend toward greater urban growth.

[107] 'State of Urbanization in Asia and the Pacific' (report on the Ministerial Conference, ESCAP, Bangkok, October/November 1993) cited in Sivaramakrishnan (1996), p. 238
[108] M. O'Meara *Reinventing Cities for People and the Planet* (1999)

Part 3

Sustainability

Part Three reviews the growth of ecologism and the ecological paradigm as a response to global and urban social and environmental problems and describes recent proposals, planning objectives and policy measures aimed at achieving sustainability at both the global and urban scales.

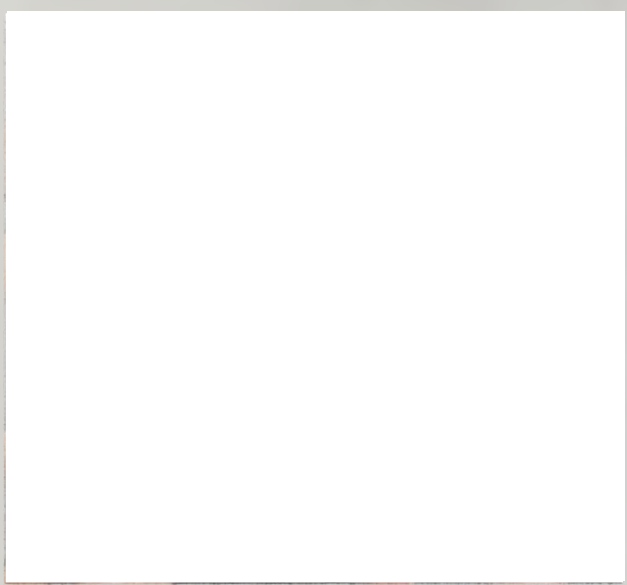


Figure (c) Women brickworkers' hands, Bangladesh

Chapter 5 - investigates the emergence of **ecologism** *and traces the ideology's historical and modern roots.*
Chapter 6 examines the social, political, economic, and technological aspects of the ecological paradigm for a **sustainable society**.
Chapter 7 reviews recent frameworks, planning strategies, and alternative models for **sustainable urban development**.

Introduction to Part Three

Introduction to Part Three

Sustainability

As environmental problems become a part of our daily existence concern over the hazards of environmental degradation is growing. In response to this concern the last thirty years has seen the emergence of a distinctively 'green' outlook, giving rise to a variety of popularly based responses, collectively referred to as the *green movement.* The beliefs, convictions and philosophy that underpins these responses has been defined as *ecologism,* since it describes an ideology which draws heavily on the language and ideas contained within the discipline of *ecology.* Generally three main types of environmentalist have been identified, namely; *the traditional* (conservationist) *greens; mainstream* (radical aims, reformist methods) *greens; and anarchist* (radical aims and methods) *greens.* Together the 'mainstream' and 'anarchist' greens now represent the radical green position held by those who seek fundamental societal change in order to create a sustainable, environmentally sound, society.

Although the level of public interest in environmental issues is a relatively recent phenomenon, the origins and early history of contemporary Western environmental concern, and attempts at conservation, lie far back in time and draw on a host of influences. Influences within the historical Romantic tradition can be traced to the ideas of Carlyle, Ruskin, Blake, Wordsworth, Coleridge, and Byron. Within the Idealist tradition there exists spiritual foundations within Buddhism, Taoism, and Hinduism as well as within the writings of St. Francis of Assisi, Spinoza, Emerson, Thoreau, de Chardin, Leopold, and the philosophies of Hegel and Heidegger. Within the Anarchist tradition there are echoes of the work of Marx; Kropotkin; and Morris. Together these references constitute some of the significant historical roots of ecologism.

Modern ideological roots, on the other hand, can be traced to ideas such as holism and Gaianism that have emerged from the attitudes and values expressed by the 'beat generation' through writers like Kerouac, Woolfe and Ginsberg, and the work of 1960s pop cultural icons such as Marshall MacLuhan, Buckminster Fuller, Teilhard de Chardin, and Paolo Soleri, as well as in the countercultural activities, transcendental meditation and alternative lifestyles that characterised a growing number of hippie communes during the 60s and 70s. Legitimation for this 'new' way of thinking is attributed, in large part, to the work of Rachel Carson and Lynn White, Jr. during the 1960s and later emerged in the various typologies within *ecophilosophy* concerning different ideas about nature and the environment, including those from Leo Marx (1970); Theodore Roszak (1972); Arne Naess (1973); Timothy O'Riordan (1976); Donald Worster (1977); Bookchin (1980); Passmore (1980); O'Riordan (1981); and Jeremy Rifkin (1983). There are those who argue that, from the ashes of radical, libertarian politics of the 1960s and 1970s, and the New Left movement in the United States and Northern Europe, we are now witnessing the emergence of a new ideology of *ecologism.* Within this emergent ideology various ideas, values, and preferences are converging around a shared political and social agenda, in which the main aim lies in the definition of a *sustainable society.*

Since the early 1970s Murray Bookchin has distinguished between *environmentalism* on one hand, and *social ecology* on the other. According to him, environmentalism, fails to address the underlying problem of society's domination of nature. What is worse, it effectively reinforces that domination by seeking ways to manage environmental decline. Social ecology, he argues, refers to an approach that rests on the ecological principles of unity in diversity, spontaneity, and the non-hierarchical nature of ecological communities. Bookchin promotes the decentralised socialism described by William Morris and tends to pre-figure what most greens think of as a

sustainable society. His strategy for social change is much more to do with overcoming economic and political obstacles to this sustainable society than promoting individual transformations in values, attitudes and lifestyles.

Our present global predicament is the result of the relentless pursuit of economic growth through increased industrialisation based on consuming ever-increasing amounts of finite resources. Increasing awareness of environmental problems have led to increasing public debate on the acceptability of conventional growth objectives, strategies and policies. Consequently the pursuit of *sustainability* involves determining ways of life, which allow the maintenance of a balanced ecosystem and the integrity of the biosphere to remain intact. Aware of the profound challenge described by the *Limits to Growth* thesis, a series of important meetings were held starting with the 1972 Stockholm Conference on Human Environment which led to the establishment of the United Nations Environment Program (UNEP). In 1974, UNEP and the United Nations Conference on Trade and Development (UNCTAD) convened the Cocoyoc seminar in Mexico on Patterns of Resource Use, Environment and Development Strategies. The World Commission on Environment and Development (WCED) defined the concept of *sustainable development* in *Our Common Future* (1987) as " development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[1] WCED prefigured a series of international conferences concerning environmental - development relations, notably the 1992 United Nations Conference on Environment and Development (UNCED), known as the Rio Earth Summit, and of the 1996 Habitat II Conference (the 'City Summit') in Istanbul.

Sustainable development is a contestable concept and it continues to give rise to a variety of different interpretations as to how we might achieve sustainable societies and how these might operate. There appears to be a growing consensus, particularly among environmentalists that solutions formed within the bounds of existing social, political, economic and technological practices will not bring about the desired results.

The *mechanical* (or *reductionist*) *paradigm* has dominated our culture for several hundreds of years, having shaped Western society and significantly influenced the rest of the world. Many of our current environmental problems arise out of seeing ourselves as separate from nature. The roots of this perspective lie in the Scientific Revolution, which dates from the time of the Copernicus, Kepler, Newton and Galileo. The modern physicist Fritjof Capra argues that the

[1] World Commission on Environment and Development, *Our Common Future* (Oxford University Press, Oxford, 1987), p. 47

major problems of our times require a radical shift in our perceptions, our thinking and our values. He believes that society is embarking on a fundamental paradigm shift "as radical as the Copernican Revolution". He has helped to define the *New Age* perspective, which sees the world as an integrated network of all living and non-living entities. Just like the medieval cosmology of the Great Chain of Being, actions in any one part this network affect the whole.

The New Age notion of social change sees different and disparate groups working on a variety of causes (ecology, feminism, community politics, architecture, consciousness raising etc.) with common elements, which are eventually brought together in collective action. The idea that an individual's values, attitudes, and lifestyle changes can act as a catalyst to widespread social change is criticised by many as idealistic, in that it seems to suggest a failure to confront the forces in society which resist change, primarily those of the state and institutionalised capitalism. The lack of any thorough analysis of why it is that capitalism pollutes the environment has meant that it has been impossible to develop a realistic political response as to how to achieve a holistic sustainable society. Therefore the issues of poverty, inequality, and urban environmental degradation (the 'environment' for an increasing percentage of the population) have not been adequately addressed in any sustainable way.

Capra also argues that the mechanical paradigm has been shown to be fatally flawed and unsustainable, and is now giving way to an *ecological paradigm* in which a number of previously entrenched ideas and values have been brought into question and assumptions challenged. From the early 1960s there have been forceful challenges to the terms of Enlightenment modernity within *ecophilosophy*, *environmental philosophy* or *environmental ethics*.

There is now irrefutable scientific evidence that we are harming the biosphere and human life at an alarming rate and in alarming ways that may soon become reversible. We are confronted with a whole series of global environmental problems; relating to the rapid depletion of natural resources, energy and materials, atmospheric pollution, climate change, deforestation, and dramatic loss of biodiversity. The more we analyse these problems the more we come to realise that they are interconnected and interdependent, in other words *systemic* problems. We now know, for example, that stabilising the world population will only become possible when poverty is reduced throughout the world. That the extinction of animal and plant species on a massive scale will go on as long as the developing world is burdened by huge debts. And that scarcities of resources and environmental degradation combine with rapidly expanding populations to lead to the breakdown of communities, collapsing infrastructures in cities and to ethnic and tribal violence.

Greens advocate a 'sustainable society', not simply because they think it would be a better place to live, but because they believe it is scientifically legitimate to do so. The modern ecological view of view of science borrows from a number of writers in the first half of the twentieth century, including Alfred North Whitehead, Henri Bergson, and Lewis Mumford. It draws on the work of Michael Faraday (particularly in the sense that his *electromagnetic field* refuted the Newtonian idea that all entities were separate and governed by fundamental mechanical laws determined by God), Albert Einstein (whose *relativity theory* offered an interconnected view of the Universe), *evolutionary theory* in biology, and in *quantum theory* within subatomic physics. More recently James Lovelock's *Gaia hypothesis*, has offered ecologism its own scientific paradigm. *Gaia* refers to the Earth as a self-regulating organic system, which is striving toward a steady-state condition favourable for the maintenance of life, while being capable of responding to changing needs for human sustenance.

The shift to a sustainable society will require radical *social change* and will involve the political question of how to change a system of social organisation, which, even if we accept is wrong,, seems deeply entrenched and inevitable. The work of the three most important classical social theorists, Karl Marx, Emile Durkheim and Max Weber involved attempts to understand the nature and origins of industrial capitalist societies through the processes of social change but they studied society in isolation from its 'natural' context. Charles Darwin, Jean Baptiste Lamarck's and Alfred Russell Wallace evolutionary principles when applied to sociology had an immense impact in the nineteenth century because they appeared to legitimate ideas of progress and advancement that were popular in a Victorian era in which Britain held economic and political supremacy. By the early decades of the twentieth century, however, fundamental flaws in their theories of social evolution had been identified.

Timothy O'Riordan in *Environmentalism* (1981) describes four main social, political and institutional positions from which sustainable societies may emerge. These draw on models and patterns within the 'new global order'; 'centralised authoritarianism'; the 'authoritarianism commune'; and from the 'anarchist solution'. Alternative development paradigms have also begun to emerge which challenge orthodox theory and practice such Maurice F. Strong's *'ecodevelopment'* notion which attempts to draw together various disperate but related concepts of sustainable development while being firmly rooted in ecological principles. Following Kirkpatrick Sale's (1985) notion of bioregionalism it begins with the existing local resources and seeks to build on these and maximise them for the direct benefit of the local population. Curitiba, in Brazil, is a notable example of the ecodevelopment approach.

Environmentalists argue that economic growth is moderated because the Earth has a limited carrying capacity (for population). But when they focus on what action to take they have tended to invoke 'old' political preferences arguing that social change must proceed from individuals, although it will also require changes in the economic structures of society. *Political ecology* tries to change this by bringing ecological themes together with social struggles. Through the work of, among others, Enrique Leff (1981); Ignacio Sachs (1982); Rudolf Bahro (1984); Andre Gorz (1985); and Adrian Atkinson (1991) political ecology aims at the construction a radically new social, political, and cultural world which will prevent the environmental catastrophe ahead and establish an economic and social system which incorporates a sustainable relationship between society and nature. Proponents seek a fundamental re-orientation in the existing relationship between humans and the 'natural' world involving a movement away from the *'technocentric'* view that environmental problems can be approached and managed scientifically, towards an *'ecocentric'* view that accepts natural limits to economic and population growth.

Today it is widely accepted that rapid growth in population numbers, along with economic growth and industrialisation, and the associated per capita increases in resource use, contributes directly or indirectly to many serious global environmental problems that demand a collective response aimed at altering people's material circumstances. The debate about the correct strategy for social change leads to issues of *structuralism*. The Green view of society, has been accused, particularly by Marxists, of embracing shallow (unrealistic) analyses based on idealised concepts, or of ignoring the materialistic facts of how humans, individually and socially have constantly changed their own nature, and transformed the natural environment, through history. For Marxists, there is no such thing as a 'nature' unmediated by society.

For many sustainable development is capitalism's answer to the environmental crisis but notable advocates of the sustainable society, like Meadows *et al* (1972, 1991); Daly (1973); Schumacher (1973); and Boulding (1973) believe that it is within our capabilities to come up with a set of social and economic structures that would keep a society sustainable, allow evolution, creativity and change, and permit many more freedoms than would be allowed in a world that continues to move beyond its limits. Their overall approach is reformist rather than revolutionary. They generally argue that humans have to contain their expansion by lowering consumption levels, improving technologies, and limiting population growth. They argue for a clear distinction to be made between growth and development, and a shift from pursuing growth, which is quantitative, to pursuing development, which they argue is qualitative.

Marxists maintain that the mainstream Green critique of conventional economics remains ambiguous. While it recognises that our socio-economic system as currently structured is

unmanageable, has overshot its limits, and is headed for collapse it concludes that information is the key to transformation and that only individuals can make changes that transform systems. *Eco-socialism*, on the other hand, employs Marxist perspectives to look particularly at the structural features of capitalism as a way of explaining today's ecological problems. The eco-socialist critique of existing society and conventional values is largely an inquiry into the detrimental global influence of Western culture and its seemingly endless search for material gain.

Every day thousands of children die of starvation. Six hundred million people in the slums of cities like Rio de Janeiro or Delhi live in housing which is so bad that their health is in constant danger.[2] The World Bank informs us that 20 per cent of the global population lives on less than one U.S. dollar per day.[3] Nearly one out of every six people in the world is either starving, very ill or close to death. While these huge numbers may be difficult to grasp, they are central to the environmental crisis and the ecological predicament of humanity. Sustainability primarily concerns the continued survival of the human species. While in the industrialised world ecological degradation is linked to economic growth and the benefits that this brings, in the poorer nations of the world it is closely linked to survival. In the developing world people are aware that environmental threats to survival must be countered but that it is impossible to deal with these without first confronting issues of poverty. The problem is inevitably one of global inequity. No purely local effort can address the environmental challenge as the world moves toward 10 billion people over the next 50 years.

Today networks of cities across the world sharing knowledge, technologies, and establishing policies that respect local cultures while implementing common environmental objectives could offer the power and structure for real change, as our awareness of our common dependence on the global ecology spreads and modern communications bring global problems into sharper focus. But, as has been confirmed in the cluster of UN conferences during the 1990s, many environmental problems are getting worse. In making our new choices we may now have to accept that we must opt for a sustainable future or no future at all.

The technological innovations that humans have produced over thousands of years of evolution are central to the reason why we have become the planet's dominant species. But no other generation has experienced the scale of luxury and freedom from want that we now seem to take for granted in modern industrialised nations. And yet a paradox lies in the fact that the same technologies have violated the environment, polluted the air and water, stolen jobs, and

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[2] *Human Development Report* (Oxford University Press, New York, 1997), p. 29
[3] World Bank, *Poverty Reduction and the World Bank* (World Bank, Washington, D. C., 1996), Chapter 1

wiped out species and still threatens to wipe out our own. We continue to compromise the earth's ecology. Faced with an ecological crisis, and in the absence of any other options our policy reforms have been geared to the technological solution - emphasising technological means for solving problems that are essentially social, political, economic, and ultimately cultural. This only serves to postpone the inevitable. There is no purely technological solution to the ecological crisis. But there can be no solution without technology.

The urban future offers vast opportunities as concentrations of human creativity and the highest forms of social organisation. Modern cities have become the world's economic growth engines fulfilling an important role in the process of open-ended wealth creation. Cities have the potential to be vibrant, sociable, life-enhancing centres of civilisation. In the developing nations huge numbers of people are migrating to cities every day as urban areas continue to grow. By reducing pressure on land, providing opportunities to increase energy efficiency, and making recycling an economically feasible option cities can offer opportunities for protecting the environment. Indirectly they also reduce environmental pressures through population stabilisation, provide opportunities for education on environmental issues and mobilise citizens around these issues, offering higher per capita expenditures on environmental protection and take an active role in environmental management.

But globally cities seem to be converging, not in efforts to improve the environment and provide a better quality of life for their citizens, but in unemployment, declining urban infrastructure, a deteriorating environment, a collapsing social impact and institutional weakness. Although they have the potential to ease global environmental pressures, urban environments within cities throughout the world are deteriorating. Increasingly high levels of energy consumption, waste production and pollution mean that today they are driving the global environmental crisis. Throughout the world, the rapid growth of populations, the accelerating deterioration of the social and physical urban environment, and the flight of people and resources into peripheral areas (either in suburban or squatter settlements) are indications that cities are converging in crisis. The unsustainable patterns of consumption among dense city populations, the concentration of industries, the intense economic activities, increased motorization and inefficient waste management, all suggest that the major environmental problems of the future will be city problems. Over the next 25 years 2 billion more people will be added to the urban population.[4] By then almost two-thirds of the global population will be classified as urban. And yet around the world our cities are fast becoming intolerable and horrifying places that appear to be destroying the planet and the well being of humanity.

The world's cities represent the basic unit of critical analysis that will guide strategies towards the sustainable society but the success of a city is now a function of its ability to integrate itself into the global society. As they create new and dynamic spatial and social orders by fabricating direct links within a global system cities are radically changing. The 'urban' is becoming the overwhelmingly dominant way in which the majority of people experience the world whether they live in cities or not. But the 'urban' is out of control, harbouring a growing set of problems resulting in environmental degradation and a whole host of social pathologies, which could eventually render cities physically uninhabitable.

Of course in some ways we have been here before. The concentrated impoverishment, the diseases and the social upheaval were familiar problems to our nineteenth century forebears and the urban malaise was well documented in the critical observations from mid-nineteenth and early twentieth century writers such as Friedrich Engels, Henry Mahew, Charles Booth, Jack London, George Orwell, Jacob Riis and W.E.B. Dubois. However the scale and speed of twentieth century urbanisation, its global nature and its environmental impact, means that the decisions we make about our cities today will determine the quality of life for generations to come. We now also know that if we do nothing we will fail them. It has fallen on our generation to understand the nature of this challenge and to explore sustainable alternatives in urban living.

In 1976, the UN held its first Global Conference on Human Settlements, Habitat I in Vancouver, Canada. Amongst others, Buckminster Fuller, shared a platform with, Paolo Soleri, discussing such development challenges as the need to improve quality of life, to achieve more equitable and fair access to resources, and to create better living conditions for the most disadvantaged groups in the developing world. Twenty years later Habitat II focused on the urbanisation process itself. "The City Summit" in Istanbul, Turkey, in 1996, recognised that humanity is faced with two unprecedented challenges, constituting the urban question within the environmental crisis:

- How can we provide adequate shelter and livelihoods for the world's ever-growing numbers of urban citizens?
- How can we achieve sustainable human settlements in an urbanising world?

The 1990s have seen the emergence of the International Ecocities Movement, which is working to create healthier, more resource-efficient cities. The recognition that the future mass of humanity will be located within urban environments demands that environmental politics pays as much attention to the qualities of the built and social environment as it now typically does to

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[4] UNPD, (1995)

the 'natural' environment. From around 1990 onwards global, regional and local efforts directed towards the confirmation of the unsustainable urban condition, understanding the challenge that it represents, and searching for alternatives to it have been collectively described under the aegis of the search for the *sustainable city.* The urgency of the need to move towards the sustainable city has become a rallying call for many environmental activists and politicians in recent years. While Michael Breheny at the start of the 1990s highlighted the lack of any cogent debate on issues of urban sustainability, a growing body of work now exists which examines and promotes the idea of the 'sustainable city' or 'sustainable urban development' in a general sense.

Urban sustainability requires that we see urban systems as ecosystems that have been knocked off balance. The challenge is to establish what actions need to be taken to counter the negative effects of human activity and maintain equilibrium within the parameters of sustainability. According to Herbert Girardet, the key to the reduction of urban ecological footprints lies in cities adopting a "circular metabolism", where consumption is reduced through implementing efficiencies and re-use of resources is maximised.[5] This involves such things as material recycling, waste reduction, energy conservation and the use of renewable energy sources. A circular metabolism would increase a city's efficiency and lessen its environmental impact. Richard Rogers (1998) has described the sustainable city as incorporating "overlapping domains", of balanced "multi-activity, dense urban structures", of "pedestrianisation" and "three-dimensional planning", characteristics that Paolo Soleri has been exploring at his urban laboratory at Arcosanti since 1970.

The contemporary debate on sustainable urban form took off in the late 1980s when it was acknowledged that city planning had a significant role to play in the promotion of sustainable development. Since then the environmental imperative has revived the idea that the planning of cities is a legitimate, indeed crucial, practice. As the debate has focused on environmental sustainability - and in particular the issues of global warming and urban sprawl - the 'centrist' view of urban compaction has gained ascendancy over the 'decentrist' view. The *CEC Green Paper* (1990) argues that both environmental and quality of life benefits can be delivered with containment. Other modern day centrists agree that high-density urban living is compatible with a higher quality of urban life.

There are, however, several arguments opposed to the compact city idea articulated by, for example, Breheny (1992) who argues that it ignores the fondness for suburban living; that telecommunication advances contradict the concept; that rural communities could be neglected; that there could be a loss of amenity and privacy; and that there is, in any case, a lot of

uncertainty concerning future patterns of population growth and dispersal. Whilst the arguments are far from resolved, urban compaction has nevertheless become, by far, the most popular policy approach, endorsed by the European Commission's *Green Paper on the Urban Environment* (CEC, 1990), and therefore part of the United Kingdom's sustainable development strategy. In searching for sustainable urban form and structure the need for a holistic approach is now granted and there exists considerable consensus, with respect to Western cities, around many policy goals, such as improving energy conservation, reducing car dependence and in a shift towards more compact city forms, with higher residential densities and mixed land uses.[6]

The need for sustainable development, however we choose to define it, is clear. Cities are the main contributors to unsustainability and therefore it is to cities that we must look in our search for solutions. Our growing dependence on a particular set of energy-inefficient and resource hungry technologies has led to the development of urban forms that assume limitless supplies of cheap natural resources. This, in turn, has led many planners and architects to call for the fundamental redesign of the physical fabric of the city. Many of the proposals aim at enabling people to be less car-dependent, in particular through attempts to increase urban residential densities, by concentrating development around key public transport routes and nodes, and by encouraging a return to mixed land-use policies within the city (Soleri, 1969; Calthorpe, 1993; Rogers, 1997).

The search for the ultimate sustainable urban form may be better redirected to the search for a number of different *approaches, models and forms* which can respond to the variety of existing settlement patterns and contexts that have been identified through a holistic view of what sustainable societies of the present and future might be like. Despite the questions regarding the intensification and consolidation of existing cities, much of the academic and policy literature that has emerged from the growing debate around sustainable cities describes a number of different approaches being considered and develop a variety of "models" of sustainable urban development, which represent radically different views of how the processes leading towards the planning of sustainable cities needs to be realised. These range from the deep ecology inspired attempts to bring about the self-reliant city, to more neo-liberal attempts to foster sustainable development by redefining the market pricing and regulatory systems. Haughton (1999) presents some of these contemporary alternative models as:[7] the *free-market model* , the *re-designing the city model,* the *self-reliant city model,* the *fair shares city model.* Another that can be added here

[5] Girardet, (1999), p. 22-3

[6] G. Haughton, 'Searching for the Sustainable City: Competing Philosophical Rationales and Processes of 'Ideological Capture' in Adelaide, South Australia', in *Urban Studies* 36(11), (1999), pp. 1891-1906

is that developed since the 1950s by the architect Paolo Soleri, the *arcology city model* or *ecological city model.*

[7] *Ibid*

5

Ecologism

Chapter 5

5.0 ECOLOGISM AND THE GREEN MOVEMENT

> An emancipated humanity will become the voice, indeed the expression, of a natural evolution rendered self-conscious, and sympathetic to pain, suffering and incoherent aspects of an evolution left to its own, often wayward, unfolding. Nature, due to human rational intervention, will thence acquire the power of developing more complex life-forms, and the capacity to differentiate itself.[6]

Figure 5.1 Environmental protests on acid rain and global warming and an alternative living poster

[6] M. Bookchin, *Remaking Society* (Black Rose Books, Montreal and New York, 1989), p. 203

5.1 The principles of ecology

Popular concern over the hazards of environmental degradation is growing, as environmental problems become a part of our daily existence. Any typical newspaper or scientific journal today contains various articles on global and local environmental issues. These might include problems of terrestrial, marine and atmospheric pollution; of acid rain, greenhouse gas emissions, the depletion of the ozone layer, and global warming; the damaging effects on human health of the use of biocides; the issue of the long term containment of toxic chemicals and nuclear wastes; the problems of genetically mutated crops and the hazards of releasing genetically engineered organisms into the environment; the degradation of fisheries, forests, croplands, and grazing lands and the related issues of topsoil erosion, the destruction of wilderness, the destruction of non-human habitat and the rate of extinction of many plant and animal species; the range of problems associated with exponential human population growth; and problems of urban expansion and urbanisation (as described in, for example, Worldwatch Institute *State of the World* reports since 1984; the World Resources Institute (WRI) reports since 1990).

In response to these problems the last thirty years has seen the emergence of a distinctively 'green' outlook, which is often labelled by commentators as *environmentalism* or, more recently, *ecologism* . In Britain, the Ecology Party changed its name to the Green Party in 1986 and the terms used to describe the particular outlook - 'greens', 'ecologists', and 'environmentalists' – are generally considered to be interchangeable. The word *ecology*, coined by the German biologist and philosopher Ernst Haeckel (initially as *oecology)* in 1866 derives from the Greek *oikos,* "referring originally to the family household and its daily operations and maintenance".[2] Haeckel described ecology as the study of the relationships between living things and the environment in which they live. Today this definition has been expanded to refer to the "larger cosmic household here upon earth".[3]

Green culture draws heavily on the language and ideas contained within the discipline of *ecology*. As a science-based discipline ecology involves the study of the distribution and abundance of different types of organisms over the face of the earth. It is about the physical , chemical but especially biological features and interactions of these living things as characteristics that determine dispersal and plenitude. Ecology deals with species on three levels: individual organisms, populations and communities of organisms and focuses particularly

[2] Worster, (1985) p. 192
[3] W. Fox, *Towards a Transpersonal Ecology; Developing New Foundations for Environmentalism* (Green Books Ltd, Devon, 1995), p. 32

on the movement of energy and matter through these. Humans are seen as one of a whole myriad of species that share the planet. Much of the fundamental thinking at the core of environmentalism derives from the ecological principles outlined below.

5.1.1 Community, ecosystems and niches

Ecologists view the plant and animal populations within a given area as a *community* in which different organisms perform different roles. A community of living things, together with the non-living parts of their environment, forms what is called an *ecosystem*. The whole earth is an ecosystem; so is a forest, an ocean, a pond, or a rotting log. The living things in any ecosystem can be classified according to their functions. The *producers* are the green plants, which make food; the *consumers* are the animals, which eat plants or other animals; the *decomposers* are the bacteria and other tiny organisms that break down animal wastes and the remains of dead plants and animals into raw materials that are used by the plants to make more food. Each species of organism in the ecosystem has a specific task, each plant species producing a different kind of food, each animal species consuming different food, and each decomposer performing a different operation on wastes. Ecologists call a species' task its *niche*, and if two species compete for the same niche in an ecosystem, one species or the other eventually dies out.

5.1.2 Equilibrium

All these living things are constantly affecting and being affected by each other, as well as by the non-living things in their environment - the soil, the water, and the air. A very simple ecosystem, such as a small, still-unpolluted mountain lake, tends to maintain a *dynamic equilibrium*, or balance of energy, among the producers, consumers, and decomposers, even though their populations vary somewhat with the seasons. But everything in nature is constantly changing - usually very gradually, but sometimes rapidly so no ecosystem can remain completely stable over a long period of time. A change of climate, for example, may affect equilibrium drastically.

5.1.3 The physical and the biological

The *physical*, or non-living, environmental factors in an ecosystem include the light, temperature, radiation, pressure, water, air, climate, gravity, and soil. For each of these factors organisms have minimum and maximum acceptable values in the environment in which they live. For example, the maximum temperature tolerated by an animal is about 126 °F (52 °C), but

for certain bacteria the maximum temperature may be as high as approximately 185 °F (85 °C).[4] Pressures also vary to an incredible degree in some environments; a fish at deep sea levels is exposed to pressure a thousand times greater than that at which a high-mountain bird may live.

The *biological* factors in an ecosystem are even more complex than the physical factors. Two of these factors that tend to limit animal populations are *predation* and *competition*. Predation is the killing of animals by other animals for food. Predatory animals are usually much fewer in number than the animals they prey on, and their hunting helps to keep the prey animals from increasing beyond the capacity of their food supply. Competition is the striving of two or more organisms for a necessity of life (such as food, water, minerals, living space, or sunlight for plants) that is inadequate to fill the needs of all. Competition often involves organisms of the same species, because they have the same requirements. It seldom results in bloodshed, but the 'losing' competitor may have to migrate or die.

5.1.4 Symbiosis and parasitism

A relationship in which two individuals of different species live together is called *symbiosis*. A symbiotic relationship that benefits both participants, is called *mutualism*. For example, the sea-anemone (an animal despite its floral name) often becomes attached to the back of a hermit crab; scraps from the crab's food feed the sea-anemone while its stinging cells help protect the crab. When one participant benefits from co-habitation without helping or hunting the other, ecologist call it *commensalism*. Ants, for example, often associate with aphids, or plant lice, to feed on the saccharine substances produced by the latter.

Parasitism occurs when one participant lives entirely at the expense of its host. This is often harmful to the host-organism, but seldom lethal. *Ectoparasites*, such as lice, ticks, and fleas, lodge on the surface of their host and usually feed on its blood; they may harm their host by transmitting internal parasites through their blood-sucking organs. The *endoparasites* install themselves in the host-organism's blood, intestines, liver, lungs, or muscles. Particularly lethal are those parasites that deposit their eggs inside other insects, which are devoured by the parasite's larvae when they hatch.

5.1.5 Habitat

The part of an ecosystem where an organism lives is called its *habitat*. A fish's habitat could be a whole pond, and thus the pond's entire ecosystem; a micro-organism's habitat might

[4] G.Pretto, A. Minelli, M.U. Tanara, *The World of Nature* (Macdonald & James, London, 1977), p. 16

be a tiny area on the pond floor, and thus only a small part of its ecosystem. Some typical habitats in nature are forests, ponds, marshes, grasslands, oceans, rivers, and so on. A barren island occupied only by birds of the same species would be an *exclusive* habitat; a forest teeming with populations of different species would be a *heterogeneous*, or mixed, habitat.

The forest, with its abundance of trees of different heights, bushes, climbing vines, and so on, is one of the environments richest in plant and animal variety. Ecologically it is one of the finest, because the soil retains all its natural richness and the water system and climate are regulated by the trees and smaller plants. The forest provides an ideal habitat for the most widely diversified species of living things, with all kinds of living habits. Unfortunately, humans have destroyed many forests and converted the land to farms.

Marshes, or wetlands, are also extremely rich in living organisms. They form in the shallow parts of a lake where water plants can take root and multiply, along rivers in places where the land is too flat for the water to drain off, and especially in estuaries - the places where rivers slow down and deposit their sediment before emptying into the sea. The latter places are called *tidal* marshes, because the tide pushes salty ocean water into the marsh twice a day. Inland marshes provide favourable habitats for fresh-water fishes and plants, amphibians, reptiles, insects, and especially birds, which feed on the other marsh animals. Tidal marshes are filled with plants that are adapted to both salt water and the brackish fresh water left when the tide ebbs. Many ocean fishes, crabs, lobsters, and so on lay their eggs in tidal marshes, where the plants and their varied insect populations provide food for the young sea animals when they hatch. These 'nurseries of the ocean' contain many times as much living material as the open sea. Only recently has the value of wetlands been recognised and an effort made to keep them from being filled in with waste and soil as residential and industrial sites.

5.1.6 Biomes

Ecologists refer to a large area in which the same climate, plants, and animals predominate as a *biome*. Similar biomes are found around the earth at the same latitudes, north and south, and at comparable altitudes above sea level. The *tundra* (Russian for 'marshy plain') is a vast, treeless land that surrounds the Arctic Ocean. The *taiga*, or northern coniferous (evergreen) forest, forms a wide band across North America, Europe, and Asia just south of the tundra. Neither of these two biomes has a counterpart in the Southern Hemisphere, because the land areas there do not extend into comparable southern latitudes. In the middle latitudes are the *temperate deciduous forests*, composed mainly of trees that shed all their leaves periodically, usually in autumn; the *temperate grasslands*, or prairies; and *deserts* in the dry climates. In

tropical areas where rain falls daily, are *tropical rain forests*; and where dry seasons are especially long and severe, the *tropical grasslands.*

Biomes of the same type have the same kinds of ecological niche, though a specific niche may be filled by plants or animals of different species in different biomes. For example, the primary consumers in grasslands are grazing animals; in Africa it is occupied by zebras and gazelles, in Asia by wild horses, and in Australia by kangaroos. Ecologists believe that by studying a particular biome intensively, they can use their findings to draw conclusions about how other biomes of the same type work.

5.1.7 Energy budget

All of the energy in an ecosystem comes originally from the sun. By drying and weighing all the plants from a measured area of land, scientists can estimate how much of the radiant energy reaching the area has been changed by green plants into chemical energy, or food. Some of that energy is transferred to the prime consumers - grazing mammals, birds, insects, even parasitic plants - that feed on the green plants; in turn, some of their stored chemical energy is transferred to the predator animals that prey on them. Finally, some of the energy reaches the bacteria and other micro-organisms as they decompose the wastes and remains of the plants and animals. Energy cannot be destroyed; but whenever it is used, some is changed into heat and transferred to the surrounding air, where it is no longer available to power the growth or activities of living organisms. A portion of the energy stored in the green plant is used and lost in this way by each organism in the *food chain* - the plant itself, the prime consumer, one or more predators in the chain, and finally the decomposers. Thus the population of any species of organism in the food chain is limited by the energy available to it from the organisms lower on the food chain, on which it feeds. Humans are no exception to this rule.

5.1.8 The human factor

The human population has been growing - slowly at first, but at an ever-increasing rate. In the two hundred years between 1650 and 1850 the earth's human population doubled from five hundred million to a thousand million. This increase was made possible by the development of new ways to raise food crops, of machines to use the energy stored in the earth's deposits of coal, gas, and oil, and of ways to extend human lives by curing certain diseases and preventing others. Such developments have continued to increase, making possible a world population that is six thousand million today and growing at a rate that could double that figure by the year 2050.

Human need for habitat and food has increased in proportion to population increase. In addition, our desire for objects and services that can only be provided by exploiting the earth's limited supply of forest stored minerals and stored energy has radically increased during the twentieth century. To satisfy these needs and desires, we have been encroaching more and more on natural areas, destroying their plant and animal populations as we grow.

During this time many species of whales - the earth's biggest mammals - have been hunted to near-extinction and will not survive unless all nations forbid their destruction. Many other species of mammals, birds, and fish have been destroyed or require an intense human will and effort to ensure their survival. In many parts of the world the destruction of forests for farming, timber, and fuel have left immense areas without plant cover, exposed to continuous erosion by wind and water.

Scientists now argue that our need to preserve natural areas is not merely aesthetic or educational in character. The extinction of any plant or animal species withdraws its unique genes from the earth's 'gene bank', thus diminishing its capacity to fund the evolution of new species or to supply genes that scientists might use in developing new and better breeds of plants and animals for human needs. As a result some areas little frequented by humans are now being preserved as 'wilderness areas' to be kept 'ever wild'.

Our ability to change the environment to suit our needs and desires is an important reason for the immense growth of the human population. But we have been pouring our waste gases, liquids, solids, and heat, many of them toxic to living organisms, including ourselves - into the earth's atmosphere, waters, and soil without regard for the capacity of natural forces to make the wastes harmless or useful as raw materials. In this way we have polluted the physical part of our environment and thus threatened our own survival as well as that of other living things.

Furthermore, we have realised since the 1970s that our supply of *fossil fuels* - energy from the sun that was stored underground in plant and animal remains millions of years ago and gradually converted into coal, oil, and natural gas - is not endless. It is widely accepted that we must adapt our behaviour to the requirements and capabilities of our natural environment, if our species' 'success' is to continue.

5.1.9 Entropy

The laws of thermodynamics imply that all production that uses material and energy eventually transforms them into a more random, that is, chaotic, or disordered, state. Disorder is termed 'entropy', and the second law of thermodynamics says that entropy increases with time. New energy from the sun slows down the process of disorder, but eventually this will run down

and the solar system will die. Industrial production, because of its intensive use of energy and materials speeds up the process of decay. Passive solar energy-based production, in combination with recycling, helps to delay it but the best approach is to reduce the demand for resources.

5.2 The green movement

Over the years, an increasing awareness of world wide problems has given rise to a variety of popularly based responses, collectively referred to as the *green movement.* In the United Kingdom, the largest and most visible part of the movement consists of various environmental groups, like the Green Party, Friends of the Earth, and Greenpeace.

TABLE 5.1

MINIMUM CRITERIA FOR BEING GREEN
(Porritt, 1984)

1	a reverence for the Earth and all its creatures;
2	a willingness to share the world's wealth among all its people;
3	prosperity to be achieved through sustainable alternatives to the rat race of economic growth;
4	lasting security to be achieved through non-nuclear defence strategies and considerably reduced arms spending;
5	a rejection of materialism and the destructive values of industrialism;
6	a recognition of the rights of future generations in our use of all resources;
7	an emphasis on socially useful, personally rewarding work, enhanced by human-scale technology;
8	protection of the environment as a precondition of a healthy society
9	an emphasis on personal growth and spiritual development;
10	respect for the gentler side of human nature;
11	open, participatory democracy at every level of society;
12	recognition of the crucial importance of significant reductions in population levels;
13	harmony between people of every race, colour, and creed;
14	greater efficiency and renewable sources;
15	an emphasis on self-reliance and decentralised communities.

Source: J. Porritt (1984)

An indication of the scale of increasing public awareness of environmental issues is that, during the 1980s, membership of these groups reportedly rose from 600,000 to over 3 million.[5]

Porritt (1984) describes essentially three types of activist within the movement:

[5] Porritt, (1984), p. 4

- those with a green lifestyle or occupation including organic farmers, vegetarians, alternative technologists, and members of co-operative and alternative lifestyle communities;
- those in other pressure groups and campaigns whose entire approach is increasingly green including the women's rights movement, the peace movement, and some among the animal's rights campaigners. Those who protest against poverty in the Third World, the arms trade, nuclear power, and transnational corporations are also included here;
- those politically oriented greens, which in Britain include the Green Party, the Liberal Ecology Group (LEG), and the Socialist Environmental and Resources Association (SERA).

Porritt (1984) also states his own view of the 'minimum criteria for being green'. Considering it was he who wrote the general election manifestos for the Ecology/Green Party these can assumed to be the basis of the green political agenda (see Table 5.1)

5.2.1 Shades of green

Environmental legislation and grassroots participation in the ecological struggle, first in the United States and later in Europe, produced an international environmental movement by the late 1960s. Although popular mythology has it that there is only one environmental movement and that it is primarily concerned with extra-urban nature (i.e. wilderness) this is now refuted within contemporary literature on ecologism (see, for example, Dobson, 1995; Fox, 1995; Pepper, 1996).

Green ideas, beliefs and values are often criticised as a diffuse and incoherent set of unrelated notions, plucked from the political right, left, and centre, and mingled with principles drawn from the science of ecology. In attempting to describe what *society* is and what it should be like they are reprimanded for getting their ideas from 'all over the place'.[6]

But today's greens deny incoherence. They claim a clear identity based on *ecologism*. They are, however, willing to accept the diverse nature of their philosophical and ideological borrowings, believing this to be a political strength rather than a weakness.[7] Although they have radical aims, the majority of greens, in their social prescriptions uphold reformist methods, and tend to straddle welfare liberalism and socialism. Distinct varieties of environmentalist have been identified within the range of the political spectrum from radical 'traditional conservatives', through reformist 'market and welfare liberals' to radical 'revolutionary socialists' by Cotsgrove (1982)[8], Porrit (1984)[9], and Pepper (1996). Generally there are three main types: *the*

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[6] Pepper, (1996) p. 10
[7] *Ibid*
[8] S. Cotgrove, *Catastrophe or Cornucopia* (Wiley & Sons, Chichester, 1982)

traditional (conservationist) *greens; mainstream* (radical aims, reformist methods) *greens;* and *anarchist* (radical aims and methods) *greens.*

5.2.2 *Traditional* (conservationist) *greens*

These are, in many ways, the heirs to the eighteenth and nineteenth century Romantic movement and the rebellion against economic individualism and the utilitarian, materialistic values of the time. Green conservationists today emphasise the restoration of order and traditional authority, albeit in small-scale, self-reliant communities, along the lines of tribal societies. However as Leo Marx (1970) contends they still hold the view that "nature is a world that exists apart from, and for the benefit of, mankind"[10] and are therefore fundamentally anthropocentric in their outlook. They believe that:

- there are limits to growth but enlightened private ownership is the best way to protect nature and the environment from over-exploitation;
- we need to protect traditional landscapes and buildings as part of our heritage;
- industrialism is bad – human societies should model themselves on natural ecosystems, e.g. should be stable, changing slowly and organically;
- diversity is important but it needs to be structured hierarchically and held together by shared beliefs;
- everyone should be content with their place (niche) in society;
- the family (perhaps extended) is the most important social unit;
- things were better in the past.

5.2.3 *Mainstream* (radical aims, reformist methods) *greens*

These include the British (and Scottish) Green Party, Friends of the Earth, Greenpeace, and other pressure groups. In recent years it has also began to embrace more radical aims *within deep ecology, social ecology*, and the *New Age* tendency. A mix of welfare liberal and democratic socialist prescriptions are represented but, in general, mainstream greens reject the politics of both the left and the right, preferring to direct their aim 'straight ahead'. Emphasis is placed on the importance of the individual and his or her need to revise values, lifestyles, and consumer habits. Advocating a lifestyle of voluntary simplicity they tend to embrace bioethics, the idea of limits to growth, and utopianism. The rejection of human self-importance in the larger scheme of things is not solely a contemporary preoccupation and can be traced back

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[9] Porritt, (1984) p. 4

[10] L. Marx, 'American Institutions and Ecological Ideas', in *Science* 170 (1970), pp. 945-52

through the philosophical and religious tradition that informs the modern environmental movement. There is interest in Eastern philosophies like Buddhism, Taoism, and Hinduism (see, for example, Watts, 1968; Watts and Huang, 1975; Snyder, 1969, 1977; Engel and Engel, 1990; Ferkiss, 1993; and Tucker and Grim, 1993). Mainstream greens believe that:

- there is a need to change social-economic structures, including ending the 'industrial society';
- small-scale capitalism is best, provided that the profit motive is secondary to production for social and environmental need;
- co-operatives and communes work;
- the state has a role especially locally;
- nature is spiritually important – this is, again, part of the Romantic tradition, especially important in deep ecology and New Ageism, which mainstream greens have a tendency towards, and which along with its dabbling in mysticism, the rejection of orthodox 'politics' and industrialism, has given it a reactionary conservative element.

5.2.4 *Anarchist* (radical aims and methods) *greens*

Green anarchists with radical aims and methods reject the state, class politics, parliamentary democracy and capitalism. They include eco-socialists and eco-feminists among their ranks. They believe that:

- people should organise themselves and have responsibility and power over their own lives;
- the individual is very important but achieves fulfilment in relation to the community;
- decentralised economy and politics is the way forward. There needs to be common ownership of the means of production and distribution according to needs (income-sharing communes);
- we need a spontaneous and organically evolving society within a non-hierarchical direct democracy;
- rural and urban co-operatives and communes work.

5.2.5 *Green values*

Together the 'mainstream' and 'anarchist' greens now represent the principle position adopted by those who seek fundamental societal change in order to create a "sustainable, environmentally sound, society".[11] A core of green values has recently been identified (by, for example, Dobson, 1990; Goodin 1992, Pepper, 1996) which have been widely adopted within

the emerging ideology of *ecologism*[12] and form the basis for the agenda within political ecology. Table 5.2 summarises these.

TABLE 5.2

GREEN VALUES COMPARED WITH CONVENTIONAL VALUES

Conventional values	*Green value*
About nature	
1) Humans are separate from nature.	Humans are part of nature.
2) Nature can and should be exploited and dominated for human benefit.	We must respect and protect nature for itself, regardless of its value to us, and live in harmony with it.
3) We can and should use the laws of nature (scientific laws) to exploit it.	We must obey the laws of nature (e.g. the law of carrying capacity, which means that there is a limit to the number of people that the earth can support).
About humans	
1) Humans are naturally aggressive and competitive.	Humans are naturally co-operative.
2) Human societies naturally organise themselves hierarchically, and must do.	Social hierarchies are unnatural, undesirable, and avoidable.
3) You can measure our social standing by our material possessions. Society mainly progresses by making more goods for people to own, and inventing more complex technology.	Spiritual quality of life and loving relationships are more important than material possessions. We reject the latter, and live simply.
4) Logical, rational thought is more valid and reliable than what our emotions and intuitions tell us. You can only trust facts and scientific evidence.	Emotions and intuitions are at least as important and valid as any other form of knowledge. There is no such thing as 'objective' facts.
About science and technology	
1) Science and technology can solve environmental problems, so we must go on perfecting them.	Science and technology cannot be relied upon. We must find other ways to solve environmental problems.
2) Progress in technology largely determines Social and economic changes. We cannot control it.	We humans determine society and economics. Technology should be servant not master. Harmful technology should be banned.
3) Large scale 'high' technology is a mark of progress.	Appropriate, and democratically owned technologies(e.g. renewables – solar, wind, etc.) is a mark of progress.
4) Problems are solved by analysis – splitting them up into component parts.	Problems are solved by synthesis – seeing all the parts as a whole and relating to each other.
5) Nature is understood by knowing the basic building blocks of matter and the forces that control them.	There is more to nature (and society) than the sum of the parts. Take a holistic view.

[11] Pepper, (1996) p. 10

[12] M. Kenny, 'Ecologism', in R. Eccleshall *et al, Political Ideologies,* 2nd edition (Routledge, London and New York, 1994), pp. 218-251

About production and economics		
1)	The main object of producing goods and is to make capital to invest in more goods and services benefiting everyone eventually.	We should produce goods and services that society needs, regardless of whether they are profitable or not.
2)	Economic growth of any kind is good, and it can go on forever. It need not harm the environment.	Indiscriminate economic growth is bad. It cannot continue because it uses up finite resources and creates pollution.
3)	Recycling materials and pollution control makes industry less competitive. It should be minimised.	Long term efficiency involves minimum use of materials and their recycling. Local economies would be less vulnerable to competition.
4)	Nations and regions develop by building trade between them.	Trade between nations and regions should be reduced: the goal should be self-sustaining regions and communities.
5)	Large scale centrally controlled production, is better and more efficient.	Small scale production, with local control is better and more efficient.
6)	Mechanised and automated production is better and more efficient and does away boring jobs.	We all need work in order to be fulfilled. Putting labour back into jobs would make them less boring.
About politics		
1)	The nation state is the most important political unit.	The local community is most important but as part of an international community (think globally: act locally)
2)	Environmental problems can be solved without changing our social-economic-political system: we will have to regulate the system and intervene in the free market.	The only way to solve these problems is by wholesale social-economic-political change – we must get rid of the industrial way of life.
3)	Greens want to revert to pre-industrial stone-age, or a romantic rural vision.	Greens want to create a 'non-industrial' society, centred on small-scale production for local economies and social need, and in greater touch with nature. They see this as moving forward.
4)	We need to leave environmental decisions to experts best suited to take them: politicians advised by scientists.	We *all* need to take decisions – 'experts' should advise us, but should not have more authority or power.
5)	The way forward is through representative (parliamentary) democracy.	The way forward is through direct democracy, that is, by consensus.
6)	A strong central state will continue to be needed to make national and global economies and social systems work – and ensure law and order in a democracy.	The state should have as little influence as possible mainly functioning to enable local communities to do what they want to do. In a green society people should organise themselves as they wish, should be laws protecting the environment.

Source: D. Pepper (1996).

5.2.6 Ecologism: an emerging ideology

MacKenzie (1994) points out that ideology implies distinguishing false hopes from true ones and understanding the philosophical foundations of knowledge. He quotes Karl Mannheim, from *Ideology and Utopia* (1936):

> ...it is only when the distrust of man toward man, which is more or less evident at every stage of human history, becomes explicit and is methodologically recognised, that we properly speak of an ideological taint in the utterances of others.[13]

The term 'ideology' first appeared in the aftermath of the French Revolution and assumed two contrasting meanings: ideology as a science of ideas (Antoine Destutt de Tracy – seeking a way of objectively showing that the 'false' ideas of the Terror [1793-94] contravened the 'true' principles that had motivated the revolution), and ideology as a set of subversive ideas (Napoleon – who saw de Tracy as a threat to his authority).

In Karl Marx and Friedrich Engels this opposition, which set the tone for the classical approach to ideology was given a new spin. In their early collaborative work *The German Ideology* (1846) they described how, rather than timeless truths generated by abstract reason it was changing historical conditions that were fundamental to the formation of ideas.

> Men are the producers of their conceptions, ideas, etc. – real active men, as they are condition by a definite development of their productive forces and of the intercourse corresponding to these, up to the furthest forms. Consciousness can never be anything else than conscious existence, and the existence of men are their actual life-processes. If in all ideology men and their circumstances appear upside-down as in a camera-obscura, this phenomenon arises just as much from their historical life-processes as the inversion of the objects in their retina does from their physical life-processes.[14]

Marx and Engels saw that it was in the actual world of human relations, principally in economic transactions, that ideas come into being and they devised a method of studying the 'inverted' forms of thinking that have arisen out of the real world. For them it was the need for the industrial bourgeoisie to protect class interests that gave rise to a set of false ideas, in ideological form. By grounding a theory of ideology in social and historical conditions Marx and Engels combined previous notions of a science of how ideas came about (de Tracy) with the exposure of false, or subversive ideas. By arguing that the real source of false ideas was to be found in the 'actual life-processes' of human beings, their theory implied that they could only be inverted by revolutionary action in the real world. For them a classless society would be devoid of ideology. They argued that the only way to remove the ideological framework of society was to remove the contradictions of particular class interests inherent in the social and economic environment.

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[13] K. Mannheim, *Ideology and Utopia: An Introduction to the Sociology of Knowledge* (Kegan Paul, London, 1936)

[14] K. Marx and F. Engels, *The Gernman Ideology* cited in I. MacKenzie 'The Arena of Ideology' in R. Eccleshall *et al* (eds.), *Political Ideologies* (Routledge, London, 1994)

There are those who argue that we are now witnessing the "slow process of debate and convergence" marking the formation of a new political ideology of *ecologism.*[15] According to this view *ecologism*, as a systematic and self-contained set of "ideas, beliefs and attitudes advocating a particular pattern of social relationships and arrangements"[16], has emerged from the radical, libertarian politics of the 1960s and 1970s, and particularly from the New Left movement in the United States and Northern Europe.

5.3 Historical roots of radical green thinking

The ideas, beliefs and values held within *ecocentrism* (as a mode of thought centred on natural ecosystems which regards humans as subject to ecological laws) and *sustainability* (as the pursuit of an ecologically benign culture) are historically derived from a diverse range of philosophical and ideological sources. Some have likened the modern surge in green awareness to the growth of religious sects in the seventeenth century – the Shakers, Quakers, Diggers, Ranters, Pilgrims, Fifth Monarchists, and Levellers. Their fiercely independent spirit of egalitarian politics, their love of the earth, their decentralist tradition, and their passionate spiritual commitment, certainly number them among a long line of antecedents for contemporary greens.[17]

It is certainly possible to identify historical influences relating to: the Romantic tradition, the Idealist tradition, and Anarchism within the three main varieties of approach outline above.

5.3.1 The Romantic tradition

Traditional greens are heirs to eighteenth and nineteenth century Romanticism and the revolt against commercialism and the utilitarian, materialistic values of the time; a) Thomas Carlyle (1795-1889); b) John Ruskin (1819-1900); and the Romantic poets, c) William Blake (1757-1827); d) William Wordsworth (1770-1850); e) Samuel Taylor Coleridge (1772-1834); and f) George Gordon, Lord Byron (1788-1824) are part of this tradition. The following extracts from their work express a concern they shared for the increasing effects of industrialisation and urbanisation on the landscape, along with a desire to hold on to traditional values and beliefs in the face of tumultuous change:

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[15] Kenny, (1994)
[16] M. Hamilton, 'The Elements of the Concept of Ideology' in *Political Studies* , xxxv (1), (1987)
[17] Porrit (1984), p. 8

If there is one historical figure who can be credited with founding a green sensibility it is John Ruskin. [18] Ruskin's views for reforming the arts and society, published in *The Seven Lamps of Architecture* (1849) and *The Stones of Venice* (1853), included his advocacy of Gothic architecture as a model for his time. In 1859 he lectured Bradford manufacturers on the potential total disfigurement of the English countryside by spreading industrialisation.[19] He later carried out practical experiments in combating pollution and, when he was convinced that changes in architecture were more often a reflection of society's social, political and technological values than a method of changing them, he developed political propositions for social change.[20]

b) The chemist defines his mineral by two separate kinds of character; one external, its crystalline form, hardness, lustre, etc., the other internal, the proportions and the nature of its constituent atoms. Exactly in the same manner, we shall find that Gothic architecture has external forms and internal elements....In that careful distinction of species, and richness of delicate and undisturbed organisation, which characterise the Gothic design, there is the history of rural and thoughtful life, influenced by habitual tenderness, and devoted to subtle inquiry; and every discriminating and delicate touch of the chisel, as it rounds the petal or guides the branch, is a prophesy of the development of the entire body of the natural sciences.[21]

Ruskin was one of a small group of Victorian critics of capitalist expansion that also included Thomas Carlyle, Karl Marx and William Morris. In *Sign of the Times* (1829) Carlyle had rejected the idea that labour could be reduced to commodity. Human spirit he saw was being eroded by the kind of mechanical production associated with the materialist philosophy:

a) The truth is, men have lost their belief in the Invisible and believe and hope, and work only in the Visible...Only the material, the immediate practical, not the divine and spiritual, is important to us. The infinite absolute character of Virtue has passed into a finite conditional one; it is no longer worship of the Beautiful and the Good; but a calculation of the profitable.[22]

Ruskin called for a renewal of moral and spiritual values in society. In what some have described as a premonition of the greenhouse effect in *The Storm Cloud of the Nineteenth*

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[18] Ruskin was the son of a wine merchant. He didn't go to school but was tutored and travelled extensively, mostly in Europe. In 1836 he went to Christ Church, Oxford, and won the Newdigate Prize for poetry in 1839. In his first book *Modern Painters* (1843 – 52), he championed the painting of Turner; In *The Seven Lamps of Architecture* (1849) he included, what is widely believed to be the contemporary green ethical standpoint on sustainability; *The Stones of Venice* followed in 1851 – 3. He became the most famous art critic of his day. From 1860 onwards he wrote increasingly on economic and social issues. His marriage failed. He was always mentally unstable. An unrequited love for a young woman (who herself went mad) was followed by permanent mental disturbance, although in the last decades of his life he wrote his autobiography *Praeterita.* In 1874, four years before his death, he visited Assisi, and spent much of the time in the Sacristan's cell and referred to himself as a lay brother of St. Francis (the adopted patron saint of the ecology movement).

[19] I. Cooper, 'Teaching Sustainability in UK Schools of Architecture', in *The Challenge of Sustainability* (ASSA Conference Proceedings, University of Edinburgh, 1993)

[20] J. Farmer, *Green Shift* (Architectural Press, Oxford, 1996), p. 68

[21] J. Ruskin, extract from 'The Nature of Gothic' from *The Stones of Venices*, 1853

Century he noted that climatic deterioration and pollution were creating a new form of cloud, a "loathsome mass of sultry and foul fog, like smoke...a plague wind".[23] Apparently referring to the pollution from the blast furnaces at Barrow-in-Furness, what seemed to concern him most was the symbolic nature of the cloud as the material expression of moral decline instigated by industry and commerce.

Romantics attempted to transcend the material life and contemplate the spiritual plane. Ruskin spoke of himself as nature's priest, interpreting God's word as expressed in a nature that had been designed for the edification of man. For William Wordsworth[24] nature inspired spiritualism and sacredness without a necessary recourse to the Christian God. Like Hegel, he believed in a spirit in the universe that was alive:

d) And I have felt
A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling in the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man:
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through things.[25]

Wordsworth and Ruskin both argued for the restoration of local small-scale industry. Wordsworth's sense of place was expressed in his poetry in the detailed descriptions of specific places, complete with local names and his character narratives. On the title page of each of the five volumes of Ruskin's *Modern Painters* (1845 - 1851) there is a quotation from Wordsworth's *Excursion:*

d) Accuse me not
Of arrogance
If, having walked with Nature,
And offered, far as frailty would allow,
My heart a daily sacrifice to Truth,
I now affirm of Nature and of Truth,
Whom I have served, that their Divinity
Revolts, offended at the ways of men.

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[22] T. Carlyle, 'Sign of the Times', 1829 cited in Pepper, 1996, p. 190

[23] Cited in D. Cosgrove, *Social Formation and Symbolic Landscape* (Croom Helm, London, 1984), p. 251

[24] Wordworth was born in the Lake District, son of an attorney at Cockermouth, and was educated at Hawkshead Grammar Scholl and St. John's College, Cambridge. He travelled in France as a young man and witnessed the early stages of the French Revolution. With Coleridge he published *Lyrical Ballads* (1798), containing some of the finest prose reflections on literature and life. Though he was considered radical in his younger days, his political and social views mellowed with age. He was Poet Laureate in 1848

[25] W. Wordsworth, extract from 'Above Tintern Abbey' from *Lyrical Ballads*, 1798

Romanticism was predominantly an artistic and intellectual sensibility expressed in literature, music and painting. It offers us a particular way of thinking, which is usually characterised as emotional, passionate, irrational, and subjective. Since it tends to idealise and mythologise nature its roots stretch far back into ancient history. The eighteenth and nineteenth century movement has strong links with modern ecocentrism, through the influence of particular individuals. Romantics maintained that science was inadequate to explain the phenomena of life. Intuition, instinct and emotion were elevated. Subjective knowledge of nature, particularly as expressed through art, was superior to objective, empirical classical science based on Cartesian dualism. William Blake[26] is considered a poet, holistic philosopher and the source of inspiration for much of twentieth century green thought. At the turn of the nineteenth century Blake wrote:

c) You don't believe - I won't attempt to make ye:
You are asleep - I won't attempt to wake ye.
Sleep on! Sleep on! While in your pleasant dreams
Of Reason you may drink of Life's clear streams.
Reason and Newton, they are quite two things;
For so the swallow and the sparrow signs.

Reason says 'Miracle': Newton says 'Doubt'.
Aye! That's the way to make all Nature out.
'Doubt, doubt, and don't believe without experiment':
That is the every thing that Jesus meant,
When He said 'Only believe! Believe and try!
Try, try, and never mind the reason why!'[27]

Blake's sentiments were derived from a Western holistic tradition and in part from Eastern philosophy. His synthesis of this ancient knowledge was a source of inspiration to people like Alan Ginsberg, who was instrumental in creating the Beat movement in the 1960s. This, in turn helped define the counter-culture generation from which the modern environmental movement derived.

Romanticism was a reaction against material changes in society, which came about through emerging and expanding industrial capitalism in the eighteenth century. In this period of transition production was located in the city. The factory system and the process of mass

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[26] Blake was born in London and went to drawing school there when he was ten. He collected prints of Raphael and Michelangelo and started writing poetry at the age of twelve. When he was fourteen he was apprenticed to an engraver who required him to draw the monuments at Westminster Abbey where he came to appreciate Gothic art. He was a student at the Royal Academy from 1778 but cut his studies short to work as an engraver for booksellers. His wife, who he married in 1782, helped him with the engravings on his own books, the first of which was *Songs of Innocence.* Although his visionary genius was not widely recognised and he spent much of his life in poverty, in his later years he became the centre of a group of young painters, including Samuel Palmer, who revered him.

[27] W. Blake , 'You don't believe', from *The Rossetti Manuscript Part II,* circa 1800-10

production were based on unleashing and controlling violent natural forces. Some critics like Wordsworth and Ruskin, saw that this process, allied with commercialism degraded and despoiled the environment. Like never before cities became places of squalor and deprivation and began to symbolise the failure of *laissez-faire* liberalism and ideas that society could be perfected by allowing people to follow their own self-interest:

d) Meanwhile, at social Industry's command,
How quick, how vast an increase. From the germ
Of some poor hamlet, rapidly produced
Here a huge town, continuous and compact,
Hiding the face of earth for leagues – and there,
Where not a habitation stood before,
Abodes of men irregularly massed
Like trees in forests, - spread through spacious tracts,
O'er which the smoke of unremitting fires
Hangs permanent, and plentiful as wreaths
Of vapour glittering in the morning sun.
And, wheresoe'er the traveller turns his steps,
He sees the barren wilderness erased,
Or disappearing; triumph that proclaims
How much the mild Directress of the plough
Owes to alliance with new-born arts![28]

Although the dualism of Romantic versus rationalist thought is an ancient one the changes in material condition created as a result of industrialisation during the eighteenth and nineteenth centuries encouraged a backlash against rationalism. Romantics feared the dehumanising possibilities of science and 'civilisation'. This was symbolised in Mary Shelley's (1818) horrific scientific product , Frankenstein's monster, part human part machine, slave turned destroyer. This opposition to scientific rationalism extended to the industrial 'civilised' society housed in cities that were meant to epitomise 'progress'. But mechanical production and materialist philosophy were turning people into cogs in an impersonal productive machine. The rational search for economically efficient production methods was leading to the spiritual alienation of people from nature and from each other. Civilised society was complex and sophisticated. Romantics were in search of simplicity of ideas and action. Simplicity was honest and nature was beautiful because it was simple and honest. Samuel Taylor Coleridge[29] wrote towards the end of the eighteenth century:

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[28] W. Wordsworth, 'Outrage done to Nature' from *The Excursion*, 1818

[29] Coleridge was born at Ottery St. Mary, in Devon, the son of a vicar, and was educated at Christ's Hospital, Westminster, and at Jesus College. Cambridge. In 1795 he met Wordsworth and together they published *Lyrical Ballads* (1798), containing 'The Ancient Mariner'. In addition to poetry he wrote literary criticism and philosophical and political pieces. Like Wordsworth his early ideas were radical: he believed in a primitive form of communism 'Pantisocracy'. He proposed a new, though conservative, regenerating force for society, a class of the educated and the artists, which he called 'clerisy'.

e) Dear Babe, that sleepest cradled by my side,
Whose gentle breathings, heard in this deep calm,
Fill up the interspersed vacancies
And momentary pauses of the thought!
My babe so beautiful! it thrills my heart
With tender gladness, thus to look at thee,
And think that though shalt learn far other lore,
And in far other scenes! For I was reared
In the great city, pent 'mid cloisters dim,
And saw nought lovely but the sky and stars.
But *though,* my babe! shalt wander like breeze
By lakes and sandy shores, beneath the crags
Of ancient mountain, and beneath the clouds,
Which image in their bulk both lakes and shores
And mountain crags: so shalt thou see and hear
The lovely shapes and sounds intelligible
Of that eternal language, which thy God
Utters, who from eternity doth teach
Himself in all, and all things in himself.
Great Universal Teacher! He shall mould
Thy spirit, and by giving make it ask.[30]

In the work of the nature-poets Wordsworth and Coleridge it is possible to identify, in the description of the landscape, in the sense of communion with nature, and in the feeling of a symbiotic relationship with all other living beings, a clear expression of what is now termed 'biocentrism'. As one of the next generation of Romantic poets George Gordon, Lord Byron[31] laughed off this sentimental view of nature, preferring to create a sense of isolated, pessimistic superiority in the withdrawal from human contact. The Romantic imagination in Byron and Walter Scott (1771-1832) was attracted to mountains, waterfalls, the precipice and to solitude:

f) Where rose the mountains, thereto him were friends;
Where roll'd the ocean, thereon was his home;
Where a blue sky and a glowing clime, extends,
He had the passion and the power to roam;
The desert, the forest, cavern, breaker's foam,
Were unto him companionship; they spake
A mutual language, clearer than the tome
Of his land's tongue, which he would oft forsake
For Nature's pages glass'd by sunbeams on the lake.

But in Man's dwellings he became a thing
Restless and worn, and stern and wearisome,
Droop'd as a wild-born falcon with clipt wing,
To whom the boundless air alone were home:

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[30] S.T. Coleridge, extract from 'Frost at Midnight', from *Lyrical Ballads,* 1798

[31] Lord Byron was born in Scotland and became a peer as a boy. Educated at Harrow and Trinity College, Cambridge, he travelled to the Near East and returned to find that his *Childe Harold's Pilgramage* had made him famous. He lived for a time on Lake Geneva with the Shelleys and wrote *Don Juan* in exile in Italy.

Then came his fir again, which to o'ercome,
As eagerly the barr'd-up bird will beat
His breast and beak against his wiry dome
Till the blood tinge his plumage, so the heat
Of his impeded soul would through his bosom eat.

Self-exiled Harold wanders forth again,
With nought of hope left, but with less of gloom;
The very knowledge that he lived in vain,
That all was over on this side the tomb'
Had made Despair a smilingness assume,
Which, though 'twere wild-as on plunder'd wresck
When mariners would madly meet their doom
With draughts intemperate on the sinking deck-
Did yet inspire a cheer, which he forbore to check.[32]

5.3.2 The idealist tradition

Conventional green thinking tends to reject the politics of both the left and the right, preferring to direct its aim 'straight ahead'. Arne Naess (1988) suggests that the *deep ecology* movement combines a concern for nature with a desire to transform society but shuns the notion of change by confrontation preferring to focus on the possibility of consensus. As Tables 5.1 and 5.2 indicate, while they may be relativist about social values, it is possible to determine a set of green attitudes largely defined by the principles of ecology. The belief that we are subject to the same ecological laws and restraints as others species and that we are dependent on 'finite' natural resources and a need to work within the earth's carrying capacity implies radical social change. Social change requires changes in social attitudes and values. Rather than look to political ideologies, deep ecology's approach to social change focuses on transformation at the level of individual consciousness. Emphasis is placed on the need to revise values, lifestyles, and consumer habits and in cultivating a respect for and peaceful co-operation with nature. When enough people have done this, Naess believes, society will change.[33]

Mainstream green thinking now holds that a fundamental transformation to a more sustainable form of society is impossible to achieve within existing social structures and society-nature relationships. Idealists claim that society can be changed by thought. If people decide that it is a good idea to start behaving co-operatively, without aggression and benignly towards nature, they can behave this way. Our Western liberal education encourages us to believe in this model of social change, often presenting history, in the sense defined by Hegel, as a series of conflicts between ideas - as articulated by 'great' individuals. The idealist tradition draws on Eastern philosophies like Buddhism, Taoism, and Hinduism and on the thoughts of St. Francis of

[32] George Gordon, Lord Byron, extract from 'Solitude', from *Childe Harold's Pilgramage,* 1816
[33] A. Naess, 'The basics of deep ecology' in *Resurgence,* 126, (1988), pp. 4-7

Assisi (1182-1226), Benedict de Spinoza (1632-77), Ralph Waldo Emerson (1803-82), Henry David Thoreau (1817-1862), Teilhard de Chardin (1881-1955), Aldo Leopold (1887-1948), Martin Heidegger (1889-1976), and to some extent on the humanistic psychology of Abraham Maslow (1908-70).

The idea that there is value in all viewpoints has led towards mainstream green's toleration of a plurality of world views. For example the deep ecology platform derives from the basic beliefs, ideals, morals and ethics that all religions share (see Table 5.3 - The eight points of deep ecology). Among other basic points they argue that richness of life is greatest when the diversity of life forms is greatest.

In 1874, towards the end of his life John Ruskin visited Assisi where he spent a lot of time in St. Francis's cell and often referred to himself as the lay brother of the Sacristan.[34] For Lynn White, Jr. (1967) the 'Historical Roots of the Ecological Crisis' lay in the Western Christian dogma of man's transcendence of, and mastery over, nature. The solution though, he argued lay, not in the abandonment of religion but in the direction of the alternative Christian view of the human-non-human relationship provided by St. Francis:

> St. Francis proposed what he thought was an alternative Christian view of nature and man's relation to it: He tried to substitute the idea of the equality of all creatures, including man, for the idea of man's limitless rule of creation.[35]

For St. Francis every creature reflected God's presence, which suggested fellowship and kinship with animals, and with the sun, moon, and earth. He also preached anti-consumerism, and a wilderness ethic. His attempt to "depose man from his monarchy over creation" and establish a "democracy of all God's creatures" makes him, for White and other Greens within the idealist tradition, "the greatest spiritual revolutionary in Western history". Accordingly White completed his analysis by proposing St. Francis as 'a patron saint for ecologists'.

> The transformative power of love is now pushing human consciousness to reach up and achieve a new level at Omega point.[36]

Teilhard de Chardin presented the story of creation in such a way as to dispense with dualisms between mind and matter and between the spirit and material, so that the inner spiritual nature of things evolved along with their material aspects. For de Chardin the psychic dimension evolved with, and is part of, the material world of atoms and molecules and every atom has its own intrinsic 'value', regardless of its instrumental worth to humans. From this perspective, he

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[34] K, Clark, *Ruskin Today* (Penguin, Middlesex, 1964), p. 12
[35] L. White Jnr., 'The Historical Roots of the Ecological Crisis' in *Science,* 155, (1967), pp. 1203-7

argued the cosmos cannot be understood through analysis, reductionism, and rationality alone. It has to be known holistically through intuitive insight and the interpretation of symbolism. In his idealistic conception of the universe, where the earth is surrounded by a 'noosphere' or realm of thought.

De Chardin believed that humankind is entering a new era in the history of the earth. Despite the scepticism that had, by the outbreak of World War II, swept away the Enlightenment hopes on which the nineteenth and early twentieth centuries had thrived ("too ingenuous" and "too materialistic"), his call was for the unification of the divided forces of humanity. He spoke of a "new soul for a new world" that would force its way over the threshold of a higher level of consciousness towards a renewed faith in human progress and in the future.[37]

He argued that scepticism and doubt, in destroying the "love of life" and the "life-force" of humans would be fatal and he proposed a counter position based on, what he considered to be, two historically valid propositions:

- When we consider the number of human beings still to be born (for example, around 4 billion over the next 50 years), the ideas that they might generate, and the forces that might be applied in terms of human energy, it seems that humankind possesses a formidable potential for progress. In terms of the history of life on earth the human species still has millions of years in which to live and develop.
- The earth is far from having completed its evolution. We might predict all forms of collapse and see evidence of various crises that could theoretically put an end to evolutionary progress but the fact remains that "for 300 million years Life has paradoxically flourished in the Improbable".

The real difficulty, he said, is not whether humans are at the centre of progress but how long this progress can continue at current levels before it will blow up on itself or "cause the Earth on which it was born to explode". Our modern world has been created in less than 10,000 years and in the last 250 years it has changed more rapidly than in all the preceding millenia. If human progress is to carry on it will need to be buttressed by a shared sense of hope. He believed that without hope and a passionate longing to grow nothing can be achieved. Within a life full of movement and ceaseless discovery de Chardin sees no place for the poor in spirit, the pessimists, or the sad of heart.

But not all directions are good for our advance. Only one leads upwards through increasing organisation to "greater synthesis and unity". De Chardin believed that those who seek to grow

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[36] P. Teilhard de Chardin, *The Phenomenon of Man* (Fontana, London, 1965 a). p. 56
[37] P. Teilhard de Chardin, *Building the Earth* (Geoffrey Chapman, London, 1965, pp. 65-9

by excluding or diminishing others, either individually, nationally, or racially should themselves be excluded. For him the movement of life is towards unification. Hope can only be realised if it finds its expression in "greater cohesion and greater human solidarity". He saw that the "Age of Nations" had past. The time had come to put differences aside and collectively build the earth.

In his *Ethics* philosopher Benedict de Spinoza identified God with nature (*'Deus sive Natura'*) and denied the possibility of an Act of Creation. Instead he suggests that a single self-subsistent entity was the cause of all things and it was self-created. In order to avoid the incoherence of dualism (a creator distinct from creation) we humans must put aside orthodoxy and accept that God/Nature is imminent in the natural order (the creator in creation). Natural order is the unfolding of God's nature in accordance with eternal laws. The arguments for God's imminence removed the need for the Church or priesthood, or any intermediary between God and humanity; there was no need for any privileged revelation of God's intention. An individual free from superstition and illusion could establish for themselves the necessary framework for human knowledge. *Ethics* elaborates propositions, structured into five parts, defining Spinoza's attempt to portray God and nature, mind and body, as one. It was a doctrine that was to inspire the Romantic poets, particularly Coleridge, who saw in Spinoza's metaphysics "an almost mystical sense of the ideal unity of Nature".[38]

Twentieth century philosopher Martin Heidegger believed that poetry could unlock fundamental truths about existence that have been obscured by our modern cosmology.[39] He shares with Spinoza the view that every being has the right to express its own nature, while the ultimate purpose of humanity is to contemplate the natural world. Heidegger was convinced that modern existence was characterised by our domination of nature as expressed through our willful exploitation of natural resources in an endless cycle of production and consumption. If, when we look at nature, all we see is a stockpile of resources, he said, we were missing the point of being. Like Teilhard de Chardin , Heidegger saw the human species as a unique form of consciousness and awareness, through which the world is revealed. In the past we relied heavily on the surrounding environment and were intimately involved with the passing of the seasons and the movement of the sun and moon defining day and night. But our production/exploitation mindset, fueled by science and technology, have dislocated us from our roots and has served to conceal us from our sense of belonging to a greater whole, so that we no longer live an authentic existence. This dislocation not only obscures from us our role as guardians of the earth but also

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[38] S. Hampshire, *Spinoza* (Penguin, London, 1951), p. 28

[39] M. Heidegger, 'Poetically Man Dwells' in *Poetry, Language, Thought,* trans. A. Hofstadter (Harper & Row, New York, 1971), pp. 211-29

distorts our view of the world we live in. Our authentic 'cosmic roots' lay in a world where all things were interconnected in a vast 'mirroring play' between 'the fourfold' of earth, sky, divinities and mortals. In *Being and Time* (1929), Heidegger describes the 'authentic self' as potentiality for action , an orientation towards the future (becoming) involving possibilities and requiring choice. For him traditional Western philosophy, which assumed the grounding of the transcendental ego had become untenable.

Expressing the sort of thinking prevalent in the Eastern religions of Buddhism and Hinduism, and the world view of North American Indians, for whom the earth is sacred, not to be owned or exploited, Hedeigger believed that, instead of trying to impose our will on it, we should listen and attempt to understand what the world really is. His work has been influential in the theories of deconstruction (through Derrida [1990][40]) and postmodernism (through Lyotard [1988][41]).

Practices within Buddhism, Taoism, and Hinduism emphasis unity in the passive contemplation of nature in the face of the forces of the universe - going 'with the flow' rather than against it. Naess, wrote on Mahayana Buddhism in 1978:

> ...the further along the path to supreme levels of freedom a human being proceeds, the greater the identification and compassion and therefore the greater the effort to help others along the same path. This implies activity of social and political relevance. Gandhi, considering Buddhism to be a reformed Hinduism, furnishes a good example.[42]

Gandhi's philosophy of non-violent direct action, and in particular his notion of self-realisation, has had a profound influence on Naess when he attempted to formulate Ghandi's views in the form of a normative system in the 1950s.[43] Ghandi describes the purpose of life as self-realisation, "Life is an aspiration. Its mission is to strive after perfection, which is self-realisation".[44]As interpreted by Naess in his fundamental norm of "Self-realisation!", self-realisation is this-worldly rather than other-worldly and is intimately bound up with the self-realisation of others. In effect Naess refers to the realisation of as expansive a sense of self as possible in a world in which selves and things-in-the-world are conceived as processes.[45]

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[40] J. Derrida, *Heidegger et la question* (Flammarion: Champs, Paris, 1990)
[41] J. F. Lyotard, *Heidegger and 'The Jews'*, trans. By A. Michel and M. Roberts (University of Minnesota Press, Minneapolis, 1990)
[42] A, Naess, 'Through Spinoza to Mahayana Buddhism or Through Mahayana Buddhism to Spinoza', in *Spinoza's Philosophy of Man: Proceedings of the Scandinavian Spinoza Symposium 1977,* J. Wetlesen (ed.) (University of Oslo Press, Oslo, 1978), pp. 136-58
[43] W. Fox, *Towards a Transpersonal Ecology; Developing New Foundations for Environmentalism* (Green Books Ltd, Devon, 1995), p. 107
[44] Ghandi, in *Young India,* cited in W. Fox, (1995), p. 109
[45] Fox (1995) p. 114

The modern green perspective is deeply concerned with the interior life but it is also interested in the possibility of transcending an individual's "personal sense of self".[46] This draws on the on influential humanistic movement within psychology, influenced by Heidegger's ontological notion of 'Being', emphasising the notion of 'self' and the power of individuals to realise their own potential through what Abraham Maslow termed 'self-actualisation'. It also leads towards ideas of transpersonal psychology. In *Towards a Psychology of Being* (1986) Maslow writes:

> I consider Humanistic, the Third Force psychology to be transitional , a prepartaion for a still 'higher' Fourth Psychology, transpersonal, transhuman, centred in the cosmos rather than in human needs and interests, going beyond humanness, identity, self-actualisation, and the like.[47]

Along with Maslow, Carl Rogers (1902-87) and Anthony Sutich (1907-76) recognised that psychology was over-concerned with the abnormal. According to the humanist school, behavioursits had ignored the interior life of organisms and regarded them basically as machines. Although he accepted the importance of interior life, Freud's (1856-1939) ideas about socialisation and human nature, having been developed largely through the observation of sick people, are predominantly pessimistic. As in his definition of the Oedipus Complex, each stage in the process of personality development is conditioned by sexuality and gender differentiation. If there is even the slightest problem encountered in the resolution of each stage, personality problems occur leading to adult maladjustments. These would then require psychoanalysis to bring the problems to consciousness before they could be resolved:

> The science of psychology has been far more successful on the negative than on the positive side; it has revealed to us much about man's shortcomings, his illnesses, his sins, but little about his potentialities, his virtues, his achievable aspirations, or his full psychological height. It is as if psychology had voluntarily restricted itself to only half its rightful jurisdiction, and the darker, meaner half.[48]

Humanistic psychology emerged in response to a critique of the mechanistic, deterministic and limiting view presented by behaviourists and Freudian theory. To develop an alternative framework within the transpersonal realm (i.e. with states of being beyond an exclusive identification with one's ego, personality or self-image) more recent writers like Stanislav Grof and Ken Wilbur have looked to the psychologies that have been developed in both the West (theory of the subconscious and the self-conscious realms) and the East (superconscious or

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[46] A. Maslow quoted in A. J. Sutich, 'The Emergence of the Transpersonal Orientation: A Personal Account", in *The Journal of Transpersonal Psychology* 8 (1976), pp. 5-19

[47] A. H. Maslow, *Towards a Psychology of Being,* 2nd edition (Van Nostrand, Princeton, 1968), pp. iii-iv

[48] A. Maslow, *Motivation and Personality* (Harper and Brothers, New York, 1954)

transpersonal realm). Although various minority traditions in the West, like in Spinoza and Heidegger, have been concerned with attaining the highest possible spiritual fulfillment in this world and Western psychologists like William James (1842-1910) and Carl Jung (1875-1961) have been concerned with the 'higher ' realms of psychological well-being, these concerns have been more typical of, more continuous through, and more comprehensively developed in Eastern spiritual traditions. Such traditions include Sufism, Vedanta Hinduism (non-dual Hinduism), Theravada Buddhism (the earlier, south and Southeast Asian development of Buddhism), Mahayana Buddhism (the later, northern development of Buddhism), Taoism, Zen Buddhism (the Japanese development of Ch'an - a Taoist-infused Chinese variety of Mahayana Buddhism), and Vajrayana Buddhism (Tibetan Buddhism).[49] As Warwick Fox (1995) points out those who have been interested in transpersonal conditions of being have generally felt it necessary to look to the East for an appropriate language, theoretical models and practical instruction.

Throughout the history of our time on Earth we have expressed a need for something to believe in, to be awed by, to commit ourselves to, in order to give meaning to our, often chaotic, lives. For many this need has been met by religion. For others it has been *nature*.

> Nature is not fixed but fluid. Spirit alters, moulds, makes it. The immobility or bruteness of nature is the absence of spirit; to pure spirit it is fluid, it is volatile, it is obedient. Every spirit builds itself a house, and beyond its house a world, and beyond its world a heaven. Know then that the world exists for you. For *you* is the phenomenon of perfect. What we are, that only we can see...Build therefore your own world. As fast as you can conform your life to the pure idea in your mind, that will unfold its great proportions.[50]

For Emerson's organically spiritualised idealism of mid-nineteenth century America, nature provided the ethereal nourishment that would allow us to walk with the "Builder of the Universe" and would give "access to the entire mind of the Creator".[51] In his essay *Nature* (1836) he called the woods the "plantations of God"; within them, "currents of the Universal Being circulate through me. I am part of the parcel of God..." The reference to vitalism harks back to the medieval cosmology of the Great Chain of Being and pre-figures aspects of deep ecology. As Pepper (1996) points out, bioethical sentiments are expressed elsewhere in *Nature*. Emerson writes:

> Such is the constitution of all things...that the primary forms, as the sky, the mountain, the tree, the animal, give us a delight in and for themselves.[52]

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[49] W. Fox, (1995), p. 299
[50] R. W. Emerson, *Nature* (1836)
[51] *Ibid*
[52] Cited in D. Pepper (1996), p. 199

For Thoreau (1854) Emerson's student, nature was something lost in childhood, to be won back, reaffirmed through a life of discipline and asceticism. He longed for "those youthful days", he said, when, "nature developed as I developed, and grew up with me".[53] He reasons that only by leading a completely frugal existence, in which people substantially reduce their needs and desires and renounce luxury, can the increasing damage to nature be stopped. His extreme position held a plea for a simplification of life resulting in the suppression of human needs and ambitions and the rejection of material possessions. Once stripped of materialism, he argued, humanity could return to its deepest core and recover a more worthwhile happiness in the appreciation of nature, implying spiritual growth and a respect for the natural environment.

In *A Sand County Almanac,* Aldo Leopold provided the green movement with a classic statement on the reach of an environmental ethic:

> All ethics so far evolved rest upon a single premise: that the individual's a member of a community of interdependent parts. His instincts prompt him to compete for his place in that community, but his ethics prompt him also to co-operate (perhaps in order that there be a place to compete for). The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.[54]

He also gave a general rule of thumb for sound environmental action, "...a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise".[55]

5.3.3 The anarchist tradition

Green anarchists with radical aims and methods, who reject the state, class politics, parliamentary democracy and capitalism including, eco-socialists and eco-feminists. Influenced by Hegel's (1770 – 1831) view of history as a process of emerging world spirit and by Marxist perspectives, particularly those of William Morris (1834 – 96), and Peter Kropotkin's (1842 – 1921) anarcho-communism (developed today by Murray Bookchin as social ecology).

Following Immanuel Kant's (1724-1804) view that our minds structure our experience of the world, Georg Wilhelm Fredrich Hegel (1770-1831) believed that the social world was essentially composed of ideas, manifested in the notion of the *Geist* ('world spirit') and he argued that these ideas could be accessed through a process of contemplation. For him the spirit is depicted in history through changes in ideas that are brought about through a dialectic process of contradiction and resolution and which unfold with individuals. His form of idealism argued that

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[53] H. D. Thoreau (1854), 'Walden' in O. Thomas (ed.)*Walden and Civil Disobedience* (WW Norton & Company, New York, 1966), p. 25

[54] A. Leopold, *A Sand County Almanac* (Oxford University Press, Oxford, 1949), p. 204

real world contradictions are surmounted in the course of 'world-history' through a more unified 'truth' (*dialectical logic*). His critique of the alienating character of commercialism influenced Marx who claimed that he had rescued Hegel's thinking from idealism by placing the dialectic firmly in the material world.

Peter Kropotkin devoted his entire life to designing a systematic and coherent theory of anarchism. For him the problem of genuine and lasting community resolved itself in the rediscovery of nature, not only in the external, physical or biological sense but in the sense of seeking to build community, and society as a whole on the basis of interdependence. He formed the basis for a libertarian ecological restructuring of society starting from this notion of the natural interdependence between humans and society and the environment. His ecological vision of society has influenced many political thinkers from William Morris, to Murray Bookchin and Kirkpatrick Sale ('bioregionalism').

His conception is that of a system of self-regulating modules (associations, communes, villages) which have local autonomy but which can co-operate with other units on a voluntary basis.[56] The central tenets of his theory are autonomy, federalism, natural harmony, mutual aid and support, minimal centralised control and most of all political and economic decentralisation.[57] In *Social Philosophers* (1982) Nisbet argues that Kropotkin is one of the first to use the concept of the 'ecological community':

> I have chosen the word *ecological* to describe this mode of community. This word, in its Greek root *oikos*, refers directly to the household and, by clear implications, to the natural and harmonious interdependencies of the household economy.[58]

William Morris was a contemporary and acquaintance of Kropotkin but their approaches are different. Morris was more concerned with providing an 'aesthetic account' of a sustainable society than being too involved with scientific research methods. Nevertheless he spoke violently against pollution, urbanisation, the commodification of nature and human labour, alienation, and consumerism. He rejected material luxury, instead advocating a relaxed and rich quality of life, in education, in the appreciation of nature, community, and creativity:

> What brings about luxury but a sickly discontent with the simple joys of the lovely earth?...shall I tell you what luxury has done for you in Modern Europe? It has covered the merry green fields with the

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[55] *Ibid*
[56] P. Kropotkin, *Mutual Aid* (Freedom Press, London, 1902)
[57] P. Kropotkin, *Fields, Factories and Workshops Tomorrow* (Freedom Press, London, 1899)
[58] R. Nisbet, *The Social Philosophers: Community and Conflict in Western Thought* (Washington Square Press, New York, 1982), p. 150

> hovels of slaves, and blighted the flowers and trees with poisonous gases, and turned the rivers into sewers...Free men, I am sure, must live simple lives, and have simple pleasures.[59]

For Morris the sole purpose of change was to make people happy. In *News from Nowhere, or an Epoch of Rest* (1891) he focuses on an artistic portrayal of a society in which the ideals of justice, freedom, equality and beauty are held in perfect balance. His aesthetic utopianism was characterised by libertarian views emphasising the importance of individual freedoms, and intellectual and creative freedom. A great opponent of centralisation and authority he advocated decentralised communities that were to be self-contained and self-governing.

> ...suppose people live in little communities among gardens and green fields, so that you could be in the country in five minutes' walk, and had few wants, almost no furniture for instance, and no servants, and studied the (difficult) arts of enjoying life, and finding out what they really wanted: then I think that one might hope civilisation had really begun.[60]

According to Morris only a society in which social equality and justice prevails can produce true art forms and only a society in which art and beauty are accorded the highest value can have ecological success. From Morris we can take the idea that a sustainable society should not only concern itself with environmental or social matters like pollution and waste but should also be aesthetically valid and satisfy the human desire for beauty.

5.4 Modern roots of ecologism

The abiding green mistrust of the high science and technology advocated by the eighteenth century Enlightenment thinkers, is central to the green perspective on how the world is, and ought to be. Their scepticism arises from seeing the Enlightenment promise to control and manipulate nature in the name of human progress, as having resulted in mass war and violence, alienation and repression, and in threat of nuclear and environmental destruction brought about via a technology that is beyond our understanding or control. Similarly they believe that the big 'modern' political theories of liberalism and socialism, which claim to benefit society through social, political, and economic change, in deflecting criticism from the root causes of our alienation from the rest of nature (industrialism and capitalism), represent more of the same. In so doing they have done more harm than good.

Greens are concerned with re-defining our relationship with the environment; its role in human well-being; human responsibilities towards it, the environment's value, and so on. An

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[59] W. Morris (1887), 'The Society of the Future' in A. L. Morton (ed.), *The Political Writings of William Morris* (Lawrence and Wishart, London, 1979), pp. 188-203

[60] P. Henderson, ed., *The letters of William Morris to his Family and Friends* cited in J. Redmond's introduction to W. Morris, *News from Nowhere* (Routledge & Kegan Paul, London, 1983), p. xvii

agenda that has led to a radically different platform for action than those employed in Western political history. By placing the environment at the core of their analysis they link ecological relationships with social and economic conditions. In this way they argue that the environmental crisis is a manifestation of a deeper problem – that humans perceive the environment as a means to an end, when it should be understood as an inherent good, independent of human consciousness. They argue that we need to accord the environment respect as an end-in-itself. But instead we exploit it as a seemingly infinite supply of natural resources and as an apparently bottomless sink for human waste. Greens call for a sustainable use of the biological support systems that guarantee human survival and demand changes in the way we 'exploit' natural resources. There are also greens who emphasise the environment's spiritual dimension, suggesting that it harbours lessons on how we might treat others better. These claims incorporate assumptions about *anthropocentrism* and *biocentrism,* which form the basis for various green political agendas and philosophical typologies. These typically present programmes for radical social reconstruction towards an ecologically benign society[61] - a sustainable society in which the environment is recognised as a vital determinant of human well-being.

Some critics have suggested that ecologism is simply part of a much bigger public expression of millennial insecurity in which people are suffering a 'future shock' relating to a new form of modernisation: the globalisation of the world into a huge electronic, economic and cultural system. In this sense people are less concerned about singular issues of physical environmental damage and more worried about modernity itself. Denis Cosgrove (1990) describes how this reaction against modernism has engendered a kind of nostalgia for a pre-modern relationship with nature, one which reiterates medieval traditions and notions of our place in the cosmos. Although it is stretching a point to say that these constitute the roots of modern ecologism, these ancient perspectives did not completely fade into the nineteenth and twentieth centuries. Within such ideas as holism and Gaianism (which have since resurfaced in the thinking of 'deep' ecologists) we can trace the basis of the modern environmental movement.[62]

5.4.1 From silent spring to deep ecology – the 1960s and 70s

The birth of modern ecologism is generally attributed to the explosion of interest that attended the 1962 publication of Rachel Carson's *Silent Spring*.[63] Carson charged modern

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[61] A classic example is K. Sale's, *Dwellers in the Land* (Sierra Club Books, San Francisco, 1985)

[62] Pepper, (1996) p. 5

[63] *Silent Spring* has joined the Bible, and works by Plato, Aristotle, Copernicus, Newton, Darwin, Marx, and Freud as the most recent of twenty-seven entries in Robert B. Down's *Books That Changed the World.*[63]For histories of this movement, its leading figures, and the main ideas that have informed it, see

humanity for its mindless rush down the technological "quick fix" path of employing synthetic chemicals to control insects. She called these chemicals (themselves a by-product of Second World War research into chemical warfare)"elixirs of death" and she warned that they invited the prospect of a dying world, one in which springtime might no longer brings forth the buds of recovery and new life, but a chilling silence. Carson's forceful statement had a huge impact at the time and the controversy that surrounded the book galvanised public concern over environmental issues and lead President John F. Kennedy (1917-63) to proclaim that these issues represented perhaps a greater threat to humanity than nuclear war.

The premise of *Silent Spring* has so far proved to be unfulfilled. This is as much an indication that environmental reforms can work as an indictment against Carson's method. Gregg Easterbrook (1995), in championing 'eco-realism' suggests that Carson performed an important public service by "being wrong". Society heeded the warning, enacted the necessary reforms (like bans on bio-accumulative pesticides such as DDT and chlordane), and initiated such a prompt environmental gain that the day of reckoning Carson foresaw has yet to arrive. She emphasised important points about an unusual ecological area where a true emergency existed. Easterbrook suggests that 'selective doomsaying', constructively employed has become "a central tenet of contemporary environmental commentary".[64] But, as Warwick Fox (1995) has pointed out, Carson's critique has to do with philosophical maturity and a call for "a thorough rethinking of our fundamental attitudes concerning our place in the larger scheme of things".[65] Our ecological thoughtlessness was resulting in a biologically damaged world. Bigger and better technology, she suggested, would not resolve our environmental problems. She concludes in a critique of the anthropocentric (i.e., human-centred) world view:

> ...the 'control of nature' is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man.[66]

5.4.2 *Defining nature*

Raymond Williams (date) offers us three distinct areas of meaning for the word 'nature':

(i) the essential quality and character *of* something

(ii) the inherent force which directs either the world or human beings or both, or

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D. Fleming, "Roots of the New Conservation Movement", in *Perspectives in American History,* 6, (1972) pp 7-91; and Worster, (1985)

[64] G. Easterbrook, *A Moment on Earth: The Coming Age of Environmental Optimism* (Penguin, London, 1995), pp. 80-5

[65] Fox, (1995), p. 5

[66] R. Carson, *Silent Spring* (Houghton Miflin, New York, 1962)

(iii) the material world itself, taken as including or not including human beings.[67]

In English sense (i) is from the thirteenth century, sense (ii) from the fourteenth and sense (iii) from seventeenth. In all three meanings he identifies an essential continuity, but nonetheless is at pains to make the distinctions between the senses clear:

> Sense (ii) developed from sense (i), and became abstract, because what was being sought was a single universal 'essential quality or character'. This is structurally and historically cognate with the emergence of *God* from *a god* or *the gods*.

To help in our understanding of the connections and distinctions in the three areas of meaning he presents us with the common phrase, *human nature* which he says can contain, without clearly demonstrating it, any of the three main senses:

> There is the relatively neutral use in sense (i): that it is an essential quality and characteristic of human beings to do something. But in many cases the descriptive character of sense (i) is less prominent than the very different kind of statement which depends on sense (ii), the directing inherent force or of sense (iii), a fixed property of the material world in this case "natural man" .

Sense (i) is a specific singular - the *nature of* something. It is definitive and descriptive. You may agree or disagree with the description or definition. But senses (ii) and (iii), in almost all their uses, are abstract singulars. The abstract idea of *Nature* as *the essential inherent force*, was "formed by the assumption of a single prime cause" and became, like the "more explicitly abstract singular force, God", an absolute norm; a source of Truth. So when we now apply the material definition of Nature, as the whole world and all life, including humanity, we carry the assumption that there is something common to all, either in the very fact of our existence or in the generalisation of a common quality. So, for example, we say, "Nature shows us that...".

Although he suggests that "any full history of the uses of *nature* would be in a large part the history of human thought" Williams thankfully sketches for us an outline of the critical uses and changes. Firstly he points to the personification of singular *Nature*:, the goddess, 'nature herself', at one extreme a literal goddess, a universal directing power, at another an amorphous but still all powerful creative force. 'Mother Nature', he suggests, resides at this end of the religious and mythical spectrum.

There have been problems with this assumption of Nature as an absolute. It has had to compete with another singular all-powerful force, in the form of a monotheistic God. A medieval European compromise was to impose a hierarchical relationship between these two absolutes, in

[67] R. Williams, *Keywords: a vocabulary of culture and society* (Flamingo, London, 1983)

which God was in charge and Nature deputised. But there developed a tendency to see Nature in another way, as an absolute monarch, a concept used to express nature's destructive, rather than benevolent, tendencies. The emphasis here was on the immense and unpredictable power of natural forces and the, often tragic, consequences for humanity, of their occasional unleashing.

From Williams we have a range of meanings on which the current conception of nature is based; the primitive condition before human society, and the sense of original innocence from which there has been a fall, and a curse requiring redemption.

5.4.3 Christianity and nature

Rachel Carson's critique of modern industrial society was powerfully reinforced by the medieval historian, Lynn White, Jr. (1967), who controversially suggested that Western Christianity was the most anthropocentric religion in the world, and that it "bears a huge burden of guilt" for the ecological problems that have attended its "occidental, voluntarist realisation of the Christian dogma of man's transcendence, and rightful mastery over, nature".[68]

White argued that Judaeo-Christianity preaches that humans are distinct from and better than the rest of nature, which is there for us to use and dominate. These attitudes, he said, were historically translated into harmful acts against nature, carried out with the aid of a technology that was developed during the rise of Christianity in medieval Europe, well before the scientific or industrial revolutions.

Developing Christian axioms have underpinned Western thinking since the Middle Ages - time is linear, history is progressive, nature was created for human benefit, God wants us to exploit nature for our use. The main source of these ideas was the Book of Genesis, which had commanded humans to be fruitful, multiply, subdue the Earth, and rule over "the fish of the sea and the birds of the air...and over all the creatures that move along the ground" (Genesis 1:24). Adam was given charge of the Garden of Eden. And God's covenant with Noah included the agreement that, after the flood "everything that lives and moves will be food for you. Just as I gave you the green plants, I now give you everything" (Genesis 9:3).

For White the combination of these attitudes along with the increase in technological power, as applied science in the nineteenth century, paved the way for ecological degradation on a massive scale:

> ...the population explosion, the carcinoma of planless urbanism, the now geological

[68] White Jnr., (1967)

> deposits of sewage and garbage, surely no creature other than man has ever managed to foul its nest in such short order.[69]

Critics have condemned White's thesis as being oversimplified and overstated. Yi-Fu Tuan (1968)[70] points out that much pollution and ecological degradation has resulted from what people have done in Asian countries, irrespective of their Eastern cultural tradition and high ideals towards nature. Thomas (1983)[71] reminds us that the Romans exploited nature far more effectively than did their Christian medieval successors. The extent to which Christianity would have influenced 'ordinary' people before the Reformation is, in any case, questionable. Atkinson (1991)[72] suggests that it was urbanisation rather than theology that overcame the traditions of paganism.

Others have pointed to the activist tradition of respect for nature in Christianity among particular orders, like the Benedictines; to the idea of equality among all creatures preached by St. Francis of Assisi; or to the biological synthesis inherent in Teilhard de Chardin's. Sociological research also shows that White overestimated how much current religious values (in a Western society that is now outwardly atheistic) have an effect on present ecological values and actions towards the environment. Shaiko (1987)[73], for example, argues that both domination and stewardship attitudes towards nature can be found among practising Christians. Undoubtedly White's view influenced the development of environmentalism during the 1970s. For him, the solution to our ecological problems lies not in the denial of religion per se but in the abandonment of anthropocentrism:

> What we do about ecology depends on our ideas of the man-nature relationship. More science and more technology are not going to get us out of the present ecological crisis until we find a new religion, or rethink the old one...We shall continue to have a worsening ecological crisis until we reject the Christian axiom that nature has no reason for existence save to serve man...Since the roots of our trouble are so largely religious, the remedy must also be essentially religious, whether we call it that or not. We must rethink and re-feel our destiny.[74]

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[69] *Ibid*
[70] Y. F. Tuan, 'Discrepancies between environmental attitudes and behaviour', in *Canadian Geographer,* 12(3), 176-91
[71] K. Thomas, *Man and the Natural World: changing attitudes in England, 1500 to 1800* (Allen Lane, London, 1983)
[72] A. Atkinson, *Principles of Political Ecology* (Belhaven, London, 1991)
[73] R. G. Shaiko, 'Religion, politics and environmental concern: a powerful mix of passions', in *Social Science Quarterly,* 68, 244-62
[74] White Jnr., (1967)

5.4.4 *Vietnam, Apollo and Woodstock*

These ideas touched a generation that were already in search of a new direction. After the near catastrophes of the failed Bay of Pigs invasion of Cuba (1961) and the ensuing missile crisis (1962), the relief that the immediate threat of nuclear annihilation had subsided was felt around the world. Racial hatred and tensions in the United States also seemed to be on the wane as the civil rights movement gained political ground under the guidance of Martin Luther King (1929-68). But the assassinations of both men, and the subsequent televised slaying of Robert Kennedy, began to temper the optimism of the post-war generation. The involvement of the United States in the war in Vietnam from 1965, resulting in the conscription of young American boys (whose average age was 19), transformed a whole section of the population into radical activists.

Television brought daily images and sounds of the reality of war into the living rooms of people around the world. The immense technological might of a world superpower was sharply contrasted with the thatched huts of an impoverished but unyielding enemy. On one hand, science and technology were harbingers of doom, leading the world into the abyss. On the other they were the blunt instruments of Western aggression, proving 'unable to deliver the goods' when confronted with primitive cunning and determination.

At the same time the Apollo (US) and Soyuz (USSR) programmes were sending mission after mission into space. When in December 1968 Apollo 8 (the 28th U.S. mission) carried out a six-day lunar orbit it sent back pictures of earth from space which transformed our perception of the planet: the blues and greens of the biosphere presented us with an image of 'spaceship earth' that was both beautiful and fragile.

> A growing number of scientists began to question the imperative of greater production through chemical and technical intervention. The pursuit of property and commodity was replaced by the pursuit of experience.[75]

Three hundred and fifty years after Francis Bacon had assured us that classical science would enlarge "the bounds of the Human Empire", Neil Armstrong's "small step" from Apollo 11's *Eagle* landing craft, onto the surface of moon in 1969 – the climax of a massive, politically driven, scientific and technological *coup de grâce* – finally delivered the goods. Armstrong's "giant leap for Mankind" served to embody the anthropocentric spirit inherent in the Baconian creed. Some of the younger generation, raised on the exhilaration and hopefulness of space exploration and science fiction, turned their attention away from a technological future back

[75] Farmer, (1996), p. 193

towards Earth to confront life in all its organic richness, diversity, and creativity. In the United States campus riots and civil rights demonstrations led to the 'summer of love' and onto a farm in Woodstock, where half a million turned up to 'tune in and drop out' and 'go with the flow' in the physical and spiritual footsteps of the beat authors and poets like Jack Kerouac (1922-69) and Alan Ginsberg (1926-97). For many the challenge was a philosophical one. It was about how to get "back to nature".

5.5 Ecophilosophy

Ecophilosophy began to develop rapidly during the mid-to late 1970s, eventually 'coming of age' with the 1979 publication of the first professional, academic journal exclusively devoted to philosophical aspects of environmental problems, called *Environmental Ethics*. The modern philosophical response was for many in the wider environmental movement too long in coming (Fox, 1995). This was seven years after the first major conference on environmental problems, the United Nations Conference on Human Environment (UNCHE) was held in Stockholm in 1972, the year that the Club of Rome published its landmark report *Limits to Growth,* and the editors of the *Ecologist* published *A Blueprint for Survival.* It was seventeen years after the publication of *Silent Spring.*

In an era of ecological breakdown finding answers to the questions of what nature is and what our place in it is has become are hugely important for our own lives and for the future of all life on earth. How we respond may ultimately decide whether our society creatively fosters natural evolution or renders the planet uninhabitable for all complex life forms, including humans.

These though are not primarily abstract philosophical questions. Everyone "knows" what nature is. Nature is that which is all around us - the earth, trees, animals , birds, and insects - that which we seem to be systematically destroying. But such shallow definitions collapse when we consider them more deeply. If nature is indeed what is all around us, we might justifiably ask if the suburban garden is not also nature? What about the lawn? And the greenhouse that it surrounds? And the garden furniture? The response to this sort of question is varied. Some will maintain that only "wilderness" is authentically natural. Others, that nature is fundamentally *being* – the material stuff of the universe (matter) in all its diverse forms.

In Western culture wide philosophical differences have existed for centuries over the definition of *nature*. Today, as environmental problems become an increasing part of our everyday existence, these differences remain unresolved. The task is made more complex when we include the human species within the definition. What about the gardener? Is he or she any less part of nature? Are the tools that the gardener is using natural? And if humans are part of

nature what role do they have? Are they simply one species among many, or do they have a unique responsibility with respect to the rest of the natural world?

Whatever *nature* may mean we need to determine how we humans 'fit' into it. Within the complex and challenging question of how historical, contemporary, and future social forms relate to nature lies the ethical foundation of our response to environmental problems.

5.5.1 Typologies of ecologism within ecophilosophy

Within ecologism there are various typologies which concern differences in ideas about nature and the environment. Some focus on the broad historical question of characterising *attitudes to nature* in general (see, for example, O'Briant, 1974 [man apart from nature/man as part of nature]; Barbour, 1980 [domination over nature/stewardship of nature/unity with nature]; Passmore, 1980 [man as despot/co-operation with nature/nature mysticism]. Others distinguish between different *political* ideas within environmentalism (for example, O'Riordan, 1981 [communalism/individualism]; Merchant, 1992 ['egocentrism' – *laissez-faire* capitalism and a mechanistic view of nature/ 'homocentrism' – based on utilitarian philosophy and Marxism drawing on both mechanism and organicism/ 'ecocentrism' – ethic is "grounded in the cosmos" and sees nature as an organism rather than a machine]; and Pepper, 1996 [radical – those who want to go back to the roots of society and change it fundamentally in some ways/ reformist - those who accept the present economic system but believe it must be revised in the direction of less or more government intervention gradually through parliamentary democracy.

Yet others examine different *philosophical* approaches to the relationship between society and nature. In *Toward a Transpersonal Ecology* Warwick Fox (1995) describes a number of human-centred (anthropocentric) and non-human-centred (biocentric) based typologies of ecologism which have appeared in green philosophical literature over the last thirty years. These include:

5.5.2 Conservationist versus ecological

The contrasting perspectives described by Leo Marx (1970) in *Science* which distinguished between a *conservationist* viewpoint in which the world of nature "exists apart from, and for the benefit of mankind", and an *ecological* perspective in which we humans along with our built environment are inextricably "embedded in the tissue of natural processes". Marx states that "conservationist thought is pragmatic and meliorist (humans can improve the world) in tenor, whereas ecology is, in the purest meaning of the word, radical". That the ecological

view was not more widely popular was because it questioned deep-rooted presuppositions in our culture.

5.5.3 Imperial versus arcadian

Believing that ecological thinking has suffered from a long-standing "identity problem", Donald Worster in *Nature's Economy* (1977) asked whether ecology is "primarily a science of control and manipulation of the non-human world or is it a philosophy of interrelatedness?"; The arcadian tradition involves a simple rural life in harmony with nature, and sees "man as part of, rather than superior to, nature". In contrast, the imperial tradition urges the deployment of science and technology as a means of extending our power over nature as widely as possible. For Worster "our fundamental task" is to choose between these two "moral courses".[76]

5.5.4 Expedient versus sacramental

Theodore Roszak, identifies the same tension in *Where the Wastelands End* (1972) but in his popular critique of industrial society he gives emphasis to the spiritual dimension:

> Ecology stands at a critical cross-roads. Is it, too, to become another anthropocentric technique of more efficient manipulation, a matter of enlightened self-interest, and expert long-range resource budgeting? Or will it meet the nature mystics on their own terms and so recognise that we are to embrace nature as if indeed it were a beloved person in whom, as in ourselves something sacred dwells?...The question remains open: which will ecology be, the last of the old sciences or the first of the new?[77]

Roszak believes that morality in our Western culture relies on the suppression of feelings of accumulated guilt over our "natural sinfulness". We attempt to deny supposed sin through a lifetime of "good behaviour, high achievement and respectability as we try to prove, again and again, that we are pure, nice, and loveable". This guilt driven behaviour helps to bolster capitalism by promoting the work ethic, in the acquisition of material possessions, and through the belief that our spiritual growth can be postponed. Therefore, for Roszak, the absence of guilt that characterises our natural state can only come about when capitalism, which is "toxic to the planet", is defeated.

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[76] Worster, *Nature's Economy: The Roots of Ecology* (Cambridge University Press, Cambridge, 1977) pp. 378

[77] T. Roszak, *Where the Wasteland Ends: Politics and Transcendence in Postindustrial Society* (Doubleday, New York, 1972), pp. 403-4

5.5.5 Engineering/technology versus ecological/empathetic

In *Algeny* (1983), Jeremy Rifkin identifies two distinct forms of knowledge, which he describes as *technological knowledge* and *empathetic knowledge* and which respectively give us the foresight for "appropriation" in exercising "power over nature", or "co-operation" within a "community". He concludes his own analysis in a similar way to Roszak:

> Two futures beckon us. We can choose to engineer the life of the planet, creating a second nature in our own image, or we can choose to participate with the rest of the living kingdom. Two futures, two choices. An engineering approach to the age of biotechnology or an ecological approach. The battle between [them] is a battle of values...Our choice, in the final analysis, depends on what we value most in life.[78]

5.5.6 Technocentric versus ecocentric

Timothy O'Riordan, in *Environmentalism* (1976) captures the general tenor of previous typologies when he distinguishes between *technocentric* and *econcentric* approaches to environmental concerns:

> The technocratic ideology...is almost arrogant in its assumption that man is supremely able to understand and control events to suit his purposes...the exercise of science to "manage" nature has been assumed for some time... technocentrism focuses more on *means per se*, particularly the utilisation of managerial principles, since its optimism about the continued improvement of the human condition allows it to be rather less troubled about the evaluative significance of its achievements.[79]

Employing O'Riordan's typology, David Pepper (1996) suggests that technocentrism represents the currently dominant set of attitudes towards nature in modern Western society, and this disposition engenders a common belief that environmental problems must be approached and managed scientifically, objectively, and rationally.[80]

Technocentrics foresee no radical changes in the current social, political, or economic structure. The technocentric position accepts that there are environmental problems but believes that, either they can be resolved and unlimited growth can be achieved within the current form and structure of society (the 'cornucopian' view), or problems can be negotiated by careful economic and environmental management (the 'accommodators' view). Central to both is a faith in classical science, technology, conventional economic thinking, and in the ability of experts. There is very little emphasis on public participation on decision making or for debates on inherent values.

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[78] J. Rifkin, *Algeny: A New Word - A New World* (Viking Press, New York, 1983), p. 252
[79] T. O'Riordan, *Environmentalism,* 2nd edition (Pion, London, 1981), p. 1
[80] Pepper, (1996) p. 10

Ecocentrism sees humans as part of a global ecosystem that is subject to ecological laws. These principles, and the demands of an ecologically based morality, tend to constrain human action by imposing limits on population and economic growth. Within this perspective there is also a sense of respect for nature in its own right (acknowledging *intrinsic* value) as well as for pragmatic reasons (conferring *instrumental* value):

> Ecocentrism preaches the virtues of reverence, humility, responsibility, and care; it argues for low impact technology (but it is not antitechnological); it decries bigness and impersonality in all forms (but especially in the city); and demands a code of behaviour that seeks permanence and stability based on ecological principles of diversity and homeostasis. Until recently ecocentrism was more of a moral or spiritual crusade, its proponents generally preferring to shun the arena in favour of the world of rhetoric and contemplation...Ecocentrism is concerned with *ends* and the proper kind of means.[81]

Ecocentrics have little faith in modern large-scale technology and are firmly against centralisation and materialism. Pepper's political typology of ecocentrism sees those on the political right tending to emphasise the idea of limits to growth and maintaining access to nature's 'commons', while those on the left tending towards decentralised, democratic, small-scale communities.

Rather than anti-technological, the ecocentric position leans more toward the 'Luddite' critique of the ownership and control of technology by an élite. It advocates the use of 'alternative' technologies, that is 'soft', 'intermediate', and 'appropriate' technologies considering that these are both environmentally benign and democratic. Examples of this kind of technology are: organic agriculture and gardening, hydroponics, soft energy (solar, wind, etc.), insulation, low-cost housing, vernacular housing built using traditional methods, houses built from subsoil, self-build, solar dwellings, carpentry, scrap reclamation, collectivised gardens, collectivised workshops, autonomous housing estates, autonomous rural villages and urban streets and areas (Boyle and Harper, 1976). The belief is that this kind technology can be owned, understood, maintained and used by individuals and groups who hold little economic or political power.

5.5.7 Shallow versus deep ecology

Norwegian philosopher Arne Naess first made the distinction between 'shallow' and 'deep' ecology in 1973 and since then many writers have promoted *deep ecology* as the philosophical basis of truly green practices and lifestyles (see, for example, Devall and Sessions,

[81] O'Riordan, (1981), p. 1

1985; Tokar, 1987; Naess, 1989; Fox, 1995).[82] The distinction was based on the difference between a shallow concern at 'pollution and resource depletion' for the harmful effects this could have on human life, and deep concern – for its own sake – for ecological principles like complexity, diversity and symbiosis (Naess, 1973).[83]According to Naess, what distinguishes the deep ecology approach is its insistence on asking fundamental questions before it considers technicalities. Thus the term 'deep' refers to both the depth of premises motivating its supporters and the depth of social changes needed to overcome the environmental crisis. Supporters of the deep ecology movement reject the dualistic view of humans and nature as separate and different, and essentially ask for "extended and deepened care for humans as well as non-humans". They also reject the idea that if we care for other living entities then somehow there will be less left for humans – as if care were kept in a small container (Naess, 1997).

This view of nature draws on the ideas of philosophers such as Benedict de Spinoza (1632-77) and Martin Heidegger (1889-1976), who proposed that every being had the right to express its own nature, while the ultimate goal of humans is to contemplate nature. This coincided with a growing interest in Eastern philosophies Buddhism, Hinduism, and Taoism (interpreted by, for example, Watts, 1968 and Snyder, 1969, 1977).

Naess (1997) suggests that the response within deep ecology is one that unites concerns for nature with a desire to transform society. The basic function of the movement is to facilitate the formulation of policies that will reach deep enough to ensure a global change from increasing to decreasing ecological unsustainabilty. The deep ecology platform is based on eight points, which express general and abstract views that most supporters accept. It is intended to be broad and undogmatic enough to act as a rallying point for groups who may have different views on the causes of the ecological crisis.

Deep ecology's platform for changing society focuses on transformation at the level of individual consciousness where attitudes, values, and lifestyles are altered to emphasise respect for and peaceful co-operation with, nature. The view is that when enough individuals have elected to change, all of society will change. The underlying philosophy, what Naess calls *ecosophy,* is based on the *precautionary principle* that, although we can never know enough for certain, we should refrain from doing anything that *might* do long-term damage to the environment.

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[82] A. Naess, 'The shallow and deep, long-range ecology movement: a summary', in *Inquiry,* 16, (1973) pp. 95-100

[83] *Ibid*, p. 95

TABLE 5.3

THE DEEP ECOLOGY EIGHT POINTS
(From Arne Naess, 1997)

1)	Every living being has intrinsic or inherent value
2)	Richness and diversity of kinds of living beings have intrinsic or inherent value
3)	Humans have no right to reduce this richness and diversity except to satisfy vital human needs
4)	The flourishing of human life and cultures is compatible with a decrease of the human population. The flourishing of non-human life requires such a decrease
5)	Present human interference with the non-human world is excessive, and the situation is worsening
6)	Policies must be changed in view of points 1 to 5
7)	The appreciation of a high quality of life will supersede that of a high standard of living
8)	Those who accept the foregoing points have an obligation to try to contribute directly or indirectly to the implementation of the necessary changes

Source: Baker et al (1997)

5.6 The new age

In *The Turning Point* (1982) Fritjof Capra presents an evolutionary view of world history suggesting that we are now entering a period in which we are shifting to a holistic ecological paradigm. The New Age perspective, essentially a deep ecological position, sees the world as an integrated network of all sentient and non-sentient entities where, as in the cosmology of the Great Chain of Being actions in any one part of the system affect the whole. Capra is one of a group of New Age thinkers which also includes Theodore Roszak who are concerned with analysing our modern global culture with respect to urban, industrial, informational factors (i.e., high population density, high resource consumption, high information throughput culture). Not satisfied with documenting the attendant problems they attempt to present hopeful and constructive alternatives.

The idea of a global consciousness features strongly in New Ageism, and like deep ecology's view on societal change, it involves a process wherein a series of individual transformations ultimately become the majority world-view. The New Age theory of social change identifies a "leaderless but powerful network working to bring radical change", constituting what has been

described as a kind of 'conspiracy'.[84] The plot involves geographically dispersed groups working on different causes which nonetheless have common elements (ecology, feminism, community politics, consciousness raising , etc.). When commonality is recognised these groups often come together to increase their political strength through acts of protest or, what George McKay (1996) has called, "senseless acts of beauty".[85]

The 'millenialist' element in the New Age tendency, which maintains that the Age of Aquarius is about to dawn along with ecological consciousness, establishing whole new civilisations and cultures characterised by holism, harmony, balance , a new ethics and morality, and a new spiritual awareness, has led critics to describe it as 'eco-la-la' and:

> ...a spiritual hotch-potch of theories and esoteric snipets...a vast umbrella movement embracing countless groups, gurus and individuals bound together by a belief that the world is undergoing a transformation or shift in consciousness which will usher in a new mode of being.[86]

5.7 Towards social ecology

Deep ecological thinking has been influential within the environmental movement through the 1980s and 90s but there are many points of disagreement with critics, both within and out with the movement. The idea that nature has intrinsic value is for many difficult to accept but perhaps more serious is the charge that its supporters are politically naive and reactionary. The idea that individual value, attitude, and lifestyle changes can act as a catalyst to widespread social change is seen as idealistic, if not simple-minded. Some argue that this results in a failure to confront the forces in society which resist change, primarily those of the state and institutionalised capitalism. The lack of any thorough analysis of why it is that capitalism pollutes the environment means that it is impossible to develop a realistic political response as to how to achieve a sustainable society. Therefore the issues of poverty, inequality, and urban environmental degradation (the 'environment' for an increasing percentage of the population) are not addressed in any sustainable way. For others deep ecology's obsession with the notion of 'community' and 'oneness with nature' is too similar to the 'blood and soil' nature philosophy of the Nazis .

The North American group Earth First!, which has been called "deep ecology's political action wing" [87] and at "the cutting edge of environmentalism" [88] have stated that:

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[84] M. Ferguson, *The Aquarian Conspiracy: personal and social transformation in the 1980s* (Granada, London, 1981)
[85] G. MacKay, *Senseless Acts of Beauty* (Verso, London, 1996)
[86] R. Storm, *In Search of Heaven on Earth: a history of the New Age* (Bloomsbury Press, London, 1991)
[87] C. Reed, 'Wild Men of the Woods', *The Guardian,* 13 July 1988
[88] B. Tokar, 'Social Ecology, Deep Ecology and the Future of Green Thought', *The Ecologist,* 18 (4/5), (1988)

> If radical environmentalism were to invent a disease to bring human population back to sanity, it would probably be something like AIDS...the possible benefits of this to the environment are staggering...just as the plague contribute to the demise of feudalism, AIDS has the potential to end industrialism.[89]

Murray Bookchin (1990) from his perspective of 'social ecology' expresses concern about the potential anti-human stance that derives from biocentric excess within deep ecology:

> The fact is that deep ecology more than any other radical ecological perspective, blames 'Humanity' as such for the ecological; crisis – especially ordinary 'consumers' and 'breeders of children' – while largely ignoring the corporate interests that are really plundering the planet.[90]

To some we humans are a "pathogenic parasite on the whole planetary organism" and believe that they are scientifically justified in their views. They would argue that their pessimistic view that we are "an unnatural part of nature" has a basis in science, which reveals the scale of our deleterious impact on nature.[91]

Bookchin's position on the anthropocentrism versus biocentrism typology is to refuse to choose between the two, preferring instead to distinguish between a pre-human evolutionary stage ('first' nature) and a subsequent human stage characterised by the "fullness of mind", consciousness, communication skills, and the ability to transform ourselves and nature ('second' stage). He argues that to deny these human attributes and submerge them in notions like 'biocentric democracy' places human beings on equal value terms with 'snails' and is "simply frivolous". For Bookchin the idea that reality can be simplified to a single, homogenous entity, substance, or force, invites the prospect of Hegel's "night in which all cows are black". Although, in his distinction between 'first' and 'second' nature he shares with 'biospherical egalitarians', the importance of complexity, he also parts company with them when he adopts de Chardin's view that humanity represents a qualitative improvement as far as evolution is concerned. De Chardin's "ascending arrow" is transformed by Bookchin into a "evolutionary stewardship thesis" [92] in which:

> An emancipated humanity will become the voice, indeed the expression, of a natural evolution rendered self-conscious, and sympathetic to pain, suffering and incoherent aspects of an evolution left

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[89] Cited in Reed, (1988), p. 21
[90] M. Bookchin, *The Philosophy of Social Ecology* (Black Rose Books, Montreal, 1990), p. 123
[91] J. Ravetz, 'Gaia and the philosophy of science' in P. Bunyard and E. Goldsmith (eds.), *Gaia the Thesis, the Mechanisms and the Implications* (Wadebridge Ecological Centre, Cornwall, 1988), pp. 133-44
[92] R. Eckersley, *Environmentalism and Political Theory: towards an ecocentric approach* (University College London Press, London, 1992), p. 154

to its own, often wayward, unfolding. Nature, due to human rational intervention, will thence acquire the power of developing more complex life-forms, and the capacity to differentiate itself.[93]

Although Warwick Fox (1995) denies that deep ecology is anti-human, arguing that it is simply *anti-human-centredness*, the inaccessibility of some of the ecophilosophical jargon and the anti-human image, mitigates against deep ecology having wider appeal. Ecophilosophy, including deep ecology, has failed to make itself practical because it has failed to understand 'the practical relations between people, and between people and their environment. This has led, for example, to an unwillingness to see the urban environment and the developed countryside as 'natural' and thus rendering villages, towns and cities as destroyers of nature, rather than transformers. Human activity, in these terms, becomes a kind of malignancy which, because it multiplies too rapidly becomes a threat to the commonwealth of life.

Charles Darwin's and Thomas Huxley's interpretation of evolution placed human beings firmly within nature and as a part of 'ecosystems' within the biosphere. The term *human ecology* was used from 1910 to describe the study of humans and their environment together, another way of considering the science of geography. In an address to the Association of American Geographers a future paradigm for the discipline was put forward by Barrows (1923) that would "make clear the relationships existing between natural environments and the distribution and activities of man...from the standpoint of man's adjustment to the environment".[94]

Humans and environment were to be studied in a holistic way, which would take account of physical and biological systems as well as their interrelationship to produce an image of a living ecosystem – with a well-defined spatial identity and a unique character. The organising concept for this "deterministic human ecology paradigm" was to be the region, which was regarded, like the earth itself, as a kind of living organism. The extended notion of the state as a Darwinian state struggling with others for '*lebenstraum*' had ominous political implications within Nazism.

Social Darwinism developed in the nineteenth century, principally through the social philosophy of Herbert Spencer (1820-1903). During the rise of the German state during the 1920s and 30s the *Volkisch* desire for national rebirth in the form of an idealised pagan and medieval golden age, saw people as basically rooted in their home locality, region, and nation, despite history and modernism. In this political climate, social Darwinism became fused with Ernst Haeckel's ideas on ecology and the imagined ties that bound 'folk' with their land were, under the Nazis, translated into a 'blood and soil' ideology that championed a recognisable form

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[93] M. Bookchin, *Remaking Society* (Black Rose Books, Montreal and New York, 1989), p. 203
[94] H. Barrows, 'Geography as human ecology', in the *Annals of the Association of American Geographers,* 13, 1-14, cited in D. Pepper, (1996) p. 187

of 'ecocentrism'. Partly because of this legacy but also because of the increasing problem of identification of 'natural' regions, geographers abandoned the notion of regionalism. But with the rise of ecocentrism this idea has come back into fashion. *Bioregionalism*, for example, states that we should abandon the nation state as our basic economic-political unit, and suggests that *bioregions* with common characteristics of soil, flora, and fauna, etc., have a specific human carrying capacity which should not be exceeded. This is the number of people whose basic needs can be satisfied by available resources without undue disruption of the environment.

Since the early 1970s Murray Bookchin has put forward a typology that distinguishes between *environmentalism* on one hand, and *social ecology* on the other (often termed 'eco-anarchism'). Environmentalism, for Bookchin, refers to a "mechanistic , instrumental outlook that sees nature as a passive habitat composed of 'objects' such as animals, plants, minerals and the like that must merely be rendered more serviceable for human use."[95] Environmentalism, in his view, fails to bring into question the underlying problem of society's domination of nature but rather reinforces that domination by seeking ways to manage environmental decline.[96] In contrast social ecology refers to an approach that rests on the ecological principles of unity in diversity, spontaneity, and the non-hierarchical nature of ecological communities.

Social ecology reacts against the perceived shortcomings of deep ecology. Influenced by Peter Kropotkin's (1842-1921) anarcho-communism, it shares deep ecology's anarchist tendencies but it also stresses that our ecological problems stem from social problems, particularly those related to hierarchy and domination, as expressed in state dominated and patriarchal society. Its solution lies in the elimination of these forces and their replacement with a 'natural' society via small-scale, decentralised communities based on geographical (local and regional) autonomy and, as far as possible, self-sufficiency. The stated aim is to fuse non-hierarchical social relations with modern scientific society thus creating democratic, communal, ecologically benign communities, which would be adequately provided for but would not be as obsessed with consumerism as our current Western society. A social structure of cultural diversity and living within nature's limits within communes (living), co-operatives (working), local neighbourhoods (political organisation), and bioregions (for wider needs) would situate the human good within the planetary good.

Although it places great emphasis on eliminating social injustice through planned development rather than any notion of getting back to a primitive form of society, and pre-

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[95] M. Bookchin, *The Ecology of Freedom: the emergence and dissolution of hierarchy* (Cheshire Books, Palo Alto, California, 1982), p. 21
[96] Bookchin, (1980), p. 59

industrial relationship with nature, the kind of anarchist-communism that Bookchin promotes has parallels with the decentralised socialism described by William Morris (1890) and tends to pre-figure what most greens think of as a *sustainable society*. Social ecology's strategy for social change is much more to do with overcoming economic and political obstacles to this sustainable society than promoting individual transformations in values, attitudes and lifestyles. Bookchin's argument says that the prevailing attitudes, values, and lifestyles would recognise how nature shapes economic, social, and cultural activity but unlike deep ecology it would not overemphasise this. Nor would it place too much emphasis on society's power to transform nature.

6

Sustainable Society

Chapter 6

6.0 TOWARDS A SUSTAINABLE SOCIETY

An age of expansion is giving place to an age of equilibrium. The achievement of this equilibrium is the task of the next few centuries…The theme for the new period will be neither arms and the man: nor machines and the man: its theme will be the resurgence of life, the displacement of the mechanical by the organic, and the re-establishment of the person as the ultimate term of all human effort. Cultivation, humanization, co-operation, symbiosis: these are the watchwords of the new world-enveloping culture. Every department of life will record this change: it will affect the task of education and the procedures of science no less than the organization of industrial enterprises, the planning of cities, the development of regions, the interchange of world resources.[7]

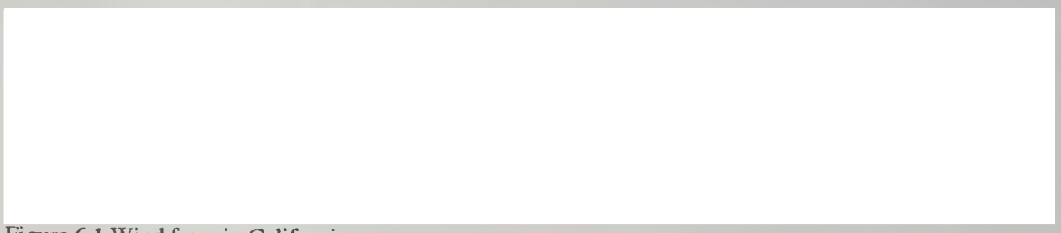


Figure 6.1 Wind farm in California

[7] L. Mumford, *The Condition of Man* (Harcourt Brace Jovanovich, New York, 1944), pp. 598-99

6.1 Shifting paradigms

In order to move towards a more sustainable form of society the social, political, economic and technological dimensions of sustainability need to be well understood. Much of the required research work has already been done or is in the process of being carried out. The complex problems cut across disciplines and subject areas. Their resolution is vital.

Needless to say within the framework of this dissertation it is not possible to exhaustively investigate all aspects of the problem. Rather, because of the recognised centrality of the limits to growth issue, the intention of this chapter is to review thinking on social, political, economic and technological aspects of sustainable development in relation to three principle positions within the ecological approach. These are:

- that the problems associated with environmental growth limits are inter-linked and interdependent and cannot be mechanistically reduced, or segmented into 'solvable pieces'. The *ecological paradigm* demands a holistic, organic, and systemic approach to resolving these problems;
- the rapid rates of population, economic and urban growth in industrialised and industrialising societies have an exponential character. This means that dangers accumulated slowly over a very long period of time can have a sudden catastrophic effect;
- solutions formed within the bounds of existing social, political, economic and technological practices will not bring about a sustainable society.

> Changes from one kind of civilisation to another do not happen often in history: the invention of agriculture, the rise and fall of conquest states...and the coming of industrialism. An earlier generation may have been justified in discounting any further such radical changes. We cannot. Most trends of the past are simply not sustainable...[2]

The dramatic changes of thinking that took place in the field of atomic and subatomic physics at the beginning of the twentieth century led Thomas Kuhn, in 1962, to define the idea of a scientific *paradigm.* He described it as "a constellation of achievements – concepts, values, techniques, etc. – shared by a scientific community and used by that community to define legitimate problems and solutions".[3] Kuhn argued that a paradigm gains its status because it is more successful than a competitor at solving some problems that have been recognised as acute, and that changes of paradigms occur in discontinuous, revolutionary breaks, which he called *paradigm shifts*. The nature of these shifts is such that it is not always possible to accurately

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[2] P. Ray, 'The Rise of Integral Culture', in *Noetic Sciences Review,* 37 (The Institute of Noetic Sciences, Sausalito, Spring 1996), cited in S. J. Goerner, *After the Clockwork Universe: The Emerging Science and Culture of Integral Society* (Floris Books, Edinburgh, 1999), p. 433

[3] T. Kuhn, *The Structure of Scientific Revolutions* (Houghton Miflin, New York,1962)

trace the rise and fall of new ideas as their beginnings may be barely perceptible and they might end unnoticed.

Kuhn (1962) also displays a sense in which paradigms not only belong to a scientific community but are constitutive of nature as well. After a revolution scientists work in a different world, he says, but led by a new paradigm they see new and different things when they look with familiar instruments in places they have looked before. In this process of transformation the scientist's perception of his environment is "re-educated" – in familiar situations he *learns* to see a "new gestalt". So that what were "ducks before the revolution are rabbits afterwards". This is how we have become aware of the unsustainable nature of the world's cities. Through a shift of paradigms, not only in science but within society at large.

6.1.1 The recession of the mechanistic paradigm

The underlying causes of the modern environmental crisis lie in the revolutions of science, religion and economics in the early modern age, which helped to lay down the foundations of the dominant Western worldview, and the systems of capitalism and state socialism. From the middle of the sixteenth century to the end of the seventeenth, early 'modernism' and the principles of 'classical' science established ways of thinking about the world and our position in it, which were vastly different from the medieval cosmologies and pre-modern notions that preceded them. Classical science holds that nature is a machine whose parts are related but discrete. Its fundamental particles, like atoms, electrons, and quarks are solid bodies in empty space. We, as observers of nature (subjects) are separate from it (the object) so we can be 'objective', impersonal, or detached, about it. The widespread acceptance of this view means that now the idea that humans are the "crown of creation, the source of all value, the measure of all things" is deeply embedded in our culture and consciousness.

Many of our current environmental problems arise out of seeing ourselves as separate from nature. This is an approach often attributed to the seventeenth century ideas of Rene Descartes (1596 – 1650), who saw science as rendering us the "masters and possessors of nature"[4], and in particular, Francis Bacon (1561 – 1626), who saw it as "enlarging the bounds of Human

[4] Descartes proposed that subject and object, mind and matter, humans and the rest of nature can be separated. 'Objective' qualities, like position, size, and shape could be universally agreed because theoretically, at least, they were the same for everyone. `Subjective' qualities, on the other hand, like colour, smell, goodness, because they are products of the human mind will always vary according to the disposition of the observer. He believed that humans were distinguished from the rest of nature by having a soul, being self-reflective, able to think rational and to contemplate the likely outcome of their actions. By contrast, the rest of nature, including animals, were seen as machine-like and so we needn't necessarily

Empire". The roots of this perspective lie in the Scientific Revolution, which dates from the time of the astronomer Nicolaus Copernicus (1473-1543) to that of physicist Isaac Newton (1642-1727), and coincides with the beginnings of industrial capitalism. The kind of science associated with this period was primarily concerned with achieving material progress and was imbued with values identified with liberalism and the French Revolution. It is often referred to as 'classical' science, in order to distinguish it from the newer scientific outlook within twentieth century physics, where Greens identify a reaction against many of the beliefs and assumptions of modernism.

6.1.2 Copernicus, Kepler, Newton, Galileo, Descartes, and Bacon

Copernicus took the medieval cosmography and swapped the positions of the earth and the sun. But the implications of this were so profound and far-reaching, and so challenged the dominant scientific paradigm and theology from which it stemmed, that it was 150 years before Newton constructed a new cosmology to accommodate them based around his laws of motion and gravity. By the eighteenth and nineteenth centuries social and economic challenges had paved the way for the Newtonian paradigm to become 'common sense'.

Johannes Kepler (1571-1630) had earlier suggested that by operating like a giant magnet the rotating sun was pushing the planets (also magnetised) around causing planetary motion. The sun was the universal driving force in a mechanism:

> My aim in this is to show that the celestial machine is to be likened not to a divine organism but rather to a clockwork.[5]

Kepler's new metaphor for nature had replaced the organism with a clock. This mechanistic view of nature is a principle part of the classical scientific (technocentric) view. It was deterministic in the sense that it presented nature as a series of linked cause-effect mechanisms. Once understood, these could be predicted and they suggested a cosmology in which the past determined the present and the future, unlike the medieval cosmology where a final cause (like God's will) guided action in the present.

Galileo Galilei (1564-1642) developed this perspective, in his reading of the 'book of nature' via mathematics. God had designed the Universe in accordance with mathematical principles so it could be understood through analysing the principles and conducting experiments and observing the results.

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be too concerned how we treated them. Some dispute the idea of seeing reality as composed of discrete, polar opposites.

[5] J. Kepler, 'Letter to Herwert von Hohenburg, 1605', cited by Pepper (1996), p. 137

Bacon defined the purpose of science as a philanthropic activity, in which scientists assumed the moral duty of improving societies material circumstances. Science was equated with human progress and the first stage in using the laws of nature for society's benefit was to understand how Kepler's and Galileo's machine of nature worked. Bacon introduced the inductive method that used experiments and drew general conclusions from them to make usable knowledge.

> The end of our foundation is the knowledge of causes and secret motions of things and the enlarging of the human empire to the effecting of all things possible.[6]

From ancient times the main goal of science had been gaining wisdom and understanding while remaining in harmony with nature. Since Bacon, the goal of science has tended to be patriarchal and has largely involved the pursuit of knowledge in order to control and exploit nature.

Dualism, as between mind and matter - championed by the acknowledged father of modern philosophy, Rene Descartes - sets the paradigm for understanding most of Western culture. Descartes doubted everything until he reached a definite conclusion in his famous dictum "Cogito ergo sum". He deduced from this that since thought was the essence of nature, mind and matter were separate and distinct entities. Descartes saw the material world as a machine without life or spirit. The natural world functioned in accordance with mechanical laws and nature could be explained in terms of the mechanistic movement of the parts. Even human beings belonged to a category of machine in which the human body was seen as a container activated by a soul that was connected to the body via the pineal gland in the brain. Thanks to Cartesian dualism the mechanical view of nature became the dominant view of classical science.

Isaac Newton used differential calculus to come up with a mathematical formulation that undertook Descartes' work and completed the mechanical world view. For Newton God had set the whole Universe in motion and it has continued to run ever since like a machine governed by immutable laws. The view is essentially deterministic and fatalistic. It says that given sufficient knowledge of nature's laws we could have predicted the present. The future is already cast, and free will is an illusion. Twentieth century physics, in contrast, has led to a very different view of the physical Universe.

6.1.3 Towards the ecological paradigm

In *The Web of Life* (1996) Fritjof Capra describes how the major problems of our times require a radical shift in our perceptions, our thinking and our values. He believes that we are

[6] F. Bacon, *The New Atlantis* (Penguin Books, Harmondsworth, 1990)

now at the beginning of such a fundamental change of our worldview in science and society, "a change of paradigms as radical as the Copernican Revolution".[7] In his analysis of cultural transformations Capra generalises Kuhn's definition of a scientific paradigm to that of a social paradigm. He defines this as, "a constellation of concepts, values, perceptions, and practices shared by a community, which forms a particular vision of reality that is the basis of the way the community organises itself".[8]

The 'mechanistic' or 'reductionist' paradigm has dominated our culture for several hundreds of years, having shaped Western society and significantly influenced the rest of the world. Capra argues that it is now receding because, as a model, it has a number of entrenched ideas and values that have recently been brought into question:

- the view of the Universe as a mechanical system composed of elementary building blocks ;
- the view of the human body as a machine;
- the view of life in society as a competitive struggle for existence;
- the belief in unlimited material progress to be achieved through economic and technological growth;
- the belief that a society in which the female is subsumed under the male follows a basic law of nature ;

All of these assumptions have been challenged by recent events and have been shown to be fatally flawed and unsustainable. A radical revision of them is now under way.

> Man's position in the world, the mode of his labour and enjoyment was no longer to depend on some external authority, but on his own free rational activity. Man had passed the long period of immaturity during which he had been victimised by overwhelming natural and social forces, and had become the autonomous subject of his own development. From now on, the struggle with nature and with social organisations was to be guided by his own progress in knowledge.[9]

This is how Herbert Marcuse in *Reason and Revolution* explains the development of the Enlightenment vision of modernity as the source of an *instrumental* identification of science with progress and of the desire to reconstruct society according to the dictates of 'reason'. It represents a view that can be traced from the realisation of the Western Christian axiom of man's transcendence of, and "rightful mastery of nature" (White, 1967), through Bacon, who saw science as 'enlarging the bounds of Human Empire' and Descartes, who saw it as rendering us 'masters and possessors of nature').[10] Within this view there resides a belief that society has to

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[7] F. Capra, *The Web of Life* (Harper Colins, London, 1996), p. 4
[8] See Fritjof Capra's, 'The Concept of Paradigm and Paradigm Shift', in *Re-Vision*, 9 (1), (1986), p. 3
[9] H. Marcuse, *Reason and Revolution* (Routledge, London, 1967), p. 3
[10] Both quotations are from Brian Easlea's *Liberation and the Aims of Science: an Essay on Obstacles to the Building of a Beautiful World* (Chatto and Windus, London, 1973), p. 253

be reorganised on a rational basis to allow people to realise their own potential in their daily lives. If only the world was governed by reason, instead of superstition and privilege, people would be able to live happy and fulfilled lives. Marcuse points out that the Enlightenment challenged the prevailing aristocratic structures of power and dominance, in the knowledge that they had to be transformed if people were going to be able to live rational and fully human lives.[11]

Capra is a teacher and researcher in theoretical physics. Both *The Turning Point* (1988) and *The Tao of Physics* (1975) have had a major impact within the Green movement. It is in the work of people like Capra and James Lovelock (1989) that Greens find the confidence to suggest that their worldview is at the cutting edge of science in general and physics in particular. In order to substantiate these claims they look to twentieth century physics and in particular the theory of relativity which, sees independent particles as inseparable from the greater undivided whole of the rest of the Universe. This serves to reinforce their *holistic* and *monistic* view of nature, which considers that the Universe is made of one basic spiritual or material entity, of which the different organisms are made. This view follows Spinoza in replacing Cartesian dualism (the mind – body split) with the idea of a single substance, in 'God' or 'nature' and the sixth-century BC Chinese philosopher Lao-Tzu who presented the notion of the Universe as having an ultimate wholeness. According to this Green perspective Bacon, Descartes and Newton have manufactured a worldview entirely at odds with that needed to address the current ecological imperative. Bacon developed methods and aims for science that involve the domination and control of nature. Descartes insisted that the organic world was simply an extension of the mechanical nature of the Universe, and Newton told us that the workings of this machine-Universe could be understood by reducing it to a collection of movable parts.

From the early 1960s there have also re-appeared forceful challenges to the terms of an Enlightenment modernity within *ecophilosophy*, *environmental philosophy* or *environmental ethics*. During the 1960s and early 1970s information about the damage being wrought on the natural environment began to inflame public concern and gave rise to a variety of popularly based responses, collectively referred to as the environmental movement.

There is now irrefutable scientific evidence that we are harming the biosphere and human life in alarming ways that may soon become reversible. In recent years advances in satellite technology have also provided us with environmental data that gives us crucial insights into

[11] See V. Seidler, *Recovering the Self* (Routledge, London, 1994). Also Th. Adorno and M. Horkheimer, *Dialectic of Enlightenment*, J. Cumming (trans.), (Allen Lane, London, 1973)

changing geological patterns, global warming and the depletion of the ozone layer. What they point to is an environmental catastrophe on an unprecedented scale. We are now confronted with a whole series of global environmental problems; relating to the rapid depletion of natural resources, energy and materials, atmospheric pollution, climate change, deforestation , and dramatic loss of biodiversity. The more we look into these problems the more we come to realise that they are interconnected and interdependent, in other words *systemic problems*. For example stabilising the world population will only become possible when poverty is reduced throughout the world. The extinction of animal and plant species on a massive scale will go on as long as the developing world is burdened by huge debts. Scarcities of resources and environmental degradation combine with rapidly expanding populations to lead to the breakdown of communities, collapsing infrastructures in cities and to ethnic and tribal violence. Ecologists now describe these problems as different facets of a single crisis deriving from an outdated worldview that is no longer adequate for dealing with our overpopulated, globally connected world (Capra, 1996). To many people it seems 'common sense' that environmental and social problems should be tackled objectively, rationally and scientifically. But to others this attitude simply belies a conception of nature as a machine, which is fundamentally separate from humans and once understood, is open to control and manipulation. Many now advocate that the dominant set of attitudes towards nature and environmental issues in Western society that underpins this view needs to change. Cosgrove (1990) has speculated that the modernist view that presents humans as separate from the rest of nature may represent a temporary interruption in a historical and cultural continuum that sees human society and nature as a unified whole. When considering the possibility of returning to a more unified conception of the society-nature relationship, an understanding of the changes in world view that occurred as a result of medieval and Renaissance cosmologies will be important.

6.2 Historical roots of the ecological paradigm

Resistance to the mechanistic way of thinking and the rejection of the assumption of human self-importance in the larger scheme of things has a long history. This kind of thinking can be traced back through the work of St. Francis of Assisi, Spinoza, Thoreau, John Muir, Santayana, Aldo Leopold and Heidegger and within medieval and Renaissance cosmologies, with their images of the world that were holistic, organic, ecological, and spiritual.

6.2.1 The medieval cosmology

The medieval (fifth to fifteenth century) view of the Universe – a geocentric cosmography with a solid, stationary, spherical, and finite earth at its centre - was a slow fusion

of the ideas of Aristotle with developing Judaeo-Christian beliefs. Stars were essentially attached to the inner surface of a rotating sphere, which from the Earth looked like a huge dome, and marked the edge of the Universe, beyond which there was nothing. In between, in the celestial zone and the edge of the Universe, the sun and the moon, and other planets orbited around the stationary earth at constant speeds. The sphere was the perfect geometrical shape and it defined the edge of the celestial region, where movements were unchanging and predictable. But on earth things moved randomly and in straight lines. Things changed – they were born, decayed and died. The terrestrial region was unpredictable and messy and, therefore, imperfect.

The view was *teleological* - the structure of the Universe conformed to a purpose and a design, which had a distant goal towards which everything was moving – what Aristotle had determined as the *final cause*. Since the cosmology was a Christian one, the final cause was the Christian God, and all physical laws could be explained as a function of God's design, as physico-theological principles. The Earth was made up of the four elements of earth, air, fire, and water, while the celestial region consisted of a different, and perfect, fifth element called the 'quintessence'.

Despite the importance of God in the scheme of things, the medieval cosmology was essentially an anthropocentric one in which human views were imposed onto nature, and human values were attributed to space. Celestial space was valued highest but within the terrestrial zone the nearer one went to the centre of the Earth the greater was the imperfection – Hell was at the centre. The Earth's surface also had some areas that were valued more than others, for example, sacred spaces like the precinct of a cathedral. The world was also defined through metaphor, as an analogy of human experience. Nature was a 'book' to be read, like the Bible, for instruction and hidden meanings, a metaphor that carried on well into the eighteenth century (Thomas, 1983).

6.2.2 *The organic metaphor*

The medieval *organic metaphor* of nature also derived from a human experience in which the Earth was perceived as a living body. So the circulation of water through the rivers and seas was comparable to the circulation of blood; the circulation of air through wind was the breath of the planet; volcanoes and geysers were seen as corresponding to the Earth's digestive system.

There were a number of Renaissance organic philosophies based on *vitalism* – the idea that all parts of the cosmos were unified in mutual interdependence, in which everything was

saturated with life, and it was impossible to distinguish between living and non-living things. Earth was a living being among humans. Even although she could also be unpredictable, wild, passionate, and dangerous, *Mother Earth* nourished and nurtured us and so should command respect and reverence.

6.2.3 The Great Chain of Being

The organic view and the medieval cosmology stemmed from the Great Chain of Being, which had originated with the Greeks and had been transmitted to medieval writers who adapted it to their own cosmology (Lovejoy, 1936).[12]

The Great Chain is a designed hierarchy in nature in which all matter, from rocks to angels, is in possession of a soul, and all earthly species of organic life have their appointed place on the chain, from the insects above the rock to the humans below the angels. All were joined together in a fixed hierarchy, and were interdependent. The metaphor and related ideas, which continued to influence essential assumptions framing scientific theories into the eighteenth century, placed people and nature in a mutual relationship in which each link in the chain was vital for the continued existence of the whole chain. The elimination of one link would dissolve the whole cosmic order and render the world muddled and disjointed.

The idea of a coherent cosmic order based on continuity and gradation was tied to the notion of *plenitude*, or abundance, which held that the world is filled by diverse living things, such that all species that could *theoretically* exist do in fact exist. Fullness stemmed from a hypothetically infinite process of reproduction. The diversity of living organisms was deemed to be so great and the numbers so abundant that some feared that a single species could multiply indefinitely and eventually cover the entire earth. This view led Malthus (1778) to posit that humans could theoretically fill not only earth but all planets in our solar system if population growth was not held in check by wars, famines, disease, and poverty, and by competition between and within species.

A concept related to humility and respect for nature within the Chain of Being is that of *animism* which attributes souls to animals, plants and inanimate objects. If one accepts that the cosmos is an organism stemming from the omnipresence of the Absolute Being which infuses everything with its spirit, then it is not a such huge leap to consider that human characteristics are present in nature. In the animism of medieval and Renaissance cosmologies this not only meant that a mountain had a 'foot' and a 'brow', and a river had a 'head' and a 'mouth', but each

[12] A. O. Lovejoy, *The Great Chain of Being: A Study of the History of an Idea* (Harper and Row, New York, 1936)

part of nature was imbued with some of the universal spirit that had flowed down to them from above.

TABLE 6.1

THE GREAT CHAIN OF BEING
(From Charles Bonnet [1720-93])

Powers
Dominations
Virtues
Choirs of Angels
Cherubim
Seraphim
Archangels
Angels
Man
Quadrupeds
Birds
Fish
Reptiles
Shellfish
Insects
Plants
Mushrooms
Stones
Metals
Earth
Water
Air
Etherial Matter

Source: Oldroyd (1980)

6.3 The modern ecological view of science

> Sit down before fact like a child, and be prepared to give up every preconceived notion, follow humbly wherever and whatever abysses Nature leads, or you shall learn nothing.[13]

The modern ecological view of science borrows from a number of writers in the first half of the twentieth century: including Alfred North Whitehead (1862-1947), Henri Bergson (1859–1941), and Lewis Mumford (1895–1990). These writers describe developments in science during the twentieth century which exhibit many characteristics of the medieval and Renaissance cosmologies, reviving images of the world which were holistic, organic, ecological, and spiritual.

Throughout the twentieth century the shift from the mechanistic to the ecological paradigm has taken a variety of forms and moved at different speeds in disparate scientific fields. It has involved scientific revolutions, reactions and complex oscillations but primarily the basic tension has been between the parts and the whole.[14] To emphasise the parts has been called *mechanistic*, *reductionist* or *atomistic*; while emphasis on the whole is described as *holistic*, *organismic*, *ecological* or *systemic*. The ecological paradigm owes a great deal to the discoveries of modern physics, in particular the detection of electromagnetics, Einstein's special and general theories of relativity, quantum physics, and chaos theory.

When, in 1821, Michael Faraday (1791-1867) produced an electric current by moving a magnet near a copper wire he, not only created an *electromagnetic field* by transforming the mechanical effort of moving the magnet into electrical energy, but changed the entire course of science and technology.[15] The fact that the field exhibited interconnectivity called into question the validity of the Newtonian atomistic conception of nature - that all entities were discrete and governed by fundamental mechanical laws determined by God.

The Newtonian world view took another heavy blow from Albert Einstein (1879-1955) whose 'four-dimensional space-time continuum' described how different observers will put the same events in a different chronological order, if they are moving at different velocities relative to the events. Einstein told us that mass was a form of energy. Even an object at rest has potential energy stored within it. Famously he formulated the relationship between the two in the equation E = mc2 (where c is the speed of light). There is no room in Einstein's theories for a Universe of separate entities since space and time must affect any particle that has mass. Euclidean geometry proved an inadequate model to explain this new interconnected view of the Universe.

The discovery of a subatomic world within quantum theory, that consisted of entities with dual nature, that "appear sometimes as particles, sometimes waves"[16], is taken by Capra (1975) as further evidence of the holistic nature of the Universe, and of the inadequacy of the reductionist approach:

> It shows that we cannot decompose the world into independently existing smallest units. As we penetrate into matter, nature does not show us any isolated 'basic building blocks', but rather appears as

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[13] T.H. Huxley, cited in S. J. Goerner, *After the Clockwork Universe: The Emerging Science and Culture of Integral Society* (Floris Books, Edinburgh, 1999), p. 435

[14] For a detailed analysis of systemic, holistic or ecological thinking see Capra (1996)

[15] F. Capra, *The Tao of Physics* (Fontana, London, 1975), p. 59

[16] Capra (1975), p. 67

> a complicated web of relations between the various parts of the whole. These relations always include the observer in an essential way.[17]

Evolutionary theory in biology challenged the Cartesian view of a deterministic world. No longer was it accepted that everything was created at the beginning of the Universe and ran in accordance with a system of laws. Evolutionary thinking opened up the possibility of development from simple forms to complex structures. But this view is counter to the entropic laws of thermodynamics within physics, whereby every phenomenon moves from a state of order to one of disorder. This paradox remained until the advent of the 'non-linear revolution' with chaos and self-organisation theory.

Self-organisation theory holds that in a condition "far from equilibrium" a system of matter tends to organise itself through positive feedback before evolving to a higher level of organisation. In the "far from equilibrium" state there is high sensitivity to tiny changes in the system. In earth's ecosystem, a typical example of a "far from equilibrium" state, where every entity is interdependent and interconnected with others, even a tiny transformation has the possibility to alter the course of global events. Fractals demonstrate the unique structure of the self-organising system:

> Fractals have an internal 'microstructure' which exhibits the phenomenon of scaled self-similar layering. Finer and finer magnification of a fractal reveals smaller and smaller versions of the same structure at all levels. Therefore fractals are infinitely complex. No matter how small a piece you take, it is an equally complex microcosm of the whole. Fractal self-similarity and scaling are particularly important because they repudiate two Newtonian assumptions.[18]

One is that reducing and segmenting problems make them simpler, and the other is that we can measure everything objectively with an absolute scale. Because it demonstrates the dynamic and diverse nature of the Universe, from the micro to the macro-scale, the 'non-linear revolution' in physics solved the coexistence problem between evolutionary theory and the laws of thermodynamics, and between Newtonian and new physics.

6.3.1 The Gaia hypothesis

The Gaia hypothesis, posited by former NASA scientist James Lovelock (1989), is a modern source of ecologism's scientific validation, relating aspects of the Greek and medieval cosmologies, the organic metaphor, and new physics. Lovelock's concept sees the earth as a self-regulating system in which conditions suitable for life are maintained by feedback processes

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[17] Capra (1975), p. 68

[18] S. J. Goerner, *Chaos and the Evolving Ecological Universe* (Gordon and Breach Science Publishers, Newark, 1994), p. 41

involving both living things and the non-living part of the planet. Gribbon (1999) denies that Lovelock is suggesting that the planet itself is alive (a commonly held supposition) and that the term *Gaia*, from the Greek Earth-goddess, is not to be taken too literally. The scientific power of the hypothesis lies in the chemical instability inherent in the earth's atmosphere. Our two nearest neighbouring planets in the solar system, Venus and Mars, which are rich in the unreactive gas carbon dioxide, both have stable atmospheres in chemical equilibrium. Earth is different. Far from a balanced chemistry it has a highly reactive atmosphere in which, under certain weather conditions, gases like methane and oxygen mix together with other compounds to form amino acids – the basic building blocks of life. As quickly as the gases are being biologically produced they are being destroyed in chemical reactions. Gribbon explains the Gaian notion by suggesting that a hypothetical alien studying the inner planets of the solar system through a telescope as they approached would immediately head for Earth, "knowing" that there was no point in searching for life on Mars or Venus, a lesson he says, which NASA has still to learn.[19] In an address delivered in 1994 Vaclav Havel describes the implications of Gaia:

> [The Gaia Hypothesis] brings together proof that the dense network f mutual interactions between the organic and inorganic portions of the Earth form a single system, a kind of mega-organism...according to this hypothesis, we are parts of a greater whole. Our destiny is not dependent merely on what we do for ourselves but also what we do for Gaia as a whole.[20]

According to the hypothesis, the self-regulating organic system is striving toward a steady-state condition that is favourable for the maintenance of life, while being capable of responding to changing needs for human sustenance. In seeking homeostasis this complex system can adjust, within certain limits, to large-scale human technological interventions. But the current pattern of urbanisation, resulting as it does in energy-intensive, highly-pollutant, forms of human settlement represents interventions which are spiralling out of control, causing levels of environmental degradation and social disruptions that threaten the earth's equilibrium. Traditional strategies of policy reform geared to technological solutions are less and less capable of correcting the imbalances that are being created as the global urban population rapidly increases.

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[19] J. Gribbon, *The Little Book of Science* (Penguin, London, 1999), pp. 24-5

6.4 Sustainability

> We do not inherit the earth from our parents, we borrow it from our children.[21]

Johnson's *Green Dictionary* (1991) describes the meaning of *sustainable* as being "able to continue indefinitely". Consequently *sustainability* "requires devising ways of life which are dependent upon the mutual interaction of humanity with the current account renewable resources of the ecosystem and the biosphere... We need to design suitable life structures which function as self-sustaining systems, consciously connected...so that human activity contributes to the dynamic balance of the whole".[22]

According to this perspective our present global predicament is the result of the relentless pursuit of economic growth through increased industrialisation based on consuming ever-increasing amounts of finite resources. The Green argument says that this has to replaced by an ecologically benign culture based on the rationalisation of consumption, moving towards maximising the utility of finite resources by means of re-use, repair, and recycling, conservation and ambient energy measures, along with the purposeful reduction in human numbers. There is a general acceptance that the managerial approach to the environment - the idea that if we simply mange the planet's resources better we can continue as before – is part of an impossible attempt to reconcile First World levels of consumption with the needs of Third World populations and is essentially unsustainable. Ruckelhaus (1990) argues that the idea of sustainable human societies is an old one:

> Sustainability was the original economy of the species. Pre-industrial people lived sustainability because they had to; if they did not, if they expanded their populations beyond the available resource base, then sooner or later they starved or had to migrate.[23]

The notion of equilibrium that underlies this recognition is central to the discipline of ecology and the idea of growth limits. Wagner (1974) notes that:

> All animals and plants, whatever their habit or form, follow one inexorable rule: their populations grow, slowly or rapidly, to some point of equilibrium, then level off in a change from steady growth to steady state. This point of equilibrium, known as the carrying capacity of the environment, may be

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[20] V. Havel, *The New Measure of Man,* Speech delivered at the Philidelphia Freedom Hall, reprinted in the *New York Times* July 8, 1994)
[21] A Kenyan proverb cited in K. Pezzoli, "Sustainable Development: A Transdisciplinary Overview of Literature" in *Environment Planning and Management,* 40(5), 549-574
[22] C. Johnson, *The Green Dictionary: key words, ideas and relationships for the future* (Macdonald Optima, London, 1991), p. 229
[23] W. Ruckelhaus, 'Towards a sustainable world' in *Managing Planet Earth: readings form Scientific American* (WH Freeman & Co., New York, 1990), p. 125-35

determined by food supply, moisture, nesting sites, competition, or various combinations of these, but it is inevitably reached.[24]

6.4.1 The global dimension of sustainability

The 1960s and 70s were marked by an increasing awareness of environmental problems leading to public debate on the acceptability of conventional growth objectives, strategies and policies. Various studies were undertaken to confirm or refute the reports central message, i.e. the impossibility of infinite growth within earth's finite biosphere.

The report followed Malthus by discussing population growth and resource consumption in global terms and the issue of who was to blame for 'overpopulation' and what should be done tended to place the burden on those who suffered most from poverty and starvation. This is the context within which Hardin (1974) proposed the 'lifeboat ethic'.[25] It rested on the notion that if ten people were adrift in a lifeboat with exactly enough supplies for ten, any compassionate attempts to save others who were drowning by dragging them on board were doomed to failure; the boat's carrying capacity would be exceeded and everyone aboard would perish. The suggestion was that not all underdeveloped countries could or should be saved from famine by the West's 'lifeboat' and only those with strong population control policies should be given aid. This position was attacked as 'ecofascist' and criticised for exhibiting a form of 'scientific racism' which used supposedly 'objective' ecological principles to advance an anti-Third-World stance.[26] Today radical environmentalism adopts almost exactly the converse position: that environmental problems are due in large part to an exploitative Western economic system which particularly victimises developing nations via the outflow of wealth relating to debt repayments and trade imbalances.

Aware of the profound challenge described by the *Limits* thesis, prominent scholars and world leaders came together for a series of important meetings starting with the 1972 Stockholm Conference on Human Environment which led to the establishment of the UN Environment Program (UNEP). In 1974, UNEP and the UN Conference on Trade and Development (UNCTAD) convened the Cocoyoc seminar in Mexico on Patterns of Resource Use, Environment and Development Strategies.

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[24] Wagner, (1974), p. 508
[25] G. Hardin, 'Living on a lifeboat', in *Bioscience,* 24, p. 10

6.4.2 Cocoyoc Seminar

The Cocoyoc meeting brought together those who had argued that priority needed to be given to satisfying the basic needs of people for food, water, and shelter rather than to growth-maximisation, and those who were concerned with the 'outer limits' of the planet's resources and its environment to sustain such growth. At the conclusion of the meeting participants issued an influential declaration:

> Thirty years have passed since the signing of the United Nations Charter launched the effort to establish a new international order. Today that order has reached a critical turning point. Its hopes of creating a better life for the whole human family have been largely frustrated. It has proved impossible to meet the "inner limits" of satisfying fundamental human needs. On the contrary, more people are hungry, sick, shelterless and illiterate today than when the United Nations was first set up. At the same time, new and unforeseen concerns have begun to darken the international prospects. Environmental degradation and the rising pressure on resources raise the question whether the "outer limits" of the planet's physical integrity may not be at risk.[27]

During the late 1960s environmentalists had understood their challenge to be primarily that of cleaning up the mess left by the previous two decades of rapid and unrestricted post-war growth MacNeil *et al*, 1991).[28] Environmental costs of development and measures to deal with them were generally seen as external to the development process. This way of thinking was at the time "pervasive and became reflected in add-on institutions promoting add-on policies often requiring add-on technologies".[29] Then it began to be accepted that in many cases it was not the lack of 'development' that brought impoverishment, but 'development' itself, as when natural resources that provide a decent subsistence livelihood for many people are transformed into industrial materials that benefit relatively few. The environment debate then focused mainly on the adverse impacts of development on the environment. But the impacts of a degraded environment on the prospects of development were largely ignored. The concept of *sustainable development* shifted the focus of the debate to this latter concern.

> We have in the past been concerned about the impacts of economic growth upon the environment. We are now forced to concern ourselves with the impacts of ecological stress - degradation of soils, water regimes, atmosphere, and forests – upon our economic prospects. We have in the more recent past been forced to face up to a sharp increase in economic interdependence among nations. Economy and

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[26] A. Chase, *The Legacy of Malthus: the social costs of the new scientific racism* (University of Illinois Press, Urbana, Illinois, 1980)
[27] Cocoyoc Declaration (1974), cited in K. Pezzoli, 'Sustainable Development: A Transdisciplinary Overview of the Literature' in *Journal of Environmental Planning and Management,* 40 (5), (1997), pp. 549-74
[28] J. MacNeil *et al, Beyond Interdependence: The Meshing of the World's Economy and the Earth's Ecology* (Oxford University Press, New York, 1991)
[29] *Ibid,* p. 21.

> ecology are becoming evermore interwoven – locally, regionally, nationally, and globally – into a seamless net of causes and effects.[30]

6.4.3 World Commission on Environment and Development (WCED)

Today the most widely cited definition of 'sustainable development' is that given by the World Commission on Environment and Development (WCED) in, *Our Common Future* (1987). It states that:

> Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.[31]

The WCED was established by the general assembly of the United Nations in 1983, to function as an independent body linked to, but outside the control of governments and the UN system. Norway's president, Gro Harlem Brundtland, chaired the Commission, which was made up of foreign ministers, finance and planning officials, policy makers in agriculture, science and technology, and other representatives drawn from a total of 21 countries. From 1984 to 1987 the Commission conducted public hearings bringing the sustainable development debate to millions of people on five continents around the world. *Our Common Future* (1987), also known as the Brundtland report, was published in many different languages. Three concepts within Brundtland's definition require more precise interpretation, namely *development*, *needs* and *future generations.*

Development is often confused with *growth.* Growth conveys the idea of physical or quantitative expansion of the economic system whereas development is a qualitative concept incorporating concepts of improvement and progress and including cultural and social, as well as economic, dimensions. Sustainable development is concerned with the earth's regenerative potential and the ability of its systems to revitalise and maintain productive capacity.

The idea of *needs* introduces the question of resource distribution. *Our Common Future* extends the opportunity to meet basic needs and satisfy aspirations for a better life to all the world's citizens. Globally, however, the environmental costs of supporting the standards of the rich while meeting the needs of the poor may prove impossible. Meeting needs is a moral issue and the redistribution of resources therefore looms as a potential area of future conflict. This redistribution may take a variety of forms including technology transfer and financial compensation to prevent environmental degradation. The needs issue highlights the question of social equity and sustainability in both developed and developing nations.

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[30] World Commission on Environment and Development (WCED), *Our Common Future* (Oxford University Press, Oxford, 1987)

Recent attempts have been made, principally through the UN's Development Programme, to forecast whether the millions of people added to the world population each year will be rich or poor, healthy or sick, educated or illiterate. An important aspect here concerns equity – among races, genders, nations, and regions – and the changing nature of opportunities for people. It is generally acknowledged that the capacity of countries to support growing populations is enhanced when those countries achieve a sufficient, equitable distribution of wealth, technological development and effective government.

The moral imperative, introduced by Ruskin, in the idea of stewardship to protect future generations was reinforced in *Our Common Future* and again a few years later in the 1990 White Paper, *This Common Inheritance.*[32] A major component of sustainable development is intergenerational equity. If the needs of *future generations* are to be satisfied it will not be enough to hand on the environment as it is now. This requires that the present generation pass on a better environment in those areas where at the moment it is heavily degraded or socially deprived, as in cities, particularly those in the developing nations.

Brundtland's message was "above all, directed towards people whose well-being is the ultimate goal of all environment and development policies".[33] But it also recognised the importance of biodiversity and the necessity to avoid irreversible damage to other species. Inevitably economic growth and development involve changes in the biosphere and in physical ecosystems making it impossible to preserve every ecosystem but sustainable development requires the conservation of plant and animal species because their loss can greatly limit the options of future generations. In order to ensure environmental conservation for present and future generations the Commission recognised that it may be necessary to restrict development of environmental assets such as important habitats, high quality landscapes, forests, non-renewable resources, and so on.

The principle of equity suggests the prioritisation of common rights over those of individuals or nation-states. In medieval Europe by the end of the fifteenth century classical feudalism was giving way to the creation of a landless peasantry through a process of land enclosure which accelerated through to the eighteenth century. During the 'mercantile' phase of entrepreneurial capitalism, stimulated by the age of discovery and the growth in political power, wealth, and status of the new ruling class, land and other resources became commodities that were valued mainly through their marketability. Then conservation of the landscape was based on private

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[31] *Ibid,* p. 47
[32] HMSO, *This Common Inheritance* (HMSO, London, 1990)
[33] WCED, (1987), p. xiv

ownership and restricted access. Today it is not only land that is viewed as commodity but, through history, landscape is packaged and sold in tourism and the heritage 'industry'.

Sustainable development seeks to maintain areas of high environmental quality for the general benefit and where possible enhance the environment in areas of deprivation, But as political reality and its ideological underpinning are messy and tight conceptual categorisation is problematic, the case for nature conservation should not rest only with development goals but should also be seen as part of humanity's moral obligation to other living beings as well as future generations.

Blowers (1993) defines the fourfold aim of sustainable development as:[34]

- The requirement to conserve the stock of natural assets, wherever possible balancing any unavoidable losses with gains so that the total is unaffected;
- The need to avoid damaging the regenerative capacity of the world's natural ecosystems;
- The need to achieve greater social equity;
- Avoiding placing additional costs or risks on future generations.

The WCED prefigured a series of international conferences concerning environmental - development relations. The most notable of these was the 1992 UN Conference on Environment and Development (UNCED), known as the Rio Earth Summit.

6.4.4 The Earth Summit (UNCED)

At the 1992 conference, the Green agenda was highlighted because governments of and environmentalists from developed countries had focused their attentions on these issues. In general people from advanced nations believe that this is where global attention should be centred. However, for those living in impacted cities in less developed countries the Green agenda is not as important as the need to resolve the acute problems related to poverty. Within these countries it is generally believed that achieving sustainable development is not possible until the urgent problems of poverty and inequality within cities are resolved.

Although the success of the Earth Summit was questionable (Goldsmith *et al*, 1992)[35], 'global order' enthusiasts drew some succour from its achievements. The conference, the largest ever held by the UN, was attended by 116 heads of state or government, 172 states, 8000 delegates, 9000 members of the press and 3000 accredited representatives of non-government

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[34] Blowers, (1993), p. 6

[35] E. Goldsmith, N. Hildyard, N. Bunyard, and P. McCully (eds.), 'Whose Common Future?', in *The Ecologist*, 23 (6), (1992), pp. 219-22

organisations (NGOs).[36] Five separate agreements were signed. Two documents represented a turning point in global environmental relations were finally adopted at the Earth Summit by consensus:

- *The Rio Declaration* – calls for the eradication of poverty world-wide. It advances the principle that those who pollute (mostly rich developed countries) should finance the clean-up, then help poor countries to improve their living standards in environmentally benign ways.
- *Agenda 21* – is an 800-page document that spells out over 120 initiatives to be put into action by the year 2000. It includes measures to cut energy use, protect ocean resources, promote sustainable agriculture and control toxic wastes.

The Preamble of *Agenda 21* contained a rallying call to the world's nations on the need to move towards a more sustainable form of society:

> Humanity stands at a defining moment in its history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns, and greater attention to them will lead to the fulfilment of basic needs, improving living standards for all better protected and better managed ecosystems and a safer, more prosperous future. No nation can achieve this on its own; but together we can – in a global partnership between nations.

6.4.5 The City Summit (Habitat II)

Sustainability was also the main theme of the 1996 Habitat II Conference (the 'City Summit'). Held in Istanbul, the City Summit, comprising of representatives from 171 countries and 16 400 people addressed two related themes: adequate shelter for all; and sustainable human settlements development in an urbanising world. Habitat II concluded with the publication of the *Habitat Agenda*, "a guide for the development of sustainable human settlements in the world's cities, towns and villages into the first two decades of the next century".[37]

6.4.6 The Rio Cluster

Together with several other UN conferences and conventions the Earth and City Summits are collectively referred to as the "Rio Cluster" (Table 6.2).

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[36] N. A. Robinson, (ed.), "Agenda 21: Earth's Action Plan" in *IUCN Environmental Policy and Law Paper No. 27* (Oceana Publications, New York, 1993)
[37] Habitat II Press Release, 3 June 1996

TABLE 6.2

THE RIO CLUSTER OF UN CONFERENCES AND CONVENTIONS

Climate Change Conference (Kyoto, 1997)
Habitat II (Istanbul, 1996)
UN Conference on Trade and Development
Fourth World Conference on Women (Beijing, 1995)
World Summit for Social Development (Copenhagen, 1995)
Migratory and straddling Fish Stocks (New York, 1995)
Conference on Population and Development (Cairo, 1994)
Sustainable Development of Small Island Developing States (Barbados, 1994)
World Conference on Natural Disaster Reduction (Yokohama, 1994)
World Conference on Human Rights (Vienna, 1993)
Earth Summit (Rio, 1992)

Source: Pezzoli (1997)
Note: Details on the above can be found on the Internet at http://www.igc.adc.org/habitat/un-proc/index.html

These conferences and conventions held during the 1990s have fuelled interest in sustainability throughout the world. Concern has led to an increasing number of publications and has amassed a body of sustainable development literature, which mostly considers sustainable development in the areas of management, policy development and planning.

6.5 Sustainable development

When he was Britain's Prime Minister, John Major conceded that "sustainable development is difficult to understand". The term *sustainable development* has been used since the Cocoyoc seminar to catalyse debate concerning the relationship between economic growth and the natural-resource base on which it depends. The widespread interest in theories, ethics, and practice concerning sustainability indicates an increasing concern about the adverse impacts that conventional models of development have had on the environment, in both the developed and undeveloped parts of the world. Today, as environmental problems have been brought more sharply into focus (particularly urban environmental problems) sustainable development is being described as a fundamental goal and the term is being used to suggest how, on both the local and global scales, the lessons of ecology can be applied to economic progress. By suggesting that environmental protection and continuing economic growth can be seen as mutually compatible, it attempts to displace the limits to growth argument. But the meaning of 'sustainable development' remains ambiguous.

To some it contains an inherent contradiction. Development uses a greater amount of natural resources to obtain economic benefits in the short term whereas "sustainability" respects the

biosphere by attempting to modify the current patterns of production and living.[38] As Ivan Illich points out "sustainable" speaks the language of limits to growth whereas "development'" speaks of the expectation of more.[39] Human development may have been defined by the charter of the United Nations as involving the promotion of "social progress and better standards of living in larger freedom" but, as O'Connor (1994) has pointed out, 'sustainability' can be used to mean almost anything we choose:

> The earliest meaning of sustain is to "support", "uphold the course of" or "keep into being". What corporate chief, treasury minister, or international civil servant would not embrace this meaning? Another meaning is "to provide with food and drink, or the necessities of life". What underpaid urban worker or landless peasant would not accept this meaning? Still another definition is "to endure without giving way or yielding". What small farmer or entrepreneur does not resist "yielding" to the expansionary impulses of big capital and the state, and thereby take pride in "enduring"?[40]

O'Connor emphasises the point that the term 'sustainability' has ideological and political content as well as ecological and economic content. There is a "struggle, world wide, to determine how 'sustainable development' or 'sustainable capitalism' will be defined in the discourse of the wealth of nations".[41]

Remarkably the modern environmental ethic that underlies sustainability is arguably best summarised by John Ruskin, who spoke of the relationship between architecture and nature in the nineteenth century. Writing on 'The Lamp of Memory' in *The Seven Lamps of Architecture* (1849) Ruskin, who towards the end of his life described himself as a lay preacher of St. Francis of Assisi, described the earth as an "entail, not a possession":

> The idea of self denial for the sake of posterity, of practising present economy for the sake of debtors yet unborn, of planting forests that our descendants may live under their shade, or of raising cities for future nations to inhabit, never, I suppose, efficiently takes place among publicly recognised motives of exertion. Yet these are not the less our duties; nor is our part fitly sustained upon the earth, unless the range of our intended and deliberate usefulness include, not only the companions but the successors of our pilgrimage. God has lent us the earth for our life; it is a great entail. It belongs as much to those who are to come after us, and whose names are already written in the book of creation, as to us; and we have no right, by anything that we do or neglect, to involve them in unnecessary penalties, or deprive them of benefits which it was in our power to bequeath. And this the more, because it is one of the appointed conditions of the labour of men that, in proportion to the time between the seed-sowing and the harvest, is the fullness of the fruit; and that generally therefore, the farther off we place our aim, and the less we desire to be ourselves the witness of what we have laboured for, the more wide and rich will be the measure of our success. Men cannot befit those that

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[38] R. Stren, 'A Comparative Approach to Cities and the Environment', in R. Stren *et al* (1992), p. 4
[39] I. Illich, "The Shadow Our Future Throws" in S. Anzouvin (ed.), *Preserving World Ecology* (H. W. Wilson & Co., New York, 1990) pp 177-185
[40] M. O'Connor (ed.), *Is Capitalism Sustainable? Political Economy and the Politics of Ecology* (Guilford, New York, 1994) p. 152
[41] O'Connor, (1994), p. 153

> are with them as they can benefit those who come after them; and from all the pulpits from which the human voice is ever sent forth, there is none from which it reaches so far as from the grave. [42]

Within the current context of an increasing globalisation of culture and production; social relations, cultural institutions, inter-societal connections, multinational organisations, etc. are becoming increasingly important. Enhanced by the new technologies of communication and information, the integration of economic activities of private capital on a global scale, allows transnational corporations to organise their activities internationally, spatially structuring production to take advantage of different wage rates and levels of unionisation. Employees are forced to compete with each other while the companies are able to 'harmonise', 'integrate,' and make their production 'flexible' while developing coherent global strategies. But globalisation also involves another trend. The tendency for world-wide diffusion of cultural patterns (in art, architecture, literature, music, etc.) can increase cultural pluralism, as in the diffusion of musical forms like jazz or 'world music'.

Such trends can be understood as part of an ongoing process of *modernisation.*

6.5.1 Modernisation and dependency

Modernisation involves the overall societal process, including industrialisation and urbanisation by which societies become developed. Usually a contrast is drawn between pre-modernised and modernised societies. Influenced by Talcott Parsons' (1902-79) theory of *functionalism,* a particular model of development was suggested by functional sociologists in the United States during the 1950s and 60s to examine the prospects of Third World societies. The main tenets of the theory are:

- modern society is contrasted with traditional society which hinders economic development;
- change occurs through evolutionary stages which are the same for all societies;
- Third World countries need agents to help them break out of this tradition;
- agents might come from within the society, for example in the form of modernising élites, or from outside, for example with the introduction of capital or educational models;
- dual economies and societies may exist. Some regions might persist in traditional forms, while others, especially in urban areas, experience modernisation;
- the preferred and likely outcome are societies like those in Western Europe and the United States.

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[42] J. Ruskin, *The Seven Lamps of Architecture* (1849), the 1880 edition (George Allen, London, 1904), pp. 337-338

Criticism of the functional sociologists chiefly derived from proponents of the *dependency theory* in the 1960s who attempted to explain the continuing poverty, deprived social conditions and political instability of many poor countries in terms of their dominance by rich and powerful countries. It opposed the orthodoxy that Third World countries could achieve modernisation by following the example of the already industrialised world and suggested that, in fact, Europe and the United States had created these countries' problems through colonialism and trade domination. Their economies had been shaped by the advanced nations' need for agricultural and mineral resources and for new markets to sell their manufactured goods. The Third World has contributed to the economic growth of Europe and the United States, a process that has created structures there, which make industrialisation virtually impossible. According to dependency theory these countries cannot repeat the experiences of their advanced counterparts because their starting point is different. Functional sociologists argued that there was a political and ideological agenda at the core of modernisation theory since many of its proponents were in governmental advisory roles and committed to socialism or communism in the developing countries.

Although dependency theory was influential in the 1970s and was often termed neo-Marxist, it came under increasing criticism from Marxist theorists who argue that its analysis is too general and is no longer adequate to embrace the diversity of experiences in Africa, Asia, and Latin America. During the 1980s many undeveloped countries experienced the kind of significant industrialisation, urbanisation and rapid economic growth which dependency analyses would seem to preclude. In classical sociological theory modernisation was conceptualised by Marx as a process of 'commodification', by Weber as a process of 'rationalisation', and by Durkheim as a process of 'social differentiation'.

6.5.2 The ladder of sustainable development

Given that economic and social systems and ecological conditions differ widely among countries, there is no single blueprint for sustainable development, Thus despite seeing it as a global objective *Our Common Future* (1987) pointed out that each nation must establish policy implications for itself. Policy makers were left the task of translating highly generalised political statements into practice.

The diversity of options associated with the different meanings attributed to sustainable development has been presented by Baker *et al* (1997) in terms of a Ladder (see Table 6.3). In the ladder each column focuses on a different aspect of sustainable development. Reading across the ladder identifies the political scenarios and policy implications associated with each rung.

This enshrines a number of alternative frameworks for putting sustainable development into practice: the treadmill approach; weak sustainable development; strong sustainable development; and the 'Ideal Model'.

TABLE 6.3

THE LADDER OF SUSTAINABLE DEVELOPMENT IN ADVANCED INDUSTRIAL SOCIETIES

Approach to sustainable development	Role of economy & nature of growth	Geographical focus	Nature	Technology	Civil society
'Ideal Model'	Right livelihood; meeting needs not wants; changes in patterns and levels of production and consumption	Bioregionalsim; extensive local self-sufficiency	Promoting and protecting biodiversity	Labour-intensive appropriate technology	Bottom-up community structures & new approach to valuing work
Strong	Environmentally Regulated market; changes in patterns and levels of production and consumption	Heightened local economic self-sufficiency, promoted in the context of global markets	Environmental management & protection	Clean technology; product life-cycle management; mixed labour and capital intensive technology	Open-ended dialogue and envisioning
Weak	Market-reliant environmental policy; changes in patterns of consumption	Initial moves to local economic self-sufficiency; minor initiatives to alleviate the power of global markets	Replacing finite resources with capital; exploitation of renewable resources	End-of-pipe technical solutions; mixed labour & capital intensive technology	Top-down initiatives; limited state-environmental movements dialogue
Treadmill	Exponential Growth	Global markets & global economy	Resource exploitation	Capital-intensive production technologies; progressive automation	Very limited dialogue between the state & environmental movements

Source: Baker et al (1997)

Sustainable development is, and will remain, a contestable concept, and like many political and social concepts embedded in liberal democratic societies, it will continue to give rise to a variety of different interpretations as to how we might achieve sustainable societies and how these might operate. The flexibility of the term has allowed policy makers the means to reject the notions that environmental conservation constrains development and that development necessarily means environmental pollution. And yet to others the term is a political fudge. Whatever the individual perspective, sustainability in practice involves the imposition of

constraints on economic activity and establishing alternatives to an urban development pattern which currently consumes most of the world's energy and causes most of its pollution.

6.5.3 Ecodevelopment

The ecological damage done by uncontrolled development in Western industrial nations - exemplified by the greenhouse effect - presents incontestable evidence against existing development patterns. Alternative development paradigms have therefore begun to emerge which challenge orthodox theory and practice. Among the most promising and influential of these is 'ecodevelopment', named by Maurice F. Strong, the first Executive Director of the UN Development Programme and coordinator of the 1992 Earth Summit in Rio.[43] The new paradigm draws together related concepts of *sustainable development* and is firmly rooted in a coherent system of values based on ecological principles [5.1].

In the balanced human and natural ecosystem, cultural diversity is as vital to evolution as biological diversity. Ecodevelopment policy therefore explicitly rejects the idea that development should always be modelled on Western industrial patterns, or that urbanisation is a 'natural' or desirable consequence of development. Instead it is based on the idea that:

> Development at regional and local levels should be consistent with the potential of the area involved, with attention given to the adequate and rational use of natural resources, and to appreciation of technological styles (innovation and assimilation) and organizational forms that respect the natural ecosystems and local socio-cultural patterns.[44]

Ecodevelopment seeks to manage the impact of human activity on the natural environment by the application of ecological development criteria to development projects. Following Kirkpatrick Sale's (1985) ideas on bioregionalism[45] each ecologically determined region is examined and defined in relation to the natural and human resources available. A programme of development is then devised that is specifically suited to the needs and character of that region. The programme is worked out and implemented with the fullest possible participation of the local inhabitants. Against the conventional top-down pattern of decision making common to centralised development planning, ecodevelopment promotes a bottom-up approach, making the most use of local know-how and emphasising:

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[43] United Nations Environment Programme (UNEP), *Ecodevelopment* (UNEP/GC/80, 1996)
[44] UNEP, (1996), p. 1
[45] Sale, (1985)

> The capacity of people themselves to invent and generate new resources and new techniques, to increase their capacity to absorb them, and to put them to socially beneficial use, to take a measure of command over the economy, and to generate their own way of life.[46]

Ecodevelopment therefore begins with the existing local resources and seeks to build on these and maximise them for the direct benefit of the local population. It stresses interdependence over dependence and quality of life over GNP.

6.5.4 Curitiba

Curitiba, in Brazil, is an emerging example of the ecodevelopment approach, whereby principles of sustainability and citizen participation are guiding development policies within a rapidly expanding city of 1.5 million people in the developing world. Thanks to the Mayor, Jamie Lerner, a series of policies have been introduced aimed at increasing environmental and social awareness among the city's shanty dwellers, covering areas as diverse as education, commerce, transport and planning. In return for keeping the informal settlements free of rubbish, for example, incentives such as health care, education, and the provision of food were offered to citizens. Consequently improved areas have been created that have been landscaped and re-used and many more residents feel that they have a stake in their own city and a responsibility for its future.

Lerner's strategy has not been limited to cleaning up the shantytowns but extends initiatives to the city as a whole. The wider urban strategy is based around a framework of existing public transportation nodes, lined by mixed-use buildings which are inter-linked by a series of landscaped public spaces and pedestrian and cycle routes converging on a compact city centre. Other initiatives include the reclamation of the city's defunct quarries and the creation within their confines of a series cultural projects; the 'university of the environment' promoting urban sustainability to teachers and students; a 25,000 person natural auditorium for concerts and festivals; and an opera house suspended over a lake.[47]

A city that once suffered from the typical problems of rapid population and industrial expansion, with poor urban infrastructure and a deteriorating environment, has emerged as a leading example of how sustainable policy initiatives can, with the participation of citizens, can result in positive social and environmental change.

Curitiba is reaping the benefits of integrated transportation and land use policies. By channelling urban growth along public transit routes, the city has managed to reduce privately owned car use, despite having the second highest per capita car ownership rate in Brazil (one car

[46] UNEP, (1996), p. 2

for every three people). On a typical day more than 70 percent of all its commuters (1.3 million people) travel by bus. As a result, Curitiba's gasoline use per capita is 25 percent lower than that of eight comparable Brazilian cities, and the city has one of Brazil's lowest rates of ambient air pollution.[48]

6.6 Social change and sustainability

> Society is the field of an intense intellectual and moral life with a wide range of influence. From the actions and reactions between its individuals arises an entirely new mental life of which we could not have the faintest idea had we lived in isolation. This we observe best at those signal epochs of crisis when some great collective movement seizes us, lifts us above ourselves, and transfigures us.[49]

There are two main senses to the meaning of the term *society.*[50] The first, and most widely used refers to the totality of human relationships. The other defines any self-perpetuating human group occupying a relatively bounded territory, and possessing its own, more or less distinctive, culture and institutions.

A few difficulties and disputes arise in the use of the concept, particularly in the latter sense. Although today's nation-states are well established and have identifiable economic and political institutions and clearly delineated borders this has not always been the case. Many ancient empires consisted of relatively loose assemblies of different individuals, peasant communities, and so on, often with no particular conception of shared nationhood. The range of membership of human societies can also be highly variable extending from membership of a local tribal group; of an ethnic and religious community; of a separatist commune within a state; or of a particular social movement seeking to bring about or resist social change.

Determining the point at which historically a society has changed sufficiently to be treated as distinct also presents difficulties. Generally the extent of interaction between members, and in a historical sense, the continuity of culture and institutions, indicates whether the concept of a single society applies. But even in apparently clearly defined societies, like in nation-states, there are connections with other societies. Such connections open up possibilities for wider social transformation.

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[47] R. Rogers (1997), pp. 59-63

[48] J. Rabinovitch, 'Curitiba: Towards Sustainable Urban Development' in *Environment and Urbanization* 4 (2), (1992), p. 66

[49] E. Durkheim, *The Elementary Forms of Religious Life,* translated by J. W. Swain (Collier Books, New York, 1961), p. 59

[50] D. Jary and J. Jary (eds.), *Unwin Hyman Dictionary of Sociology* (HarperCollins, Glasgow, 1991)

Change is central to an understanding of societies because neither they nor their constituent parts are ever static. Within social theory *social change* describes the difference between the current and former condition of any particular aspect of social organisation. The objective is to show why change happens in one way and not another.

The 'Ideal Model' on the Ladder of sustainable development is philosophically ecocentric and requires radical social change. The challenge involves a very old political issue of how to change a system of social organisation which, even if we accept is wrong, seems deeply entrenched and inevitable.

6.6.1 Sociology and change

Sociology as a discipline arose out of a need to understand the nature of the dramatic social, economic and political upheavals associated with the industrial revolution during the eighteenth and nineteenth centuries in European societies. The work of the three most important classical social theorists, Karl Marx (1818-83), Emile Durkheim (1858-1917) and Max Weber (1864-1920), can only be understood in the context of their attempts to comprehend the nature and origins of industrial capitalist societies through the processes of social change.

Marx believed that it was not only necessary to study society but also to change it. He saw the human condition under capitalism as being characterised by alienation, a condition in which humans were estranged from their world, their work, from others and from themselves. For him social science was the means to social liberation. His theoretical project had a number of objectives:

- to understand and explain the human condition in capitalist society;
- to unravel the dynamic of that society and reveal its inner workings and its impact on human relations;
- to understand the mechanisms at work in the overall process of historical change in which capitalism was a particular phase.

Durkheim offered a third sense to 'society' in promoting sociology as the 'science of society' and treating society as a distinct entity, with its own reality. Working within the tradition of positivism established by Saint-Simon and Comte he viewed society as an object of study that was distinct from and greater than the sum of the individual parts. Its reality was a 'moral power' external to and constraining individuals. He described a category of facts with distinctive characteristics "consisting of ways of acting, thinking, and feeling" that were outside

the individual but were "endowed with a power of coercion by means of which they control him".[51]

Sociologists are generally divided between those who stress this view and those who emphasise the view that individuals participate fully in the construction of their social lives. In this latter view Durkheim's conception of a social reality *sui generis* is criticised for suggesting that subjective ideas of individual actors could be disregarded.

The theoretical counterpoint to Durkheim's view is held with *methodological individualism* which argues that adequate sociological descriptions necessarily involve references to individuals, their interpretations of their circumstances, and the reasons and motives for their actions. Max Weber was opposed to the use of collective concepts (like the state and society) unless these were related to subjectively meaningful human action of individuals. Weber and proposed ways that social categories, like 'capitalism' or 'the state' could be explained by reference to real or abstract individuals or people. In its extreme form methodological individualism proposes that all sociological explanations must begin and end with reference to individuals. The standard objection to this is that individuals owe many of their defining features to their cultural and social context.

Marx, Durkheim and Webber were not specifically involved with the changing relationship between individuals, society and the environment. They were more interested in studying the changing relationships between individuals and social groups. Their main concern was the erosion of traditional human interactions and the rise of functional, formal social intercourse. Society was generally viewed in isolation from its 'natural' context.

6.6.2 *Evolutionary theory*

Ideas of progress and advancement were popular in a Victorian era in which Britain held economic and political supremacy on an international stage. Evolutionary theory involves the explanation of the origin, development and diversity of biological species proposed by Charles Darwin (1809-82) and Alfred Russell Wallace (1823-1913). In sociological terms this implies the explanation of social change in terms of Darwinian principles.

Darwin's theory, which seemed to establish these trends as features of biological development, held great social and intellectual appeal, in that they seemed to suggest that Britain's imperial strength and the dominance of Western culture, were proof of the 'natural' law that the best would always win.

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[51] E. Durkheim, *The Rules of Sociological Method* (Free Press, New York, 1950)

In this evolutionary theory as applied to sociology, the new industrialised countries of the nineteenth century represented the advanced stage of a long process of development, which had started with much simpler forms of society (pre-industrial, peasant, hunter-gatherer societies) now left behind. The theory combines two propositions:

- that evolutionary advancement involved the development of complex forms of social organisation from simple ones, via the differentiation of social structure and the specialisation of function.
- these structural changes involved a parallel process of continuing moral, intellectual, and aesthetic development.

Darwin's theory of organic evolution by random variation and natural selection, as applied to social development, was particularly useful in an age of imperialism because it allowed the distinction to be made between civilisation and barbarism. These ideas had an immense impact in the nineteenth century, appealing as much to those interested in maintaining the status quo, as to those, like Marx who were interested in changing it. But it was problematic. Darwin had developed his account of evolutionary change among non-human species. Culture (consciousness, reflexivity and creativity) could therefore be ignored as a significant variable. But these were the very characteristics that made human society possible.

Another evolutionary paradigm, however, took culture into account. Jean Baptiste Lamarck's (1744-1829) theory argued for the inheritance of acquired characteristics in the evolutionary process. The capacity of individuals and societies to learn from each other - to acquire culture or mimic cultural developments (like language and writing) - was believed to distinguish human social life. This now discredited theory that traits acquired by an organism during its lifetime are inheritable was preferred to Darwin's by the Soviet state under Joseph Stalin (1879-1953). In a project that was concerned with defining the new socialist state consisting of a new breed of socialist individuals the idea that human characteristics were inherited (and could therefore be perfected) was bound to find favour.

By the early decades of the twentieth century three fundamental problems with theories of social evolution had been identified:

- the assumption that there was one path of human development through which all societies would pass;
- an inability to adequately describe the intermediate stages of development between simple and complex societies;
- the idea that social development involved a particular form of moral enlightenment (i.e. conceived in European terms).

As problems of development and underdevelopment in Third World countries have forced themselves onto global political agendas there has been a revival of interest in economic and social development and a reopening of critical debate in evolutionary sociology.

6.6.3 Various social, political, and institutional positions

Various responses are available in terms of the sort of social and political practices that a sustainable society would need to follow. Those offered by Timothy O'Riordan in *Environmentalism* (1981) are perhaps the most widely acknowledged and accepted. O'Riordan suggests that in political-institutional terms there are four main positions; the *'New Global Order'*, *'centralised authoritarianism'*, the *'authoritarian commune'*, and the *'anarchist solution':*

1. *The new global order*

The problems of global co-ordination presented by the world wide nature of the ecological crisis suggests the possibility of a 'new global order'. Supporters of this position typically claim, like de Chardin, that the nation-state, which regards itself as absolute sovereign, is too small to play a real role at a global level and deal with global problems. Some argue that economic pressures being brought to bear by the expanding global economy means that the 'age of nations' is coming to an end:

> Traditional nation states have become unnatural, even impossible, business units in the global economy...Nation states are political organisms, and in their economic blood streams cholesterol steadily builds up. Over time, arteries harden and the organism's vitality decays.[52]

The UN seems to be the kind of organisation on which a new world government would be based although the current lack of efficacy of the UN is considered a problem. People like Barbara Ward, author of *Progress for a Small Planet* (1979), René Dubos, co-author with Ward of *Only One Earth* (1972) and more recently Gro Harlem Brundtland, in *Our Common Future* (1987) are supporters of this view. Alvin Toffler is another. In *The Third Wave* (1980) he writes: "we are moving towards a world system composed of units densely interrelated like the neurons in a brain rather than organised like the departments of a bureaucracy".[53]

The most spectacular example to date of U.N.-sponsored attempts to deal with global environmental problems was the "Earth Summit" in 1992.

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[52] K. Ohmae, *The End of the Nation State* (Simon & Schuster, New York, 1995), p. 142
[53] A, Toffler, *The Third Wave* (Bantam Books, New York, 1980), p. 327

2. *Centralised authoritarianism*

The second position is described by O'Riordan as 'centralised authoritarianism'. This position also recognises the existence of the environmental crisis but its supporters consider that, because no one is likely to succumb voluntarily to the measures needed to address the problems, they will need to be compelled to do so. Since the locus of authority is generally seen as the governments of nation-states, it would require no major political-institutional changes. Governments would decide which actions are required to achieve sustainability (i.e., protectionism, rationing, population control, urban development legislation, restriction on immigration, and so on) and make policy regardless of opposition.

O'Riordan cites William Ophuls as an exemplar of this position. In *The Sustainable Society* (1977), Ophuls suggests that "whatever its specific form, the politics of sustainable society seem likely to move us along the spectrum from libertarianism toward authoritarianism".[54] There is historical precedence within sociology for this view of social transformation and reform being achieved through coercion. Both Saint-Simon and Comte saw history in terms of progress, direction and stages of development. Each used evolutionary theories of human societies to describe intellectual and social change, that they saw would occur in accordance with particular laws.

3. *The 'authoritarianism commune'*

The 'authoritarian commune' is primarily differentiated from the previous position by the scale on which the sustainable society would operate. Institutional structures would be disassembled and decision making devolved but social structures would, of necessity remain hierarchical. O'Riordan gives the Chinese commune as the model for this position.

4. *The 'anarchist solution'*

The final possibility described by O'Riordan in his typology is the 'anarchist solution'. Here he refers to the "classical ecocentric proposal" of the "self-reliant community modelled on anarchist lines".[55] This shares the commune perspective with the previous position and so envisages a major shift in the locus of authority and decision-making but it moves away from authoritarianism, instead adopting a left-liberal stance on relations with in the community. In political terms this position is fundamentally egalitarian and participatory. Precedence here can

[54] W. Ophuls, 'The Politics of a Sustainable Society' in D. Pirages (ed.), *The Sustainable Society* (Praeger, New York, 1977), p. 161
[55] O'Riordan, (1981), p. 307

be found in Peter Kropotkin's (1842 – 1921) anarcho-communism and the nineteenth and early twentieth century community experiments of the utopian socialists, Henri de Saint-Simon (1760 – 1825), Charles Fourier (1772 – 1837), and Robert Owen (1771- 1858). Murray Bookchin's theoretical small-scale, decentralised communities based on geographical autonomy and self-sufficiency fall within this solution.[56]

6.7 From ecophilosophy to political ecology

The politics of ecology do not follow the same ground rules as the radical forms of its philosophy (Dobson, 1995).[57] If in ecophilosophy the reasons for caring for the non-human world are as important as the care itself this cannot be said of political ecology where, reasons of clarity and expediency emphasis falls on ends rather than the appropriateness of the means of achieving them.

In *Green Politics* (1985), Spretnak and Capra extend the idea that "we are part of nature, not above it, and that all our massive structures of commerce – and life itself – ultimately depend on wise, respectful interaction with the biosphere". They suggest that any government that ignores this principle is "leading humankind into suicide".[58] But while the Green political agenda might privately reject human-instrumentality and the assumption that humans have the ability to confront and solve the ecological crisis through the application of human reason and by rearranging the natural world and human interactions, the strong public anthropocentric message comes through clearly in Green Party manifestos.

Jonathon Porrit reminds us that we all depend on the Earth's natural systems and that the fact of increasing loss of biodiversity is not an abstract problem, "our own survival depends on our understanding of the intricate webs of life in which we are involved".[59] Porrit goes on to suggest that the changes required by ecological imperative will derive from "a reinterpretation of enlightened self-interest...the key to any radical transformation".[60] The German Green Party's manifesto of 1993 had the same strong anthropocentric message stating that:

> Encroachment on natural habitats and the extermination of animals and plant species is destroying the balance of nature *and along with it the basis of our own life.* It is necessary to maintain or restore a biologically intact environment, *in order to ensure the humane survival of future generations.*[61]

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[56] Bookchin, (1980)
[57] Dobson, (1995), p. 67
[58] C. Spretnak and F. Capra, *Green Politics* (Paladin, London, 1985), p. 28
[59] Porrit, (1984), p. 99
[60] *Ibid,* p. 117
[61] *German Green Party Manifesto* (Heretic Books, London, 1983), p. 29, cited in A. Dobson, (1995), p. 67

The founder of the German Greens resigned in 1985 over the issue of experimentation on animals, to which he is uncompromisingly opposed for deep ecological reasons. He complained that the Party:

> Has no basic ecological position; it is not a party for the protection of life and I know that it never will be, for it is rapidly distancing itself from that position. Yesterday, on the question of animal experiments, it clearly came down in favour of the position taken by the speaker who said, more or less: 'If even one human life can be saved, the torture of animals is permissible'. This sentence expresses the basic principle by which human beings are exterminating plants, animals and finally themselves.[62]

Dobson (1995) suggests that the German Green Party's acceptance of the principle of animal experimentation and Bahro's departure are concrete examples of ecophilosophy's failure to make itself practical. Since the tendency towards philosophical abstraction is itself a function of the underlying causes of the problem, the final resolution of the environmental crisis will therefore depend upon changes in social practice.[63]

These 'changes in social practice' to which Marx refers are, in Dobson's interpretation, conceived within the environmental movement to be the concern of its political, rather than its philosophical 'arm'. The failure to link the theoretical and the practical together points towards an identity problem within the environmental movement and indicates the immense difficulty involved in moving towards a more *sustainable society*.

6.7.1 Political ecology

Most Greens argue that economic growth is moderated, not for social reasons – like those involved in the political battle between capital and labour – but because the Earth itself has a limited carrying capacity (for population). They would generally hold to the view that they are neither to the left nor the right of the political spectrum but 'straight ahead', or 'above the old politics'. The 1992 Green Party manifesto set the tone.

> The political choice today is not between Right, Left, or Centre, but between conventional grey politicians and the Green Party.

But when they focus on what action to take on the ecological crisis, arguing that social change must proceed from individuals (welfare liberalism) but will also require changes in the economic structures of society (democratic socialism), Greens tend to invoke 'old' political preferences. *Political ecology* brings ecological themes together with social struggles. Political

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[62] R. Bahro, *Building the Green Movement* (GMP, London, 1986), p. 210
[63] Dobson, (1995), p. 70

ecologists, in particular eco-socialists, argue that the Green critique of existing society and conventional values is not new and is more than just a protest against the immediate effects of a polluted, 'overpopulated' world where natural resources are believed to be running out. It demands a fundamental re-orientation of the dominant values, political systems and ideological beliefs of modern industrial society. Some argue that, despite claims that it is beyond ideology the radical Green position expressed within environmentalism *is* an ideology which Kenny (1994) identifies as *ecologism* (Vincent, 1993; Kenny, 1994; and Dobson, 1995).[64]

Although the term 'political ecology' has been around since the 1970s it has become more widely used since the late 1980s through the work of, among others, Enrique Leff, 1981; Ignacio Sachs, 1982; Rudolf Bahro, 1984; Andre Gorz, 1985; and Adrian Atkinson, 1991. It is concerned with, "building a radically new social, political, and cultural world out of the ruins of the old, one which will obviate the environmental catastrophe ahead and establish an economic and social system which incorporates a sustainable relationship between society and nature".[65] By critically focusing on the relationship between environmental change, socio-economic impact and political processes, such research addresses neglected issues. It rejects facile assumptions about environmental change and human welfare – for example, that ecological degradation is a universal evil befalling rich and poor alike. Rather, it explores how such change is incorporated into concrete political and economic relationships, and the ways that it may then be used to reinforce or challenge those relationships. Political ecologists stress two points with regard to the sustainable society:

- consumption of material goods by individuals in advanced industrial countries should be reduced;
- humans needs are not best recognised by continual economic growth as we conventionally define it today.

They tend to claim that terrible consequences will result if their warnings go unheeded and if their recommendations are ignored. In the context of modern political ideologies the consistent Apocalyptic tone employed is unique and the movement has been criticised for relying too heavily on doom mongering in order to galvanise people into action. This has led to criticism that it is informed by an overwhelming sense of pessimism concerning the fate of the earth and the human population. But the Green world-view is not inherently pessimistic and does not see environmental decline as inevitable. As Dobson (1995) has pointed out the pessimism relates

[64] A. Vincent, 'The character of ecology', *Environmental Politics,* 2(2), (1993), pp. 248-76
[65] Atkinson, (1991)

only to the expected duration of the current social and political condition.[66] On the contrary political ecologists are mostly optimistic about our chances of responding to the ecological crisis they believe they have uncovered. They simply argue that a major change of direction is needed.

> [This] decline is not inevitable. To avoid it two changes are necessary. The first is a comprehensive revision of the politics and practices that perpetuate growth in material consumption and in population. The second is a rapid, drastic increase in efficiency with which materials and energy are used.[67]

Its proponents seek a fundamental re-orientation in the existing relationship between humans and the 'natural' world. This involves a movement away from the 'technocentric' view that environmental problems can be approached and managed scientifically, objectively and rationally towards an 'ecocentric' view that accepts natural limits to economic and population growth.

Nonetheless the late 1960s and early 70s saw the climax of what came to known as the Great Doom debate, conducted between the anthropocentric establishment and its emergent biocentric critics. Attacks on the industrial world view came from a variety of directions (from E. J. Mishnan's *The Cost of Economic Growth* [1967]; the Club of Rome's *The Limits to Growth* [1972]; the Ecologist's *Blueprint for Survival* [1972]; and E. F. Schumacher's *Small is Beautiful* [1973]). Europe's first national Green Party – the UK Green Party (initially known simply as 'People') – was founded in 1973. By the early 1980s Green parties had set up in most western European countries. In West Germany Die Grünen entered the Bundestag in 1983. In subsequent years Greens have entered national and local assemblies throughout Europe and have begun pose both an intellectual and political threat to the prevailing anthropocentrism of the traditional political parties.[68]

Anthropocentrism currently remains a dominant force in national and international politics. But the public nature, and momentum, of the ecological critique of industrialism, and the arrival of the Green parties in the political arena, has incurred a backlash which has attempted to dilute criticism by adopting the concept of 'stewardship over nature'. This is viewed by some as representing the middle ground between the environmental destruction associated with the industrial worldview and the ecological determinism advocated by ecologism (O'Riordan, 1976). Others simply see it as a watered-down version of domination theory in which

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[66] Dobson, (1995) p. 22
[67] Meadows *et al* (1992) pp. xv – xvi
[68] D. Richardson, 'The politics of sustainable development', in Baker *et al* (eds.) *The Politics of Sustainable Development* (Routledge, London, 1997), p. 46

humankind is still in charge of the 'natural' world. Some see evidence of this scientific-rationalist aspect of domination theory in the concept of *sustainable development.*

6.7.2 *Political ecology and sustainable development*

> The centrality of the limits to growth thesis and the conclusions drawn from it have lead political ecologists to suggest that radical changes in our social habits and practices are required. The kind of society that would incorporate these changes is often refereed to by Greens as the sustainable society.[69]

Pezzoli (1999) presents the four principle spheres of concern and keys challenges in the political ecology of sustainable development as: (1) *holism* (an integrated co-evolutionary understanding of the connection between social, economic, and ecological concerns); (2) *empowerment and community building*; (3) *social justice and equity*; and (4) *sustainable production and reproduction.*[70] Table 6.4 summarise these challenges.

The notion of 'collective effervescence' refers to a process that Durkheim described as occurring at moments when social life takes on a special intensity that is marked by an increase in the number of 'assemblies' providing actors with new creative impulses. Historical examples of periods of crisis, when processes of social and intellectual activity are particularly apparent include the Renaissance, the French Revolution, and the social movements of the nineteenth century.[71]

TABLE 6.4

POLITICAL ECOLOGY OF SUSTAINABLE DEVELOPMENT:
PRINCIPLE SPHERES OF CONCERN AND KEY CHALLENGES

Spheres of Concern	*Key Challenges*
Environmental context	*Holism and co-evolution* We need to develop a holistic world view in order to better understand how the environment and development interrelate. Holism attempts to cross-fertilise the fruits of a 'sociological imagination' with a 'biogeophysical imagination' in order to conceptualise a new ecological system of production in opposition to the dominant industrial system. Great importance is placed on the idea of social experimentation and social learning. The challenge

[69] Dobson, (1995), p. 17
[70] Pezzoli, (1999), p. 556
[71] C. Barker, 'Some Remarks on Collective Action' in C. Barker and M. Tyldesley (eds.) *Proceedings from the Third International Conference on Alternative Futures and Popular Protest,* Volume 1 (Manchester Metropolitan University, Manchester, 1997)

	calls for new insights and theory building about the interplay of nature, history and power.
Legal and institutional grounds	*Empowerment and community building* An ecological perspective focuses on certain social and political rights that the liberal way of thinking has left out. Instead of conceiving of social justice as involving the equal rights of individuals, it seeks to protest the rights of each "community of people to a familiar habitat, like creatures in the natural world" recognising, "the attachments which bind people to each other and to places, and out of which evolve the unique meaning of each person's life". Sustainable development needs new approaches "that challenge not only economic rationality but also bureaucracies, in ways that encourage political pluralism, and the participation by civil society in the management of its productive and vital processes". It calls for the organisation of struggles "to democratise the workplace and the state administration so that substantive contents of an ecological progressive type can be put into the shell of liberal democracy".
Culture and civil society	*Social justice and equity* The conceptual, technical, and organisational bases for a sustainable society will be built upon a foundation of ethics and moral philosophy. "Before we accept sustainable development as a new morality as well as a new economic strategy, we need to know what ecological, social, political, and personal values it serves, and how it reconciles the moral claims of human freedom, equality and community with our obligations to individual animals and plants, species and ecosystems".
Economy and technology	*Sustainable production and reproduction* Sustainable development calls for more than minor modifications in our current economic and technical paradigms. Some argue that the answer lies in technology but what is the question? If it is about how we can sustain current rates of production and consumption then it is inadequate. We need to ask how it is that we can promote the kind of technology, social learning and social change, needed to bring our current patterns of production and consumption into line with the ecosystem's long – term capacity to perform life-giving functions – this will involve the capacity to regenerate the raw material input, and absorb the waste output of the human economic system, including our cities, in ways that promote equity between generations, as well as among them.

Source: K. Pezzoli (1999).

6.7.3 The environment as a new frame of reference

> There are periods in history when, under the influence of some great collective shock, social interactions have become much more frequent and active. Men look for each other and assemble together more than ever. That general effervescence results which is characteristic of revolutionary or creative periods. Now this greater activity results in a general stimulation of individual forces. Men see more and differently than in normal times. Changes are not merely of shades and degrees; men become different.[72]

In recent years environmental problems have risen to the forefront of popular concern. Peter Brand (1999) suggests that the immersion of these issues in our daily lives means that the environment has today become a frame of reference for describing our general spatial experience. Environmental issues that appear in the media - asthma epidemics and car pollution; cancer risks and the ozone layer; the NIMBY (not in my back yard) reactions to the siting of nuclear power stations or telecommunication masts; the noise and light pollution associated with road rail and air traffic; the safety of food production methods; and so on – have come to dominate everyday spatial politics.[73] Although the great mass of people have not become environmentalists in the sense that they are scientifically informed and politically motivated to operate on an environmental platform, certain Green ideas have achieved orthodox status within public opinion.

Today it has become widely accepted that rapid growth in population numbers, along with economic growth and industrialisation, and the associated per capita increases in resource use, contributes directly or indirectly to many serious global environmental problems. Global warming, ozone layer depletion, deforestation, exhaustion of non–renewable resources, and the loss of biodiversity are problems that demand a global response. It is now also well established that these environmental problems are linked to the persistence of mass poverty and large-scale, predominantly rural-urban, migrations. These involve social and physical urban environmental problems of air and water pollution, inadequate waste management, the lack of basic services and Green areas, declining infrastructure, and poor housing conditions, as well as issues of health, crime, violence, and social exclusion.

These kinds of problems demand a collective response that attempts to change people's material circumstances. And yet many Greens still reject the notion that radical social change inevitably involves confrontation between those who hold power and those who seek it. Many still prefer to focus on lifestyle changes and changing people's ideas of how society should be.

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[72] E. Durkheim, (1961), p. 241

[73] P. Brand, 'The Environment and Postmodern Spatial Consciousness: A Sociology of Urban Environmental Agendas', in *Journal of Environment Planning and Management,* 42 (5), (1999), pp. 631-648

The debate about the strategy for social change towards a more sustainable society - whether what we think about nature conditions what we do to it (as White [1967] proposes) or whether what we do to nature conditions how we think about it (as Marx would argue) - leads on to a related issue of structuralism.

6.7.4 Structuralism

Is social reality to be interpreted in terms of underlying structures in the human mind or in society (in Marxist materialist terms) or is what we see all that there is (the 'poststructuralist' view)? Inspired by Saussere's theories of linguistics, Levi-Strauss was concerned with relating behaviour and institutions to basic characteristics of the human mind,

> The unconscious activity of the mind consists in imposing forms on content, and if these forms are fundamentally the same for all minds - ancient and modern, primitive and civilised (as the study of the symbolic function, expressed in language, so strikingly indicates) - it is necessary and sufficient to grasp the unconscious structure underlying each institution and each custom, in order to obtain a principle of interpretation valid for other institutions and other customs.[74]

Levi-Strauss argued that the apparent meaning and order of the natural world is not inherited. We humans, by virtue of our capacity to classify, impose order and since all humans have the same kind of brain we impose structure universally. Structural Marxists on the other hand, like Althusser, reduce the model entirely to economic, social, and political arrangements ('modes of production') which are variable through space and time and cannot therefore be described as universal.

Green views of society, historically rooted in idealism, have tended to the universal interpretation. They have consequently been accused, particularly by Marxists, of embracing shallow (unrealistic) analyses based on idealised concepts or of ignoring the materialistic facts of how humans, individually and socially have constantly changed their own nature, and transformed the natural environment, through history.

6.8 Sustainable economics

Sustainable development is capitalism's answer to the environmental crisis. But will it work? A society obsessed with growth tends to view any criticism of growth as a complete negation. The tendency is to replace one oversimplification with another. Aurelio Peccei (1977), founder of the Club of Rome, articulates the problem:

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[74] Levi-Strauss, *Structural Anthropology,* cited in Atkinson (1991), p. 73

> All those who had helped to shatter the myth of growth...were ridiculed and figuratively hanged, drawn, and quartered by the loyal defenders of the sacred cow of growth. Some of those...accuse the [*Limits to Growth*] report ...of advocating ZERO GROWTH. Clearly such people have not understood anything, either about the Club of Rome, or about growth. The notion of zero growth is so primitive - as, for that matter, is that of infinite growth - and so imprecise, that it is conceptual nonsense to talk of it in a living dynamic society.[75]

Peccei argues that sustainability does not mean *no* growth. A sustainable society would be interested in qualitative development, not physical expansion. It would be neither for nor against growth *per se* but would discriminate between different kinds of growth and their purposes. Before deciding on a specific proposal certain questions would be asked:[76]

- what is growth for?
- who will benefit?
- what will it cost?
- how long will it last?
- can the growth proposal be accommodated within the earth's carrying capacity?

According to the Club of Rome, a sustainable society would apply its values and its knowledge of the earth's limits to select only those growth proposals that would serve social aims and enhance sustainability.[77] Material growth in this sense is merely another tool for qualitative development rather than a "perpetual mandate". When it had met its objectives it would be stopped.

Beyond the Limits (1992) describes a sustainable society as one "that can persist over generations, one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social system of support". From a systems point of view the report describes the need for informational, social and institutional mechanisms to be put in place to check the positive feedback loops that cause exponential population and economic growth. Until there is technical and social justification for changes in the levels of population or capital, "birth rates would roughly equal death rates", and "investment rates roughly equal depreciation rates".[78]

The society's material and energy throughputs, based on an optimum configuration of population, capital and technology, would have to meet economist Herman Daly's three conditions:[79]

- its rates of use of renewable resources should not exceed regeneration rates;

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[75] A. Peccei, *The Human Quality* (Pergamon Press, Oxford, 1977), p. 85
[76] D. Meadows *et al* (1992), pp. 210-11
[77] D. Meadows *et al* (1991), p. 209
[78] *Ibid*
[79] H. E. Daly (ed.), *Toward a Steady-State Economy* (W. E. Freeman and Company, San Francisco, 1973)

- its rates of use of non renewable resources should not exceed the rate at which sustainable renewable substitutes are developed;
- its rates of pollution should not exceed the capacity of the environment to assimilate such emissions.

There is a persistent assumption that a society based on moderation would, of necessity be one which is subject to strict, centralised government control. Although a sustainable society, like every human culture, would require to abide by certain rules, laws, standards and boundaries there is no reason to believe that totalitarianism is desirable or necessary. Rather than destroy freedom, necessary controls based on social consensus, such as the international agreement on ozone, are already emerging to protect freedoms against those who would see them removed or destroyed.

Advocates of the sustainable society, like Meadows *et al* and Daly believe that it is within our capabilities to come up with a set of social structures and feedback loops that carry new information about costs, consequences and sanctions that would keep a society sustainable, allow evolution, creativity and change, and permit many more freedoms than would be allowed in a world that continues to move beyond its limits.

Meadows *et al* argue that there is no reason why such a society needs to be technically or culturally primitive:

> Freed from both material anxiety and material greed, human society would have enormous possibilities for the expansion of human creativity in constructive directions. Without the high costs of growth for both human society and the environment, both technology and culture could bloom.[80]

John Stuart Mill, one of the few economists to take seriously the idea of a sustainable economy consistent with the limits of the earth, believed that, what he called a "stationary state" could support a society which was continuously evolving and improving. Almost one hundred and fifty years prior to Club of Rome report, he wrote:

> I cannot...regard the stationary state of capital and wealth with the unaffected aversion so generally manifested towards it by political economists of the old school. I am inclined to believe that it would be, on the whole, a very considerable improvement on our present condition. I confess I am not charmed with the ideal of life held out by those who think that the normal state of human beings is that of struggling to get on; that the trampling, crushing, elbowing, and treading on each other's heels...are the most desirable lot of human kind...It is scarcely necessary to remark that a stationary condition of capital and population implies no stationary state of human improvement. There would be as much scope as ever for all kinds of mental culture and moral and social progress; as much room for improving the Art of Living, and much more likelihood of its being improved.[81]

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[80] D. Meadows *et al,* (1992), p. 211
[81] J. S. Mill, (1852)

6.8.1 Towards an economy of space

Towards a Steady-State Economy (1973)[82] is a collection of articles, edited by Herman Daly, including contributions by various authors (Georgescu-Roegen on entropy; Ehrlich on population growth; Schumacher on Buddhist Economics; and Boulding on Spaceship Economy).

Boulding's article *The Economics of the Coming Spaceship Earth* is at the core of the debate on economic limits and sustainability. His starting point is that the aims of a traditional economic approach will lead to a maximisation of the use of energy and resources which, in turn, leads to the sort of environmental problems that now confront us. This production process is based on a "cowboy" economy that seeks new frontiers with new reservoirs of raw materials to exploit. Boulding uses the analogy with the 'cowboy' to symbolise the idea of the infinite plains and the exploitative and violent behaviour of an open economy. In this type of economy the maximisation of consumption in the form of throughput (extraction of resources and production of pollution) becomes a measure of success. The Gross National Product (GNP) is such a measure.

In contrast with this Boulding suggests that the closed economy of the future might be called the "spaceman" economy, in which the earth, in Buckminster Fuller's terminology, has become a single spaceship, with finite limits on its resource reservoirs and its capacity to assimilate pollution. Within such a system humans must find their place in a cyclical ecological system that is capable of continuous reproduction of matter and absorption of energy. In a spaceman economy consumption is considered as something to be minimised rather than maximised. The essential measure of success of the economy is not consumption but the nature, quality and complexity of the total stock, including the mass of humanity in body and mind. Any technological change that results in the successful maintenance of the stock and the reduction in throughput (less production and consumption) is seen as a gain.[83]

The relationship between the ecosystem and the system of production and consumption is the central point of all theoretical reasoning about environmental problems. The idea that production and consumption could be bad things is an anathema to economists fixated on perpetual growth and income-flow concepts. Boulding has, however, influenced many within a new generation of environmental economists and scientists who have become aware of the need to develop new approaches and new paradigms appropriate to modern environmental problems. *Towards a Steady-State Economy* became a point of cohesion leading to the 1990 formation of the International Society for Ecological Economics, now the leading organisation in environmental

[82] Daly, (1973)
[83] Boulding, in Daly, (1973), pp. 121-32

economics, whose leading principle is that traditional economics cannot describe and analyse environmental problems.

From 1988 to 1994 economist Daly had worked at the World Bank, where he struggled to convince his colleagues that there were inevitable limits to economic growth. Daly argued that the environmental limits to economic growth were fast approaching, not only with respect to ozone depletion and global warming but also, in neo-Malthusian fashion, with regard to the food chain. He refers to the fact that biologists estimate that up to half of all the solar energy captured by photosynthesis on earth (via plant matter) is consumed by humans and all other species as food. Such estimates make it clear that the environmental scale of humanity cannot keep expanding for long. While a doubling of the global population might be arithmetically possible, it is ecologically unsustainable, in as much as it would leave no energy for other species. Daly argues that humans therefore have to contain their expansion by lowering consumption levels, improving technologies, and limiting population growth. He argues for a clear distinction between growth and development, and a shift from pursuing growth, which is quantitative, to pursuing development, which is qualitative.

6.8.2 The' triumph of capitalism'

This begs the question: can such a shift occur under capitalism, an economic system whose very essence is growth for growth's sake? In an era of capitalist triumphalism this is a difficult question to ask. Capitalism needs and promotes ceaseless expansion, yet the evidence that human activity is already overwhelming the earth's eco-systems is all around us. Environmentally benign technologies and behaviour can help but they cannot prevent the earth's eco-system from overload if consumption continues to rise indefinitely.

The mainstream Green critique of conventional economics remains ambiguous. On the one hand markets are the 'triumphant expression of individual rights and civil liberties"[84] and a "marvellous institution for effecting individual preference".[85] On the other they are a "debilitating virus in the economic system" which serve as confirmation of Marx's view that capitalism's main tendency is the concentration of power and wealth by "making money out of money independently of productive activity or real wealth creation".[86] Pepper (1996) suggests that the ambiguity of the critique is matched by that of Green solutions that attempt to reform the financial system by proposing a Green mixed economy with capital-labour partnerships in which

[84] W. Achterberg, 'Can liberal democracy survive the environmental crisis?' in A. Dobson and P. Lucardie (eds.), *The Politics of Nature: explanations in green political theory* (Routledge, London, 1993), p. 91
[85] P. Ekins, (1992), p. 24-6)

the basis of power-sharing remains unclear. He also describes the conclusions offered by Meadows *et al* (1992) as equally ambiguous and "glib". After having recognised the need to "step back and acknowledge that the human socio-economic system as currently structured is unmanageable, has overshot its limits, and is headed for collapse...and...change the system" there is the less than revolutionary conclusion that information is the key to transformation and that "only individuals can make changes that transform systems".[87]

Daly too is reformist rather than revolutionary. He advocates the reform of capitalism through market mechanisms that would be used to guide the development of new technologies and practices needed to navigate the transition to genuine sustainability.[88] With sufficient pressure applied on corporations to adopt environmentally benign policies, market forces can achieve a great deal. Consumers can mobilise their buying power to encourage advances like 'soft' technologies and Green products. But in the end there can be no substitute for government.

6.8.3 Eco-socialism

Eco-socialism employs Marxist perspectives to look particularly at the structural features of capitalism as a way of explaining today's ecological problems. The eco-socialist critique of existing society and conventional values is largely an inquiry into the detrimental global influence of Western culture and its seemingly endless search for material gain. Within it, Pepper (1996) identifies a fundamental discontent at the "alienation of urban-industrial capitalism" and its core institutions, and hierarchical power relations.[89]

> The critique has affinities with most of the dissenting voices that accompanied the rise of modern capitalism , with its political philosophy of *laissez-faire* liberalism, over the past three hundred years; ranging from Romanticism, traditional conservatism and anarchism to the many varieties of socialism. Its most immediate ancestor is probably the 'countercultural' movement of the 1960s, which was intellectually sustained by, among others, 'neo-Marxists' concerned with social and spiritual alienation in our society.[90]

Marx's analysis of the capitalist system convinced him that it was so full of contradictions that it was bound to collapse. For technical economic reasons he held that capitalists would suffer from a declining rate of profits and the whole system would be subject to periodic crises of overproduction. Ultimately though it would be the conflicting interests between the working-class proletariat and the capitalist bourgeoisie that would bring about capitalism's downfall.

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[86] P. Ekins, (1993), p. 272
[87] Cited in Pepper, (1996), p. 88
[88] H. Daly in an interview with Mark Hertsgaard, cited in Hertsgaard, (1999), p. 278
[89] Pepper, (1996) p. 14
[90] *Ibid,* p. 10

Although he was aware of the 'middle class' in capitalist society his analysis convinced him that society was increasingly polarised into these two great hostile classes. The hostility was borne of an objective conflict of interests between the two classes; the bourgeoisie exploited the proletariat by paying less than the value of their labour, and through their private ownership of the means of production, frustrated the collective social interest in the development of productive forces at society's disposal. Marx predicted that when the working class became conscious of these facts it would overthrow capitalist society and establish a new form of classless society.

Although the Marxist tradition remains an important and powerful influence in social theory, his economic writings and his evaluation of capitalist society have been widely challenged. His class analysis has been attacked on the grounds that it failed to take sufficient account of the global rise in 'middle class' groups or affluence, suggesting that his theory of social change and revolution is inadequate.

6.8.4 The growing middle class

For much of history small political élites have ruled, often brutally, over a large mass of impoverished people. They had education, knowledge, wealth, and military might to help them consolidate power. There are those who argue that with the rise of the international middle class, the power of these ruling élites is being diluted.[91] They argue that just as the industrialisation of Europe helped bring down the monarchies and empires of the old order, so too the massive process of industrialisation now going on in the developing world is creating a new middle class that will be an engine of social change.

Today this growing middle class has a stake in protecting the environment, as well as promoting trade and the free flow of information. Armed with fax machines, the Internet, satellite dishes, and cellular phones, they are able to become a formidable political force and they have rising expectations and wants. When they are no longer distracted by the imperative of hunger and disease people, increasingly aware of the existence of luxury items from the industrialised nations, will begin to demand more consumer goods themselves. Perhaps more significantly with stability and affluence they will inevitably "start to look around them and ask why they cannot have what others have. Equally important, they will start to ask why they were not able to have it in the past".[92]

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[91] Ohmae, (1995), p. 44
[92] Ohmae, (1995), p. 45

6.8.5 Poverty and sustainability

Even although the global membership of the middle class is expanding, a major obstacle to achieving sustainability is the current trends in wealth disparity. In the developed world today the average per capita consumption of energy is six times higher than in developing countries and the per person use of water is one hundred times higher.

The demand for global structural change in society is a natural condition in many developing countries where political equality, achieved via the democratic process, is a pre-condition for economic equality. History has been shaped by the struggle between the rich and the poor. But in a globalised world of high-tech communication, where information has instant access to all but the most remote reaches of the planet, the rich can no longer hide their wealth from the poor. In *Reshaping the International Order* (1977), Tinbergen and Dolman conclude that our future depends on coming to terms with these differences and developing a new understanding and awareness based upon interdependence and mutual interest of working together.[93]

Throughout the Third World nearly 40 per cent of people live in absolute poverty.[94] Every day around eleven thousand children die of starvation. In India less than half of children under the age of five have enough to eat. Six hundred million people in the slums of cities like Rio de Janeiro or Delhi live in housing which is so bad that their health is in constant danger.[95] The World Bank informs us that 20 per cent of the global population lives on less than one US dollar per day.[96] In 1996 the UN Food and Agriculture Organisation estimated that 841 million people were chronically malnourished. Perhaps such numbers are too big and too abstract to mean very much but in essence what they amount to is the fact that nearly one out of six people in the world are either starving, very ill or close to death.

The ratio is central to the environmental crisis and the ecological predicament of the humanity. Sustainability is not primarily about "saving the planet". Its main concern is the continued survival of the human species. In the industrialised world ecological degradation is linked to economic growth and the benefits that this brings, in the poorer nations of the world it is linked to survival. In the developing world people are aware that environmental threats to survival must be countered but first bread needs to be put on the table. In Africa, for example, it is impossible to deal with the problems of soil erosion, desertification, deforestation, and lack of clean water without confronting issues of poverty and development.

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[93] J. Tinbergen and A. J. Dolman, *Reshaping the International Order; A Report to the Club of Rome* (Hutchinson, 1977), p. 24
[94] UN International Fund for Agricultural Development, 'The State of Rural Poverty' (IFAD, 1992)
[95] UNDP, (1997), p. 29
[96] WB, (1996)

6.8.6 The fair distribution of resources and Environmental Space

These issues raise inevitably raise distribution and equality. It may be that as Brand (1999) has suggested the environment is slowly establishing itself as a new paradigm for the management of space.[97] If the planet's atmosphere can only absorb a certain quantity of greenhouse gases then collectively the means of sharing the atmosphere's capacity need to be agreed. Similarly if the earth's forests, fisheries and farmlands can only supply a certain amount of resources before collapsing then these too need to be equally distributed. The distribution of *environmental space* can relate to almost all environmental threats.

> The quantity of energy, water, land, non-renewable raw materials and wood we can use in a sustainable fashion is called our Environmental Space. This criterion is imput/use-oriented...[or] based on estimates of output/sink capacities. As modern economies not only use national resources, but are built on international commodities trade the calculation of Environmental Space a national economy uses has to be based on an estimate of the global supply for that respective national economy. The available environmental space gives a ceiling to the permitted level of use of natural resources, which can be used in very different ways to meet the demands of society.[98]

At the moment the bulk of the earth's environmental space is claimed by the United States Northern Europe and Japan, but this situation cannot last. Over the coming decades those nations like, China and India, who have huge populations and economies that are developing rapidly will generate substantial amounts of pollution, even if they adopt environmentally benign technologies to aid their development. These two nations could be the cause of severe global warming. Technology can help us to use the earth's environmental space more efficiently but, like the biosphere itself, this space is finite. As population and economic growth continues the pressure on the earth's environmental space will increase. As we look to create an environmentally sound future no challenge will be more fundamental than attempting to bridge the historic gap between the rich and poor.

Recent historical discontinuities have offered the opportunity to take new initiatives in redirecting the evolutionary process of social change (these include the collapse of the Soviet Union, the demand for development in the Third World, the global increase in consumption of energy and resources, the increased awareness of the environmental crisis, and the increasing globalisation of production, culture, and information). These breaks in historical trends have placed humanity on the threshold of new choices. Clearly in securing a sustainable balance between development, resource use and environmental impact the guidance of local leadership is decisive. Just as clearly there is a fundamental need to engage citizens themselves into the plans and struggles that will determine their future. But if global policies do not change 75 per cent of

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[97] Brand, (1999), p. 645

the global population will have to continue to survive on 20 per cent of the world's resources. Global imbalance on this scale is a critical factor in determining the success or failure of development - in the farms, forest and seas, as well as in the cities, old and new. Sustainability must involve more socially compact, economically efficient and ecologically benign ways of producing and distributing the world's resources. It must be concerned with securing quality of life by placing values on the things that people have in common - like resources, the environment and community - and recognising our mutual dependence on these.

No purely local effort can address the environmental challenge as the world moves toward 10 billion people over the next 50 years. As Barbara Ward pointed out in *Progress for a Small Planet* (1979), "it is either the whole world's business. Or it will not be done in time".[99] Mostafa Tolba , the executive director of the UN Environment Programme, believed Ward's book would have a "profound and beneficial impact on all those grappling with the problem of how to ensure and to advance the sustainable development of mankind and of human society".[100] Much has changed in the twenty years since the publication of a book. Today networks of cities across the world sharing knowledge, technologies, and establishing policies that respect local cultures while implementing common environmental objectives could offer the power and structure for real change. As our awareness of our common dependence on the global ecology spreads and modern communications bring global problems into sharper focus. But, as has been confirmed in the cluster of UN conferences during the 1990s, many environmental problems are getting worse. In making our new choices we may now have to accept that we must opt for a sustainable future or no future at all.

6.9 The myth of the technological solution

Dobson (1990) argues that radical Greens advocate the 'sustainable society', not simply because they think it would be a better place to live, but because they believe they have science on their side. In theory at least the global community has the means to achieving sustainability. It is conceivable that with sufficient investment in basic needs and infrastructure, communities in the developing world can provide the food, water, farmlands and labour-intensive industry needed to raise them above absolute poverty. This should result in more decent living standards and bring about stable levels of population among the billions who will be born there in the next few decades.

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[98] Friends of the Earth Europe, *Towards Sustainable Europe* (FOEE, Brussels, 1995), p. 11
[99] B. Ward, *Progress for a Small Planet* (Penguin Books, Harmondsworth, 1979), p. 242
[100] M. Tolba cited in Ward, (1979), p. x

But neither those who write-off science as a possible contributor to human well-being and environmental stability nor those who believe that the 'holy grail' of technology will solve all of our human ills and rid us of all our environmental problems, can ever be more than half right. Technology is both the cause and the cure of what ails us. Human strategy and planning is what gives technology its stimulus and defines its limits. The modern world, with its rapid growth in population, its pursuit of material wealth via increasing rates of resource consumption, and its rapid shift from rural to urban life via the process of urbanisation, lacks the strategies of conservation in the broadest and yet most important sense.

Technological solutions, no matter how clever, cannot facilitate infinite growth in a finite system. Such a task is impossible. As Irvine and Ponton point out (1988) our technological gadgetry "merely shift the problem around, often at the expense of more energy and materials input and therefore more pollution".[101] The question therefore arises; what form of technology is appropriate for achieving a sustainable society?

In *The Tragedy of the Commons* (1968), Garret Hardin refutes the implicit and almost universal assumption that all of our modern problems (rapid population growth, pollution, nuclear war) have a technical solution. He defines a 'technological solution" as "one that requires "a change only in the techniques of the natural sciences, demanding little or nothing in the way of change in human values or ideas or morality".[102] Barry Commoner (1971) proposes a functional connection between pollution and economy via modern technology. He sees the link emerging in two ways. Firstly he argues that pollution tends to become intensified by the displacement of "older productive techniques by new, ecologically faulty, but more profitable technologies" so that pollution is an unintended by-product of the drive to increase profit by introducing technologies that increase productivity. Secondly the cost of environmental degradation is borne, not by the producer, but by society as a whole, in the form of Pigou's "externalities". Polluters are therefore being subsidised by society. Commoner argues that these relationships must change.[103]

If technological solutions to the problems of growth are impossible, then it follows that more profound social changes, in our thinking and in social practice - "in human values or ideas or morality" - will need to be argued for. According to Hardin such changes will require the recognition of the necessity of "mutual coercion" in social arrangements (e.g. pollution taxes) and a careful rethinking of the meaning of "freedom". He offers the legislation against robbery

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[101] Irvine and Ponton (1988), p. 36
[102] G. Hardin, 'The Tragedy of the Commons' in *Science,* 162, (1968), p. 1243-8
[103] B. Commoner, *The Closing Circle: Nature, Man and Technology* (Knopf, New York, 1971)

as an example of human beings becoming more, not less, free through mutually agreed laws. Quoting Hegel he writes "Freedom is the recognition of necessity". This necessity, as Dobson (1990) points out, will involve altering social practices to accommodate environmental limits and "abandoning the Promethean (in the context of technological) attempt to overcome them".[104]

6.9.1 The rise and fall of the toolmakers

Tool use, once incidental to the human experience of nature, has evolve into a technology, now central to our experience, and in the near future threatens to completely replace it. Twelve thousand years ago when the first bipedal apes took their first few faltering steps on the Rift Valley in East Africa they paved the way for the next big development in human evolution - the hands were freed for other purposes the use of tools. Because this shift coincided with another major transformation, the enlargement of the brain, within another half million years pre-humans were not only using tools (like apes), they were creating them. It was at this point, around 15 million years ago that *Homo erectus* began to transform the natural world by cutting down trees to make rudimentary shelters, and using animals for food and clothing. A million years later a creature with a larger brain, more erect posture , and a generally more human appearance had evolved. *Homo sapiens,* including Neanderthals, proved unequal to evolutionary challenge and died out over subsequent millenia. Today's humans can be traced to a tribe of *Homo sapiens sapien* who were still living in Africa around 200, 000 years ago. A subset of this tribe left Africa about 70, 000 years ago and they and their descendants eventually spread throughout the planet and evolved into the various races and ethnic groups that make up modern humanity.[105]

Throughout the millenia of evolution our ancestors have lived as hunter-gatherers and this way of life related to everyone until about ten thousand years ago, when humans in disparate parts of the planet gradually began cultivating crops, husbanding animals, and generally nurturing food that they previously simply collected. The 'Agricultural Revolution', which began just after the last Ice Age, was perhaps the single most fundamental change in humanity's relationship with the environment. Large amounts of land were cleared and the human population gradually began to rise beyond the four million or so that had prevailed for millenia, Above all it wrought the kind of social change that made all future technological advances possible. The shift to agriculture encouraged humans to forsake their nomadic past in favour of a

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[104] Dobson (1995), p. 75

[105] C. Stringer and R. McKie, *African Exodus: The Origins of Modern Humanity* (John Macrae/Holt, New York, 1997)

settled life, and led to the emergence of the first villages and towns around nine thousand years ago.

Eventually these settled societies were able to support a culture based on craftsmen, builders, artists, and scientists, and this form of the division of labour set the foundation for an expansion of human thought, creativity, and problem solving that hugely increased humans' ability to manipulate the natural world for their own benefit. Technological innovations began to arise much faster now. By six thousand years ago writing had developed. Five hundred years afterwards the wheel was invented, revolutionising transportation and fostering increased production and trade. With the invention of metalworking came the realisation that matter could be taken apart and reassembled to suit human purposes. Humans left the Stone Age and entered the Bronze and Iron Ages. Metal tools and weapons increased economic and military power and the world's first empires arose in Persia and Egypt, five thousand years ago.

In *A Green History of the World* (1991) Clive Ponting relates many examples where human societies have failed to achieve a sustainable balance between their own material demands and the environment's well-being. The Sumerian empire was the first literate society on earth and the first to succumb to self-inflicted ecological collapse. The technical innovation of irrigation, which had been invented around 5500 B.C., eventually brought Sumeria to its nemesis. Irrigation increased crop yields substantially but it also increased the salt content and water retention of the soil. The rapid population growth, which resulted from increased crop production, meant that the land could not be left to lie fallow in order to recover. Crop yields remained high for a time, but collapsed abruptly in 2400 B.C. The food shortfall made it difficult for the empire to support its army and Sumeria was conquered within a matter of decades.[106]

The rise and fall of Sumeria illustrates a tendency that has shown itself time and again in the history of human society: a given technological development increases humanity's ability to extract a higher level of comfort from the natural world, but it does so at the cost of greater environmental damage. The Chinese, Greek, and Roman empires all ignored ecological constraints, and eventually suffered because of it. The Greeks felled the trees from the mountains above Athens to build the war ships that made them the world's greatest sea power, but when the trees were gone the mountains turned bare and dry from soil erosion and the navy was weakened by its enforced reliance on imported timber.

Ponting points out that damage to the environment was usually one among a number of factors, which caused these societies to come apart, and in such cases "the decline and eventual

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[106] J. Diamond, *Guns, Germs and Steel: The Fates of Human Societies* (W.W. Norton, New York, 1997)

collapse were usually prolonged...and generations living through this process would probably not have been aware that their society was facing long-term decline".[107]

6.9.2 *Revolutions in science, capital and industry*

For 1,500 years after the fall of the Roman Empire the human population grew very slowly - one child in three survived infancy and life expectancies remained at around thirty years. The majority of the world's people lived in conditions of grinding poverty. Often the despoliation of the environment occurred, not because people were ignorant, selfish, or apathetic, but because they were so caught up in the daily struggle to survive that they lacked the luxury of foresight. With the Industrial Revolution many things began to change. Two preceding developments made it possible: the Scientific Revolution, which generated the knowledge needed to build modern machines, and the Capitalist Revolution, which amassed the capital needed to finance the machinery. The melding of science and capital into industry signalled the most rapid acceleration yet of human's control over the natural environment. Modern science pioneered by people like Copernicus, Kepler, Newton, and Galileo asserted that the world operated according to consistent physical laws which could be discovered through reason and experiment and applied to practical effect. To a rising class of capitalists, better knowledge resulted in better machines, which lowered production costs, attracting more and more people into the system and accumulating the capital needed to develop better production methods and machinery. By the late eighteenth century the pursuit of technological advantage had culminated in the industrial steam engine, a machine which would power the Industrial Revolution through the next hundred years.

During the nineteenth century better technology raised the standard of human welfare across Europe but inflicted greater environmental damage as forests were systematically reduced to stumps and brush. Eventually, because wood was becoming too scarce, it was replaced by coal as the primary source of fuel. For centuries humans had limited the burning of coal, because as a fuel source it was inefficient, messy and difficult to extract from the ground. Dwindling wood stocks and technological breakthroughs in the 1840s enabled coal to be converted into heat much more efficiently and the industry grew rapidly. But the environmental trade-off for coal was worse than it was for the steam engine. As "progress" became the key word of nineteenth century philosophy and politics, massive increases in production and efficiency were accompanied by blackened skies, putrid rivers, and other side effects leading the William Blake's passionate assault on the "dark Satanic Mills" of industrial England.

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[107] C, Ponting, *A Green History of the World* (St. Martins, New York, 1991), p. 401

The technological innovations that humans have produced over thousands of years of evolution are central to the reason why we have become the planet's dominant species. But no other generation has experienced the scale of luxury and freedom from want that we now seem to take for granted in modern industrialised nations. What is striking about contemporary technology - cars, televisions, computers - is how "natural" they seem and the high status and affection we hold for these personal lifestyle products. In the past this kind of bond was usually reserved for attributes of nature. Our idealised form of sustainable society, in which all environmental and social problems are solved, would most likely still include our favourite technological toys (the computer and the car), labour-saving gadgets (the computer and the dishwasher), and entertainment devices (the computer and the television). These are considered vital extensions and facilitators of our modern lifestyle. These human-made creations collectively define us and we depend upon them. But there is another part of the technological persona, in the "impersonal omnipresent system" of technologies that has violated the environment, polluted the air and water, stolen jobs, and wiped out some species while threatening to wipe out others even, in some case, our own".[108]

6.9.3 New Atlantis and the megamachine

In considering the role of technology in human life, Lewis Mumford, suggested that the machine age started, not with the steam engine, but thousands of years ago when the first centralised, authoritarian societies - the Ancient Egyptian, Mayan, Chinese, and Incan civilisations - allowed power to be concentrated in the hands of rulers who presided over huge numbers of slaves as well as the priests who held the scientific and technical knowledge. To Mumford, these machine-like authoritarian social hierarchies capable of producing great pyramids, walls, temples, and road systems were "megamachines" and represented the first large-scale systems of domination over both human society and the rest of nature.[109] These megamachines anticipated the bureaucratic, military-industrial economies of the United States and the former Soviet Union by thousands of years. They also pre-figure Francis Bacon's scientific utopia in *New Atlantis*.

In *New Atlantis* (1624) Bacon portrayed a mythical island where a community of scientists was given a high social status. The dignified leader of the all male group was peaceful, serene, pitying and democratic. The community was dedicated to gaining knowledge, not for profit,

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[108] R. L. Thayer Jr., *Gray World Green Heart: Technology, Nature and the Sustainable Landscape* (John Wiley & Sons, New York, 1994)

fame or power, but for the benefit of all. The members accepted no authority except that of the scientific method. They bore no allegiance to any particular social group, even keeping their knowledge secret if they felt it undesirable for the state to have it. So objective knowledge was produced and protected by a group dedicated to humanity as a whole. Therefore anything leading to the development of science was, by implication good, and also by implication it was scientists who should have the leading decision-making roles.

The view of the new professional scientist committed to improving society's lot can be equated to that of the 'priests' of Mumford's megamachines, replacing the established religious priesthood. Since the interests of science are universal, Bacon could argue that he was working for a universal good. This was classical science's self-justification and it was a powerful one, helping it to become the dominant ideology over the past 250 years.

Mumford's megamachine - the combination of physical technique allied to the mass societal structure that applies it - is a useful concept when considering the technological dilemma of the limits to growth thesis and the idea of the sustainable society. Mumford maintained that the "myth of the machine" was false; humanity had only to come to its senses and realise that the promise of a better life for individuals within a system of technological determinism, wholly outside their control, was absurd.[110]

6.9.4 Machine, "self" and "environment"

Bohm and Edwards (1991) argue that the steady growth of technology throughout human history has been paralleled with an equally persistent psychological degeneration. They maintain that the most primitive and genuinely "human" existence was within highly co-operative, social bands of primal humans. But as tool use and its accompanying social structure evolved into more complex technology, the nature of thought itself changed, causing the individual consciousness to fragment into two. One part consists of the "self "as a subjective observer of reality, and the other part deals with the general representation of society including all "externalities: like the "environment", For many, the division of modern consciousness into distinct *observer* and *observed* components and the Western notion of "self" independent of "environment" lies at the core of the current environmental/technological dilemma.[111]

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[109] L. Mumford, *The Myth of the Machine: Technics and Human Development* (Harcourt, Brace and World, New York, 1967)
[110] *Ibid*
[111] D. Bohm and M. Edwards, *Changing Consciousness* (Harper Collins, San Francisco, 1991)

The separation of "self" from "environment" represents the point of intellectual convergence between ecophilosophers (for example O'Briant, 1974[112]; O'Riordan, 1976; Naess and Rothenberg, 1989[113]; Fox , 1995), advocates of sustainable development (for example, Rees, 1988; Girardet, 1992; Blowers, 1993; and Rogers , 1997), psychologists (Ornstein and Erlich, 1989[114]), poets (Snyder, 1989[115]), and social critics like Mumford himself. The idea that of human consciousness has 'evolved' to the point where it might consider itself separate from its natural context is now considered by many to be a dangerous human deception, and a chief cause of accelerating social and environmental violence.

Today we live in a fragmented world where we hold an affection and reverence for "nature" (or the "environment") but, at the same time, we depend upon a technology that it is destroying the natural world. To delude ourselves into thinking that the problem doesn't exist or isn't too critical, we tend to split the persona of technology into two parts (those dominating technological systems that are "out there" causing the earth considerable environmental damage [like electrical power plants, chemical factories, and so on] and those that are "in here", our personal technologies that feel natural to us, fascinate us, on which we are dependent [like electrical goods, computers, televisions, telecommunications and so on).[116] By splitting technology into two, we maintain the illusion that we as individuals are neither part of nor responsible for the technological fabric that makes up the modern world, nor are we at fault for the damage being caused to the biosphere. William Rees suggests that we need to abandon the term "environment" because it reinforces this destructive split:

> By definition, humankind cannot be part of the "environment". The very word separates "us" from "it". But the global reality belies the myth. The truth is that human beings are now the dominant species in all the world's ecosystems and the most powerful geological force on earth. From this perspective, we do not have environmental problems, the biosphere has a people problem. There can be no solution to our present dilemma unless we are prepared to accept this reality. There is only a singularity, the biosphere, and we are in the thick of it. Like it or not there is no "away". It is ironic that to resolve the environmental crisis we must first give up the environment.[117]

Our current level of comfort has been achieved through an unprecedented degradation of the biosphere on which future generations will depend. But our generation have developed an affection for, and dependence on, the technological conveniences that industrialisation has

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[112] W. H. O'Briant, 'Man, Nature and the History of Philosophy' in W. T. Blackstone (ed.), *Philosophy and the Environmental Crisis* (University of Georgia Press, Athens, GA, 1974)
[113] A. Naess and D. Rothenberg, *Ecology, Community and Lifestyle* (Cambridge University Press, New York, 1989)
[114] R. Ornstein and P. Erlich, *New World, New Mind* (Doubleday, New York, 1989)
[115] G. Snyder, *The Practice of the Wild* (North Point Press, Berkeley, 1989)
[116] Thayer, (1994), pp. 80-100
[117] Rees (1988), p. 17

offered. Any programme of ecological reform towards a sustainable society that does not take this into account will fail. Our dilemma is that, on the one hand scientific evidence suggests that the current consumption levels in developed nations are ecologically unsustainable and that extending our standard of living to six billion people could threaten the survival of the human species. On the other hand, social forces have been set in motion that will not be contained. Electricity, telephones, clean running water, damp-free homes - people in the undeveloped world who do not have these things want them no matter the ecological cost. Are we, in industrialised society to tell them that they cannot have them?

By locating the fearful part of technology outside our control we are trying to escape the sort of anguish that Mumford expressed throughout his life as an increasingly pessimistic observer of the evolution of technology and its effects on human existence. Because he believed that important characteristics like imagination, symbolic thought, and abstract language precede tool use in human evolution Mumford put his faith in a way out of the dilemma of technology by re-establishing an organic vitalism to replace a mechanistic order, and by exploding the myth of the machine as an automatic solution to the dilemma of our age.

In dealing with environmental and social problems, the modern deterministic and mechanical view of the world promotes a specialised instrumental approach, which relies heavily on scientific method and technological know-how. When this is associated with the relentless pursuit of material progress, based on a no-limits-to-growth mentality, we loose sight of ecological limits and the fact that beyond a certain threshold (carrying capacity) such a social system depletes the world's natural resources and overburdens the biosphere with waste products that are incapable of being absorbed by the planet's self-balancing system. In this way we undermine the earth's equilibrium-seeking mechanisms.

Faced with ecological overreach and collapse, the response has generally been limited to a strategy of policy reform geared to the technological solution - emphasising technological means for solving problems which are essentially social, political, economic, and ultimately cultural. In supporting wasteful and unsustainable lifestyles and social institutions, such a strategy has served only to postpone the inevitable 'day of reckoning'.

In *Gray World, Green Heart* (1994) Robert Thayer suggests that in the midst of an ecological crisis characterised by a deteriorating technological world we have latched on the increasingly popular notion of sustainabilty that raises questions about our technologies, our landscapes and ourselves. He is convinced that the notion of sustainability has been thrust of the forefront of our thinking and our policy debates because it promises to respond to the challenges posed by technology and nature. The urgency of the conflict means that the movement toward

sustainability, he argues, is both inevitable and essential. Sustainable planning, design and development may become the major means of easing the growing tension that exists between those who believe that technology can resolve all of our problems and those who know that it cannot. Through careful normative evaluation we can develop those technologies that can be proven to be sustainable, and employ these productively at a reduced cost to the ecosystem, within our resource availability, while maintaining our cultural integrity. To achieve this we need conduct as many experiments and look to as many alternatives as possible.

7

Sustainable City

Chapter 7

7.0 TOWARDS A SUSTAINABLE CITY

...we can't have a sustainable economy unless we build a physical setting to house it. The physical setting we presently dwell in itself exhausts our capital. It is, in fact, the biggest part of the problem.[8]



Figure 7.1 Repairing the Earth, Glasgow, Prague and Barcelona

[8] J. H. Kunsler, *The Geography of Nowhere* (Simon & Schuster, New York, 1994)

7.1 The good city?

The world is in the midst of a massive urban transition which is unprecedented in its scale and celerity. Throughout our history cities have been significant engines of economic and social development. As Jane Jacobs (1984) concludes in her study on *Cities and the Wealth of Nations*, in many ways, they now fulfil a more important role than individual countries or empires in the process of open-ended wealth creation, in large part because of their ability to adapt to change.

> The people who developed agriculture couldn't foresee oil depletion. The people who developed the automobile couldn't foresee acid rain...Economic development [is] a process of continually improvising in a context that makes injecting improvisations into everyday life feasible...Cities are open-ended types of economies in which our open-ended capacities for economic creation are not only about to establish "new little things" but also to inject them into everyday life.[2]

Cities provide capital, labour and markets for entrepreneurs and innovators at all levels of economic activity. As centres of industry and commerce, of wealth and political power, they account for a disproportionate share of a nation's income. Over the next few years, the World Bank estimates that in the developing countries of the world as much as 80 percent of economic growth (GNP) will take place in towns and cities.[3] But the 'benefits' of cities are not solely economic. Today's cities have the potential to be vibrant, sociable, life-enhancing centres of civilisation. They offer access to creativity, innovation, diversity and information, improved health, higher literacy, and a better quality of life. They embody the diversity and energy of human pursuits. Offering efficiencies, amenities and opportunities not found elsewhere, they are in many ways remarkable engines of economic and social progress. On average people who live in cities have higher incomes and live, healthier, easier lives than the emerging minority who live in rural areas.

> The urban future carries many risks for the physical environment and natural resources and for individual rights but it also offers vast opportunities. The experience of large cities as concentrations of human creativity and the highest forms of social organisation suggests that the future will open new avenues for human development.[4]

Throughout history attempts to limit urban growth have failed. Today in the developing nations huge numbers of people are choosing to live in and around cities every day. For some

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[2] J. Jacobs, *Cities and the Wealth of Nations* (Random House, New York, 1984)
[3] Carl Bartone *et al.*, 'Toward Environmental Strategies for Cities: Policy Considerations for Urban Environmental Management in Developing Countries', Urban Management Programme Policy Paper No. 18 (The World Bank, Washington, DC, 1994)
[4] United Nations Population Fund (UNPF) Report 1997 cited in J. Lichfield, "Super-cities threaten to swallow humanity. Developing world hosts explosive urban growth", *The Independent, May 1997*

urban migration is not only an inevitable aspect of modern life, but a positive phenomenon.[5] Urban areas continue to grow. As well as being the focus of global finance, industry and communications, cities are home to a wealth of cultural diversity and political dynamism. They can also be immensely productive, creative and innovative, offering the promise of a better life for their citizens. The Habitat Agenda recognises the potential of cities to integrate human, economic and technological resources to maximum effect while leaving the natural environment intact:

> Urban settlements, properly managed, hold the promise for human development and the protection of the world's natural resources through their ability to support large numbers of people while limiting their impact on the natural environment.[6]

Cities can directly and indirectly offer opportunities for protecting the environment in other ways. Directly, with proper planning dense settlement patterns can:

- reduce pressure on land from population growth;
- provide opportunities to increase energy efficiency;
- make recycling an economically feasible option;
- make the development of waste management infrastructure easier and more cost effective.

In indirect ways cities may help improve the environment by:

- reducing the environmental pressures from population growth (birth rates are three to four times lower in urban areas than rural areas);[7]
- providing opportunities for education on environmental issues and mobilise urban residents around these issues;
- offering higher per capita expenditures on environmental protection (in absolute terms and as a percentage of the GNP);[8]
- taking an active role in environmental management (from developing local strategies to protecting regional biodiversity and natural resources to collaborating with other cities in an effort to reduce global greenhouse gas emissions).

The future for most of the global population will undoubtedly be urban.[9] While those opposed to the city argue that urban life is too expensive and that it wastes resources, it is clear from the above that urban settlements have the potential to become a positive force in addressing

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[5] WRI, *World Resources 1996-97* (1996) points out there are currently more than 150,000 people being added to urban populations in developing countries every day.
[6] UN (Habitat II), (1996)
[7] U. S. Agency for International Development (US AID) Office of Environment and Urban Programs, *The Role of the City in Environmental Management, 1994 edition* (US AID, Washington, D. C., 1994)
[8] *Ibid*

environmental problems. Within the current global context, cities are now the fundamental engines behind economic growth – housing the administrative and financial centres for large global corporations. Issues of urban sustainability, of adequate standards of living and sufficient levels of personal and corporate safety are now firmly allied to issues of economic development. Maria Elena Ducci (1996) offers three other reasons why urban living is a good option and why a concentrated effort on improving the urban environment is important. These, in turn, involve freedom of choice, equality and efficiency:

- a large proportion of the population in the developed world lives in urban areas and there appears to be a "natural" tendency towards the urban way of life;
- the goal of universally improving living standards in order to provide a minimum level of access to basic services for all can only be achieved in cities. The concentration of people in urban areas facilitates the provision of social services and infrastructure;
- technological advances and improvements in agricultural productivity make it possible for a very small workforce (of less than 10 percent of the world population) to maintain adequate levels of food and raw material for the world population. The highest levels of productivity are achieved where there is less demographic pressure on the land. To produce efficiently it is best that the majority of the population live in cities.

In *The City Shaped* (1991), Spiro Kostof offers some simple general characteristics of cities that are worth briefly summarising here:

A. *Energised crowding* - they are places with high settlement densities, where, by definition, the crowding of people happens.

B. *Urban clusters* - they tend to come in clusters whereby a town is inevitably locked into hierarchical urban system.

C. *Physical circumscription* - they have a certain scope, whether material or symbolic, that separates those who belong in the urban order and those who don't.

D. *Differentiation of uses* - they are places where there is specialisation and where wealth is distributed unevenly. Within such a social heterogeneity hierarchies exist as do different ethnic groups, races and religions.

E. *Urban resources* - they are favoured by a source of income - whether through trade, intensive agriculture and the possibility of surplus food, or by a physical, geographical (a harbour), or human resource (a monarch).

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[9] 'Turn up the Lights: A Survey of Cities', *The Economist* (24 July - 4 August, 1995)

F. *Written records* - they rely on written records, like legislation, that support the construct of ownership.

G. *City and countryside* - they have a reciprocal relationship with the surrounding environment, which feeds them and which they, in turn, must protect, and provide services for. Separation is unwise and historically invalid. *Polis, civitas,* commune, township - these are terms that have applied to an urban settlement *and* its region. "Once the city loses sustenance from the countryside, the city is doomed".[10]

H. *Monumental framework* - they are distinguished by some kind of monumental definition that give the city a civic scale, and landmarks that provide a common identity for their citizens. Often these are technological in character - like the aqueducts in Rome. The European commune in the Middle Ages had its *palazzo pubblico* and its "civic" cathedral.

I. *Buildings and people* - finally they are made up of buildings and people. In his *Theory of Good City Form,* Kevin Lynch (1981) reminds us that "City forms, their actual function, and the ideas and values that people attach to them make up a single phenomenon".[11]

But although they may promise the 'good life', across the world today's cities seem to be converging and finding common ground, not in concentrated efforts to improve the environment and provide a better quality of life (as in Curitiba), but in a curious blend of splendour and squalor that seems to define the globalised economy in which they compete. Although cities offer many benefits to their populations, and harbour the potential to enhance the lives of individual citizens and to ease global environmental pressures, urban environments throughout the world are deteriorating (Chapter Three). Increasingly high levels of energy consumption, waste production and pollution mean that cities today are driving the global environmental crisis. And, around the world, the rapid growth of populations, the accelerating deterioration of the social and physical urban environment, and the flight of people and resources into peripheral areas (either in suburban or squatter settlements) are indications that cities are converging in crisis. As more and more of the world's people live in urban areas cities throughout the world are becoming more alike in terms growing unemployment, declining infrastructure, collapsing social compact, and institutional weakness.[12]

As discussed in the previous chapter, if we are to move towards a more sustainable form of society we must seriously consider the social, political, economic and technological dimensions of sustainability. But this will not be sufficient. The idea that environmental problems are the

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[10] P. Soleri, *Arcosanti: An Urban Laboratory?* (Avant Books, San Diego, CA, 1984), p. 17
[11] K. Lynch, *A Theory of Good City Form* (MIT Press, Cambridge, Mass., 1981), p. 36
[12] Cohen, 'The Hypothesis of Urban Convergence', (1996) pp. 25-38

consequence of deep seated social processes that can somehow be addressed independently of their physical settings needs to be opposed with a view that sees the production of physical structures as being firmly within the social process. Urban forms might then be redefined as spatial /temporal places/moments of intervention and transformation within the process. Cities have always been fundamentally about wealth creation and consumption. Getting things right in the city is the only real way to economic improvement for the mass of the global population. Rather than places where the rich minority get richer, they may offer the setting for the kind of fundamental redefinition of wealth, well-being and values that will be more conducive to the development of human potential. Such wealth creation depends on social collaboration and co-operation as well as social justice. Getting things right will involve the transformation of social relations *within* an urban setting and the continuous process of socio-environmental change that has been part of a long-running tradition aimed at the construction of an alternative society.

7.2 The rural-urban dichotomy

Raymond Williams (1973) examines the history of socio-environmental relationships in *The Country and the City* and identifies a number of themes that emerge in texts about the city from the sixteenth to the nineteenth century – money and law, wealth and luxury, the mob and the masses, and finally mobility and isolation. He says that in the past, as now, our real experience within the city and in the country is heterogeneous, yet our imagery is always of two opposing realities; in the rural-urban dichotomy.

Williams presents this dichotomy as one of the major binary classifications through which we become aware of a central part of our lived experience. He suggests that, in recognising the opposing concepts, we not only locate our selves in relation to the form of the contrast but we become more conscious of a "general crisis" in our society wherein that which has come to represent the immutable and imperishable in our lives is 'division' itself. He sees its symptoms all around:

> ...in the idea and practice of social classes, in conventional definitions of work and education, *in the physical distribution of settlements,* and in the temporal organisation of the day, the week, the year, the lifetime.

Williams argued that we experience these symptoms of division through changes in our "structures of feelings" brought about through the distinction between social modes of production and techniques of production. We refer to the technical changes as 'progress' but, since production is out of our hands, we experience only the external effects, and in the externality of the process we can feel either numbed or divided. In those times when the city

seemed alien to us, we looked to nature and the image of a natural, rural way of life, to guide our thoughts and actions.

> The city closes in on him now, and in his strange perspective it becomes the antithesis of what he believes. The citadel, not of Quality, the citadel of form and substance. Substance in the form of steel sheets and girders, substance in the form of concrete piers and roads, in the forms of brick and asphalt, of auto parts, old radios and rails, dead carcasses of animals that once grazed the fields. Form and substance without Quality. That is the soul of this place.[13]

Williams described the changing structures of feeling between the urban and the rural - what Fredric Jameson (1991) has translated as "new forms of practice and social and mental habits"[14] - at a time when it was still possible to put forward a theory constructed on the premise that a binary opposition existed between them. This was a time when the "city" could be a relatively easily defined place that was different, and could therefore be clearly distinguished from another sort of place called the "country". The division of two opposing socio-cultural systems, one of which is eroded under the forces of industrialisation, was a prominent element in the study of pre-industrial societies and of industrialisation. Today however these traditional paradigms are being threatened as the accepted division is put under considerable pressure. In a rapidly urbanising world the distinction may, in fact, no longer be a tenable one. Richard Skeates (1997) suggests that process of urbanisation is now effectively replacing both 'city' and 'country' with a homogeneous urban world, which renders the concepts anachronistic. He writes:

> We are beginning to understand that there has been a shift, a break with the past that means that we can no longer use the term 'city' in the way that it has been used to describe an entity which, however big or bloated is still recognisable as a limited and bounded structure which occupies a specific space. In its place we are left with 'the urban': neither 'city' in the classical sense of the word, nor 'country', but an all-devouring monster that is engulfing both...and in so doing collapsing the old distinction.[15]

When Williams wrote *The Country and the City* just over one third of the world's people lived in urban areas. Over the next 25 years another 2 billion is expected to be added and the proportion of the world population living in urban areas is expected to rise to almost two thirds.[16] This change will have vast implications both for human well being and for the environment. It will be within cities that human destiny will be played out, and the sustainability of the planet will be determined. As we stand on the edge of a new millennium we are witnessing a dimension to the urban revolution on a scale that could not have been imagined a hundred, let alone a thousand years ago.

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[13] R. M. Pirsig, *Zen and the Art of Motorcycle Maintenance* (Bodley Head Ltd., London, 1974), p. 356
[14] F. Jameson, *Postmodernism or, The Cultural Logic of Late Capitalism* (Verso, London, 1991)
[15] Richard Skeates, 'The Infinite City' in *City* 8 (June, 1997), pp. 6-20
[16] UNPD, (1995)

7.3 Out of control in the "space of flows"

The phenomenal growth of information technologies, high-tech industries and telecommunications during the 1980s and 90s is evidence (if evidence were needed) of humanity's innovative capacity for economic development. As Jacobs (1987) point s out modern cities have been the major engines of this economic growth but it has been achieved at the cost of unprecedented environmental damage.

Cities are the principal destroyers of earth's ecosystems and the greatest threat to our survival. They now have a global hinterland from which they draw their resources and they use up to three-quarters of the global consumption of fossil fuels. They generate the majority of greenhouse gases and account for the majority of the world's pollution. They are the major consumers of the world's tropical timber and their appetite is in danger of turning the planet into a desert. And yet the pressure for arable land is rapidly increasing. Urban demand accounts for around 40 per cent of the planet's photosynthetic capacity and this proportion is increasing. Soon there will be little land left that does not produce crops for human consumption. As post-war cities have sprawled outwards the sense of social cohesion has been eroded. In the cities of the South social instability among the world's poor is exacerbating environmental decline. While in the North suburban development has swallowed up farmland on urban fringes and produced a settlement model, which is energy profligate and unacceptable in a world threatened by global warming and hugely depleted reserves of fossil fuel.

Over the next thirty years or so an additional two billion people will be added to the cities of the developing world. This is close to the current combined population of India and China, two regions, which on their own are already capable of causing global environmental instability. This massive urbanisation will cause an exponential growth in the volume of resources consumed and pollution created. And yet half of this growing urban population will live without adequate shelter, electricity, sanitation or running water. They will swell the ranks of the 600 million people who already live in life-threatening urban environments.

The present form of postindustrial information-based globalised economy coupled with a propensity in advanced societies for suburban flight, will determine the course of early twenty-first century urban development, first in the developed world, and later world wide. Critics over the last twenty years have been predicting that the globalisation of information and culture heralds the end of the urban age.

> Since it is out of control, the urban is about to become a major vector of the imagination...We were making sand castles. Now we swim in the sea that swept them away.[17]

Social theorist Manuel Castells, in recognising the historical changes in emerging patterns of employment that have allowed post-industrial labour to detach itself from cultures, values, and communities, has pointed to the rise of "the space of flows in opposition to the space of places".[18] The new electronic communication technologies may well allow us if we choose, to live alone but, aware of the human need for community, Castells identifies that the real challenge of the new informational city lies in reconciling the "new techno-economic paradigm" and "place-based social meaning".[19]

> At the cultural level local societies territorially defined, must preserve their identities, and build upon their historical roots, regardless of their economic and functional dependence on the space of flows.[20]

Some commentators consider that reality is increasingly immaterial and that the 'space of flows' should be celebrated and promoted as part of a *Brave New World* in which 'virtual reality' environments increasingly shape our experience.[21] Christine Boyer (1996) in *CyberCities* and Martin Pawley (1998) in *Terminal Architecture*[22] both enthusiastically describe a world where virtual reality (pre-industrial pastoral scenes are produced holographically every morning) and sensory stimulation systems (our bodily senses are downloaded into machines, while our body parts simply receive and emit information stimuli to and from computer data banks and simulation programmes) tend to negate the power and traditional notion of place.

> The specifics of time , space and architecture that Sigfried Giedion discussed in the early 1940s have been condensed or eradicated by our instantaneous modes of telecommunications, telemarketing, telepresence, and telesurveillance.[23]

7.3.1 A premature obituary

> The Apocalypse shows us what we are resisting, unnaturally. We are unnaturally resisting our connection with the cosmos, with the world, with mankind, with the nation, with the family. All these connections are, in the Apocalypse, anathema, and they are anathema to us. We *cannot bear connection.* That is our malady. We *must* break away, and be isolated. We call that being

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[17] R. Koolhaus and B. Mau, *S, M, L, XL* (010 Publishers, London, 1995), pp. 969-71
[18] M. Castells, 'The world has changed: Can Planning Change?' in *Landscape and Urban Planning* (Elsevier, Amsterdam, Netherlands, 1992)
[19] M. Castells, *The Informational City* (Blackwell Publishers, Oxford, 1989)
[20] *Ibid*
[21] The term 'virtual reality' was introduced in computer science in the 1980s to designate nearly exact simulations of audiovisual experience. The field has grown to include simulations of holistic environments.
[22] M. Pawley, *Terminal Architecture* (Reaktion Books, London, 1998)
[23] M. C. Boyer, *CyberCities* (Princeton Architectural Press, New York, 1996), p. 11

> free, being individual. Beyond a certain point, which we have reached it is suicide (emphasis in original).[24]

Like the premature obituary of Mark Twain, the death of the city, although widely publicised, has been highly exaggerated. Human history is awash with predictions of the city's demise and yet it has survived. Despite all the problems and challenges of urban life, they continuously manage to re-invent themselves. Postmodernism (as defined by Fredric Jameson (1991), offering as "a profound collective self-transformation , a reworking and rewriting of an older system"[25]) has promised to get rid of whatever we find restrictive, or unsatisfying about modernity. Although the extreme version of this philosophy, when applied to urban theory has either engendered a theoretical paralysis (on what basis can a claim be made for one theoretical viewpoint over another?) or implied the end of the professions, of civilisation, and possibly of the human species (promoting the notion that we must destroy the village in order to save it), in encouraging a wider range of sensitivity, it may be that it can help guide responses to some of the new challenges facing urban planning.

In attempting to describe the postmodern urban condition Michael Dear (1999) has recently pointed out that its promotion of radically re-orientated new ways of thinking has resulted in "a totally new appreciation of diversity and difference" (racial, ethnic, and gender issues appear more often on the social agenda); "Self conscious questioning of the relationship between geographical knowledge and social action" (Regionalism);[26] and "a reassertion of the role and significance of space in social theory and social process".[27] Dear (1999) believes that there is every reason to think that postmodern society is as rooted in its urban place, as modernist and traditional societies have been. What will be different will be the method of settlement and the urban forms that result.

7.3.2 The future's history

As the crisis of the modern age appears all around us in our formal social institutions and in our daily consciousness and everyday lives, we can experience a sense of historical dislocation, social malaise, and personal disorientation. Even as the industrial-economic engines of growth and social progress promise a better life to those who can afford to pay, fatal threats to human life and the environment loom large on the horizon. The future of most of humanity, for the first time in history, is fundamentally linked with the process of urbanisation and yet the

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[24] D. H. Lawrence, *Apocalypse* (Penguin Books, London, 1974), p. 125
[25] Jameson, (1991)
[26] Dear, (1999), pp. 303
[27] *Ibid,* p. 99

social infrastructure of urban agglomerations is rapidly deteriorating under the crushing weight of drug abuse, violence and social prejudice. And still the corporate faces, reflected in the gleam and polish of the postmodern city skyscrapers, the icons of late capitalist urban planning, shine on.

David Harvey (1996) has pointed out that the qualities of urban living in the twenty-first century will define the qualities of civilisation and yet, when we consider the current state of the world's cities, it is unlikely that future generations will find that civilisation particularly sociable or pleasant.

> Every city has its share of concentrated impoverishment and human hopelessness, of malnourishment and chronic diseases, of crumbling or stressed out infrastructures, of senseless and wasteful consumerism, of ecological degradation and excessive pollution, of congestion, of seemingly stymied economic and human development, and of sometimes bitter social strife, varying from individualized violence on the streets to organized crime (often an alternative to urban governance), through police state exercises in social control to massive civic protests (sometimes spontaneous) demanding political-economic change.[28]

Optimism about possible urban futures must be tempered with the knowledge that around the world our cities are fast becoming intolerable and horrifying places that appear to be destroying the planet and the well being of humanity. As witnessed daily on our television screens and in our newspapers, they seem to be disintegrating into bureaucratic mobilisation, environmental catastrophe, chronic social war, and a condition of permanent violence. Far from offering a pluralist and dynamic society, the unsustainable patterns of consumption among dense city populations, the concentration of industries, the intense economic activities, increased motorization and inefficient waste management, all suggest that the major environmental problems of the future will be city problems. Far from being excited about the future, many people are worried:

> For many, then, to talk of the city of the twenty-first century is to conjure up a dystopian nightmare in which all that is judged worst in the fatally flawed character of humanity collects together in the same hell-hole of despair.[29]

It is unlikely that the planet can accommodate an urbanised humanity which consistently draws more and more resources from an ever decreasing hinterland, or routinely dumps more and more of its waste in the biosphere, the oceans and the atmosphere. If the rhetoric about handing on a decent living environment to future generations is to have any meaning whatsoever cities will need to transform themselves yet again.

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[28] D. Harvey, 'Cities or urbanization', in *City* 1/2 (1996), p. 38
[29] *Ibid*

Few architects or urban designers today would disagree with Christopher Alexander's (1965) attack on the formality and sterility of modernist 'treelike' city planning:

> The city is a receptacle for life. If the receptacle severs the overlap of the strands of life within it, because it is a tree, it will be like a bowl full of razor blades on edge, ready to cut up whatever is entrusted to it. In such a receptacle life will be cut to pieces. If we make cities which are trees they will cut our life within to pieces.[30]

The 'big solutions' of twentieth century modernist urban planning inspired by Le Corbusier (*La Ville Contemporaine*, 1922 and *La Ville Radieuse*, 1933) and the Congrès Internationaux d'Architecture Moderne (CIAM, 1933) have been discredited for their rigid vivisection of human life into distinct areas for housing, working, and leisure, all thinly connected by traffic arteries (now thoroughly congested). But in these days of escalating environmental decline it seems that the integration of the urbanisation question into the environmental-ecological question, what David Harvey has called a *"sine qua non* for the twenty-first century",[31] will require not only theoretical foundations, but the kind of radical social and urban transformation that many have believed impractical or impossible. As Harvey points out, perhaps the chief sin of the twentieth century was that "urbanisation happened and nobody much either cared or noticed".[32] Now that the ecological stakes are much higher it would be a grave error to make the same mistake. So, if we accept a need to strengthen the fragile bonds that hold society together and our responsibility to each other and to the planet, postmodernism's rejection of the possibility of planning our cities may ultimately represent its fatal weakness. Perhaps, as some have argued, we have been waiting for a problem big enough to equal that of the nineteenth century industrial city.[33] If so we may have found it in the environmental imperative. And while our perceptions of place and time may be different in the Informational City, we are, in the final analysis, still human and there will be no substitute for human imagination and vision. As populations and cities continue to grow rapidly, and environmental problems escalate, we need as much of both as we can muster.

Marshall McLuhan in the 1960s predicted that the whole world would one day become a "global village" with every member of humanity communicating with one another in a real-time simulacrum of a Neolithic community.[34] Just as advances in technology transformed brought about the industrial society, rapid changes in information technology are producing a global

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[30] C. Alexander, 'A city is not a tree' in *Architectural Forum,* 122, (April 1965)
[31] Harvey, 'Cities or urbanization', (1996), pp. 38-61
[32] Ibid
[33] M. Breheny, 'Centrists, Decentrists and Compromisers: Views on the Future of Urban Form' in M. Jenks *et al* (eds.), *The Compact City: A Sustainable Urban Form?* (E & FN Spon, London, 1996)
[34] M. McLuhan *et al, War and Peace in the Global Village* (Hardwired, San Francisco, 1968)

society and, at the same time disseminating knowledge about the scale of the world's environmental and social crisis. If the traditional notion of economy (in terms of the exchange of commodity) is being transformed into a new "creative economy" in which the exchange of ideas is to form the basis of future prosperity then the recognition that the earth's ecology is a fragile and limited entity must infuse the knowledge based sustainable society.

Dobson (1995), in discussing green political thought, reminds us that the Treaty of Rome of 1957 that established the European Economic Community (EEC) contained no explicit reference to the idea of environmental policy or environmental protection. By 1992, however, and the Maastricht Treaty, environmental protection, sustainability, and sustainable growth were all explicitly mentioned in the articles. Now the environment has achieved full status as a priority objective within the European Union (EU). The political and economic history of this striking shift in direction is complex but it clearly involves the kind of cultural change that demands a response from professional policy-makers.[35]

The raising of environmental awareness, and the subsequent adoption of 'green consumerism' in much of the developed world over the last few decades is key to the radical change that is to follow but, as Dobson (1995) points out, it is merely Act One of a global environmental "paradise play". As confirmed by the United Nations Conference on Human Settlements (Habitat II) in 1996, Act Two will be played out in the world's cities, within the 'space of places', even if the global audience ultimately experiences it through the 'space of flows'.

7.3.3 Cities' on line' to the sustainable future

The world's cities represent the basic unit of critical analysis that will guide strategies towards the sustainable society but the success of a city is now a function of its ability to integrate itself in the global society. Even if some cities want to remain traditional it is unlikely that they can resist the structural and institutional renovations in the face of steadily increasing urban populations. Cities that are plugged in to a television cable, an electronic web, a telecommunications network, and a financial-markets information service:[36]

> ...will evolve down varying paths. Global cities, like New York and London will no doubt seek to strengthen their positions...attractive residential locations will become denser...Communities that have been marginalized through isolation and poverty will try to improve their conditions through

[35] Dobson, (1995)

[36] A. Blair *et al,* 'Globalism and Local Realities' in M.A. Cohen et al (eds.), *Preparing For the Urban Future* (Woodrow Wilson Centre, Washington, D.C., 1996)

> remote education, telemedicine, and other kinds of electronically delivered low cost services...all will seek the advantage that makes the most local sense[37].

In *e-topia* William Mitchell (1999) presents his vision of a pluralist dynamic physical future while offering a positive spin on the relationship between the electronic revolution and the environment. In his insistence that the power of place will prevail Mitchell offers a more humane and ecological future for postmodern urbanity. As the traditional geographical relationships and priorities weaken, he sees a transition towards:

> ...settings that offer particular cultural, scenic, and climatic attractions - those unique qualities that cannot be pumped through a wire - together with those face-to-face interactions we care about most.[38]

It is highly unlikely that cities are about to take off into hyperspace or, as Koolhaus and Mau (1994) have suggested, about to become "a major vector of the imagination".[39] But as they create new and dynamic spatial and social orders by fabricating direct links within a global system they *are* radically changing. Perhaps what is of most significance to all of us is that, whether we like it or not, we are all becoming urbanised and the environmental costs of our transition to an urbanised world may be more than any of us can afford. In this sense it is not the 'city' but the 'urban' that is out of control. And it is towards the phenomenon of urbanisation that our attention is being turned. The 'urban' is becoming the overwhelmingly dominant way in which the majority of people experience the world whether they live in cities or not. Many observers, however, now point to a growing set of problems resulting in environmental degradation, and a whole host of social pathologies, which could render cities uninhabitable.

7.4 The unsustainable city

The *Declaration on Human Settlements* from the 1996 Habitat II Conference, signed by the representatives from 171 countries stated the following:

> We have considered, with a sense of urgency, the continuing deterioration of conditions of shelter and human settlements... To improve the quality of life within human settlements, we must combat the deterioration of conditions that in most cases, particularly in developing countries, have reached crisis proportions. To this end, we must address comprehensively, inter alia, unsustainable consumption and production patterns, particularly in industrialised countries; unsustainable population changes, including changes in structure and distribution, giving priority consideration to the tendency towards excessive population concentration; homelessness; increasing poverty; unemployment; social exclusion; family instability; inadequate resources; lack of basic infrastructure and services; lack of

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[37] W. J. Mitchell, *e-topia: Urban Life, Jim – but not as we know it* (MIT Press, Cambridge, Mass., 1999), p. 144

[38] *Ibid,* p. 155

[39] Koolhaus. and Mau, (1995)

> adequate planning; growing insecurity and violence; environmental degradation; and increased vulnerability to disasters.[40]

Contemporary cities are responsible for considerable environmental damage. In the developed world this damage stems from car dependency, low energy efficiency, high resource use and urban structures that have developed in response to a society that is driven by materialism and economic growth, rather than considerations of environmental sustainability. Modern cities are also places of vast inequalities in terms of the different life chances of their citizens, and access to opportunities. They are therefore physically, economically and socially unsustainable. In terms of human health this has negative consequences.

There is an uncomfortable feeling that, in many ways we have been here before. In various contemporary accounts of the unsustainable nature of our current cities, in both the developed and the less developed nations, there are distinct echoes of the socialist realist tradition in literature[41] and from critical urban observations from the mid-nineteenth and early twentieth century. In England these include Henry Mahew's *London Labour and the London Poor*(1851-62), Charles Booth's *Conditions and Occupation of the People in East London and Hackney* (1887), Jack London's *People and the Abyss* (1903), and later George Orwell's *Down and Out in Paris and London* (1933). In the United States Jacob Riis's *How the Other Half Lives* (1903) and reports on the conditions of life in the African-American ghettos such as W.E.B. Dubois's *The Philadelphia Negro* (1899).

These accounts described cities that were too big, too congested, too polluted, too devoted to private gain, and too little concerned with the public welfare, especially of the poorest citizens. For example, in *The Condition of the Working Class in England* (1845) Friedrich Engels recognised that:

> What is true of London, is true of Manchester, Birmingham, Leeds, is true of all great towns. Everywhere barbarous indifference, hard egotism on one hand, and nameless misery on the other, everywhere social warfare, every man's house in a stage of siege, everywhere reciprocal plundering under the protection of the law, and all so shameless, so openly avowed that one shrinks before the consequences of our social state as they manifest themselves here undisguised, and can only wonder that the whole crazy fabric still hangs together.[42]

Engels built the bulk of his argument mainly by walking around and describing what he saw. But he grew frustrated of simply *telling* people about the social misery of the working class. He

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[40] UN (Habitat II), (1996)

[41] From Charles Dickens and Mrs Gaskell in England and Upton Sinclair and Theodore Dreiser from the United States.

[42] F. Engels, 'The Great Towns' from *The Condition of the Working Class in England* (1844-5) cited in R. T. Le Gates and F. Stout, *The City Reader* (Routledge, London and New York, 1996), pp. 46-55

wanted to *show* them the full horrors of industrial urbanism by taking them on a tour of the working-class districts of Manchester. Like Dante's *Inferno*, his account descends deeper and deeper into the filth, misery and despair that characterised the greater part of the city.

> ...we must confess that in the working-men's dwellings of Manchester, no cleanliness, no convenience, and consequently no family life is possible; that in such dwellings only a physically degenerate race, robbed of all humanity, degraded, reduced morally and physically to bestiality, could feel comfortably at home.[43]

Today many of the dystopian elements are the same; the concentrated impoverishment, the diseases and the social upheaval were familiar problems to our nineteenth century forebears. Poverty and human hopelessness, like ecological degradation and pollution are not a twentieth century phenomenon. The legacy of decisions made by nineteenth century industrialism is real enough. But the scale and speed of twentieth century urbanisation, its global nature and its environmental impact, has presented the current generation with an unprecedented moral and ethical dilemma. We might forgive our forebears but today we are being made aware that our decisions about cities today will determine the quality of life for generations to come. We also know that if we do nothing we will fail them. And while the fragmentation of our modern lives might mean that today the notion of what the city is has become confused it has fallen on our generation to understand the nature of this challenge and to explore sustainable alternatives in urban living. No-one today advocates pollution. Our governments have agreed to develop laws to reduce the environmental impact of urbanisation. Yet the crisis deepens. Some say we deserve our increasing pollution because according to our structure of values, so many other things have priority over achieving a viable ecology (White, 1967). Our generation have both inherited the 'crisis' and contributed to it. What we do about it will depend on what value we put on the lives of future generations? A principle, agreed at the Rio 'Earth Summit' is that people are entitled to a healthy and productive life in harmony with nature. But what might be left of 'nature' in a world of sprawling mega-cities?

> The modern city reverts beyond even the archaic blood group to a herd territory of alienated humanity and to all that is demonic in human society. The city in our time is the secular altar on which propinquity and community are sacrificed to a lonely anonymity and privitized automization; its culture is the debased creature of commodity production and the advertising agency, not the gathered wisdom of the mind; and its claims to freedom and individuality are mocked by the institutionalised manipulation of unknowing masses among whom crass egotism is the last residue of selfhood that once formed the city's most precious human goals.[44]

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[43] *Ibid*

[44] Bookchin, 'The Myth of City Planning' in *Towards an Ecological Society* (1980), p. 135-6

Today, as we are confronted by a much broader crisis, which is demanding amongst other things that we adopt a new way of thinking about our cities, we are beginning to see that the poverty of the living conditions in Engel's *Great Towns* was an integral part of a much larger cultural transformation.

7.5 Urban sustainability

In 1976, the UN held its first global conference on human settlements: Habitat I in Vancouver, Canada , as part of the International Development Strategy for the United Nations' Second Decade, with the objective "to exchange experiences, stimulate innovation, and ensure the broadest collaboration and dissemination of new ideas and technologies related to the setting of man's co-existence".[45] The conference drew international attention to problems in settlements of all kinds, rural as well as urban, at a time when there was still hope that rapid urban growth could be contained.

Amongst the delegates, Buckminster Fuller shared a platform with Paolo Soleri, discussing such development challenges as the need to improve quality of life, to achieve more equitable and fair access to resources, and to create better living conditions for the most disadvantaged groups in the developing world. Emphasis was placed on the poverty and human degradation suffered by the majority of the population in a world of sharp disparities in economic and social opportunities in the context of the New International Economic Order. Concern was expressed over post-war demographic explosion and massive urban migration that had seen almost 300 million people move into urban areas in underdeveloped countries since 1950. Among the main recommendations for settlement made at the conference was that "planning on all levels should be redefined as an ongoing process that requires observation, evaluation, and research".[46]

In Istanbul, Turkey, in 1996, "The City Summit" focused on the urbanisation process itself recognising that humanity is faced with two unprecedented challenges, constituting the urban question within the environmental crisis:

- How can we provide adequate shelter and livelihoods for the world's ever-growing numbers of urban citizens?
- How can we achieve sustainable human settlements in an urbanising world?

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[45] United Nations Conference on Human Settlements (Habitat), *Vancouver Declaration on Human Settlements and a Plan of Action* (UNCHS, 1976)

[46] M. Schteingart, "What Has and Has Not Changed Since Habitat I" in *Preparing for the Urban Future* (The Woodrow Wilson Center Press, Washington, D.C., 1996) pp. 66-79

7.5.1 Frameworks for achieving urban sustainability

> Cities consume the majority of the world's resources and contribute the majority of the world's waste products and pollution. With nearly half of the world's population now urban dwellers, the fate of the environment depends on the future development of the city - the way it functions, the way it is planned, the way it relates to the rest of the world and its architecture. There is an imperative to assess cities not only by their cultural output but also by the implications they have for the environment and to gain a greater understanding of how to reduce their dependence on global resources.[47]

Today the city represents a legitimate and immense problem. Action is now needed to address acute global and urban environmental problems. The city and everything that it contains is as much part of the solution as it is a contributing factor to these ecological problems. The recognition that the future mass of humanity will be located within urban environments demands that environmental politics pays as much attention to the qualities of the built and social environment as it now typically does to the 'natural' environment. From around 1990 onwards global, regional and local efforts directed towards the confirmation of the unsustainable urban condition, understanding the challenge that it represents, and searching for alternatives to it have been collectively described under the aegis of the search for the *sustainable city.* The urgency of the need to move towards the sustainable city has become a rallying call for many environmental activists and politicians in recent years (WHO, 1987; Commission of European Communities, 1990; OECD, 1990; UN (Habitat), 1990; ICLEI, 1991; World Urban Forum, 1992; Breheny, 1992; Girardet, 1992; Haughton and Hunter, 1994; Jenks *et al,* 1996; Burgess *et al.,* 1997; and Roseland, 1998).

7.5.2 The UNCED Agenda 21

The WCED Brundtland Report (1987) made it clear that the kind of lifestyle enjoyed by the citizens in the North, including the way in which our cities are planned, constructed, and maintained, is not environmentally sustainable. This was the central message that inspired the Rio Earth Summit' and resulted in the signing of the massive Agenda 21 as the basis for turning around the development process and bringing it onto a sustainable path.

In Rio international agreement was reached on a Framework Convention on Climate Change and a sustainable development strategy for the twenty-first century, known as Agenda 21 - a 500 page action plan providing a framework for various programmes including:

- the promotion of energy efficient technologies and practices;

- the promotion of environmentally sound energy systems including new renewable energy systems (solar, wind, hydro, biomass, geothermal, ocean, animal and human power but excluding nuclear) - especially in developing countries;
- the review of energy supply policies;
- the development of energy planning and programme management skills;
- the setting of energy efficiency and emission standards;
- the encouragement of education and awareness raising;
- the development of less polluting and safer transport systems;
- the integration of transport planning strategies and urban and regional settlement development strategies.

7.5.3 The WHO Healthy Cities Project

In 1987 11 European cities became the founding members of the World Health Organisation's Healthy Cities Project, an initiative of the WHO Regional Office for Europe. It aims to achieve policies which promote and support the health of their citizens. Hancock and Duhl (1986) defined the model for the health-promoting city as "one that is creating and improving those physical and social environments and expanding those community resources that enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential".[48]

Health is considered as central to the agenda of sustainability. The necessary relationship between economy and health is defined as equity; between health and environment as viability; and between environment and economy as sustainability. Making cities more physically, economically, and socially sustainable would not only reduce environmental impact but also improve levels of human health both directly by reducing pollution and indirectly by facilitating lifestyle changes. Global benefits in terms of reduced greenhouse gas emissions and ozone depletion would be matched at the local scale by creating healthier towns and cities. The essential elements of a healthy city are:

- clean water supply;
- clean air;
- low noise levels;

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[47] T, O'Riordan, cited by R. Talbot, 'Sustainability: Opportunities for Architectural Research and Practice', a paper presented at the Department of Architecture and Building Science, University of Strathclyde (January 1994)

[48] T. Hancock and L. Duhl, 'Healthy Cities: Promoting Health in the Urban Context', *WHO Healthy Cities Paper 1* (FADL, Copenhagen, 1986)

- adequate shelter from the elements;
- efficient sanitation;
- freedom from poverty and fear.[49]

But to satisfy the requirements of health promotion defined by the Healthy Cities project, a healthy city would have to do more than this. It would have to be an environment in which both physical and mental health was maximised and in which the health of individuals and the health of the community were considered as interdependent. In so far as the physical aspect is concerned a healthy lifestyle might, for example, involve facilitating cycling and walking as the chief means of transport. Opportunities for physical exercise must be widely and equally accessible to all, and children in particular, should have every opportunity to move around safely on foot and by bicycle, to and form school, and in play. Adequate, damp-free housing, housing with affordable heating, should be available to everyone, regardless of income.[50]

Non-physical aspects would involve the creation of a low-stress environment, within smaller scale and more varied neighbourhood with supporting social networks.

> On an urban scale this means an urban structure which minimizes the stress of journeys to work and shop, to be achieved by land use and transport policies integrated in such a way as to minimize distances travelled.[51]

In general the built environment should be structured to reduce inequalities, eliminate the preconditions for racism, be sensitive to the needs of women, children and the elderly, and reduce unemployment. The emphasis on the Healthy Cities Project is on the process of building community and the institutional support needed for health at the urban level.

7.5.4 The CEC Green Paper on the Urban Environment

The European Commission in Brussels put forward its paper (CEC, 1990) to highlight the functional, social, economic and environmental problems in today's cities and put forward objectives and directives towards a more sustainable urban environment and established a strong policy link between urban planning and environmental policy and re-establishing old relationships between town planning and issues of sustainability. Along with Agenda 21, the CEC Green Paper has significant bearing on the sustainable city debate because of the political weight behind them. Within the United Kingdom central government the shift towards sustainable urban development policy was signalled in the white paper The Common Inheritance

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[49] Smith *et al*, (1998), p. 125

[50] A. Tsouros, *World Health Organisation Healthy Cities Project: A Project Becomes a Movement* (WHO/FADL, Copenhagen, 1990)

(UK Government, 1990). The Green Paper was also instrumental in framing UK Environmental Protection Act (UK Government, 1991) and the UK Strategy for Sustainable Development (UK Government, 1994), highlighting the role of the planning system and the need for policies on land use and transport, was drawn up in response to the Rio Earth Summit.

7.5.5 The UN Sustainable Cities Programme

In 1990 the United Nations Centre for Human Settlements (Habitat) launched its Sustainable Cities Programme. Its principal goal is to provide municipal authorities in developing countries with an improved environmental planning and management capacity which will strengthen their ability to define the most critical environmental issues, to identify available instruments to address these issues, and to involve all those whose co-operation is required in concerted and practical action. The Programme is designed to promote the sharing of expertise between cities in different regions of the world. In August 1991 representatives from 130 cities signed the *Toronto Declaration on World Cities and their Environment*, committing these cities to the preparations of sustainable development plans.

7.5.6 The International Council for Local Environmental Initiatives

The first experiments in creating local institutions and initiatives, and establishing responsibilities for realising sustainable urban development originated from the United States in the mid-1970s and, more potently from European cities in the mid-80s. The experiments grew rapidly through international conferences leading up to the 'Earth Summit', when local authorities and NGOs put forward the view that ordinary citizens will be the real actors in any play that delivers genuinely sustainable development. The International Council for Local Environmental Initiatives (ICLEI) was created with the assistance of the UN Environmental Programme and the International Union of Local Authorities (IULA); and its policies were endorsed in the IULA Oslo Declaration of June 1991. It was these initiatives which ensured that the Earth Summit's Agenda 21 document that contained the basis of a strategy for the reconstruction of community initiatives from the grass roots, based on people's needs rather than on priorities determined from above.

7.5.7 *The World Urban Forum*

'Local Agenda 21', as defined in Chapter 28 of Agenda 21 was supplemented by the 'Curitiba Commitment ' endorsed by the World Urban Forum in 1992. In many ways this

[51] Smith *et al*, (1998), p. 125

constitutes a blueprint for action which individual cities can follow in drawing up sustainable development plans in consultation with their local communities. It sets out the basic institutional principles for the reorientation of the development process as a whole (environmental, social, cultural, social and economic planning and management). Essentially it proposes that:

- local government should be a significant focus of development programmes;
- networking between local areas, rather than hierarchical relations, should be the preferred method of communication (and potentially resourcing) initiatives;
- decision-making within local areas, whilst being co-ordinated by local government, should operate through active consensus of all stakeholders.

In addition to the above the *OECD Urban Programme* (1990) aimed at enhancing an understanding of how ecosystems work within urban areas and evaluate good practice in urban environmental improvement. The *OECD Ecological City Programme* (1994-5) is concerned with developing policies and processes aimed at the clarification of the meaning of sustainability for cities, and methods by which it can be pursued. There have been a series of regional European Union (EU) initiatives including *Towards Sustainability: the Environmental Action Plan 1993-2000,* which was accompanied by a *Report on the State of the Environment* in 1993 and underlined the urgent need for action. The main goal of the programme was to raise and change public attitudes and behaviour within EU countries in five key areas - industry, energy, transport, agriculture and tourism - the link of all of these to the urban environment is explicit in the report.

In the mid-1990s *The ESRC/SERC,* launched a major research funding programme, the *Global Environmental Change Initiative,* aimed primarily at advancing an understanding of issues related to clean technologies and demographic change/environmental relationships. Projects funded under the heading "Cities and Sustainability" were included, and emphasis was placed on the holistic and cross-disciplinary nature of the research task, which might involve engineers, social scientists and architects working alongside local authorities, businesses or communities.[52]

The 'Earth Summit' showed that environmental concerns are present in all countries and at all levels of society but it did not bring about fundamental changes in national decision-making mechanisms which are still based on conventional economic criteria. Along with the cluster of

[52] R. Talbot, 'Sustainability: Opportunities for Architectural Research and Practice', a paper presented at the Department of Architecture and Building Science, University of Strathclyde (January 1994)

conferences and conventions which followed, it did, however increase awareness in the international community, of the need to move towards sustainable development.

If the concept of sustainability is changing the way in which development is understood and promoted, then the way that cities are understood, planned, and managed must also be changed with a focus on the goal of urban sustainability. Considering the rapid global urbanisation rate and the fact that within the next decade most of the world population will be living in cities there is urgent need for this change.

It has long been accepted that rapid growth in population numbers, along with economic growth and industrialisation, and the associated per capita increases in resource use, contributes directly or indirectly to many serious global environmental problems. These green agenda problems include; global warming, ozone layer depletion, deforestation, exhaustion of non–renewable resources, and the loss of biodiversity (Chapter 1). More recently the reinterpretation of urban problems associated mainly with poverty has elicited a brown agenda.

Because of the burden that cities place on the environment, they have taken centre stage, in an unfolding "global environmental drama".[53] The agglomeration of economic activities and the high levels of resource consumption among dense city populations ensure that cities use over three-quarters of the world's resources and produce a similar proportion of its total waste, even although they occupy only two per cent of the earth's land surface. The impact of cities is felt locally and globally. For example as major consumers of energy city populations causes both regional and global air pollution with deleterious effects on the health of people and the biosphere.

After the Earth Summit international attention was directed to the fact that the global green agenda could not be addressed until the urgent problems of social deprivation and inequalities within cities are resolved.[54] But the boundaries between global environmental sustainability and urban sustainability are difficult to define due to their complex interrelationship. Although for analytical and practical purposes these 'different' agendas are often considered separately, in reality they are inseparable. Real progress will require advancements in both fields (on both agendas) simultaneously. Understandably the strong international effort directed towards the brown agenda is aimed mostly at improving the living standard of the world's poorest citizens, those who have neither basic services nor adequate housing. Yet, until recently, very few people were questioning the development goal being pursued, or the effect of Third World urban

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[53] W. N'Dow, 'Habitat II', foreword in H. Girardet, *The Gaia Atlas of Cities: New Directions for Sustainable Urban Living* (Gaia Books, London, 1996)

[54] Stren *et al*, (1992)

development programmes on the global environment. More people are beginning to accept that changing the direction of urban development will require a change in the current patterns of consumption.

For a nation to be more developed or wealthy has, until now, meant to have a higher per capita income and a higher GNP. For individuals within these nations this has translated into more square feet in their houses, more and bigger cars, more power, more consumer goods, more of everything. There seems to be two alternatives within this conception of wealth:

- The majority of the world's people can remain poor and underdeveloped so that the minority who are already relatively wealthy can continue to improve their standard of living;
- Widespread development could begin to reach the poor counties. As a result an ecological crisis of unknown dimensions could take place: global warming could cause large areas of land to be flooded by sea water; pollution could reach unbearable levels in cities; a major portion of the earth's natural resources could be lost; or some other form of environmental degradation which has not yet begun to take effect may begin to emerge.

New meanings need to be assigned to the concepts of development and progress, and certain core objectives, which have hitherto appeared to give structure and meaning to our lives and society need to change. Instead of looking for "more" we need to search for "better", to seek out quality in the built environment, instead of quantity.

7.6 Planning for sustainability

The *brown agenda,* presents a renewed challenge to the planning and management of cities and is concerned with social and physical urban environmental problems mainly associated with poverty; problems of air and water pollution, inadequate waste management, the lack of basic services and green areas, declining infrastructure, and poor housing conditions, as well as issues of health, crime, violence, and social exclusion. While Michael Breheny (1992) at the start of the 1990s highlighted the lack of any cogent debate on issues of urban sustainability, a growing body of work now exists which examines and promotes the idea of the 'sustainable city' or 'sustainable urban development' in a general sense (see, for example, Stren *et al* 1992; Haughton & Hunter, 1994[55]; Smith *et al.*, 1998), in relation to particular issues like energy consumption, pollution, and transportation (for example, Nijkamp & Perrels, 1994[56]; World

[55] G. Haughton and C. Hunter, *Sustainable Cities* (Jessica Kingsley Publishers, London, 1994)
[56] P. Nijkamp and A, Perrels, *Sustainable Cities in Europe* (Earthscan Publications, London, 1994)

Resource Institute [WRI], 1996); Girardet (1999), and with regard to urban form (for example, Breheny, 1992; Calthorpe, 1993[57]; Jenks *et al.* 1996; Frey, 1999[58]).

7.6.1 Adopting a circular metabolism

Urban sustainability requires that we see urban systems as ecosystems, where humans through their actions, have produced changes that have thrown the global ecosystems off balance. The challenge then is to establish what actions need to be taken to counter the negative effects of human activity and maintain equilibrium within the parameters of sustainability. A city's use of resources has been measured in terms of its 'ecological footprint' - an area geographically dispersed throughout the world and much larger than the physical boundary of the city itself [2.5.1].[59] According to Herbert Girardet (1992) the key to the reduction of urban ecological footprints lies in cities adopting a "circular metabolism", where consumption is reduced by implementing efficiencies and where re-use of resources is maximised.[60] Material recycling, waste reduction, energy conservation and the use of renewable energy sources are approaches, which are recognised as part of this strategy. Girardet argues that, since the majority of current production and consumption takes place in cities, the current "linear metabolism" involving processes that involve high levels of production and consumption must be replaced by those that aim at a circular system of use and re-use. Such a process would increase a city's efficiency and lessen its environmental impact.

7.6.2 Sustainable cities for a small planet

There seems to be little doubt that many of the world's major environmental problems will only be solved through new ways of planning and managing cities, by adopting different urban lifestyles, and through public participation in the process of decision-making and in the implementation of urban policies. Following Girardet, Richard Rogers (1997) believes that to achieve a circular metabolism cities must be planned to manage their use of resources. In order to move towards this he argues that we need to develop a new from of "comprehensive holistic urban planning" that will signal a "new and dynamic equilibrium between society, cities and nature ".[61] In *Cities for a Small Planet* (1997) Rogers describes his approach to urban

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[57] P. Calthorpe, *The Next American Metropolis: Ecology, Community and the American Dream* (Princeton Architectural Press, New York, 1993)
[58] H. Frey, *Designing the City: Towards a More Sustainable Urban Form* (E &FN Spon, London, 1999)
[59] Wackernagel and Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth* (New Society Publishers, Gariola Island, BC, 1996)
[60] H. Girardet (1992), p. 22-3
[61] R. Rogers, *Cities for a Small Planet* (Faber and Faber, London, 1997), p. 30

sustainability as a reinterpretation and reinvention of the 'dense city' model which would adopt modern technologies to redefine the social advantages of proximity. Rogers concludes by listing some of the many facets of the *sustainable city*:[62]

- *A Just City,* where justice, food, shelter, education, health and hope are fairly distributed and where all people participate in government;
- *A Beautiful City,* where, art, architecture, and landscape spark the imagination and move the spirit;
- *A Creative City,* where open-mindedness and experimentation mobilise the full potential of its human resources and allows a fast response to change;
- *An Ecological City,* which minimises its ecological impact, where landscape and built form are balanced and where buildings and infrastructures are safe and resource-efficient;
- *A City of Easy Contact,* where the public realm encourages community and mobility and where information is exchanged both face-to-face and electronically;
- *A Compact and Polycentric City,* which protects the countryside, focuses and integrates communities within neighbourhoods and maximises proximity;
- *A Diverse City,* where a broad range of overlapping activities create animation, inspiration and foster a vital public life.

Rogers' main argument is presented in favour of "compact mixed-use nodes" forming "lively sustainable neighbourhoods". His 'sustainable city' would consist of as a series of inter-linked sustainable communities. Speaking in Glasgow in 1997 Rogers argued that we needed to turn the present situation around. Three years research on 'the integration of environmental issues into design' had provided him with some worrying statistics. His talk in Glasgow described a sustainable city of "overlapping domains", of balanced "multi-activity, dense urban structures", of "pedestrianisation" and "three-dimensional planning" (Rogers, 1998). These characteristics are identical to those Paolo Soleri has been exploring at his urban laboratory at Arcosanti since 1970. He agreed that we should look to as many alternatives as possible.

7.6.3 Centres of civilisation

Ultimately, as Girardet (1999) argues, we will not achieve sustainability without changing the cultural values underpinning our cities. He suggests that cities must, once again become "centres of *civilisation*, not of *mobilisation*" [his emphasis] - places of creativity and of beauty, with great public spaces, as well as intimate community spaces, but above all places of

[62] Rogers, (1997), p. 169

settled living.[63] The "masterpieces" of human creativity should circulate within cities, not be imported from outside, bringing in more and more products from further and further afield. The future of cites, he claims depends on the rich knowledge (including environmental knowledge) of their citizens.

In following the idealist tradition Girardet stresses that changes in individual's attitudes, as well as in their spiritual and ethical make-up, can bring about the deeper transformations required to provide the cultural context needed to create sustainable cities. Following Hegel and Heidegger, he describes how "*thought* has created an unstable world...manifested in mega-technology, mega-cities, global power structures and vast environmental impacts"[64] but identifies an urgent need for "practical visions and working examples of innovative, alternative systems". When he argues for new practical thinking on sustainability emphasising human-scale solutions that will contribute to a "core transformation of contemporary urban culture"[65] as part of a "revolution in urban problem solving"[66] he invokes a radical conception of the problem. But by concluding his discourse on urban planning and management with the suggestion that urban sustainability would entail new partnerships between national government, local authorities, urban communities, NGOs and the private sector he tempers his radicalism with a reformist position which has tended to characterise much of the current debate.

7.7 The debate on urban compaction and decentralisation

> If urban design can be described as the art and science dedicated to enhancing the quality of life in cities, to provide civilising and enriching places for people to live in them, then the current basis of urban form must be examined.[67]

The contemporary debate on sustainable urban form took off in the 1980s when it was acknowledged that city planning had a significant role to play in the promotion of sustainable development. Since then the environmental imperative has revived the idea that the planning of cities is a legitimate, indeed crucial, practice. As the debate has focused on environmental sustainability - and in particular the issues of global warming and urban sprawl - the 'centrist' view of urban compaction has gained ascendancy over the 'decentrist' view.

Centrists believe in the virtue of high density and are critical of urban sprawl. Stricter urban containment , they argue, would reduce the need for travel and therefore minimise the fastest

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[63] Girardet, (1992), p. 118
[64] Girardet, *Creating Sustainable Cities* (1999), p. 71
[65] *Ibid,* p. 71
[66] *Ibid*
[67] M. Hough, *City Form and Natural Processes* (Routledge, London, 1989), p. 12

growing (and least controllable) contributor to global warming - the motor car, while reducing urban dispersal. The CEC Green Paper (1990) argues that both environmental and quality of life benefits can be delivered with containment. Other modern day centrists agree that high-density urban living is compatible with a higher quality of urban life (for example Jacobs, 1961; Soleri, 1969; Sennett, 1970[68]; Koolhaas, 1978; and more recently, Parkinson and Bianchini, 1993[69]; Montgomery, 1995[70]; and Rogers; 1997). For some the Italian hill town seems to provide the ideal model to which urban compaction might aspire (CEC, 1990; Yanerella and Levine, 1992[71]; and Rogers, 1997).

Largely in response to the problems of industrial cities, decentrists, favour urban decentralisation, through dispersal and low density development. Advocates claim that low densities can be sustainable (or at least no more unsustainable than compact urban forms) and that the quality of life they offer is much higher. Decentrists tend to fall into one of two groups:[72]

- The 'free-marketers', who claim that it is interference by planners in land markets that is at the root of the problems and that left to their own devices market solutions will optimise urban forms;
- The 'good lifers', who argue for a return to 'rural values' via a geographically and institutionally decentralised lifestyle.

Exponents of the free-market approach to urban form argue that centrist policies go against the grain and that resistance from the property market is inevitable (Gordon and Richardson, 1989). Their support for decentralisation is indirect and based on their call for a relaxation of planning policy, which they argue is to blame for high land and property prices. A more direct advocacy of decentralisation is found amongst the second group. In a solution based on Wright's Broadacre City model (1935) some (for example Robertson ,1990; and Green and Holliday; 1991) argue for geographically dispersed communities in which people have enough land to become near self-sufficient in crop production. It is now accepted that this form of decentralised living would be supplemented with the optimum use of telecommunications in the "electronic cottage" model of life but the view that increased telecommuting will render the city obsolete is

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[68] R. Sennet, *The Uses of Disorder: Personal Identity and City Life* (Alfred A. Knopf, New York, 1970)
[69] M. Parkinson and F. Bianchini (eds.), *Cultural Policy and Urban Regeneration* (Manchester Metropolitan University, Manchester, 1993)
[70] J. Montgomery, 'Urban vitality and the culture of cities', in *Planning Practice and Research,* 10 (2), (1995), pp. 101-9
[71] E. Yanerella and R. Levine, 'The sustainable cities manifesto: pretext, text and post-text', in *Built Environment* 18 (4), (1992), pp. 301-13
[72] M. Breheny (1996), p. 20

disputed (by, for example, Richardson, Gillespie and Cornford, 1995; and Handy and Mokhtarian, 1995).

7.7.1 The compact city

Whilst the arguments are far from resolved in favour of urban compaction (Breheny, 1992, 1996) this has become, by far, the most popular policy approach, endorsed by the European Commission's *Green Paper on the Urban Environment* (CEC, 1990), and therefore part of the United Kingdom's sustainable development strategy. The CEC Green Paper (1990) calls for a return to the 'compact city' along the lines of the densely developed cores of many historic European towns and cities.[73] The high population densities in such places are deemed to encourage social mix and interaction and make them good places to live and work. Supporters of the compact city model (including Jacobs, 1961 and Soleri, 1969) believe that it has environmental and energy efficiency advantages, as well as social benefits.

Arguments for the compact city form suggest that it can address the physical and social urban environmental problems within the brown agenda - in particular those health issues, problems of urban transportation, and the urban impacts on energy, natural resources, and pollution, described in Chapter 4. As a result of the containment of high population densities within a compact city form:

- existing infrastructure and previously developed land can be re-used;
- existing urban areas can be regenerated and revitalised;
- allowing the surrounding countryside to be conserved.

The promotion of affordable public transport means that:

- the daily travel needs of the majority of the urban population can be met without widespread use of the car;
- levels of traffic related pollution are decreased along with the risk of death and injury in road traffic accidents;
- as congestion is alleviated accessibility and mobility can improve.

High population densities mean that:

- a policy of mixed land-use becomes viable;
- travel distances are reduced;

[73] G. Dantzig and T. Saaty , *Compact City: A Plan for a Liveable Urban Environment* (Freeman, San Francisco, 1973)

- cycling and walking become the most energy efficient ways of moving around;
- car-dependency is further reduced.

Less car-use means:

- a reduction in the most rapidly growing source of "greenhouse gas" emissions - chemicals that have the potential to contribute to global warming such as carbon dioxide, chlorofluorocarbons (CFCs), nitrous oxide, and carbon monoxide;
- a reduction in energy demand leading to a lowering in the level of consumption of non-renewable fossil fuels;
- improved air quality and consequently better health.

A denser urban fabric would increase opportunities for economies of scale allowing for:

- energy savings due to agglomeration;
- the introduction of collective 'soft energy' systems (solar, wind, water power, etc.) and renewable electricity supply;
- the promotion of community based material recycling policies - glass, metal, paper, and some plastics;
- the promotion of large-scale biological waste treatments
- further reductions in levels of pollution associated with an overall reduction in energy consumption.

As highlighted by the Inter-Governmental Panel on Climate Change (IPCC) in the years 1990, 1992, and 1995 the need for low-energy intensive patterns of activity to address the world-wide green agenda issue of global warming has tended to provide credence to the view that the compact city offers a way forward in the debate on sustainable urban development. Although research work on the relationship between transport, urban form and energy consumption remains largely inconclusive, studies by Bannister (1992) indicate that higher-density cities tend to have lower fuel consumption rates because of shorter travel distances and the increased use of public transport.[74]

There are several arguments opposed to the compact city idea articulated by, for example, Breheny (1992) who argues that it ignores the fondness for suburban living; that telecommunication advances contradict the concept; that rural communities could be neglected; that there could be a loss of amenity and privacy; and that there is, in any case, a lot of

[74] D. Bannister, 'Energy use, transport and settlement patterns', in M. J. Breheny (ed.), *Sustainable Development and Urban Form* (Pion, London, 1992), pp. 171-4

uncertainty concerning future patterns of population growth and dispersal. Knights (1996) also points to the potential for increased congestion and pollution. Harvey (1995) raises the general concern about the activities of planners who, he argues put physical things, like urban form, before social processes. This leads to failed attempts at social engineering based on changing the physical fabric of cities but concedes that "high density urbanised living and inspired forms of urban design are the only paths to a more ecologically sensitive form of civilisation in the twenty first century".[75]

The decline of cities, the dominance of urban sprawl, and the deteriorating environment , seem to be demanding big solutions or 'metanarratives'. The post-Brundtland (1987) political urgency of the sustainable city debate has taken hold in recent years. As countries' commitment to the sustainable development idea has increased throughout the 90s, politicians are falling over themselves to deliver major environmental improvements (in line with both the green and brown agendas) and are looking to planning systems to achieve greater urban compaction. Eager to meet international environmental obligations, politicians are pressing on with specific 'centrist' policies, before the research community have been able to confirm what effect such policies will have. Breheny (1996) now concedes that even although profound questions remain on whether the compact city can deliver sustainability, the focus of the debate is now on technical questions on how to achieve compaction.

Although within these competing visions there are clearly differences in the underlying rationales and there is general consensus that a city must be sustainable not only in terms of how it functions economically and socially but also environmentally. In searching for sustainable urban form and structure the need for a holistic approach is now largely accepted, There exists considerable consensus with respect to Western cities around many policy goals, such as improving energy conservation, reducing car dependence and in a shift towards more compact city forms, with higher residential densities and mixed land uses.[76] The areas of difference over policy measures tend to be ones of degree rather than fundamental disagreement. The main debate has become essentially philosophical and strategic.

The centrist view is now being promoted both academically and politically.[77] Although there are still those who hold the decentrist view, the debate seems to have been concluded in favour of the so-called 'big idea ' of the *compact city*. Questions remain, however, as to whether the 'compact city' will deliver the kind of environmental gains that our governments are now obliged

[75] D. Harvey, (1996), p. 60
[76] Haughton, (1999)
[77] Breheny, (1996)

to achieve and the broader questions of the social, economic, and cultural viability of transforming existing cities into more compact versions have largely been ignored.

The debate has not fully explored the consequences of the profound lifestyle changes taking place as we enter the twenty-first century nor the different choices between compact urban living and suburban living that individuals might deem desirable at different stages in their lives. It seems unthinkable that one model will offer a solution to the complex and multivalent problems of accommodating sustainable societies.

It is being suggested that the search for the ultimate sustainable urban form may be better redirected to the search for a number of different *approaches, models and forms* which can respond to the variety of existing settlement patterns and contexts.

7.7.2 Various descriptions of what a compact city is

In 1997 an urban symposium held in Hong Kong focused on where we might be heading in *Cities of the Future - Towards New Urban Living.* It concluded that, "the city of the future will be compact, dense and filled with buildings taller than any currently on the planet. But it will also be a city built for pedestrians, and a city built to conserve the world's fast depleting energy resources" (Taylor, 1997). The architect Terry Farrell, who recently became the first British architect to win a major design commission in China[78], said in Hong Kong:

> ...cities will live to have populations of 50 to 100 million but the people who inhabit them will learn to live with the density. Going vertically is clearly the right way to go for the future of cities.[79]

Thomas and Cousins (1996)[80] and Frey (1999)[81] point to the various interpretations of the compact city concept. McLaren (1992)[82] discusses the benefits of high population densities. Elkin *et al* (1991)[83] list intensification in the use of space; higher residential densities; centralisation; compactness; integration of land uses; and some form of self-containment, as key

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[78] The commissic ı is to design a huge (230,000 sq m) cultural and commercial development for south China publishing giant Guangzhou Daily News. The £100 million building, the Guangzhou Daily & Cultural Plaza, features 24-storey blocks raised 10 stories in the air. Underneath will be a vast, covered public plaza of hectare in size, open on two sides. The square will be around 50 times bigger than the undercroft of Foster & Partners' tower for HSBC in Hong Kong.

[79] Taylor, D. 'Creating the Vertical Smile', in the *Architects Journal* 5 (205), (1997)

[80] Thomas and Cousins, "The compact city: a successful, desirable and achievable urban form?' in Jenks *et al*, (1996), p. 53-65, especially p. 54

[81] Frey, (1999), p. 29

[82] D. McLaren, 'Compact or dispersed? Dilution is no solution', in *Built Environment* 18 (4), (1992), pp. 268-84

[83] T. Elkin *et al*, *Reviving the City: Towards Sustainable Urban Development* (Friends of the Earth, London, 1991)

properties. Newman and Kenworthy (1989)[84] cite more intensive land use; centralised activity; and higher densities as important characteristics. Breheny and Rockwood (1993)[85] list high density; mixed use; and limited growth within the boundaries of existing urban areas, as main criteria. Friends of the Earth suggest that a sustainable city should be "of a form and scale appropriate to walking, cycling and efficient public transport, and with the compactness that encourages social interaction".[86]

As these descriptions indicate the compact city concept is complex and the issues are multi-layered. But there are clear indications from which a consensus is emerging and from which we might draw some future directions. The ecological imperative is now globally endorsed. The need for sustainable development, however we choose to define it, is unequivocal. Cities are the main contributors to unsustainability and therefore it is to cities that we must look in our search for solutions. Our growing dependence on a particular set of energy-inefficient and resource hungry technologies has led to the development of urban forms that assume limitless supplies of cheap natural resources. This, in turn, has led many planners and architects to call for the fundamental redesign of the physical fabric of the city. Many of the proposals aim at enabling people to be less car-dependent, in particular through attempts to increase urban residential densities, by concentrating development around key public transport routes and nodes, and by encouraging a return to mixed land-use policies within the city (Soleri, 1969; Calthorpe, 1993; Rogers, 1997).

7.7.3 New urbanism and the next metropolis

In academic debate the concepts of sustainable urban development are described as 'models' implying that there are a number of options available from which we need only choose the ideal form and begin to apply it universally. This, however, does not reflect the fact that unless we restrict ourselves to building new urban structures, more compact cities can only be achieved through a process involving the *intensification* and *consolidation* of existing cities.[87]

'Intensification' and 'consolidation' are terms used to describe various strategies by which an area can become more heavily built up or used. 'Intensification' can relate to built form through:

- the redevelopment of existing buildings or previously developed sites at higher densities;

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[84] P. W. G. Newman and J. R. Kenworthy, *Cities and Automobile Dependency. An International Sourcebook* (Gower Technical, Aldershot, 1989)

[85] M. Breheny and R. Rockwood, 'Planning the sustainable city region', in A. Blowers (ed.), *Planning for a Sustainable Environment* (Earthscan, London, 1993)

[86] Cited in Elkins *et al* (1991), p. 12

[87] K. Williams, E. Burton, and M. Jenks, 'Achieving the Compact City through Intensification: An Acceptable Option?' in Jenks *et al* , (1996), pp. 83-96

- the subdivision or conversion of buildings;
- the building of additions or extensions to existing structures
- development on previously undeveloped urban land.

'Intensification' of activity is defined as:

- the increased use of existing buildings or sites;
- changes of use, which lead to an increase in activity;
- increases in the numbers of people living in, working in, or travelling through and area.

'Consolidation' is generally interchangeable with 'densification' and 'compaction' and is used to describe processes such as high-density infill housing development, building on large plots of vacant land, and development where there is a focus on townhouses, tenements and terraced housing.

From an ecological standpoint no area of human activity is in more in need of a new relationship with nature than our current mode of haphazard suburban development. The concept of low-rise, high-density urban housing was introduced by Serge Chermayeff and Christopher Alexander in 1963 but there have been very few examples of this approach since. Isolated examples have been designed by Atelier 5 in Switzerland, Roland Rainer in Austria, Neave Brown in England and, more recently, Alvaro Siza in Portugal and Tadao Ando in Japan. Frampton (1980) calls these projects "reformist strategies of neo-capitalist urban expansion". Highlighting the "apocalyptic prospect of megapolitan explosion", which he describes as being "comparable in its negative ecological impact to the destruction of the rain forests and the depletion of the ozone layer".[88] Frampton questions the ability of the building industry or the architectural profession to respond to problems of such magnitude:

> For all its relative permanence, building has no choice but to exist in its own historical moment. It has as its task the realisation of the here and now. This means that its object can no longer be the idealised projections of the Enlightenment but rather must become the embodiment of habitable places. In a society mesmerised by consumerism, balanced eco-ontological conditions perhaps can only be achieved through the strategy of creating discontinuous enclaves; that is to say bounded fragments wherein a certain cultural and ecological symbiosis can prevail in defiance of the surrounding chaos.[89]

More recently a number of architects and planners have presented proposals involving mixed density, mixed land use, projects aimed at dealing with the problems of suburban settlements

[88] K. Frampton, *Modern Architecture: A Critical History,* third edition (Thames and Hudson, London, 1992), p. 342
[89] Ibid, pp. 342-3

(for example , Register, 1987; the Urban Villages Group, 1992[90]; Calthorpe, 1993; and Rogers, 1997). Perhaps the most influential of these has been the urban futurist, Peter Calthorpe, who proposes the creation of "pedestrian pockets"[91] as a new form of suburban development within the area that Garreau (1992) has dubbed "Edge City"[92] and which Robert Fishman calls "technoburbs".[93] He proposes relatively dense developments combining residential, commercial, and workplace elements, which like Howard's vision of the Garden City, would allow residents to walk to the urban centre within a short period of time. In *The Next American Metropolis* (1993) he further refines and matures the pedestrian pocket idea to fit the emerging realities described by Garreau and Fishman with what he calls "transit orientated developments". Calthorpe's pedestrian pockets are balanced mixed-use areas located within a quarter-mile radius (or five minutes walk) of a transit station. Within these zones of between 50-100 acres are housing, offices, stores, day care, recreation, and parks. Calthorpe suggests that 2,000 units of housing and 1 million square feet of office space can be accommodated within three blocks of a transit station. This 'urban village' approach adopts many of the key characteristics of the compact city; relatively high densities, mixed land use, encouraging pedestrianisation and bicycle commuting, and the preservation of the natural environment, interspersed between pockets of development.

Calthorpe is the most prominent member of a growing band of architects and planners, including Andres Duany and Elizabeth Plater-Zyberk in the US, and the Urban Villages Group in Britain, collectively known as the "new urbanists" [94], who are designing human-scale communities drawing on traditional small town elements exemplified in Herbert Gans analysis of post-World War II tract-home suburbia, *The Levittowners* (1967).[95] Their main aim is to show how mixed use, pedestrian developments of varying densities might begin to address the need to balance modern lifestyle aspirations within a more energy conscious design approach that incorporates well defined open space. Calthorpe argues that this is simply the result of a culture adjusting itself to new realities. But critics of "new urbanism" argue that in responding to a transformation that is already expressing itself (the shift from industrial forms of segregation and centralisation to the decentralised forms of the post-industrial era) these new forms either

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[90] A. Aldous, *Urban Villages: A concept for creating mixed-use urban developments on a sustainable scale* (Urban Villages Group, London, 1992)
[91] P. Calthorpe, 'The Pedestrian Pocket', in D. Kelbaugh (ed.), *The Pedestrian Pocket Book: A New Suburban Design Strategy* (Princeton Architectural Press, New York, 1989)
[92] J. Garreau, *Edge City: Life on the New Frontier* (Anchor, New York, 1992)
[93] R. Fishman, *Bourgeois Utopias: The Rise and Fall of Suburbia* (Basic Books, New York, 1987)
[94] P. Katz, *The New Urbanism: Towards an Architecture of Community* (McGraw-Hill, New York, 1994)
[95] H. J. Gans, *The Levittowners* (Pantheon, New York, 1967)

represent merely the continuing process of suburbanisation[96], or the end of suburbia in the traditional sense and the creation of a new kind of decentralised city.[97] Perhaps the ultimate irony of modern urbanism, lies in the first principle of what Calthorpe considers to be the "next American metropolis" - that suburbia has become the city itself.[98]

Calthorpe's model of transit-orientated development (1993), Duany and Plater-Zyberk's model of traditional neighbourhood development (1992), and the cluster of urban villages model (1992) do not adequately respond to the energy consumption implications of their separation. They also tend to ignore the requirement for the process of urban intensification to "make the fullest possible use of land that is already urbanised"[99], encourage development where "technical encroachments on nature have already taken place"[100], or promote urban consolidation through "the increase of population and/or dwellings within a defined urban area".[101]

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[96] K. Jackson, *The Crabgrass Frontier* (Oxford University Press, New York, 1985)
[97] R. Fishman, (1987)
[98] R. T. LeGates and F Stout, (1996), p. 484
[99] D. Lock, 'Room for more within city limits?' in *Town and Country Planning* 64 (7), (July 1995), pp. 173-6
[100] P. Naess, 'Can urban development be made environmentally sound?' in *Journal of Environmental Planning and Management,* 36 (3), (1993), pp. 309-33
[101] J. Roseth, 'The case for urban consolidation', in *Architecture Australia* (March 1991), pp. 30-3

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DEPARTMENT OF ARCHITECTURE AND BUILDING SCIENCE
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ECOLOGY, SUSTAINABILITY AND THE CITY

Towards an Ecological Approach to Environmental Sustainability: with a case study on Arcosanti in Arizona

Volume Two: The Arcology Model and the Arcosanti Laboratory

DAVID GRIERSON
A thesis submitted for the degree of
Doctor of Philosophy
August 2000

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Abstract

As the world population moves toward 10 billion people over the next 50 years environmental decline seems inevitable unless changes are implemented. Issues of *ecology, sustainability and the city* are now being recognised as critical. The systemic and holistic nature of the problem means that sustainable policies must address a wide range of social issues, political attitudes, economic practices and technological methods. *Volume One* offers a wide-ranging and comprehensive review of *Environmental Problems and Sustainability* and seeks to map out both the historical and contemporary basis for a widespread transition towards a more sustainable society.

The world's cities now offer the critical context within which sustainable strategies can be developed and tested. Much current academic and policy literature describes a range of sustainable development models representing radically different views of how the processes leading towards the planning and implementation of cities needs to be realised. *Volume Two* describes Paolo Soleri's *Arcology Model and the Arcosanti Laboratory* as a relevant methodology and case study. The arcology model attempts to address issues of sustainability by advocating a balanced relationship between urban morphology and performance within cities designed to conform to the complexity - miniaturization - duration (CMD) paradigm. The methodology recognises the need for the radical reorganisation of urban sprawl into dense, integrated compact urban structures in which material recycling, waste reduction and the use of renewable energy sources are part of a sustainable strategy aimed at reducing the flow of resources and products through the urban system.

As governments, eager to deliver major environmental improvements, press on with, as yet, untried and untested 'centrist' urban policies, there is a need to research relevant models of compaction. Over the last ten years, as the criteria of urban sustainability have become more widely accepted and understood the relevance of the Soleri's model has become clearer. Arcosanti in Arizona , begun in 1970, offers a laboratory for testing the validity of the theory. Volume Two concludes by critically reviewing arcology and Arcosanti in the context of the discourse on sustainability offered in Volume One. Since the energy crisis of the mid-1970s efforts at Arcosanti have been directed toward the definition and testing of various architectural effects that, when combined, could offer a response to many of today's environmental problems. But today progress is painstakingly slow. Lacking the level of funding and resources that would enable it to be convincing, it now represents not so much a specific prototypical solution but an activist engaged strategy that advocates the possibility of building our dreams and visions. In a world plagued by so many problems, and so few alternatives, it continues to offer a beacon of hope for a sustainable future.

Aim and structure of the thesis

The aim of this thesis is to firstly appraise the notion of ecological limits to population, economic and urban growth and to examine the implications of exceeding growth limits, both on a global scale and in relation to generic problems associated with local urban environments, in developed and developing nations. An analysis of social, political, economic and technological aspects of sustainability will provide the context for a review of contemporary sustainable urban planning and development issues and for a synopsis of the current debate on urban compaction versus decentralisation. In the final part of the work the aim is to locate the arcology theory, as an alternative model of urban development, and the laboratory at Arcosanti in Arizona, within the context of the current debate on urban sustainability and to describe and critically review its theoretical and practical response to today's social, ecological and environmental problems.

Having lived, worked and studied at Arcosanti for a few years in the late 1980s, and having then researched and taught ecological aspects of architecture and urban sustainability at Strathclyde University during the 1990s, it seems appropriate to draw the strands of my own experience together with the growing theoretical body of knowledge in the area of environmental studies. The work is structured into two volumes encompassing nine chapters.

Volume One Environment Problems and Sustainability

Part 1 The Global Environment

Part 1 reviews various historical and contemporary accounts of global environmental limits to population, economic and urban growth and examines the implications of going beyond such limits.

A mismatch currently exists between the global *green agenda* on the one hand, relating to world wide problems of resource depletion, loss of biodiversity, accelerating pollution, and global warming, and the urban *brown agenda* on the other, involving social and environmental problems within growing cities. The approach taken here is to distinguish between them for the purposes of study, while recognising that they are essentially interrelated and inseparable. Ultimately by focusing more on the urban environment the argument is not for less attention to be paid to global concerns, but for the recognition that urban and global concerns are inter-related, and planning and policy measures aimed towards sustainability must, of necessity, address both.

Chapter 1 - focuses on issues relating to maintaining the balance and integrity of the biosphere, while highlighting the scale and extent of specific green agenda problems.
Chapter 2 - looks in more detail at the Limits to Growth *thesis and examines its implications in both the developed and developing nations of the world.*

Part 2 The Urban Environment

Part 2 focuses on the scale and character of contemporary urbanisation and the rapid growth of cities, particularly within the developing nations, and examines associated urban environmental problems.

Historical and current patterns of rural-urban migration and urban demographics are discussed within the present context of the emergence of huge mega-cities and the economic, political, and socio-cultural re-structuring of modern life implied by the phenomenon of globalisation. The question arises as to whether an urban revolution of such scale and celerity is sustainable, particularly in the context of urban convergence theory suggesting that globally cities are becoming more alike in their most problematic characteristics. Along with the current pattern of growth of large cities has come a whole host of *brown agenda* problems relating to issues of human health and well being and environmental degradation, such as unemployment and poverty, inadequate shelter, sanitation and water supplies, congestion, and increased air pollution. Urban lifestyles and consumption patterns within today's cities account for the majority of the world's energy burden and natural resource depletion.

Chapter 3 - focuses on the process of urbanisation and urban growth.
Chapter 4 examines some of the social and environmental problems associated with current urban development patterns.

Part 3 Sustainability

Part 3 reviews the growth of ecologism and the ecological paradigm as a response to global and urban social and environmental problems and describes recent proposals, planning objectives and policy measures aimed at achieving sustainability at both the global and urban scales.

We, in the developed world, continue to grow at the cost of others' ability to develop. Sustainable development policies, in recognising that the world's problems are interconnected and interdependent, must be implemented in a holistic process that addresses simultaneously the social, political, economic and technological aspects of sustainability. Building an urban culture of sustainability that will promote environmental (and economic) stability and ecological sanity and, at the same time, emphasise the well-being of people throughout the world and their long term needs is a fundamental challenge of the twenty-first century. Human self-interest demands that sustainable relationships between the city and the biosphere are established. But this will not happen unless we make profound changes to the value systems underpinning our cities, including adopting new political attitudes, economic practices and technological methods within a social milieu that promotes spiritual and ethical growth, and values quality over quantity.

Chapter 5 - investigates the emergence of ecologism and traces the ideology's historical and modern roots.
Chapter 6 examines the social, political, economic, and technological aspects of the ecological paradigm for a sustainable society.
Chapter 7 reviews recent frameworks, planning strategies, and alternative models for sustainable urban development.

Volume 2 The Arcology Model and the Arcosanti Laboratory

Volume2 examines arcology (architecture and ecology) as a relevant methodology and Arcosanti as an urban laboratory that attempts to confront the most critical areas of sustainability.

By advocating an urban system and structure that adopts a balanced relationship between its morphology and performance *arcology* offers a theoretical response to problems of population expansion, scarcity of land resources and energy, pollution, technological mindlessness, waste, greed, cultural, social and spiritual deprivation. The arcological model of sustainable urban development sees, in the contraction and greater sophistication of the city (including all its equipment, machinery, infrastructure, services, etc.), both the efficient possibility of achieving more with less and the chance of reaching new levels of spiritual development. Such transformation involves a radical revision of the current social, cultural, political and economic structure. The systemic nature and complexity of the sustainability imperative requires that we explore alternatives that might offer a community-wide holistic response to ecological, social and environmental problems. At the urban laboratory at *Arcosanti*, in Arizona, Paolo Soleri has been exploring such an alternative since 1970, by attempting to build and operate a working prototype arcology. Volume 2 concludes by critically reviewing Soleri's model in the context of the discourse on sustainability offered in Volume One.

Chapter 8 examines the arcology model, traces its 20th century genealogy and describes its subsequent evolution.
Chapter 9 relates the history, development and current status of the Arcosanti project.

Vol. 2

The Arcology Model and the Arcosanti Laboratory

Volume2 examines arcology (architecture and ecology) as a relevant methodology and Arcosanti as an urban laboratory that attempts to confront the most crucial areas of sustainability. It concludes with a critical analysis and an assessment of its validity in response to the challenges described in Volume One

Figure (d) Arcosanti at dusk

Chapter 8 examines the **arcology theory**, *traces its 20th century genealogy and describes its subsequent evolution.*
Chapter 9 relates the history, development and current status of the **Arcosanti** *project.*

Introduction to Volume Two

Introduction to Volume Two

Models for sustainable urban development

The revolutionary changes needed to address the questions of urban sustainability adequately will take a huge amount of imagination and political will. If we are to hand on a decent living environment to future generations, we need to institute radically different collective thought processes that are able and willing to engage in discussions about possible alternative futures in a rapidly urbanising world.

The sustainability imperative now has political priority status and governments are demanding a planned response to global and urban environmental problems that is based on both solid theoretical foundations and hard technical evidence.

The concept of sustainable development has been rightly criticised as being too vague and contradictory. We need to find the inspiration to deal innovatively with environmental problems but there currently seems to be a lack of new ideas concerning the future of our society. Big ideological differences do not seem to exist any more and there is a lack of grand

'metanarratives' and inspiring ideas of the kind described by Howard, Le Corbusier and Frank Lloyd Wright. Some might argue that this is just as well. However in their absence it is proving very difficult to initiate debate in which the current orthodoxy, including current patterns of urban growth, can be adequately criticised. The question arises; who will create an environmentally sustainable society?

More recently however, within the academic and policy literature that has emerged from the growing debate around sustainable cities, a number of different approaches are beginning to be considered. A number of "models" of sustainable urban development have been developed which represent radically different views of how the processes leading towards the planning of sustainable cities needs to be realised. These vary from the deep ecology inspired attempts to bring about the self-reliant city, to more neo-liberal attempts to foster sustainable development by redefining the market pricing and regulatory systems. Haughton (1999) describes some of these contemporary alternative models as:[1]

- The *free-market model* - generally focusing on non-spatial views of economists seeking a response to urban environmental problems through altering market mechanisms. This 'light green' approach to sustainable development sees de-regulated global trade and trickle down methods of wealth distribution as the solution to environmental damage and social malaise. Environmental problems are thus subordinated to economic efficiency.
- The *re-designing the city model* - where a main theme is that re-designing the physical fabric of the existing city can improve resource efficiency. The rapid urban decentralisation, which has occurred in Western countries since WW II, has resulted in a low-density sprawling form of growth. This, in turn, results in an increasingly fragmented spatial experience, with increased distances between places where people live, work, and use urban services. This adds impetus to the tendency towards heavy car-reliance, and requires considerable consumption of land and energy.
- The *self-reliant city model* - derives from the green anarchist tradition and the rejection of the state, class politics, parliamentary democracy and capitalism. Influenced by ecological utopian perspectives, particularly those "utopias of sufficiency"[2]of William Morris (*News From Nowhere*, 1891) and Peter Kropotkin (*The Conquest of Bread*, 1892), they owe a more contemporary debt to the work of Murray Bookchin (1974), and Richard Register (1987). Embracing most of the key tenets of the radical green approach to sustainability, the

[1] Haughton, (1999)
[2] M. de Geus, *Ecological Utopias: Envisioning the Ecological Society* (International Books, Utrecht, 1999), p. 20-2

preservation of nature is a major concern, in particular designing cities that maintain a balanced relationship with the surrounding environment. This preservationist or 'frugal' stance to natural resource use is usually interpreted as minimising urban impacts on all natural assets including a general commitment to reducing the 'ecological footprint' of the city. Kirkpatrick Sale's (1985) bioregional vision[3] becomes one of the main building blocks for the sustainable city-region, with inhabitants using the bioregion's resource rather than importing, and absorbing wastes locally, rather than exporting "negative external effects"[4] in the form of pollution.

In terms of the engagement with the hinterland the approach is to reduce the number and frequency of exchanges and to build up local economies based upon local resources. The emphasis tends to be placed on small-scale production systems for local need, using appropriate local technologies, rather than on large-scale production for the global markets using imported, expensive, high-technology, capital intensive production systems. Growth is focused primarily on environmentally benign products and services. In many ways Arcosanti adopts the characteristics of the *self-reliant city model.* Some forms of exchange with external areas are accepted as necessary, but the goal is to minimise these. This level of introspection however "raises fears of regional autarky linked to technological, cultural and other forms of stagnation".[5]

- The *fair shares city model* - involves achieving a balance between 'ecological footprint' concerns and those of maintaining a sustainable level of trade between a city-region and its hinterland. In essence this model takes many of the features of the previous two models (e.g. increased regional autarky and greater urban compaction) and adds these to tools for establishing more equitable trading relationships with other areas. Because it focuses on changing relationships there are also potentially close ties with the *free-market model* of the externally dependent city. The main difference involves the existence of trade regulations relating to environmental assets (including compensation mechanisms) that would be in place in the fair shares city. In this sense the model is one of quasi-autarky where some trading in environmental assets is seen as essential to human development. The argument is that it should be possible to establish a mutually beneficial relationship of fair trading in environmental resources and pollution without breaching local or global ecological tolerance limits. In contrast to the 'hands-off the hinterland' approach of the self-reliant model, and the

[3] K. Sale, *Dwellers in the Land: the Bioregional Vision* (1985)
[4] Pigou, *The Economics of Welfare* (1920), pp 183-4.

'geographical neutrality' of the externally dependent city, the fair share city is more closely tied into the surrounding area.

Although this model appears to offer a pragmatic compromise of certain radical aspects of the others and might also be seen to address the ideological concern that cities should 'pay their way', it is the least developed within environmental literature.

Arcology

A fifth model representing a radically different view of how the sustainable city might be realised and one which has, until recently, been largely overlooked in much of the academic and policy literature, involves the ecological design work dating back to the 1950s of the architect and visionary, Paolo Soleri:

- The *arcology city model* or *ecological city model* - embodies the fusion of architecture with ecology. The concept proposes a highly integrated and compact three-dimensional urban form that is the opposite of urban sprawl with its inherently wasteful consumption of land, energy, time and human resources. These urban structures are called *arcologies.* An arcology would need about two percent as much land as a typical city of similar population. The car is eliminated from inside the city and reserved for use outside. Walking becomes the main form of transportation. The city is designed to improve the life quality of its inhabitants, and to be highly efficient in the processes of production and consumption. The central tenet of Soleri's theory is that cities must miniaturise and become more complex in order to survive. The miniaturisation of the city enables radical conservation of land, energy and resources. An arcology would rely as much as possible on the sun, the wind and other renewable energy sources so as to reduce pollution and dependence on fossil fuels:

> The problem I am confronting is the present design of cities only a few stories high, stretching outward in unwieldy sprawl for miles. As a result of their sprawl, they literally transform the earth, turn farms into parking lots and waste enormous amounts of time and energy transporting people, goods and services over their expanses. My solution is urban implosion rather than explosion.[6]

Such urban structures would need less energy per capita thus making recycling and the use of solar energy more feasible than in present cities. Influenced by Teilhard de Chardin's 'point Omega ' hypothesis, Soleri's ideas on ecological cities have, in turn, influenced many

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[5] G. Haughton, 'Developing models of sustainable urban development', in *Cities,* 14 (4), (1997) pp. 189-195

[6] P. Soleri *Earth's Answer* (Lindisfarne Books, 1977)

architects involved with ecological design (including Richard Register (1987)[7]; Peter Calthorpe (1993); Jon Jerde [architect of Horton Plaza in San Diego]), architectural educators (including Marcos Novak [Visiting Professor of Architecture and Urban Design at UCLA; and Founding Director of the Reality Lab at the School of Architecture, University of Texas]and Ron McCoy [Director, School of Architecture, Arizona State University], theologians (including Harvey Cox, Professor of Divinity at Harvard: and John B. Cobb, Professor of Theology at Claremont), Science Fiction writers (including William Gibson [*Neuromancer,* 1984]; and Larry Niven [*Oath of Fealty,* 1987] and [*The California Voodoo Game,* 1992]), and a new generation of cyberspace technology entrepreneurs and critics (including Erik Davis [*TechGnosis: Myth, Magic & Mysticism in the Age of Information*]; Mark Pesce [Internet visionary, co-inventor of VRML - the Virtual Reality Modelling Language]; and Coco Conn [Creator of the CitySpace Project]).

Arcology's methodology sees material recycling, waste reduction, energy conservation, and the use of renewable energy sources as part of strategy for sustainability aimed at reducing the flow of resources and products through the urban system. As more people have become aware of the need to develop new approaches and new paradigms appropriate to modern environmental and social problems Soleri's views on the *ecological city* have been more widely sought. There are also signs that, as the balance of the urban sustainability discourse begins to move away from theory and into the realm of practical policies and of urban forms that could contribute to achieving a more sustainable future, the work at Arcosanti, Soler's *urban laboratory* in Arizona, is attracting a resurgence of interest.

Typically today's cities devote up to sixty percent of their land for car functions. An arcology would need about two percent as much land as a typical city of similar population since it eliminates the car from inside the city and reserves it for use outside the city. Walking becomes the main form of transportation inside. Arcology would rely as much as possible on the 'soft technologies' of sun and wind power and other renewable energy so as to reduce pollution and dependence on fossil fuels. Because it needs less energy per capita the arcology model renders recycling and the use of solar energy more feasible than in present cities.

Urban utopians such as Tony Garnier (*Une Cité Industrielle,* 1917); Le Corbusier (*La Ville Contemporaine*, 1922 and *La Ville Radieuse*, 1933); Frank Lloyd Wright (*Broadacre City,* 1934), Constantin Doxiades (*Ecumenopolis*, 1969), and Paolo Soleri (*Arcology*, 1969) have approached the problem of societal change by first redefining the form and infrastructure of the

[7] R. Register, *Ecocity Berkeley: Building Cities for a Healthy Future* (North Atlantic Books, Berkeley, CA., 1987)

city. Marius De Geus has recently made the distinction between *'ecological utopias'* or 'utopias of sufficiency' on one hand (including the "ecotopias" of More, Thoreau, Kropotkin, Morris, Howard, Callenbach and Bookchin), and 'technological utopias' or 'utopias of abundance' on the other (including, among others, the "technotopias" of Bacon, Owen, De Saint-Simon, Fourier and Bellamy). The main difference between them, he suggests, lies in the notion of whether an ideal society should be based on luxury and excess or moderation and frugality. The notion of utopia as a blueprint for a new society or a fixed model of the future has been rightly rejected but utopia thinking can also be used as a 'critical norm', offering criteria against which to measure current social development. Alternative visions of the future can present themselves for discussion, critique and transformations. Since the relationship between sustainability and urban form is now being recognised as critical, by referring both to classical and recent ecotopian thinkers we might be better placed to contribute to the social debate on sustainability. Soleri's *Arcology* can be considered as operating within such an 'ecotopian' tradition.

Soleri contends that many of the problems that afflict modern society are as a direct consequence of the sprawling pattern of twentieth century urban development. What sets him apart from his contemporaries, and tends to encourage comparisons with Ebenezer Howard, is his radical approach to solving these problems, the sheer scale of his vision, and his determination, since 1970, to test his hypothesis by building a prototype at Arcosanti in Arizona.

Indeed there are similarities between Soleri's arcological approach and Howard's ideas on the *Garden City*. Both believe that the town and the country can co-exist happily and be mutually dependent. Both advocate the establishing limits to the physical dimensions of the town and leaving the agricultural hinterland undeveloped. Citizens in a Garden City and in an arcology would work in the city but would be close to the countryside, while the rural community, working mostly in agriculture, would have the benefits of proximity with the city and could share in its social and cultural life. Howard's formulation of ecological preconditions was intended to maintain self-sufficiency while guiding industrial activities and a large portion of the policy-making choices. Environmental considerations were, in this way, fully immersed in planning and social structures. Soleri's ecological foundations within the *complexity - miniaturisation - duration (CMD) paradigm* underpins his arcological thinking and has determined the evolution of the concept, and the development of various generations of arcologies, since the Mesa City project from 1958. But while ecology is at the root of both approaches, for Howard the 'natural' environment forms a basis for architectural and social planning. But Soleri's goal lies in the definition of a new kind of environment that he calls *"neonature",* a new human-made physical layer designed to support biological, human, and

social evolution while containing human societies along with all their material goods. Howard's decentralised ecological approach to town planning has been criticised for underestimating the ecological benefits of urban life. A central tenet of Soleri's centralised arcological approach is that the city is a necessary instrument for the evolution of humankind.

In seeking a truly 'urban' solution Soleri is pursuing the objectives, which have occupied since he left *Taliesin West* in 1949. His apprenticeship with Frank Lloyd Wright was short lived. Rather than accept Wright's notion of decentralisation, as manifest in *Broadacre City* (1934 - 1958) Soleri has, since the 1950s, envisaged a re-orientation of city life through a process of *urban implosion,* wherein the city is compacted and intensified, made three-dimensional and pedestrian and designed to conserve the earth's energy and resource. Rather than accept the inevitability of the outward drift of cities Soleri rejects *Ecumenopolis* (Doxiadis, 1969) as representing a frightening "map of despair".[8] Looking at the same emerging realities of urban sprawl he takes human society in an entirely different direction by attempting to draw the city's elements back together towards a revolutionary new kind of human environment within arcologies leaving the rest of nature to develop on its own terms. Some of these proposed structures contain populations of millions,

Influenced by Teilhard de Chardin, Soleri's vision proposes the building of the *Civitas Dei* as the next step in the progressive transformation of human existence. What he terms, the *urban effect* is the principle whereby human interaction creates new forms and levels of individuality and community. The stated function of arcology is to ease the breakthrough to these new levels. According to John Cobb (1981), if humanity gains its meaning from its place in the evolutionary process then the relevance of Soleri's urban vision is that it offers hope for the future in the progressive transformation of human existence.[9]

Of course there are great risks associated with attempting to create a model for an ideal society. The idea of unity tends towards uniformity. Popper's criticism that no single objective, absolute truth exists nor can be expressed in a blueprint is now generally accepted along with the criticism that utopias are not realistic because they generally fail to provide a plausible strategy for change. The dangers of seeking ultimate happiness an attempting to achieve political perfection are now generally recognised. Radically breaking with the past and implementing large-scale changes all at once is a high-risk strategy, not least because it would be impossible for a new social model to eliminate existing problems without having them replaced by a set of

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[8] P. Soleri, *Arcology: The City in the Image of Man* (MIT Press, Cambridge, Mass., 1969), p. 2
[9] J. B. Cobb, Preface to P. Soleri, *The Omega Seed: An Eschatological Hypothesis,* (Anchor Press/Doubleday, Garden City, New York, 1981), p. 16

new ones. In defining a definitive final condition, utopias, since they are already perfect, need no further improvement and are basically static.

Paolo Soleri argues that an arcology would be 'anti-utopian' by design and content. Rather than seek perfection (through 'self-containment' of the habitat) in the evolution of the theory since the 1950s, the attempt has been to define a methodology and illustrate it in various 'generations' or 'models'.

The model described within the *Two Suns Arcology* (1975) concept is capable, at least theoretically, of demonstrating positive responses to the many problems of the urban environment, including those of population, pollution, energy and natural resource depletion, food scarcity and quality of life. Its methodology recognises the necessity of the radical reorganisation of the sprawling urban landscape into dense, integrated, three-dimensional cities. Soleri contends that the city structure must contract, or miniaturise, in order that it can support all the complex activities that sustain human culture and give it a new perception and a renewed trust in society and its future. The metaphor for the city "in the image of man" emphasises the idea of 'self-containment' rather than self-sufficiency. Without self-containment the city cannot act effectively with the surrounding natural environment. When the city loses sustenance from the countryside it is doomed. Recycling, waste reduction, energy conservation and the use of renewable energy sources become part of a sustainable strategy aimed at reducing the flow of resources and products through the urban system. In particular the arcology concept responds to the urban environmental problems related to land use, transportation, food and energy production, impact on natural resources and pollution. The development of the Two Suns Arcology produced some highly significant environmental effects (*greenhouse effect, horticultural effect, apse effect, chimney effect, and the heat sink effect*) and it gave greater priority to the Sun as the main source of renewable energy. It also placed the arcology concept much more firmly into its own ecological niche. The ideas that emerged within the concept of the 'energy city' served to reinforce the relationship between architecture and ecology. The development of the *Hyper Building* arcology concept from 1995 draws together many of these environmental benefits, in one large building.

Arcosanti

An urban laboratory is taking shape at *Arcosanti* (meaning 'architecture before things' or 'anti-materialist architecture') in Arizona. When complete it will be a small town of around 6,000 people, built on only 15 acres of a 860 acre land preserve in Arizona's semi-arid high desert region. It aims to combine a compact urban structure with large-scale solar greenhouses. Since

1970 Soleri has used Arcosanti to rethink modern urban design and planning from the ground upwards. Instead of accepting the logic of two-dimensional cities, and what he sees as the inherent wastefulness of suburban sprawl, he has developed Arcosanti as a laboratory to explore the idea of urban "implosion", where the city infrastructure contracts and intensifies in order to become more efficient, ecological, and sustainable. Shortly after work had started on Arcosanti the American publication *Newsweek* described it as "probably the most important urban experiment in our times". To those in search of an alternative urban environment it offers thirty years of experimentation in this field.

In early built projects, from the partially earth-bermed *Cave Creek Dome House* (1949), incorporating a passive heating and cooling system, and the process-led design for *Ceramica Artistica Solimene* (1951-2) Soleri developed his particular approach to ecological architecture. He continued his experimental approach in a series of *silt-casting* workshops focusing on the construction of a number of earth structures at Cosanti, in Scottsdale. The technique of *silt-casting* involves the use of river silt to make moulds and forms for the casting of various materials including clay, plaster, wax, and concrete. The technique has been used to produce, architectural models and the, now famous, bronze and ceramic wind-bells. Adapting the method to create habitable structures was the next logical step. The result is a complex of partially submerged buildings that are used as craft studios, a foundry, work areas, offices and residences for the Cosanti Foundation, an organisation dedicated to pursuing the research and development of an alternative urban environment.

Although the site was purchased in 1970, construction work at Arcosanti began in 1971. The construction of the first main structures involved extensive silt casting using the silt from the Agua Fria River bed that runs through the land. Unlike the buildings at Cosanti, the cast-in-place or pre-cast structures at Arcosanti are mostly constructed above ground using a similar, but more sophisticated earth-casting technique. The concrete structures, many characterised by the apse form, constitute a cluster of various structures and spaces built on a south-facing mesa. These currently define the living, working and learning environment for a community of around one hundred residents.

Arcosanti is intended to be a laboratory for the purpose of investigating the process of designing building and operating a functioning prototype arcology. It is a framework, for various experiments within the field of environment and habitat and for research within the complexity - miniaturisation - duration (CMD) paradigm. The premise of the research work is that, since the urban phenomenon is seen as a process of increasing complexity, which must take place in proportionally shrinking spaces, then the miniaturization of its structure is an imperative. More

specifically Arcosanti aims at constructing a living demonstration of a compact three-dimensional town as a proposed alternative to suburban sprawl and all its inherent social and environmental problems. Since it is largely self-financed the project, of necessity, has had to be a simple assessment of the urban phenomenon and a modest attempt to contribute to it.

As well as the ongoing construction work, there are many projects at Arcosanti which involve the community in a wide variety of activities ranging from project development, networking and media work, research activity, exhibitions, drafting work, conference organisation to wind-bell production and site maintenance. These including *Construction Workshops; Arcosanti Organics; Energy Apron* and *Greenhouse Experiments; Minds for History; Paradox; Arcosanti 2000*; and *Arcosanti Super Critical Mass.*

8

Arcology

Chapter 8

8.0 THE ARCOLOGY MODEL

The city is an organism in a constant process of complexification. Nature shows that for all organisms or society of organisms with any increment of complexity, there corresponds a spatio-durational contraction of its functions. Complexity is a function of miniaturization. This is a rule that... cannot be amended by politics, economy, religion, science, or philosophy... Structure comes before performance.[9]



Figure 8.1 Images of Arcology

[9] Soleri, *Arcology* (1969), p. 122

8.1 Paths to the sustainable urban future

Cities are definable structures with an evolutionary history that can be traced back at least nine thousand years. Wirth (1938) defined the city as "a relatively large, dense, and permanent settlement of socially heterogeneous individuals"[2] For Mumford (1937) it is "a point of maximum concentration for the power and culture of a community". In its complete sense, he wrote, it is:

> ...a theatre of social action, and an aesthetic symbol of collective unity. The city fosters art and is art; the city creates the theatre and *is* the theatre. It is in the city...that man's more purposive activities are focused, and work out, through conflicting and co-operating personalities, events, groups, into more significant culminations. [3]

Before cities existed village life was structured around the affinity of families and neighbours and mostly dedicated to the harvesting of food and the reproduction of life. In contrast with a nomadic lifestyle, the physical enclosure of the village and the social relations within it brought security and common a sense of identity. Order was kept through the council of elders, representing the consensus of wisdom and opinion. Survival and stability depended upon maintaining a sustainable balance between the community and the natural environment and the resources that it had to offer.[4]

There are a number of theories on the origins of cities in which they are presumed to have developed in response to the concept of surplus, i.e., they began when there was a shift away from a simple, self-reliant village economy. The argument goes that surplus production beyond the needs of the community made it possible for some to free themselves from the toil of the land and become specialised in particular tasks, like scribes, craftsmen, priests, and warriors. "Surplus production presumes irrigation, and efficient irrigation systems assume a complex bureaucracy, and that means cities".[5] Others see urban origins in the notion of the city as a protected marketplace that required agricultural intensification to sustain it[6] or as a holy place in need of a ceremonial centre. For some cities were agents of defence and domination evolving as mechanism's by which a society's rulers could establish administrative and military centres to "consolidate and maintain their power".[7] For Sjoberg,(1960) pre-industrial urban growth had more to do with military conquest and political stability than trade. Wheatley (1963) contrasts

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[2] L. Wirth, 'Urbanism As a Way of Life', in *American Journal of Sociology* xliv (1), (University of Chicago Press, July 1938)
[3] L. Mumford, 'What is a City?', in *Architectural Record,* lxxxii (McGraw-Hill, November, 1937)
[4] L. Mumford, *The City in History* (Pelegrine Books, London, 1961)
[5] S. Kostof, *The City Shaped* (Thames and Hudson Ltd,. London, 1991), p. 31
[6] Jacobs, (1984)
[7] G. Sjoberg, *The Preindustrial City* (London, 1960), pp. 67-8

this view of urban imposition by an established political authority, seeing the process as much more internally driven "as a result of the spontaneous readjustment of social, political and economic relationships within the context of folk society".[8]

It is unlikely that a single cause will ever be identified in the complex web of social, economic and political changes, which resulted in the emergence of urban forms. What has become clear is that their beginnings signalled both the transformation of the 'natural' environment and the mutation of the human species from hunter-gatherers and peasants into, what Raymond Williams identified as "a new kind of civilisation".[9] Within the next few years humanity will be a predominantly urban species. Williams argues that the emergent roots of this new form of civilisation can be traced to mid-nineteenth century England, and specifically to that moment during the Industrial Revolution when the urban gained irrevocable ascendancy over the rural, the first time in human history that this had ever been so anywhere. For him the date has "unforgettable significance".[10]

These transformations have been 'achieved' through the application of accumulated scientific and technological advances and yet today many people believe that there are no technological solutions to the environmental crisis. As the ecological limits of urban growth become increasingly apparent and the notion of the scarcity of resources becomes more widely accepted, questions of urban sustainability are falling into sharper focus. Can an urbanised world be ecologically viable? Is the move to full urbanisation a sign of humanity fulfilling its destiny or are we entering the 'end game' - the final stage in decline toward chaos and collapse? Or will we be able to, as Paolo Soleri suggests, transform the urban condition, and in so doing, turn society and the natural environment away from ecological demise.

Although twentieth century urban theorists like Patrick Geddes and Lewis Mumford, and more recently Christopher Alexander and Jane Jacobs have emphasised, not only how a cities might be better shaped physically but also what could improve people's lived experience of them, the emerging planning profession over the years have chosen to focus mainly the material aspects of these ideas and have tended to disregard the psychological effects. Correspondingly they have broken the problems down into their component parts and provided a physical solution. This approach has led planners to introduce ideas of zoning (separating dirty industry from housing), of grid street patterns (to ease mobility) and height restrictions (to protect

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[8] P. Wheatley, cited in S. Kostof, *The City Shaped* (Thames and Hudson Ltd,. London, 1991), p. 33
[9] Raymond Williams, *The Country and the City* (The Hogarth Press, London, 1973)
[10] *Ibid*

skylines) and encouraged by the garden city movement, have tried to bring aspects of the country into the city.

This approach has long been part of the dominant intellectual tradition, which has shaped urban policies throughout modern history and is profoundly rooted in a belief in the virtues of instrumental, rational and analytical thinking. Indeed, in respect of planning, sewage, water, utilities, roads, these approaches have helped to transform chaotic, disease ridden cities into safe and healthy environments. But reason, grounded in science, governed by logic, has its limits too. Today the built environment in the developed world results in damaging effects on the wider environment, both globally and locally. Such "negative external effects" stem from the structure of our modern urban settlements, the ways in which resources are used to construct and service them, and the lifestyles that they shape.

Today, when we consider the immense problems now facing the emerging mega-cities in nations in Africa, Asia and Latin America we can put into perspective the remarkable achievements of Western cities in overcoming the basic problems of urban living through the process of planning and design. But it is equally clear that the late twentieth century model of urban development, characterised by the cities of the industrialised Western world, if repeated globally, would bring ecological collapse.

Much, of course, depends upon the future demographics of the global population and how the process of world urbanisation develops. As mentioned earlier, the UN Population Division estimates that rapid population growth will gradually slow down before reaching 10 billion around the middle of the twenty-first century. Eventually it could level off at around 12 billion at some point in the twenty-second century.[11] Over the last 50 years to population of the world's cities has soared from 200 million to almost 3 billion.[12] The future for the majority of people in the world will be an urban one. Kingsley Davis (1965) predicted an "end to urbanisation" but not necessarily to absolute population growth, economic development, the physical size of cities, or the total number of people they might contain. He suggested that this "end" would be "more apparent than real" since, as countries ascend the attenuated 'S' curve of urbanisation an increasing number of urbanites simply become suburbanised and the boundaries of urban places simply become enlarged. He saw that as a society becomes advanced enough to be highly urbanised the whole "concept of urbanisation becomes ambiguous"[13] and less developed countries eventually become unable to sustain their populations.

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[11] UNPD, (1998)
[12] UNPD, (1995)
[13] Davis, (1965)

As the global population continues to expand, cities will either be the locus of our ecological nemesis or the source of our salvation. Today many people accept that the city represents a legitimate and immense problem and that action is now needed to address the acute crisis of urbanisation and urban environmental degradation. While academics and urban theorists from various disciplines, along with policy makers and politicians throughout the world, have in recent years been debating ways to address these problems very few serious alternatives to the apparent logic of two-dimensional urban expansion, exemplified in cities like Phoenix, Los Angeles, Mexico City, Sao Paolo, and London, have been offered.

It is still unclear in which direction our society must go in order to begin the twenty-first century with a better environment. While it has become apparent that "there will be no sustainable world without sustainable cities"[14], more than a decade after the United Nations Centre for Human Settlements (Habitat) launched its *Sustainable Cities Programme,* we still have no conception of what sustainable cities of the future might look like, how they might be planned, structured, or designed. The sustainability imperative has now attained the sort of political priority status that demands a planned response based on solid theoretical foundations as well as hard technical evidence. There is an increasing realisation that significant obstacles must be overcome before environmental problems can become manageable and an ecologically sustainable society can be brought within our grasp. It is proving extremely difficult to initiate sufficiently broad and in-depth debate, in which accepted orthodoxy such as continuing economic growth, industrial development, and the current patterns of urban growth can be questioned and alternative visions taken seriously. There is a blatant lack of new ideas concerning the future of society. Robert Fishman (1977) recognises the same poverty within the visionary tradition in urban planning after Howard, Wright and Le Corbusier.[15] The question arises; who will create the environmentally responsible society of the future?

8.2 Urban narratives of the twentieth century avant-garde

Paolo Soleri joins those from the nineteenth century, including Ruskin, Blake, and Wordsworth, who were critical of the degradation and despoliation of the environment by industrial production and industrial capitalism. But, in arguing that most of the problems that afflict modern society are a direct consequence of the sprawling pattern of twentieth century urban growth, he also adds his name to those who have voiced concerns about the quality of life

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[14] H. Girardet, *Creating Sustainable Cities,* (1999)
[15] R. Fishman, *Urban Utopias of the Twentieth Century: Ebenezer Howard, Frank Lloyd Wright and Le Corbusier* (Basic Boos, New York, 1977)

in the modern metropolis and echoed many of the real fears and ambiguities that have surrounded the notion of the city during the twentieth century. His critique of the current patterns of urbanisation is echoed in much of the work of contemporary urban theorists, such as David Harvey, Manuel Castells, Doreen Massey, and Robert Beauregard. His desire to come up with a workable alternative is shared by many urban designers and planners, including Peter Calthorpe, Andres Duany and Elizabeth Plater-Zyberk, Herbert Girardet, Richard Register, Richard Rogers, and the Urban Villages Group. And his desire to see widespread social change is being expressed by an increasing number of government organisations and NGOs (WHO, 1987; Brundtland, 1987; Commission of European Communities, 1990; OECD, 1990; UN [Habitat], 1990; ICLEI, 1991; World Urban Forum, 1992; UNCED, 1992). What distinguishes Soleri is his radical approach to solving these problems, the sheer scale of his vision, the philosophical foundation of his urban model, and his determination, since 1970, to test his hypothesis by building a prototype at Arcosanti. Soleri calls for nothing less than the complete transformation of the spatial and physical configuration of the modern city into "three-dimensional" structures. The core of his argument is that:

> In order to support all the complex social and economic activities that sustain human culture, and to give it a new perception and renewed trust in society and its future, the city structure must contract and miniaturize into dense, integrated, three-dimensional structures.[16]

In abandoning traditional architectural practice and focusing on the projection of a different way of thinking about buildings Soleri joins a long list of visionary architects that includes Piranesi, Boullée and Ledoux, from the eighteenth century. His theoretical work also follows in the tradition of other futuristic urban narratives of the twentieth century avant-garde. Like Howard, Garnier, Le Corbusier, and Wright, Soleri has tried to rethink and re-plan the twentieth century industrial city from its infrastructure upwards.

And as in other urban narratives of the twentieth century avant garde; like Antonio Sant'Elia's *Città Nuova* (1914); Fritz Lang's expressionist metaphor in *Metropolis* (1929); Iakov Cherrnikhov's Constructivist *Architectural Fictions* (1933); Yona Freidman's *Spatial City* (1958); Kiyonari Kikutake's *Marine City* (1958); Buckminster Fuller's *Geodesic Dome for Manhattan Island* (1962); Arata Isozaki's *Modern City* (1963); the Archigram Group, Peter Cook's *Plug-in City* (1964) and Ron Herron's *Walking City* (1964), Ridley Scott's post-apocalyptic urban scenario in *Blade Runner* (1982), Soleri's designs have had the power both to excite and disturb their reviewers.

8.2.1 Garden city

At the end of the nineteenth century in *Tomorrow: A Peaceful Path to Real Reform* (1898)[17], Ebenezer Howard (1850-1928), stated that an extensive reconstruction of the environment was necessary in order to resolve the seemingly endless process of rural/urban migration which had led to a lack of labour in the countryside and overcrowded urban areas characterised by mass unemployment, poverty, insecurity, crime, unsanitary conditions and pollution.[18] Influenced by Ruskin's Romantic notions of social reform and Morris's anarcho-communist ideals [5.3.3]. Howard set out to resolve the migration problem and counter the trend toward urbanisation. Because he believed that neither the city nor the country could satisfy all human needs, his solution was a form of revolutionary city planning, wherein new cities would be designed and built which were also lush gardens (or gardens would be designed and created which were also cities).

The attractive qualities within both the country and the city were to be harmonised within what he termed a new "town-country" magnet. Incorporating an extensive public transportation system, clean industry and electricity, spacious green zones, re-use of waste materials, and the intentional integration of living, working and recreational areas, his garden cities offered conditions intended to stimulate environmentally benign behaviour, thus ensuring that the environment became an integral part of society. His theories, influenced by Edward Bellamy's Utopian novel *Looking Backward 2000-1887* (1888) which predicts the transformation of human society, through environmental revolution and the demise of economic competition, constitute a decentralised ecological approach to town planning. To test his ideas he put forward a scheme to build a small model city.

'Garden City' was to be built on the central 1,000 acres of a 6,000acre estate, and have a population of 32,000. The town was circular in plan and was surrounded by farms, small-holdings, allotments and woodland on the remaining 5,000 acres. Also located within the "green belt" were brickfields, institutes for the blind and deaf, convalescent home, industrial schools and an agricultural college. The town's industry was positioned on the perimeter serviced by a circular railway looped-up from the main railway line. Electricity would power the industry and keep pollution hazards to a minimum. The architecture was to be varied to allow for the widest possible individual taste and preference.

[16] P. Soleri, *Arcosanti Workshop Program Brochure* (Cosanti Foundation, Scottsdale, 1987), p. 1
[17] Later re-issued with some changes of emphasis as *Garden Cities of To-morrow* (1902)
[18] E. Howard, *Garden Cities of To-morrow* (1902), (Attic Books, Eastbourne, 1985), p. 6

Six radial boulevards divided the town into six wards of equal size. In the centre was a small garden of five acres. Fronting onto this, with the Central Park at their backs, were the public buildings like the town hall, hospital, library, museum, and art gallery. The central park was surrounded by a glass shopping arcade that Howard called "Crystal Palace". Five circular avenues divided the town with the third, Grand Avenue, being 126 metres wide, complete with parkland, schools. Churches, and recreational areas.

Houses set in their individual gardens fronted onto the avenues and boulevards, and were planned at a density of about 20 houses to the acre. Raymond Unwin (1863-1940) would subsequently reduce this figure to 12 houses per acre when the first garden city was finally planned and built at Letchworth (1903). These figures were lower than the average at the time although higher than many contemporary suburbs. The wards were wedges of a circle which were a microcosm of the whole town, housing almost self-contained communities of 5,000 people - the conceptual forerunner of the neighbourhood units of contemporary planning.

In Garden City Howard believed that the town and the country would co-exist happily and be mutually dependent. The physical dimension of the town would be permanently limited and the agricultural belt would be left undeveloped. Citizens mostly working in the industries would be close to the countryside, while the rural community, working mostly in agriculture, would have the benefits of proximity with the town and could share in its social and cultural life. Howard's precise formulation of ecological preconditions was intended to maintain self-sufficiency while guiding industrial activities and a large portion of the policy-making choices. Environmental considerations were, in this way, fully immersed in planning and social structures. The environment thus formed a foundation for architectural and social planning. Despite his overemphasis on the unity of design and his underestimation of the ecological benefits of urban life, Howard's vision, which was realised as a developmental strategy at the Garden Cities of Letchworth and Welwyn (1920), was able to address the complex and connected issues of urbanisation, industrialisation, environmental degradation and pollution, in a structured and holistic way. City planners, social reformers and architects from around the world have since drawn inspiration from his theories and, filtered through Patrick Geddes (1834-1932) and the nineteenth century French geographers, Elisée Reclus and Vidal de la Blache,[19] they led to the development of regional planning and the New Town programme that emerged after the Second World War.

Patrick Geddes, and subsequent followers, Patrick Abercrombie and Lewis Mumford, were proponents of regional scale planning which attempted to place more importance on the regional

approach by placing them in a wider economic, social and physical context. This led to the idea of the civic or regional survey, and to planning at a city region scale. Overall the regionalist approach was to accept the inevitability of the forces of outward drift and to plan for it accordingly.

8.2.2 Futurist city

> Now the giant city sucks the country dry, insatiably and incessantly demanding and devouring fresh streams of men till it wearies and dies in the midst of an almost uninhabited waste of country.[20]

Futurism was a poetic current before it became a movement in painting and sculpture. The 'Foundation Manifesto of Futurism' published in *Le Figaro* in 1909 was created by the poet Tommaso Filippo Marinetti who attacked traditionalism, and upheld an expression nourished by contemporary forces and the new industrial environment. The modern metropolis, seen as the typical expression of the forces of society, was the typical subject matter of the movement although there was not a 'Futurist Architecture' as such. There was though an architecture manifesto attributed to Antonio Sant'Elia (1888-1916) although it is widely accepted that it is largely Marinetti's responsibility. In its first version, known as the *Messaggio* (1914) it accompanied an exhibition of Sant'Elia's carefully rendered presentation drawings for the 'Città Nuova' along with his vision of Milan in the year 2000.

> We must invent and rebuild *ex novo* our modern city like an immense and tumultuous shipyard, active, mobile and everywhere dynamic, and the modern building like a gigantic machine...The house of cement, iron and glass...as big as need dictates, and not merely as zoning laws permit, must rise from the brink of the tumultuous abyss; the street which , itself, will no longer lie like a doormat at the level of the thresholds but plunge storeys deep into the earth, gathering up the traffic of the metropolis connected for necessary transfers to metal catwalks and high-speed conveyor belts.[21]

There was no overall plan for Sant'Elia's city. It was more a collection of new building types and suggested ideas for power stations, airports, airport hangars, multi-level stations and stepped apartment buildings of a type called *Casa a Gradinate.* 'Città Nuova' was reputedly inspired by his earlier proposal to rebuild Milan Central Station (1906)[22], which was based on a complex network of transport services, seven levels deep in places. Out of this "three-dimensional grid of

[19] H. Meller, *Patrick Geddes: Social Evolutionist and City Planner* (Routledge, London, 1993)
[20] O. Spengler, *Decline of the West* (George Allen and Unwin, London 1926), p. 102
[21] Sant'Elia, *Messaggio* (1914) a preface to the exhibition of 'Città Nuova'. The entire text is cited in R. Banham, *Theory and Design in the First Machine Age* (Architectural Press, Oxford, 1960), pp. 128-30
[22] R. Banham, *Theory and Design in the First Machine Age* (Architectural Press, Oxford, 1960), p. 132

communications"[23] arose huge *gradinate* structures, usually of buildings with floors of equal depths that stepped back progressively toward the top. The overhangs at the rear were matched with the building's twin, which backed up against it, leaving an archway through which transport and services passed. Lift shafts were positioned on the façades and rising vertically required connecting bridges at the upper levels.

Although there precedents for the formal design of the blocks in Henri Sauvage's set-back apartments built in Rue Vavin, in Paris (1912), in the dramatic forms of nineteenth century warehouses, and bridges and in the lifts on the shores of Lake Como, "rising from landing stages, and connected back to points on the mountainside by bridges"[24], Sant'Elia's concept of the multi-layered tower city, presented like a "colossal dynamic mechanism"[25] is just as likely to have been inspired by early images of Manhattan with its elevated railways and skyscrapers.

Futurism's central assumption was that the spirit of the age was inevitably tied to the evolution of mechanisation and that modern architecture must take this into account in its function, its methods of construction, its aesthetics, and its symbolic form. With the celebration of modern materials allied to an indulgence in mechanical references it drew together a collection of progressive attitudes and future-orientated positions that influenced the subsequent utopian projects of Garnier's *Une Cité industrielle*, Le Corbusier's *La Ville Radieuse*, and Soleri's *Arcologies*.

8.2.3 Industrial city

In 1917 Tony Garnier (1869-1948) published a less radical contribution to contemporary urbanism in *Une Cité industrielle* (1917) which demonstrated his belief that the cities of the future would have to be based around industry.[26] Garnier's industrial city was designed for 35,000 inhabitants, as a regional centre of medium size, to be planned in a sensitive relationship with its surrounding environment. Without walls, private property, churches, barracks, police stations, or law courts, all the unbuilt areas were to be left as public parkland. In accordance with a strict set of planning codes, aimed at maximising the provision of light, ventilation and green spaces Garnier established a housing typology, resulting in low-density housing at an average of two storeys in height, distributed along a hierarchy of tree-lined streets of varying widths. Anticipating the principles of zoning separation advocated by the Congrès Internationaux d'Architecture Moderne (CIAM) *Athens Charter* of 1933, Garnier's industrial city was based on

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[23] *Ibid,* p. 133
[24] *Ibid*
[25] W. J. R. Curtis, *Modern Architecture since 1909* (Phaidon Press, London, 1987), p. 74

distinct zoning for residential, industrial, transport, and health areas. At the first meeting of the CIAM (1928) Walter Gropius and Le Corbusier had argued that architecture should be put "back in its true sphere which is economic, sociological, and altogether at the service of humanity".[27] By 1933 the doctrines of the *Athens Charter*, which would later appear in José Luis Sert's *Can Our Cities Survive?* (1942), were firmly fixed on the problems of the modern city:

> Today most cities are in a state of total chaos. These cities do not come anywhere near achieving their aim, which is to satisfy the biological and psychological needs of their inhabitants...On a spiritual and material level, the city should ensure individual freedom and the benefits of collective action.[28]

Above all else Garnier's industrial city was the vision of a socialist arcadia where the public buildings, including a museum, library, theatre, swimming pool were to be grouped around the axis of an assembly complex, complete with a cluster of union meeting rooms and a central circular 3,000-seat auditorium flanked by smaller amphitheatres. As Frampton (1980) points out the various democratic gatherings would have taken place beneath the massive railway station clock-tower with its entablature inscribed with two quotations, one from Saint-Simon about achieving "international harmony through industrial production and communication", and the other from Zola's *Travail:*

> This was the incessant production suitable for epochs of peace, rails and yet more rails, so that all frontiers might be passed over, and so that all peoples, reunited, might form a single people, on an earth entirely furrowed by routes. These were the great steel ships, no longer the abominable ships of war carrying devastation and death, but ships of solidarity and fraternity, exchanging the products of continents, increasing the domestic riches of humanity tenfold, to that point when tremendous abundance reigned throughout.[29]

Garnier's plans draw on French urban formalism in its use of axes, on Howard's decentralised ecological ideals, on principles from the utopian-socialist tradition, and proposed the use of new construction methods using reinforced-concrete being pioneered in Paris by Auguste Perret (1874-1954). Although Garnier's plans conserved the "old city" it also offered a compelling model for an emerging machine-age society and among others it influenced Charles Edouard Jeanneret, later to become Le Corbusier.

[26] T. Garnier, *Une Cité industrielle: Etude pour la construction des villes* (Paris, 1917, 2nd edition 1932)
[27] CIAM, 'Declaration of Aims' (La Sarraz, Switzerland, 1928)cited in W. J. R. Curtis, *Modern Architecture* (1987), p. 171
[28] J. L. Sert, *Can Our Cities Survive?,* (Harvard University Press, Cambridge, MA., 1942)
[29] A quotation from Zola's *Travail*, alluding to the ritualistic celebration of a utopian harvest cited in K. Frampton, *Modern Architecture* (1980), p. 102-3

8.2.4 Radiant city

> The machinery of Society, profoundly out of gear, oscillates between an amelioration, of historical importance, and catastrophe. The primordial instinct of every human being is to assure himself of shelter...It is a question of building which is at the root of the social unrest of today...The problem is one of adaption, in which the realities of our life are in question. Society is filled with a violent desire for something which it may obtain or may not. Everything lies in that: everything depends on the effort made and the attention paid to these alarming symptoms. Architecture or Revolution.[30]

Le Corbusier (1887-1969) believed that it was the business of architects and planners to give form to the new society and thereby avoid an imminent revolution. He perceived the same problems of the industrial city as Howard and Wright but his own radical solution, demonstrated in the late 1920s and early 30s in his ideal city plans, was to increase rather than reduce urban densities, "to decongest the centres of cities by increasing their density".[31] In the late nineteenth century Camillo Sitte (1843-1903) had argued for urban planning to resurrect the activity and intensity of the medieval or Renaissance urban core and became the unintentional guiding light for many twentieth century urban centrists. Le Corbusier, an early enthuisiast for Sitte's ideals, designed *La Ville Radieuse* (1933) ('the radiant city') as a centralised and densely populated collectivist city, laid out in a rigidly symmetrical grid pattern quite unlike Sitte's towns. Based on his earlier urban models of *La Ville Contemporaine* (1922), and the reworked version superimposed on the Right Bank of Paris, *La Ville Voisin* (1925), the *radiant* city was designed according to Le Corbusier's belief that within an environment of strict geometric order, the human mind would be uncluttered, and hence 'calm'. He believed that the home should be a place of silence and solitude, a place in which to meditate and be creative. But in order to develop this the home had to adopt an entirely new character and this, in turn, necessitated a complete re-arrangement of the urban fabric , a new arrangement of transport, new concepts of space and techniques of building construction. Because he understood that proximity to nature was a stimulus to meditate and introspection, Le Corbusier advocated the concept of the Vertical Garden City combining the high density of the metropolis with Howard's Green ideals. The mass of a building, he suggested, rather than be strung out along the edge of a site with accommodation arranged around a central courtyard, should be re-configured into one tall structure in the centre of the site. The ground plane could then be opened up for pedestrian use, for transport, and natural landscaping, and could allow the ingress of light and air into the structure.

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[30] Le Corbusier, *Towards a New Architecture* (1923) in J. Rodker (transl.), (Architectural Press, Oxford, 1989), p. 8 and pp. 288-9

[31] P. Hall, *Cities of Tomorrow* (Basil Blackwell, Oxford, 1988), p. 207

In *La Ville Contemporaine*, a "contemporary city of three million inhabitants", the city's core of twenty-four 60-storey cruciform "Cartesian" office skyscrapers, was surrounded by twelve storey high-density residential blocks set within a park that extended to an area four times the size of Manhattan. All the buildings were to be raised clear of the ground on *pilotis*, including garages and roads, leaving the surface free in the form of a continuous park through which pedestrians could wander at their leisure. Broad roads were designed to allow the rapid flow of traffic to and from the countryside and to connect different parts of the city. The traditional notion of the 'corridor-street' was destroyed. Instead of the polluted industrial city a new clean and efficient world of light, air, and greenery was to be created within a reintegration of the country and the city. To convey an idea of how the 'contemporary city' might look and the notion that this was a future that was attainable in the present Le Corbusier fused images of Manhattan with those of Sant'Elia's *Città Nuova* (1914).[32]

Although it contained many of the same elements as his earlier plans, Le Corbusier's *La Ville Radieuse* (with a planned population of 1.5 million), like Garnier's Cité Industrielle and the linear-city concept proposed by Milyutin, was zoned along parallel bands assigned to various uses; from the isolated offices in skyscrapers at the "head" of the city via the cultural "heart", located between the two "lungs" of the residential zone in the middle, to the warehouses and industry at the base.[33] This less centralised model allowed the city to be theoretically expandable. Le Corbusier's plan for the industrial city of Zlín (1935), then Czechoslovakia, designed for the shoe manufacturer Bata, was an adaption of the model to a specific site, linking the old town and manufacturing centre at the base of the valley with an airport on the plateau above. In the Zlín plan the industry buildings are located on one side of the road and railway line running through the valley, with the housing units positioned on the opposite, south-facing slope of the hill. The Radiant City was an influential model for post-war urban development in Europe. Depending on which method of analysis is adopted the residential density of the proposed city ranges between 1000 and 3,500 people per hectare.[34] In Britain a stream of proposals for high-rise blocks, based on Corbusian ideals were designed and implemented in the 1950s and 60s. Two new capitals were indebted to the ideas it embodied, at Chandigarh, capital of the Punjab (masterplanned by Le Corbusier in 1950) and Brasilia in Brazil (planned by Lucio Costa in 1957).

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[32] Curtis, (1987), p. 165

[33] N. A. Milyutin, *Sotsgorod: The Problem of Building Socialist Cities* (1930), (MIT Press, Cambridge, Mass., 1974)

[34] J. Dunnett, 'Future Cities: contemplative or delirious?' in *The Architects' Journal* 212 (1), (July 2000), pp. 20-1

TABLE 8.1

A CHRONOLOGY OF SELECTED CENTRIST AND DECENTRIST URBAN PROPOSALS
Including Key Projects by Paolo Soleri

	Centrists		Decentrists	
	Project	**Protagonist**	**Project**	**Protagonist**
1800			New Lanark	Robert Owen
1850			Saltaire	Titus Salt
			Bournville	George Cadbury
			Port Sunlight	William Lever
1900			Garden Cities movement	Ebenezer Howard
1915	Città Nuova	Sant'Elia	Regional planning	Patrick Geddes
1930	Ville Radieuse	Le Corbusier		
1935			Broadacre City	Frank Lloyd Wright
1955	*Cosanti*	*Paolo Soleri*	New towns movement	Lewis Mumford
1960	Urban diversity	Jane Jacobs Richard Sennett		
	Mesa City	*Paolo Soleri*		
1970	*Arcology*		Ecumenopoly	Constantin Doxiadis
	Arcosanti	*Paolo Soleri*		
1975	Compact city	Dantzig and Saaty		
	Two Suns Arcology	*Paolo Soleri*		
1980	*Habitats for Shifting Populations*	*Paolo Soleri*		
1985	*Space for Peace*	*Paolo Soleri*		
1990	Compact city	European Commission National governments	Market solutions	Gordon & Richardson
	Circular metabolism	Herbert Girardet	'Good life'	Robertson, Green & Holliday
1995	Sustainable city	Richard Rogers		
	Hyper Building	*Paolo Soleri*		

Source: various

As in Renaissance ideal cities like Filarete's Sforzinda (1457-64) or Palmanova (1593-1623), the utopian socialist diagrams of, for example, Claude Nicolas Ledoux at Chaux (1775) and Robert Owen's 'Project for a Village of Co-operation' (1816), and Howard's plan (1889), Le Corbusier's city exhibits a concern for geometric purity and the establishment of social order through clarity and symmetry. The Renaissance idea of the Humanist city, where perfect form is the image of a perfect society is translated in La Ville Radieuse in the symbolic analogy of the human body, where the city has a spine, a heart, lungs, and a head, thus incorporating the ideal

of twentieth century 'man' in a perfect and harmonious balance with nature. This Humanist anthropomorphic metaphor was to be adopted by Soleri in his *Mesa City* project from 1958.

8.2.5 Broadacre city

In the 1920s and 1930s Frank Lloyd Wright called for a radical transformation of American society which would restore the traditional Emersonian ("love of wilderness") and Jeffersonian (pioneering "struggle for independence") sentiments. In *Broadacre City* (1934 - 1958), the embodiment of his vision, every citizen of the United States was be given a minimum of one acre of rural land per person. The independent family homestead was to be the basis for a decentralised American society, which would re-inhabit the rural landscape with restored virtues of 'freedom' and 'self-reliance'. Unlike Kropotkin's communes, based on the Russian *mir* and founded on the principle of mutual aid (1902), in Broadacre City family stability was to be augmented in relative isolation. A sense of community was to be achieved principally through telecommunications and transportation.

Wright seems, in many ways, simply to have been accepting the inevitable. In the 1920s the new technologies of the motor car and electricity began to loosen the cities, enabling them to spread into the countryside. Cities have always been places of opportunity and problems, change and crisis. Often the challenges they have thrown up – overcrowding, disease, social disorder, conflicts over land and its uses, a lack of infrastructure – have been tackled in innovative ways. In the period after the Industrial Revolution the challenge was how to respond to immediate problems of the "evils of the nineteenth century city".[35] Physical infrastructures needed to be created - sewage systems to contain disease and improve public health; housing to accommodate ever-expanding populations; roads and railways to increase mobility for people and products. For Ebenezer Howard, Patrick Geddes, Frank Lloyd Wright, Le Corbusier and their followers their primary motive lay in the reaction to the squalor of the towns and cities that were thrown up by the first era of rapid industrialisation.

The Industrial Revolution had already spawned a number of responses in the UK during the nineteenth century in the form of private, philanthropic ventures at New Lanark, Saltaire, Port Sunlight and Bournville. What these enterprises had in common was a desire to create healthy and efficient communities within a pleasant environment, away from the disease and congestion of the industrial city. These social experiments had very little impact on the general process of urban centralisation, which continued throughout Europe until the 1940s.

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[35] P. Hall, (1988), p. 7

Like Ebenezer Howard, Wright was reacting against the industrial city and industrial capitalism. But unlike Howard who favoured regional autonomy through the establishment of local councils, and Le Corbusier who advocated centralised control through the state, Wright wanted individuals to be free to live and work in the countryside and, in Broadacre City he wanted to be the architect of a planned and aesthetically controlled process of decentralisation. But from the 1920s onwards various forces combined to create the massive suburbanisation and uncontrollable urban sprawl that has come to characterise much of the modern built environment.

8.3 Paolo Soleri at Taliesin West

Paolo Soleri was born was born in the industrial part of Turin, Italy, on June 21 1919. In 1933 his family moved to Grenoble in France to escape Mussolini's fascist regime and Soleri attended L'Ecole d'Art Industriel. When, two years later, they returned to Italy, he continued his education at Torino Academia Albertine in the Liceo Artistico. Between 1941 and 1946 he studied at the Turin Polytechnical Institute, where he graduated with highest honours taking a doctorate in architecture, which focused on the subject of 'human ecology'. Within two years he was one his way to the United States as a Fellow of the Frank Lloyd Wright Foundation. After a compulsory month-long stay on Ellis Island he travelled to Taliesin West, outside of Phoenix, Arizona, where, in between working in the kitchen and acting as a personal aid to the Wright family, he undertook research on bridges and passive heating systems.

Soleri's early architectural studies were influenced, like many of his contemporaries in Europe, by the work of Le Corbusier, Mendelsohn, Gropius and Aalto [36] but then "suddenly this little booklet comes out in Italian on Frank Lloyd Wright with a photo of the desert thing. And it threw me".[37] After a brief exchange of letters, he joined an expanding group of post-war foreign apprentices who were then converging on Taliesin to hear at first hand Wright's radical views on the new architecture of American democracy. Many were awarded scholarships and given a 'fair trial at working their way through without fees'.[38]

It was traditional for apprentices around this time to give Wright a gift each year at Christmas and on his birthday. The 'Box', as it was called, contained the students own architectural projects and offered an otherwise rare opportunity to get feedback from the 'master architect' on their

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[36] G. Stanishev. 'Soleri's Laboratory' in *World Architecture* 21 (International Forum of Young Architects, January, 1993), pp. 58-63

[37] T. Ostler, 'Preaching in the Wilderness' in *Building Design* (February 18, 1994), pp. 12-3

[38] B.B. Pfeiffer (ed.), *Frank Lloyd Wright: Letters to Apprentices* (California State University, Fresno, 1982), p. 23

own imaginative terms. He put great emphasis on this event and the comments he made were seen as "the greatest architectural critiques any apprentice would ever receive".[39] Soleri, described by Blake (1969) as one of Wright's 'most brilliant students'[40], made his box contribution with others in the summer of 1948 (see Plates 1 & 2). In his letter of response Wright wrote that:

> Paolo really went to town on his. His passionate rendering had a painter's virtuosity and technique...The plateau he mounted his well conceived building scheme upon was richly decorated by his buildings. But again they seemed to me all *on* the plateau, not *of* it. And there again even in scheme Paolo seemed more the brilliant painter than the Architect. But there are many roads to Architecture and he may find one of them if he is patient enough.[41]

About a year later, Soleri's apprenticeship was abruptly terminated with a polite letter of dismissal from Wright.[42] The young apprentice had not, it seems, been patient enough. He had asked Wright's permission to establish another Taliesin in Italy and, although initially enthusiastic, Wright had become upset to discover that a group of his own apprentices were keen to join Soleri in Europe. When he found out that the young student's design for a bridge had been published in Elizabeth Mock's *The Architecture of Bridges* (1948) alongside his own, and had attracted better reviews, Soleri was on his way out of Taliesin.

Although some argue that his architecture is a 'parody' of Wright's in the sense that his building is an "organic outgrowth of its site"[43] Soleri does not subscribe to being an 'organic architect'. For him Wright's prairie houses represent a "spurious and superficial way of being in sympathy with nature".[44] Soleri did not share Wright's enthusiasm for decentralisation. He writes about environmental collapse and how "suburbia" is a prime culprit. He sees in urban sprawl the symbol of our functional, social and cultural vacuum in the midst of an ecological debacle. Soleri argues that Wright, the spokesman for 'organic architecture', had demonstrated his fundamental hostility towards urbanism in the proposals for Broadacre City. His decentralised view of American society was based on the widest possible use of the motor car and involved, the "general mobilization of the human being". To Soleri the car is, "... the great villain of the century, and quite possibly the great villain of all time...an apocalyptic example of mindless

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[39] *Ibid,* (1982), p. 110
[40] P. Blake, Foreword in *Arcology: City in the Image of Man* (January 1969)
[41] Letter from Wright, July 3, 1948 cited in Pfeiffer, (1982), p. 110
[42] R. Pizarro, 'Soleri's Pendulum: Between Urban Design and Theology' , (Masters thesis, Arizona State University, 1996), p. 108
[43] R. Candida Smith, 'Frank Lloyd Wright as Educator: the Taliesin Fellowship Program, 1932-59' in I. Borden and D. Dunster (eds.) *Architecture and the Sites of History: Interpretations of Buildings and Cities* (Butterworth Architecture, Oxford, 1995), pp. 227-42
[44] Soleri cited in Ostler, (1994), p. 12

logistics and technological slavery".[45] His alternative involves drawing people and their activities back together into dense, complex and integrated three-dimensional structures. His urban model is more in the centrist tradition of Sant'Elia (1914), Garnier (1917) and Le Corbusier (1922), but, like Howard, his approach is firmly ecological.

> There are no real answers in the cities as we have known them...No organism can overcome prolonged starvation, even if it is starvation in the midst of plenty. Every one of its organs becomes segregated in an attempt to survive, and such mutilation brings about their abandonment one by one. The present reduction of metropolitan life to a pure struggle for survival is the reason for the conception of a more apt system...[46]

Today at over eighty years old, Soleri is pursuing the objectives, which have occupied since he left Taliesin West in 1949. He has throughout this time expressed the view that our current patterns of urban development are fundamentally flawed and has dedicated his life to finding a workable alternative to urban sprawl with its detrimental impact on communities and the environment.

Rather than accept the trend of outward drift and the inevitability of decentralisation Paolo Soleri has, since the 1950s, envisaged a re-orientation of city life through a process of *urban implosion,* wherein the city is compacted and intensified, made three-dimensional and pedestrian and designed to conserve the earth's energy and resource. Avoiding the bandwagon of environmental despair and the Arcadian view that by moving into the wilderness we can escape the degradation of the city, his attempt has been to define a truly urban solution which seeks to provide shelter, not just for individuals, or families, but for society as a whole. His response to the discrepancy between the city and the countryside identified by Howard, lies in the relationship between architecture and ecology and in his attempts to seek how the two can come together so that the integrity of the environment is preserved and the quality of life is kept intact:[47]

> Soleri's answer is urban implosion rather than explosion. The city should contract and intensify, but in order to hold its information in negroponic form, it should imitate evolution and complexify itself through intense miniaturization. A city of 600,000 should become a single recycling organic arcology. The people would not live crowded in ghettos but on the outer skin of a towering arcology that faced toward a nature that was once again natural. Thus the surface of an arcology would be a "membrane and not a wall". Inside the arcology, along its central spine axis, would be not the natural but the civic space. Here society would turn inward for the concerns of man and culture.[48]

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[45] P. Soleri, *The Bridge Between matter and Spirit is Matter Becoming Spirit* (Anchor Press/Doubleday, Garden City, NY, 1973), p. 164
[46] Soleri. *Arcology,* (1969), p. 8
[47] H. Skolimowski, 'Paolo Soleri: the Philosophy of Urban Life' in *aaq* 3 (1), (1971), pp. 134-42
[48] W. I. Thompson, *Passages about Earth* (Harper & Row, New York,1973), pp. 35-36

Although he was critical of his urban theory, Soleri was inspired by Wright's organic philosophy of architecture, and equally impressed by the integrated community life that was the basis of Taliesin's Fellowship. The experience would have a strong influence in how the workshop program at Arcosanti was later structured. But there were few thoughts on arcology during his spell with Wright.

> ...when I was at Taliesin I wasn't thinking about arcologies and all those things. I was just absorbing and doing the little things I was asked to do. I was very grateful to have that experience and it was very important to me.[49]

8.4 Ecumenopoly versus arcology

Among the most useful urban utopias of recent years are the radically different visions of Constantin Doxiadis (1913-75) and Paolo Soleri. Doxiadis applied his theory of "ekistics", his "science of human settlements", to the existing trends that he identified in world wide population growth, and urban development patterns, and proclaimed his vision of the urban future, which he called *Ecumenopolis* (1969).[50] Doxiadis argues that five basic elements of Nature, Man, Society, Shells, and Networks together form a system of human settlement which ensure our continued happiness and safety within Ecumenopolis. He argued that the major "trends of present technological and economic progress cannot and should not be reversed" and that problems that have traditionally concerned urban theorists and designers - such as poverty, overcrowding, environmental degradation, social conflict - were no more than distractions. He branded the visions of others - including eliminating the car, colonising space, back-to-nature ideas, the creation of megastructures, and the establishment of new towns, as "escapist solutions" and argued that "the most probable, logical and practical solution...is the progressive expansion of the present type of city as a result of the massive influx of an ever-increasing population". Ecumenopolis was described as emerging "universal system of life" and single "global settlement".

In attempting to balance, what he saw as a historical human need to live in small-scale communities with the inevitability of urban sprawl, he proposed a global city of twenty billion inhabitants spread out along the seaboards of the major continents and organised into semi-autonomous communal "cells", each sustaining a population of 40,000. Others have described the kind of conurbation to which he refers as "megalopolis". Lewis Mumford described it as

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[49] Soleri cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[50] C. Doxiadis, 'Ecumenopolis: World City of Tomorrow', in *Impact of Science on Society* (UNESCO, Volume xix, No. 2, 1969)

"urban pathology" and "sprawling gigantism". To Soleri (1969) ecumenopoly presents a frightening "map of despair":

> The thinking is that of a creature bound to a surface existence. *He has been given a surface enveloping a solid sphere, and he is doing his level best to carpet it with one or two or five layers of performace. It will not do.* [original emphasis][51]

Soleri looks at the same emerging realities and takes human society in an entirely different direction, drawing the elements back together towards a revolutionary new kind of human environment, a "neonature", arranged within 'giant' *arcologies* some containing populations of millions leaving the rest of nature to develop on its own terms (see Plate 3).

Having spent most of his working life trying to find ways in which the combined processes of architecture and ecology can move towards a better form of urban life, and following Teilhard de Chardin, Soleri argues that "life in general and human life in particular can be symbolised by a vector and...not by a random pattern".[52] He says that we humans are both the 'means' and the 'ends' in a process in which the direction of human energy, and what we call time and we know as history is towards a conclusion.[53] Arne Naess has put it another way. He says that we humans are "something essentially on the way". Rather than seek perfection, Soleri has been trying to clarify some of the basic processes by which human life and human societies have evolved, and apply these concepts in producing of a different kind of architecture, one which he says is historically valid and based on sound ecological principles. He says it is, "simply part of the nuts and bolts pragmatism of matter becoming spirit".[54]

8.5 The arcology theory

As described earlier a number of models have recently been proposed to respond to local and global environmental problems highlighted in both the green and brown agendas. The compact city idea is now being promoted as a major component of the various strategies emerging to tackle some of these problems. The rationale for its implementation lies in a set of strategic benefits that are seen as the outcome of more compact urban forms in which travel distances are reduced lessening fuel emissions, rural land is saved from development, local facilities are supported and local areas become more autonomous. Despite reservations that

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[51] Soleri, *Arcology* (1969), p. 2

[52] *Ibid,* p. 1

[53] Following De Chardin's idea of organic unity at 'point Omega' Soleri's eschatological hypothesis describes the 'Omega seed' as a conclusion in a process of 'esthetogenesis' in which all matter, the physical world will finally be transcended into pure spirit. Accordingly all parameters: mass, energy, time and space are instrumental and therefore sacred

many of these benefits are far from certain, the concept is being held up as the way forward and, policies which promote urban compaction are being promoted by Western politicians, eager to deliver major environmental improvements.

Many more people are willing to accept that, in large part, the environmental crisis is caused by the way our cities are designed and built. But few have been working towards serious alternatives. Paolo Soleri is an exception.

> ...[He] has thought deeply about what is wrong with our civilization, what renders it unsustainable. He has envisioned a redirection of the organization of urban life which would not only ensure that we have a futurebut also make it likely that that future would move towards the consummation of the human adventure rather than obliteration.[55]

Since 1970 the "urban laboratory" in Arcosanti, Arizona , under his direction has been conducting experiments in the radical reorganization of the sprawling urban landscape into dense, integrated, three-dimensional cities. Upholding the traditional medieval model of containment the *arcology theory,* which underpins this approach, is directed towards the optimal performance of the human habitat and the definition of a new type of urban "instrument" that aims at maximising, what he calls, the *urban effect* via a process of *complexity* and *miniaturisation*.[56] (see Plate 4). Soleri describes the "urban effect" as "that fundamental phenomenon in which two or more particles of 'physical matter' interact in ways other than statistical and fatal. That is to say, in ways which are organic or living and eventually the 'instinctive', conscious, self-conscious, mental, cultural, spiritual ways".[57] Cities are essential to humanity's continued evolution because they are the "crucibles of [a] complexifying process at the collective level of consciousness". He believes that an urban environment that enhances and encourages human interaction is bound to raise humanity's collective consciousness. "It's very clear that life is not an explosion of things , but an implosion".[58]

As a model derived from biological principles arcology merges the discipline of architecture with the science of ecology in an attempt to define a habitat which is more efficient and economic than the current pattern of urban development on the basis that:

[54] Soleri, *The Bridge Between Matter and Spirit* (1973)
[55] J. Cobb, 'Comments on Arcosanti: An Urban Laboratory?' in Soleri, (1983), p. 12
[56] The urban effect is described as a universal effect involving the transformation of mineral matter into mind via the potentially unlimited power of complexification and minaturization.
[57] P. Soleri, *Technology and Cosmogenesis* (Paragon House, New York, 1985), p. 51
[58] P. Soleri cited in J. Monczunski, 'Arcosanti, a Habitat for Humanity' in *Notre Dame magazine* (Winter 1998-99)

> The better use you can make of what's available the better the situation is going to be. Since arcologies...fundamentally would deliver more for the buck, or for the amount of material or energy used, then it is quite evident that as an instrument it would be a positive one.[59]

8.5.1 The complexity-miniaturization-duration paradigm

In the critical part Soleri asks us first to consider that the best hopes for humanity have been fulfilled. We are to assume that in time human skills have cleared the urban environment of slums and cleansed it of all its problems and grievances. "Equity is thus granted...We then have happy man in a full fledged co-ordination of city and urban expanse. Megalopoly stretches over continents...emerging victorious and shiny above an unending suburbia".[60] The critical end of his work is to expose this condition as a double dose of false hope; false because it's utopian and false because it is fatal, "a scourge far greater than the squalor of the present".[61] Teilhard de Chardin wrote that "Man is the ascending arrow of the great biological synthesis".[62] In megalopoly and suburbia Soleri sees the disowning of any conscious urge that might exist in us to evolve and a settlement for something less absorbing. He describes suburban sprawl as a 'flight to boredom', a kind of "giving up", he says, "in the calm sea of affluence".[63]

> Suburbia doesn't work because it is endless matter which is flat and amorphic. It promises so much but gives so little. Life's bulk is negated when megalopoly and suburbia become the environmental bulk.[64]

Soleri argues that for a city or community to evolve and improve itself, it must, like any other living organism, live in accordance with what he terms the "complexity-miniaturization-duration paradigm".[65] Invoking organic philosophies based on vitalism (see 7.2.2), and in line with the modern ecological view of science emphasising a holistic, systemic view (see 7.4), he argues that all of nature, "from bacteria to God" conforms to an imperative involving three fundamental principles:

1. COMPLEXITY. Many events and processes cluster wherever a living process is going on. The make-up of the process is immensely complex and ever intensifying.
2. MINIATURIZATION. The nature of complexity demands the rigorous utilization of all resources - mass-energy and space-time, for example. Therefore, whenever complexity is at work, miniaturization is mandated and a part of the process.
3. DURATION. Process implies extension of time. Temporal extension is warped by living stuff into acts of duration, i.e., the eventual "living outside of time".[66]

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[59] Soleri cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[60] P. Soleri, *Arcology* (1969), p. 1
[61] *Ibid*
[62] Teilhard. de Chardin, *Building the Earth* (1965), p. 9
[63] Soleri, *Arcology* (1969), p. 1
[64] Soleri cited in Stanishev, (1993), p. 61
[65] Soleri, *Arcosanti* (1983), p. 15
[66] *Ibid*

In nature as an organism evolves its complexity increases and it develops into a more compact and miniaturised system. In this way the process of evolution is acting against the direction of entropy. As William Irwin Thompson (1975) wrote:

> ...as matter moves towards more probable states of molecular disorder, life moves towards increasingly more improbable states of maximum molecular organisation. More and more is packed into less and less, until the miniaturization process reaches its greatest level of what Teilhard calls "complexification" in the compactness of the human brain. The simplicity of its size and shape belies the dazzling complexity of its interior.[67]

Soleri suggests that the city should follow the same process in order to become a "more lively container for the social, cultural, and spiritual evolution of [humankind]". More events can occur in a more complex system. An increase in "eventfulness" brings with it the phenomenon of "liveliness".[68] Miniaturization occurs as a result of complexity rather than simply through a reduction in size. The main physical characteristic of the brain , for example, is not its size but its complexity. But since he argues that miniaturization increases with complexity (the degree of complexity is directly related to physical space) Soleri suggests that urban complexification demands that higher population densities within cities be created in an efficient way, which enhances people's lives and promotes personal growth. Like the human body, he says, the city must be an efficient organism. Compactness is seen as the structure of efficiency. Through compactness, the energy flow (metabolism) is held in balance with the function that is being performed. Soleri's 'compact city' is a three-dimensional city in which the vertical dimension is appropriate to the horizontal dimension. The city is conceived as a solid and not a two-dimensional 'surface'. Miniaturization in this context is a physical phenomenon that keeps things together in order that they can perform better and achieve higher levels of efficiency. In Soleri's definition the compaction of urban space allows for the miniaturization of city and the removal of elements such as streets, roads, car parks, etc. allowing higher levels of social interaction, intensity and liveliness, within and urban 'complex'. The three-dimensional city, because of its efficiency, is respectful of the earth's ecological system and its atmosphere. "It does not pollute the earth".

> [the] tearing apart [of] our towns and cities, is a degenerative process, not a growth process. It is necessary instead to have a miniaturizing contraction.[69]

"Miniaturize or die has been the key rule for incipient life", Soleri says.[70] But since the modern two-dimensional city does not follow the complexity-miniaturisation-duration paradigm,

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[67] Thompson, (1975), p. 35-6
[68] Soleri, *The Bridge Between Matter and Spirit* (1973), p. 207

he argues, it suffers from "horizontal gigantism and vertical dwarfism".[71] It cannot improve itself. Eventually it losses sustenance and dies.

> In evolution simplicity is always linked with complexity: while huge dinosaurs lumber into extinction, tiny mammals chatter in the trees. I would say it is much the same with our cities now. The huge megapolitan beasts are sprawling all over the earth; in terms of thermodynamics, they are spreading their energy equitably through space and are approaching the heat-death of entropy. They destroy the earth, turn farmland into parking lots, and waste enormous amounts of time and energy transporting people, goods, and services over their expanses. They so fill their ecological niche that they destroy it, and thus become caught in their own evolutionary dead end.[72]

The city is, and has always been, the most complex of social events. In Soleri's view, it owes its existence as much to the human need for congregation, as to the market exchange of surplus goods or the expression of military or political power. He sees in the urban effect the city's role, not only in maximising ecological potential, but as an actor in a process that gives meaning to life by helping to transform the human condition. The development of a new urban instrument is, for him, fundamental to developing a new society and a renewed trust in the future. The two main platforms of arcological thinking are *ecological* and *theological.*

8.5.2 The ecological platform

Arcology's ecological model derives from the source of its implosion – the elimination of the motor car, and the reclamation of all the space associated with the culture of this form of transportation in roads, car parks, showrooms, garages, petrol stations, repairs, junkyards. Developed from his doctoral research in human ecology, completed in 1946, Soleri's conception, in opposition to the fragmented nature of current cities, involves the creation of a new physical layer, what he calls a "neonature".[73] The scope of arcology, as he defines it, is to produce a theoretical model for this new landscape that would be designed to support biological, human, and social evolution while containing human societies along with all their material goods. The aim is towards an alternative urban environment, which moves away from the traditional model of urban sprawl and its inherent cycle of increasing production, consumption, pollution and waste.

> The city is like an organism. Soleri has tried to define what it is that the city has to take in, and what it doesn't need to take in (what is harmful). If we can define those elements more accurately (and many

[69] Soleri, *Arcology* (1969), p. 122
[70] *Ibid*
[71] Soleri, *The Bridge Between Matter and Spirit* (1973), p. 24
[72] Thompson, (1975) pp. 35-6
[73] Soleri, *Arcology* (1969), p. 20

> of those things are economically driven) then we have a better opportunity for sustainable city in which everyone prospers.[74]

Soleri's friend Umberto Eco writes in *structuralist* terms on the symbolic importance of architecture and suggests that architects must design structures for "variable primary functions" (the conventional uses) and "open secondary functions" (the symbolism or communication). Architecture, in this sense, becomes primarily an informational process rather than a material activity. In *Travels in Hyperreality* (1986) he describes Buckminster Fuller's *Geodesic Dome* built for the 1967 Expo in Montreal as perhaps the best example of this to date. Describing the U.S. pavilion he wrote:

> ...the symbols inside were recognisable, but in the end they told us what we already knew, ...underscored a typical image of the U.S,...The only element which did not ...but added something new even if intangible and ambiguous was the Fuller dome. In other worlds the dome was aesthetically the strangest element of the pavilion, and it was so full of nuance, so open to different interpretations, that it affected the symbols inside and added depth to their easily identifiable, more superficial qualities.[75]

Soleri needs to be taken seriously because few other environmental thinkers have contributed as much to understanding how the city operates in advanced industrial societies. His critique could, according to Luke (1997), "greatly improve radical ecology's intellectual mission of world disclosure".[76] For Soleri, adopting a position historically rooted in idealism, sees architecture as more of a social calling than a material activity. Because it is primarily an informational process it can help lead to an ecological revolution.

> Architecture is the alterations made upon nature by the organic, the psychological, the mental, the components of man's consciousness where the social-cultural stresses operate within and emanate out of the human kind. Architecture ...is not only a shelter for communication and information institutions, but it is also...mass information itself.[77]

For Eco architecture acts as a stimulus "only if it first acts as a sign". The built environment is both the material embodiment and expression of society. The environmental crisis within our cities signifies a crisis within individuals and in society. One is the cause and reflection of the other. The radical transformation of society thus requires, not only that we change our paradigms and our social, cultural, economic and political institutions, but also our most fundamental

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[74] C. Tribken , Phoenix City Councilman cited in D. S. Mayne (ed.), *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[75] U. Eco, 'A Theory of Expositions', in *Travels in Hyperreality,* (Picador, London, 1986), p. 302
[76] T. Luke, 'Developing an Arcological Politics' in *Ecocritique: Contesting the Politics of Nature, Economy and Culture* (University of Minnesota Press, Minneapolis, 1997), pp. 156-7.
[77] P. Soleri, *The Omega Seed: An Eschatological Hypothesis,* (Anchor Press/Doubleday, Garden City, New York, 1981), p. 223

information technology: the architecture of the built environment. Soleri sees ecology and sustainability as simply part of our theological and technological evolution. The architect's sacred task of ecological design is then directed towards the attainment of the *Civitas Dei* (City of God).

Ecology becomes humanity's most important science because the Earth's ecosystems contain the processes by which matter will eventually become spirit. Aesthetic living, in which art is seen as an agent of transformation (what Soleri calls "esthetogenesis") is key to an ecology-environment-theology triad; the environment represents the "imminent manifestation of an eschatological drive", religion provides an anticipated model of perfection , and the aesthetic offers the emergence of spirit from matter through specific forms of "grace" (a painting, a piece of sculpture, a novel, a building, a city).[78] Aesthetic imagination and artistic discipline provide the individual spark that gives the non-living world spiritual significance.

8.5.3 Soleri's philosophical heritage

Arcology is not a reductivist system. Because it aims at a different way of life, it does not attempt to be a conceptual reduction of any sort, but rather a form of synthesis. While its ecological and holistic perspective is admirable this inevitably leads to a wide-ranging scope of research which makes the literature difficult to classify within any specific field of inquiry. The philosophical and theological scope of his thinking crosses traditional boundaries between the subjects of architecture, ecology, biology, urban design, sociology, environmental studies, and art. His wide philosophical reach, ranging from speculation on the evolution of the cosmos to his eschatological hypothesis is daunting but the integration of his philosophical and theological thinking with ideas about the design of cities has given Soleri a unique status both as a philosopher and as an urban planner.

Since his writing does not conform to any specific scientific and his books contain few references or citations, other than those to Pierre Teilhard de Chardin, it is difficult to find verifications that might support his conclusions within his own text. Some who have attempted to trace the origin of Soleri's philosophy have encountered problems:

> Not even Soleri is aware of his own borrowings. The indirect effect of this process is twofold. On the surface it gives the idea of supreme arrogance because he does not seem to recognise anything outside the net he is weaving. But deep down there is supreme modesty because he takes himself to be just an instrument of a larger design. The apparent arrogance comes from Soleri's concept that we must

[78] Soleri, P. (1981) *Fragments: A Selection from the Sketchbooks of Paolo Soleri*, New York, Harper and Row, p. 190.

> express our potential radiance in a bold and non-apologetic manner by transforming ourselves and our habitat.[79]

Henryk Skolimowski explored Soleri's philosophical propositions in a series of publications in the 1970s (Skolimowski, 1971; 1976; 1977a; and 1977b)[80] and believes that his two main sources are Friedrich Nietzsche and Teilhard de Chardin. "Soleri is Nietzschien", Skolimowski argues, "in the sense that he considers mediocrity to be (almost) a sin against human nature, and he considers the quest for perfection to be an imperative of human purpose".[81] But the difference between his idea of the perfect human being and Nietzche's 'Superman' lies in Soleri's interpretation of de Chardin's Omega Point theory. Soleri, after de Chardin, takes the environmental movement's mantra of "Thinking Globally and Acting Locally" to a new dimension:

> We must realise that we are part of something bigger than ourselves and act in accordance with that. We are cosmic stuff, and unless we are clear on that we are bound for problems. We must stop taking the small view of things. The larger view needn't be sacrificial. I t can be a most incredible leap into something really most exciting.[82]

For both Soleri and de Chardin, evolution is the driving force pushing consciousness to greater levels of awareness. In *The Phenomenon of Man* (1959) de Chardin put forward the proposition that evolution is driven, not by an initial force (or "Father-God") but by a final source of attraction (or "Son-God"), albeit with the same qualities and characters attributed to the Judeo-Christian God. [83] The 'Omega Point' is the final and highest stage in the evolution of the human phenomenon.

8.5.4 The theological platform

The search is under way for remedial and restorative responses, whereby a redefined urban system might restore health and well-being to humanity and to the earth's ecosystem via a more sustainable instrument of urban living. As critical as this project undoubtedly is it is not the main reason why Soleri argues that the "arcological commitment" is indispensable. There is a specifically creative aspect to Soleri's enterprise, which sees the city as a necessary instrument in

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[79] J. B. Cobb in P. Soleri, *The Bridge Between Matter and Spirit* (Anchor Press/Doubleday, Garden City, NY., 1973), p. 3

[80] In addition to Skolimowski (1971) cited earlier his work on Soleri can be found in 'Teilhard, Soleri and Evolution' in *Eco-Logos* 22 (1976), pp. 793-800; 'Arcology as a State of Mind' in *The Teilhard Review* 12 (1977), pp. 247-8; and 'Arcology as an Expression of Process Theology' in *The Teilhard Review* 12 (1977), pp. 238-9

[81] H. Skolimowski, Foreword in P. Soleri, *Fragments: A Selection from the Sketchbooks of Paolo Soleri* (Harper and Row, San Francisco, 1981), p. xi

[82] Soleri cited in Monczunski, (1998-99)

the human evolutionary process. Because we shape our environments and are then, in turn, shaped by them, he argues that cities can have a positive role in our evolution by helping to enlarge the potential of human societies. This emphasis connects him with a long line of urban theorists including Patrick Geddes (1915), Lewis Mumford (1937), Paul and Percival Goodman (1947), Christopher Alexander (1965), and Peter Calthorpe (1989).

8.5.5 The omega seed hypothesis

Much of Soleri's written work was produced during the 1960s and 70s when he engaged with many pop icons of the era - Mashall McLuhan, Buckminster Fuller, Woodstock Nation, the Whole Earth Catalogue - in his discourse on arcology. Although the context seems dated, and the style of writing is complex and esoteric, a lot of it seems to be even more relevant to the problems of our own age. Much of what he wrote seems anachronistic when we read it today.

In his "eschatological hypothesis", *The Omega Seed* (1981) Soleri acknowledges the "Teilhardian imprint" in his work and advocates patterns for the creative evolution of human life that aim towards a perfection only achievable at the end of the Universe[84] (see Plate 4). As in his previous work, *The Bridge Between Matter and Spirit is Matter Becoming Spirit* (1973) the book aims at a synopsis of his philosophical ideas and the fundamental aspects of his arcology theory. Together the books form the core of Soleri's philosophical and theological project. The central message in both is that only by bridging the gap between matter and spirit will intelligent life be directed toward a future deity. He argues that the catalyst of this creativity should be a city that is coherent with an evolutionary process that has been transformed from matter at the beginning of the Universe, into pure spirit at the end. He sees urban sprawl, the model we are currently producing, as fracturing the bridge that channels matter into spirit.

Soleri partially adopts the hypothetical model of a closed-ended Universe, developed by Hawkings (1989),in which reality started with the "Big Bang" some 13 billion years ago. As predicted by Einstein' general theory of relativity, which says that empty space itself is stretching and taking galaxies along with it, the Universe is expanding and will end in a black hole, a "singularity of infinite compression" operating under such powerful gravitational forces that it will suck everything, including light, allowing nothing to escape.[85] The second law of thermodynamics defines the future as an arrow of time in which ice cubes melt, buildings collapse and disorder increases in the Universe. Finding it difficult to accept this ultimately fatal

[83] Teilhard de Chardin, *The Phenomenon of Man* (1965)
[84] P. Soleri, *The Omega Seed* (1981)
[85] S. Hawkings, *A Brief History of Time* (Bantam Books, London, 1989)

view of the future, Soleri posits another destiny for humanity where the possibility exists of "transcending this fate of annihilation into a radiant resolution" through the transformation of matter toward the direction of spirit (in Soleri, 1973; 1981a; 1981b; and 1993). He sees that the human task is to "transfigure the deterministic Universe...into a compassionate, ultra-logical, and ultra-rational reality".[86] He understands reality as a cosmic metamorphosis "that began as a point of mineral light at the 'Big Bang' and will end as a point of radiance of unknown 'nature'", the Omega Seed. Soleri has called this theory the *Omega Seed Hypothesis* and his theological views and eschatology have attracted the interests of a group of theologians (Rogers, 1973[87]; Lewis, 1977[88], and Dolin, 1979[89]). Harvey Cox, Professor of Divinity at Harvard, and John Cobb, Professor of Theology at Stanford have both endorsed is work. Soleri describes himself as "a Teilhardian devoid of God, a neo-Teilhardian"[90]

According to his evolutionary theology between the Big Bang and the Omega Seed, the continuum of reality defines a progression of events that move and change the components of reality (mass-energy and space-time) through four stages; from the probablistic stage, through the opportunistic stage, to the compassionate stage (where we are now), and eventually to the spiritual stage at the Omega Seed. The model he presents identifies the "ecological transformation with a theological development. A God being slowly and painfully created".[91]

The idea of "transforming reality" from "matter into spirit" seems like the plot of a pulp science fiction novel but Soleri argues that the Omega Seed project is not about what is "feasible" but rather about what is "desirable":

> Omega Seed is not feasibility-driven but desirability driven, I am not trying to tell myself what reality *might be*, I am trying to tell reality what *it ought to be*...[it] won't come automatically or randomly...we have to create it ourselves.[92]

By placing the fruition of the Omega Seed so far into the future it make s the acceptance of the hypothesis as a guide to current action difficult but humans have, throughout history, been guided by the pursuit of utopias. In the justification of his Omega Seed utopia, Soleri says:

- it gives meaning and direction to the human condition;
- it offers the possibility of justice, beauty and grace;

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[86] Soleri, *The Bridge Between Matter and Spirit* (1973), p. 120
[87] D. G. Rogers, 'Paolo Soleri' in *Christian Ministry* 4 (1973), pp. 21-6
[88] R. Lewis, 'Residual Anguish, Compassion and Aesthetogenesis in Soleri's Arcologies
[89] J, Dolin, 'The Relationship of the Arcological Architecture of Paolo Soleri to The Evolutionary Thought of Teilhard De Chardin', (Doctoral dissertation, Ohio State University, Athens, OH, 1979)
[90] Soleri, *Technology and Cosmogenesis* (1985, p. 121
[91] Soleri, *The Omega Seed* (1981), p. 19
[92] Soleri , *The Bridge Between Matter and Spirit* (1973), p. 183

- it demythologises the past;
- it gives an explanation to suffering - the consequence of a reality in the process of creating itself;
- it puts the responsibility of transcendence on human beings.

The mandate he draws from this is that human society needs to continuously strive towards transformation in order to achieve its inner cosmic potential. He argues that if we could develop an understanding of the dynamics of the process whereby inorganic matter turns into living, we might be able to create the tools of this transformation.

Humanity stands in "the flow of evolutionary process and gains its meaning from its place and role in that process".[93] Cobb (1981) points out that Soleri is engaged in the "theological reformulation" of this vision but he goes far beyond Teilhard in his analysis of what this means for us in contemporary society. Teilhard's vision failed to offer guidance for present action. To Cobb Soleri's arcology theory offers today's Church "torn between its historic-future-orientation and its awareness that it offers no convincing vision of a hopeful future", a "beacon of hope". The concrete implications of Soleri's vision proposes the building of the *Civitas Dei* as the next step in the progressive transformation of human existence.[94] The urban effect is "the principle whereby the interaction of individuals gives rise to new forms and new levels of individuality and community".[95] The function of arcology is to facilitate the breakthrough to these new levels.

8.6 Evolutions in arcology

Soleri asserts that "the most common mistake" about his work is the assumption that "years of introspection have produced a take it or leave it package...rather" he says "I am proposing a methodology and at the same time trying to illustrate it ".[96] The methodology was initially developed within the Mesa City Project and illustrated in *The Sketchbooks of Paolo Soleri* (1971).

8.6.1 Mesa city

Throughout the 1950s and 60s Soleri developed his urban theories while experimenting *in silt-casting* techniques for producing ecological structures. During this period he also gained recognition as an ethical philosopher, social critic and architectural visionary, and grants from the Graham (1961) and Guggenheim (1964) Foundations for his work on the *Mesa City Project*

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[93] Cobb, 'Paolo Soleri and Christian Faith', Preface to Soleri, *The Omega Seed* (1981), pp. 13-26
[94] *Ibid*
[95] *Ibid*

(1958-67). This was a theoretical regional plan to house 2 million people on around 55,000 acres (about the size of Manhattan Island) on an isolated and pre-flattened desert plateau.

Developed as part of Soleri's ongoing research in the field of "architecture as human ecology" Mesa City was specifically aimed at introducing the idea of "corposity into the urban morphology, a premonition of the arcological concept".[97] The project, which pre-figured the arcology concept, is described by Soleri (1971) as a quest to find "an environment in harmony with Man", one which would stand as an "ecological organisation of nature within the new balance demanded by large social aggregates".[98] It consists of clusters of rural towns and villages, multipurpose structures housing social facilities for living and working designed to capture and make use of cosmic energy (solar, wind and water power) and its derivatives. This aspect developed from Soleri's "Cosmic Potentials" project (from 1950) which considered "energy collection and consumption and the performances of individual and collective man within one structure ".[99]

Set on top of the widest end of a semi-arid desert plateau, the drawings and models of Soleri's "City on a Mesa" show an organic bone-like plan surrounded by agricultural and grazing land (see Plate 5). The elongated form stretches to around 35 kilometres long and 10 kilometres wide. Along a waterway created by an elaborate system of dams reservoirs and canals. The "backbone" of social activities stretches from the centre for advanced study in the south, through the man-made " Central Park", to the theological complex in the north. The park would act as both the source of quarried building material on one side and a sculptured landscaped park, complete with museums, churches, and amphitheatres on the other. Thirty-four arts and craft villages (with 3,000 people in each) are clustered in groups of five, around civic and retail facilities that circle the Centre for Higher Learning on the south end. Each of these pedestrian villages is 1 kilometre in diameter, with on average a 300 metre public garden at its centre. The whole area is criss-crossed by pedestrian and bicycle paths and there is no vehicular traffic of any kind within the city centre. High-density dwellings line the east and west side of the main park on sloping grounds allowing for a terraced plan, similar in form and scale to the Casa a Gradinate at Sant'Elia's 'Città Nuova'. And like Le Corbusier's Contemporary City, a business centre consisting of a complex of towers complete with a roof-top airport, is located at the city's centre.

[96] Soleri, *The Omega Seed* (1981), p. 206
[97] P. Soleri, 'Mesa City: A Quest for an Environmnet in Harmony with Man' in *The Sketchbooks of Paolo Soleri* (MIT Press, Cambridge, Mass., 1971), p. 1
[98] *Ibid*
[99] *Ibid*, p. 11

Three belts surround the main city; the inner belt with workshops and living quarters integrated to the circulation network; the middle belt consists of a network of speedways, roads, parking places and a system of waterways for freight and passengers. Along this band are located the industrial commercial, entertainment and cultural facilities. Furthest away from the social backbone, the third is located underground and consists of consists of a ribbon of second-hand stores and markets, car and equipment dealers and junkyards. Processing and recycling plants are positioned at the foot of the mesa .

Mesa City was not designed as a blueprint or masterplan but as a series of ideas as to how such an organism might develop. The centre for advanced study and a research facility in biophysics and biochemistry would be designed and built first, polarising all the energies and efficiencies needed to implement the growth of the city. The villages and civic centre would follow along with segments of the "life-carrying" bands around the perimeter. The theological complex would then be created to balance the mind centred learning complex. When the three perimeter belts were completed they would determine the conditions for growth of the high-density community. The axial park would provide the substance for the cultural growth of the towns and villages within the "linear city".

Although there are parallels with Le Corbusier's plans of Radiant City in terms of the anthropomorphism, the linear morphology and scale and ambition of the Mesa City project, Soleri's organic and biological concerns is the source of fundamental differences. The idea of zoning, advocated by Garnier, Gropius, CIAM, and Le Corbusier, is sacrificed in Mesa City to the notion of the city as human ecology, wherein the city/organism mirrors the complexity of life within its own structural complexity. The city is meant to grow. Soleri's arcological urbanism sees Mesa City as an "aesthetic organism with compassion as its content", a new human-made setting (a "neonature") for the purposeful transfiguration of the natural environment "not just sparsely and haphazardly 'colonised' but ecologically humanised".[100] Located between the wilderness and megalopoly it was to be a forerunner of a series of *arcologies*:

> ...powerfully built organisms, modular ecologies [that] would rise high in the sky, roots deep in land and seas. Their skeletal framework would provide for the "functional" needs, and the citizens, thousands of minds and hands freed from repetitive labor would give a part of their lives to the ultrastructuration (aesthetogenesis) of a truly three-dimensional environment conceived by man and dedicated to him.[101]

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[100] *Ibid,* p. 7
[101] *Ibid*

8.6.2 The city in the image of man (first generation arcologies)

Just as Sant'Elia had done in 1914 with his Città Nuova and Milan 2000 exhibition and the accompanying publication of the *Messaggio,* Soleri published his own form of 'manifesto' as *Arcology:the City in the Image of Man* in 1969 and followed with an exhibition of drawings and models entitled 'The Architectural Vision of Paolo Soleri', which toured the U.S. and Canada to record attendance figures throughout the following year. In both the book and the exhibition he sketched out giant structures that would dwarf the Empire State Building. He calls these structures 'arcologies' (architecture + ecology) to underline their conceptual basis, both in the discipline of architecture and the science of ecology.

> *The concept is that of a structure called an arcology, or ecological architecture*...Such a structure would take the place of the natural landscape inasmuch as it would constitute the new topography to be dealt with. This man-made topography would differ from the natural topography in the following ways:
>
> - It would not be a one-surface configuration but a multilevel one.
> - It would be conceived in such a way as to be the carrier of all the elements that make the physical life of the city possible - places and inlets for people, freight, water, power, climate, telephone; places and outlets for people, freight, waste, mail, products and so forth.
> - It would be a large-dimensioned sheltering device, fractioning three-dimensional space in large and small subspaces, making its own weather and its own cityscape.
> - It would be the major vessel for massive flow of people and things within and toward the outside of the city .
> - It would be the organizing pattern and anchorage for private and public institutions of the city.
> - It would be the focal structure for the complex and ever-changing life of the city.
> - It would be the unmistakable expression of man the maker and the creator. It would be diverse and singular in all of its realizations. Arcology would be surrounded by uncluttered an open landscape.[102]

Although they were designed for different environmental contexts like oceans, deserts, mountains and canyons and varied considerably in size, shape and form, the structures are conceived of, after Mesa City, "in the Image of Man" and, like the early Humanist ideal cities of the Renaissance and Le Corbusier's *La Ville Radieuse* (1933), they exhibit features of the human body. The outer layer of an arcology is analogous to the eyes and ears of the 'organism'. Attached to the skin and in immediate contact with the outside world are the residential areas, which although they look out over the wilderness are part of the city. Nature exists outside and the city is sharply distinct from it but citizens would have immediate visual and physical access to it. These outer areas also contain parks and transport nodes but it is the dwellings that characterise the outer surface, as a sensitising skin. On the next layer, in the 'mind' of the arcology, there are public facilities like offices and shops, schools, theatres, museums and

[102] Soleri, *Arcology* (1969), p. 13

libraries. These are the places where people obtain services, where they work, gather and play. And then deep in the central core of the city were the power plants, warehouses and heavy industry. Like the internal organs, the digestive and vascular systems, the core involved the basic 'life processes' that underlay the workings of the 'mind' and the 'sensory' parts of the system.

> The natural landscape is not the apt frame for the complex life of society. Man must make the metropolitan landscape in his own image: a physically compact, dense, three-dimensional, energetic bundle, not a tenuous film of organic matter. The man-made landscape has to be a multi-level landscape, a solid of three congruous dimensions. The only realistic dimension toward a physically free community of man is toward the construction of truly three-dimensional cities.[103]

Related as it is to the development of modern biology and the science of life, the notion of the city as an organism is a fairly recent one. The pairing of human organs and elements of urban form on the basis of functional similarities seems to have satisfied an urge to affirm the primacy of idea urban *life*. Open spaces such as squares and parks have often been described as the 'lungs ' of the city while the centre is invariably the 'heart', pumping 'blood' (traffic) through the 'arteries' (streets). The biological analogy has been extended to encompass urban economics where the habitat is the 'cell'; the city's financial district, industrial area or suburbs are 'organs' or specialised tissues; and capital, whether in the form of money or buildings is the energy that flows through the urban system.[104] As described in [7.6.1], Giradet (1992) also develops the analogy to describe an approach to urban resource maximisation through the city's adoption of a circular "metabolism".

Other aspects of organisms, their structural logic and their pathogeny have been used to support the "organic" metaphor. Plants and animals have definite boundaries and self-regulating systems of growth; they are subject to processes of change that can be predicted and planned for. Changes in their form are as a result of functional requirements. The argument is that the same should be true of "organic" cities. Like other organisms, cities are subject to disease and decay. Much of the nineteenth century urban literature establishes a causal relationship between the built environment and the physical and social health of urbanites and places the root cause of the pathological deterioration of the urban fabric in the Industrial Revolution [7.4].

But, as Kostof (1992) warns, the comparisons between organisms and cities is only useful up to a point. An insistent overemphasis on the idea of the "living" city inevitably comes across as false, and leads to confusions. It is human purpose and willfulness that drives the creation of

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[103] *Ibid,* p. 14

[104] As in, for example, S. Olsen, 'Urban Metabolism and Morphogenesis' in *Urban Geography* 3 (2), (1982), pp. 87-109

cities.[105] As Lynch (1981) points out, "Cities are not organisms...They do not grow or change themselves, or reproduce or repair themselves".[106]

The thirty *first generation arcologies,* designed between 1963 and their publication in 1969 consist of two groups: *Dionysian* and *Apollonian.* Dionysian arcologies are affiliated to Mesa City and are configured in a "free form" character. Like Novanoah II (a city for 2,400,000 to float on coastal waters or open sea), Arcoforte (20,000 people on a sea cliff), Veladiga (15,000 people on a dam site), Stonebow (200,000 people above a ravine or canyon), and Theology (with a population of 13,000 set within a cliff). Apollonian arcologies are characterised by the elementary geometry of the envelope and the simplicity of the form: a cube, sphere, pyramid, hexahedron, cylinder, etc. Examples of these are Arcube (a city of 400,000 people located on flatlands), Hexahedron (a city of 170,000 on any topography), and Asteromo (70,000 people living in space) and the original proposals for Arcosanti (for 1,500) (see Plate 6).

Soleri does not make a qualitative distinction between these types in terms of function but does point out the dangers of imbalance within free form when "for the sake of nonsymmetry there is a lopsided density of action that will result in hyperfunctions in some places and atrophy in others".[107] Certainly the departure from the "organic" form of Mesa City signalled a shift in Soleri's thinking and marked the next stage in the evolution of the arcology concept when, during the 1970s, predominantly symmetrical structures were designed to respond to the symmetry of the Sun's trajectory.

8.6.3 The two suns arcology (second generation arcologies)

With the development of the next generation of arcologies, *The Two Suns Arcology* (1975) in responding to the growing energy crisis of the mid-70s Soleri split the architectural concept of the first generation structures in half "exposing the core to the sun" (see Plate 7). This produced some highly significant related effects; it gave greater priority to the main source of renewable energy and placed the arcology concept much more firmly into its own ecological niche. The ideas that emerged in *the second generation arcologies*, within the concept of the "energy city" served to reinforce the relationship between architecture and ecology.

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[105] S. Kostof, *The City Shaped* (1992), p. 53
[106] Lynch, (1981), p. 95
[107] P. Soleri, 'Arcube' in *Arcology* (1969), p. 112

In 1975 six major (and simple) architectural "effects" were described, collectively under the aegis of the "urban effect".[108] As Luke (1997) has pointed out these offer a "remarkable solution for many of today's environmental problems":[109]

> The *greenhouse effect* is a membrane that seals off an area of ground that can be cultivated, extending the growing season to practically twelve months, and also saves a great amount of water...With the "greenhouse", one has intensive agriculture, limited use of water and extension of seasonal cycles. This is the *horticultural effect.* Then there is the *apse effect.* Some structures can take in the benign radiation of the sun in winter months, and tend to cut off the harsh radiation of the sun in the summer. By the *chimney effect,* which is connected with the greenhouse effect, one can convey, passively, energy through the movement of air; the heat from one area to another. So we have these four effects; there is also the capacity of masonary to accumulate and store energy - *the heat sink effect.* With relatively large masonary, one can store energy during the warm hours of the day, and give it out during cool or cold hors of the night. The intent is to see if these five effects can be organized around what I call the *urban effect.* The urban effect is the capacity of mineral matter, to becom lively, sensitive, responsive, memorizing...If we were to co-ordinate those six effects together, then we definitely could save on resources like land, water, time, energy, materialism, and have a better ecological sanity.[110]

These effects were combined in a series of designs for second generation arcologies, including *Air Dam Arcology*, *India Village*, *Maryland Arcology*, and *Regina Arcology* (see Plates 8, 9 & 10). In these arcologies the entire form of the urban structure , as well as a huge area of south-facing greenhouses containing vegetable gardens, are designed to maximise the use of solar energy while reducing dependence on external energy sources.

8.6.4 Habitats for shifting populations (third generation arcologies)

By the end of the 1970s Soleri had developed the *Two Suns* concept into proposals for *third generation arcologies* that would package the combined energy and urban effects of the *second generation* into modular and standardised structures that could be articulated in a variety of arrangements and sizes to respond to changes in the environment, the climate, the available technology, and the size of the community.

The methodology adopted uses the *apse* form as the generating structure to define the prototype for what Soleri describes as the "post slab" habitat. Research and development work on the *Two Suns Arcology* had led to the idea of taking the slab and manipulating it in order both to increase its inherent strength, while at the same time, enveloping space. The apse then also became the anchoring device onto which transparent and translucent membranes and shading devices were attached via a tensile mechanism. This "garment architecture", along with the apse defines areas of external space that are climatically modified so that temperature, moisture, and

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[108] P. Soleri, 'Two Suns Arcology' in *aaq* 7 (2), (1975), pp. 33-41
[109] Luke, (1997), pp. 161-2
[110] Soleri, *Technology and Cosmogenesis* (1981), p. 137-8

air circulation can be altered as, and when needed. The apse form acts as a passive solar device when orientated towards the Sun, which allows the structure to retain heat in the winter and provide shade and cooling in the summer (see Plate 11). The *apse effect*, along with the other effects (*greenhouse, chimney and heat-sink*) act collectively to define the physical climate of the entire habitat. The shift from the slab to the apse is a highly significant step in the evolution of the arcology idea in that it signals the move to a more environmentally responsible and resource efficient design while introducing an architectural form which can provide a social and cultural focus for the community that might inhabit it. The *Valetta Spring* complex, designed for Arcosanti, demonstrates the main designs principles of the *third generation arcology* (see Plate 12).

Climate control within the three-dimensional landscape of an arcology can, through various spatial and functional adaptations of the prototype (for example, changes in scale, orientation and morphology, and the introduction of additional elements) be designed to a variety of uses and environmental contexts.

These, he proposed, could serve human population shifts of various types including:

- Migration from old (and modest) settlements to new (and stronger) ones. The problems associated with urbanisation are, in large part, the " wages of progress" but the enormous social and environmental problems generated threaten to overwhelm society.
- Migration caused by climatic changes. Mostly caused by overtaxing the environment leading to global warming. During the last ten years severe droughts, floods, famines, cyclones, and hurricanes have raised the spectre of massive demographic shifts associated with climate changes and its effects.
- Migration caused by technological development that foster over-exploitation of natural resources for economic growth.
- Political refugees seeking asylum.
- Travel for education (new transnational or global dimensions of learning and knowledge seeking), business and tourism.
- Accommodating the renaissance of pre-existing or indigenous cultures via "pollination".
- The colonisation of space.

8.6.5 Space for peace (fourth generation arcologies)

In direct opposition to the Reagan administration's strategic defence initiative within the "Star Wars" programme of the mid-80s Soleri proposed his own initiative, called *Space for*

Peace, as a development of the earlier *Asteromo* project (one of the arcologies published in 1969) into a *fourth generation arcology*.[111]

From 1984, Soleri produced a series of images and models focusing on the notion that space will eventually be peppered with space cities or colonies. In the tradition of those who, throughout the twentieth century have been exploring the possibility of life beyond the Earth's boundary (for example, Tsiolkovsky 1923, Bernal, 1929; Dyson, 1971; Bond, 1973; and O'Neill, 1977 [1.11]), the *Space for Peace* project was an attempt to predict what some of the characteristics of space habitats could be. *Asteromo* was designed as a space community of 70.000 people engaged in research in astronomy, physics, and space chemistry, located on an asteroid. In 1969 the stated aims involved testing the conceptual foundations of arcology by[112]:

- exploring the rigorous confinement and inward orientation of a community within a membrane;
- examining the loneliness of living in the "non-environment" of space;
- defining an ecology and the balance of performance within it;
- the self-reliance necessary for a system dependent on its own resources and within a hostile environment;
- testing the rigour of the rules of complexity and miniaturization.

Astronaut, Brian O'Leary in *Mars 1999* had suggested that mining asteroids could represent the most feasible and cost effective basis for operations in space. Soleri's designs from 1984 show how asteroids of different sizes and types, once "captured" can be processed into tiny, and relatively simple habitats for people with names like *Euclidean, Urbis et Orbis, Ovum II* and *In-Orbit* (see Plates 13 & 14). Collectively these projects were exhibited under the heading of *Eco-logic Minutiae* (1989).[113] Soleri suggested that these space cities would function as centres of:

- mining, processing and shipping;
- research, testing and production;
- an urban laboratory for environmental and socio-cultural experiments;
- leisure ("decompression habitats") for space travellers;
- building, maintenance, repair and cargo stations for space machines.

The forerunner of *Eco-logic Minutiae* is *Mesa City* (1958) where the broad manipulation of the geological mass of the mesa was carried out, both to generate construction material and to

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[111] P. Soleri, *Space for Peace Monograph* (Cosanti Foundation, Scottsdale, 1984)
[112] Soleri, *Arcology* (1969), p. 116
[113] This work was exhibited at the New York Academy of Sciences in 1989. Ecologic minutiae are described as the extensive ("alchemical") manipulation-metamorphosis of stellar material into minute ecological-mental cells.

transform the natural landscape into a cityscape. Soleri has described the *first generation arcologies* as "Space Cities anchored to Earth" and suggested that they could be seen as testing grounds for the eventual "urbanisation of space".

8.7 Arcology's theoretical response to urban environmental problems

Arcology is capable, in theory at least, of responding to many of today's urban environmental problems; of exponential population expansion and the inefficient use of land, air and water; pollution caused by technological society; energy and natural resource depletion, distribution and consumption; food scarcity; the loss of quality of life through waste, affluence and opulence and the physical and social segregation of people, things and activities, and the increasing problems of social alienation and exclusion. Its methodology recognises the necessity of the radical reorganisation of the current pattern of urban sprawl into dense, integrated, three-dimensional cities in which material recycling, waste reduction, energy conservation and the use of renewable energy sources are part of the sustainable strategy aimed at reducing the flow of resources and products through the urban system. In his biological model for the city there are parallels with Giradet's (1992) idea of cities adopting a "circular metabolism", where consumption is reduced by implementing efficiencies and where re-use of resources is maximised. [114]

8.7.1 Self-containment of habitat

In terms of urban form arcology through its adherence to the complexity-miniaturization-duration paradigm s dedicated to the 'old' notion of containment in opposition to the relatively recent idea of diaspora (where the car is the main protagonist). In nature the idea of unlimited sprawl is adopted by organisms at the lower levels of the evolutionary process. More developed species (like, bees, wasps, ants, and termites) have opted for optimal dimensions for their habitats.

Soleri's metaphor for the city "in the image of man" emphasises the idea of self-containment (See Plate 15). The self-containment of humans within the structure of our bodies allows is to communicate and interact with other humans. Having a complex system contained within a body "is the imperative for any organism capable of connecting effectively with the 'outside'". [115]

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[114] H. Girardet (1992), pp. 22-3

[115] P. Soleri, *Selected Paolo Soleri Papers: 1981-93* Volume 1 (Cosanti Foundation, Scottsdale, 1993) p. 45

Without self-containment the city cannot act effectively with the surrounding natural environment. Soleri argues that "ecological sanity...is dependent on centres of life so intense as to retain within their boundaries (city-town) the bulk of the planetary population and its paraphernalia".[116] But he points out that the converse is also true. When the city looses sustenance from the countryside it is doomed.

> ...if we were scattered to the four winds we would not be able to contain the complex arrangements of matter-energy that allows performance and we would just disappear and die. Arcologies will be contained within a "skin" that will make it possible to "perform and achieve", to communicate, so the city can be in a position to control itself.[117]

8.7.2 Land use

The 30 arcologies presented in 1969 were located on marginal lands, far from main transportation networks, many poor in resources and generally considered difficult to "colonise". Soleri argued that these might be the sort of reserves where future cultures may have to settle, leaving fertile lands free for increasing crop cultivation. Part of Soleri's project is to demonstrate the viability of the self-containment of a community on such inhospitable land. Many civilisations throughout history have had to deal with restrictive eco-systems. They have survived by making the best of the environment. Arcologies use the land, its geological structure and its water as the main physical resource, as well as the sun, the climate and connections with neighbouring communities in order to do more with less.

One of the best methods of altering the impact of cities on the natural environment is through land use. A higher concentration of land use derives from mixed use development. Arcology is mixed use in its purest form - accommodating a variety of uses within one structure (See Plate 16). Soleri describes suburbia as the "ultra-segregation habitat" which acts as a negation of life and liveliness, and incurs high social and cultural costs. In contrast to sprawl, an arcology acts as a large integrated, self-contained structure, in which pedestrian circulation is reinstated as the main method of getting around. Its compact design allows agricultural land and biologically diverse habitats to remain preserved beyond the city's perimeter. In an attempt to reintegrate people with their community arcologies are designed as mixed-use complexes, containing homes, offices, schools, parks, and a cultural centre on the basis that a close interaction of city functions and people will induce a greater sense of community. Mel Roman, psychologist and family therapist, believes that within an arcology:

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[116] Soleri, *Arcosanti* (1983), p. 17
[117] P. Soleri in P. Bonvicini, 'Soleri Dialogues' in *L'architettura: cronache e storia* 422, (December, 1990), p. 874

> ...the integration of living, working and recreation become a very natural part of everyday lives . Its not something you have to take a child to see, to do, but rather something that is experienced in everyday life. [118]

The integration of the three main components of life - living, learning ,working and playing - is a main goal within arcology and points to the reshaping of the entire urban landscape and, along with it, the culture that such a landscape supports. Lewis Mumford regarded the first step toward regaining possession of our souls would be to "repossess and replan the whole landscape". For Soleri the information age offers society an unprecedented opportunity to bring together the main components of life, but the habitat that we have constructed for ourselves during the last century is alien to such integration. Therefore, he argues, it must be reconfigured.

8.7.3 Transportation

Today cities devote up to 60 per cent of their land for car use. Lewis Mumford warned in 1963 that granting cars unlimited access to the city invited the city's destruction.[119] Today his prediction has proved accurate around the world. In the United States traffic jams account for $100 billion a year in lost productivity. Many European cities with good mass transit systems have been all but ruined by cars. London and Paris are among the world's great cities but their environments have been diminished by the near-constant noise and exhaust of cars on their streets. In the United Kingdom the Royal Commission on Environmental Pollution warned in 1994 that in Britain "the unrelenting growth of transport has become possibly the greatest environmental threat". Our car-dominated transport system, the report said, is unsustainable".[120]

Like many critics of car dependency is not against the technology *per se* but against our complete reliance on it for transportation. As just another consumer product, he argues that the car "should be giving back the legitimacy [it has] lost...as an auxiliary mode confined to marginal urban and country drives for work and for leisure".[121] But since our modern culture has become almost totally dependent on the car it is:

> The great villain of the century and quite possibly the great villain of all time...an apocalyptic example of mindless logistics and technological slavery.[122]

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[118] Mel Roman, Family Psychologist cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[119] L. Mumford, *The Highway and the City* (Mentor Books, New York, 1963)
[120] Royal Commission on Environmental Pollution, *Eighteenth Report: Transport and Environment* (HMSO, London, 1994)
[121] Soleri, *The Bridge Between matter and Spirit* (1973), p. 51
[122] *Ibid,* p. 164

While he acknowledges planning efforts that aim to produce more efficient land use patterns thereby reducing the number and frequency of car trips, and the introduction of fuel-efficient technology in car design and manufacture, Soleri contends that such improvements fail to attack the core of the problem. They are, he says, simply "a better kind of wrongness",[123]

By virtue of its compact design, an arcology would allow cars to be relegated to service areas in the city's periphery (as in Mesa City) or reserved for travel between communities. In 1969 he proposed that these be linked to each other via an "urban river", 1 to 1.5 miles wide, whose core would serve for transportation and communication and whose top would be an endless airport. Along this modular urban system, urban nodes attached to arcologies would be located at around 10 mile intervals carrying the bulk of civilisation. Soleri's global version of the Milyutin's "linear city", extends along an international network connecting the five continents via bridges and tunnels (similar to the Eurotunnel). Later, as part of his *Superconductivity Initiative* (1991-3) project, Soleri proposed that the connection between the city nodes would be based on superconductivity transportation technology featuring high-speed trains travelling at 300 mph or faster. Beyond the river, the regional landscape would be made up of agricultural fields, mining areas, and forestry.

8.7.4 Food and energy production

Arcology aims at a degree of autonomy and self-reliance, rather than 'self-sufficiency '. Self-sufficient communities, which aim at total self-provision of food and energy, and the complete recycling of wastes, are according to Soleri "extravagant and devoid of sense" and truly utopian in the sense that they aim for a perfection that, he says, can only exist as the final act in a cosmic process. There is no way the Earth or anything in it, he argues, can be perfect because it is a small part of a much larger system.

The arcology concept is directed instead at a more restrained and judicious use of resources via the power of complexity and miniaturisation and the discipline of frugality. This, Soleri believes will favour a condition of self-sustenance less dependent on external sources.

The degree of self-reliance in food production has changed as the arcology concept has evolved. In *Mesa City* the settlement was designed to be entirely dependent on the produce of the surrounding hinterland and on traditional agricultural practices. With the development of the *Two Suns* approach food and energy (radiant) were to be produced within south-facing greenhouses located within the city. These are designed to support the city's population at a

[123] *Ibid*

minimum level. Other produce is imported from outside to supplement the goods and services provided on this self-reliant base (e.g. electricity from the main grid).

All Soleri's projects after 1958 have explored methods of generating and harvesting energy from renewable sources and have aimed at transforming the urban structure into an "energy machine". This approach derives from his *Cosmic Potential* period (1958-62) which specifically included work on *Mesa City* and a series of Dam projects, and introduced ideas that would become increasingly important in the evolution of the arcology concept. The focus has, however, shifted from *Mesa City* and the first generation arcologies (1963-9), where the priority was on the design of the urban structure as a social and cultural system operating within an organic metaphor, to the *Two Suns* approach in which the city is conceived of as a complex in which living, working and learning are integrated with food and energy production. The city , still in the "image of man" becomes both consumer and producer. Apses and *exedra* (semi-circular edifices - developed from the apse form) that respond to the Sun's trajectory as energy devices and large expanses of greenhouses attached to the city, are used to generate heat and electricity as well as to grow food, help define the urban structure as an "energy city".

8.7.5 Impact on natural resources and pollution

Arcologies, through a blend of energy conservation and land use efficiencies, together with waste recycling systems, could maintain the ecological integrity of the region while placing fewer demands on the environment in terms of land, water, soil, fuel and other resources (See Plates 17, 18 & 19 (a) & (b)). By reducing the demand for petrol -based transportation systems air quality could be radically improved. Non-pollutant passive solar-active energy systems such as wind turbines, photovoltaic cells, and solar cooling and heating would further help to reduce water, air and land pollution.

The Gaia hypothesis [6.3.1) sees the earth as a self-regulating system in which conditions suitable for life are maintained by feedback processes involving both living things and the non-living part of the planet. In a similar vein Soleri sees both the planet, and the arcology as "a semi-autonomous organism, constantly recycling and digesting parts of itself, constantly redefining its own "constitution".[124] By combining various passive energy strategies within a single integrated urban system, arcology aims at a theoretical and architectural synthesis, in which philosophical, ecological and theological ideas are "woven into a structure of great beauty

[124] Soleri, *Arcosanti* (1983). p. 24

and integrity, and which, at the same time, is a structure of stunning frugality from the standpoint of energy conservation".[125]

> ...all arcologies are "small" in the sense of their being miniaturization of performance. They take the place of the megastructures of breakdown and paralysis. Los Angeles is a super-megastructure, incorporating all the syndromes of waste, pollution, and segregation. The urban effect of arcology is at the opposite end of the spectrum...a complex, miniaturized, self-limiting habitat is the best site for more efficient, less costly disposal and recycling programs. Naturally frugality is the most cost effective way to confront the pollution-recycling-cost dilemma. [126]

8.7.6 Information technology and arcology

We face a future in which issues of population expansion, per capita food-production, deforestation, loss of biodiversity, global warming, climate change, acid rain, ozone depletion, soil erosion and the pollution of land, water and air are certain to feature more prominently. An increasing strain on the Earth's resources may render arcology an important model for developing urban sustainability policies. Some see the benefits of information technology (IT) as offering widespread solutions to environmental problems. The main assumption is that when the global information system becomes sufficiently advance, we will be able to enjoy increased levels of technological-induced production and consumption, but with less pollution and waste. By increasing the flow of information between the parts of the complex, global industrial machine ("megamachine") we have constructed and reducing the need for travel, we can make it run more efficiently, reduce environmental impact and so help contribute to future sustainability. The argument is that IT is simply part of an ongoing attempt to bring the global "control system" into line with advances in industrial technology. The E.U.'s Information Society Forum (ISF) cites various ways in which IT can help reduce environmental impact:[127]

- delivering productivity improvements for relatively small amounts of resources and materials;
- enabling 'dematerialisation' (for example electronic banking, where transactions are carried out without paper);
- making Third World development less resource-intensive;
- creating more efficient ("smart')transport systems that pollute less;
- reducing the need for mass mobility (for example through telecommuting) and therefore congestion, energy consumption and pollution;
- environmental monitoring via remote sensing.

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[125] H. Skolimowski, Foreword in Soleri, *Two Suns Arcology* (1975)
[126] Soleri, *Arcosanti* (1983), pp. 24-8

Some have questioned whether information technology is necessary or sustainable, if its aim is simply to sell relatively useless information to each other and expand market demand for products that we don't need (electronic devices for an increasing number of activities) and that, in many cases, act to aggravate the already detached relationship we have with the environment.

Although there is some evidence of the environmental benefits of telecommuting[128] the idea that the use of computers will negate the need for urban commuting, is too simplistic. Since the majority of car trips (around 75 percent) in developed countries are unrelated to work IT may actually increase car travel by allowing more people to live in outlying low-density areas. IT-induced sprawl could offset any potential environmental gains by increasing the environmental pressures associated with this form of development. In addition the ISF points to the possibility an IT-induced "rebound effect" where new demands for material consumption are created by the technology itself.

The least desirable form of urban development from an environmental perspective is low-density suburbanisation.[129] The *Habitat Agenda* (1996) highlights the significant environmental impact of urban form. It stressed that in order to:

> ...avoid unbalanced, unhealthy and unsustainable growth of human settlements, it is necessary to promote land-use patterns that minimize transport demands, save energy and protect open and green space.[130]

Within the arcology theory there is the basis of a response to this challenge. It also aims at a different way of life. On a finite planet, in a world of limits that faces a future of dwindling resources and expanding consumption perhaps of far greater benefit than new technology will be the kind of changes to the pattern of our daily activities that a more frugal lifestyle may offer.

Currently there are around 3 billion people but by 2025 there could be around 5 billion people living in urban areas [3.2].[131] A increase of this magnitude in such a relatively short period of time will create severe strains on food supply, housing stock, transportation, sewage treatment systems, urban sanitation and water resources. During the 1990s hundreds of millions

[127] EU Information Society Forum, *Networks for People and their Communities: First Annual report to the European Commission* (June 1996). <http:www.ispo.cec.be/infoforum/pub/inrep.1.html>
[128] A recent study in California indicated that telecommuting in a sample group reduced the number of personal trips by 27 percent leading to emission reductions of 64 percent for carbon monoxide (CO) and 69 percent for nitrogen oxides (NO). P. L. Mokhtarian, 'Telecommunications and Travel Research , University of California Institute of Transportation Studies (Home Page, 1997) <http://www.engr.ucdavis.edu/~its/telecom/>
[129] W. P. Anderson, 'Urban Form, Energy and the Environment: A Review of the Issues' in *Urban Studies* 33 (1), (February 1996), p. 19
[130] UN (Habitat II), (1996), p. 111
[131] UNPD, (1995)

of people were without clean drinking water and sanitation. The rapidly increasing demand for food and resources will result in the inevitable consumption of more land. The increase in population has translated into a human habitat that consumes an increasing amount of arable land. More and more people are being forced onto arid land. There is therefore a growing need to establish how such land can support burgeoning communities throughout the world.

8.8 The hyper building

Many of these environmental benefits have been drawn together in the most recent development of arcology concept dating from 1995. Soleri has been commissioned by the Japanese government to design a 1000 metre-high *Hyper Building* with a projected life-span of 1000 years.[132] Asked by the Hyper Building Research Committee (HBRC)[133] to site his design in a rural location, he has chosen a place midway between Los Angeles ("an icon for hyper-consumption") and Las Vegas ("an icon for hyper-hedonism"), near Interstate 15, in the Mojave Desert. The Hyper Building stands in contrast to these extremes of modern society as a place for "the continued evolution of human culture".

Soleri's design consists of a one-kilometre-high central tower, 500 metres wide at the base, surrounded by a double set of multi-level concentric exedra which contain a large spectrum of urban activities. The Sun is a primary agent in the design of the Hyper Building. The tower and the exedra are connected either by transparent or opaque membranes according to the seasons. These membranes are stretched from one exedra to the other and drape the southern edge of the tower. The spaces between the exedra form a zone of acclimatisation between the outside and the inside where temperature, light, wind, and rain can be modified and moderated (See Plate 19 (b)).

> The self-contained, three-dimensional landscape... marks a clear distinction between nature and city, while putting nature at the "feet of the city" at a walking distance for residents and guests. The identity of the city, whatever the originality it might develop, would have a powerful signature in its physical structure...The miniaturized and complex environment generated by the Hyper Building is a definer of frugality, the same frugality impossible in the scattered mode of suburban sprawl now embraced by the hyper-affluent societies. Frugality is the vessel for interiorization and life, the whole of it, is interiorization.[134]

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[132] In 1994 the Japanese government formed the Hyper Building Research Committee (HBRC) as a joint research organisation with the support and co-operation of the Japanese Ministry of Construction. The Committee is charged with adopting policies to make possible the construction of a hyper building. Soleri was one of three architects invited to develop design proposals. The others were Rem Koolhaas and Nobuaki Furuya.

[133] Hyper Building Research Council Committee (Home Page, 1997) <http://www.cyber-bp.or.jp/hyper/>

[134] The Hyper Building by Paolo Soleri (Home Page, 2000) <http://www.arcosanti.org/arcology/hb/index.html>

Together the tower and the exedra house a permanent population of 10,000 and a daytime, commuting population of 140,000. Eight multi-level neighbourhood "terras" (or "artificial grounds") within the tower comprise of open spaces that include parks, community and cultural places have their own micro-climate and give residents "breathing space" and provide a human scale to the mass of the tower. Midway up the tower a large, multi-level ""park terra" is developed into a greenhouse, similar to the Biosphere II project in Tuscon, Arizona.[135] Since various activities are juxtaposed and overlapping within the three-dimensional structure of the tower it becomes a layered sequence of focal points rather than a dispersed two-dimensional grid.

The Hyper Building provides 1044 hectares of space. Almost half of this is residential, formed in neighbourhoods between terras and in the exedra. Around 15 percent is commercial space, including shops, offices, restaurants, and production facilities. Five percent is reserved for administration, distribution centres and conference facilities. Another 5 percent is for the construction yards on the eight terras. Green space covers around 15 percent of the total area within the terras, the exedra, and within the areas surrounding the tower providing public streets and parks. Another 15 percent contain the "intermittent cultural zones" including schools, medical facilities, day care centres, theatres and art facilities. Around a third of the cultural area is designated as a "virtual reality recreational park" located within the bowels of the building, "disconnected from ecological reality" where "fantasy worlds can be developed three dimensionally in a totally controlled environment".[136]

The logistics of the building are based on separate provisions for people, goods and services. The site is located on a planned Mag-Lev transportation line in the Mojave Desert. A transport terminal located on the northeast side of the structure allows occupants to shift from the mass transit system to local and express elevators operating between the terras. A heliport with 38 landing pads is located at the top of the tower. Movement within the building is via pedestrian circulation, enhanced by elevators, escalators, moving walkways, and bicycle routes. Service transportation originates in construction yards, warehouses and distribution areas on each of the terras. Freight elevators handle construction materials and large goods. A 25,000,000 square metre underground car park, with spaces for 64,000 cars and 30, 000 commercial vehicles is located within a solar power generation plant. Although Soleri envisions that the cars will not be used on a daily basis he expects them to be used by residents for recreation and long-distance travel.

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[135] The Biosphere II Centre (Home Page, 2000) <http://www.bio2.edu/index.html>
[136] The Hyper Building (Home Page, 2000)

In terms of energy production and consumption the Hyper Building is semi-autonomous. While it remains connected to the conventional energy grid its dependency is reduced through a combination of active and passive alternative energy production[137], and by energy savings gleaned through the efficiency of the three-dimensional system. The design places emphasis on the pedestrian and would result in a radical reduction in the scale of fossil fuel consumption normally associated with an urban system of this size. The compact, three-dimensional, design ensures that residents are within walking distance of most activities while the multi-functional and integrated nature of the complex allows them to live, work and learn in a densely-packed, lively environment. Food production in the greenhouses contributes to the self-contained character of the habitat while further reducing the consumption of fuel normally associated with transportation.

The "garment architecture" defines both greenhouses (through transparent membranes) used to capture warm air, which is channeled through the building via convection, heating it on cold evenings and in winter, and parasols (through opaque membranes) to provide shade from the Sun during the hot summer months. The *chimney effect* defines the structure's ventilation system by taking advantage of rising warm air and sinking cool air.

8.9 Arcological economics and politics

Soleri's approach to arcology's economic and political system is intentionally vague and open-ended. While he actively discourages an economic system based on capitalism, suggesting that "there is more to life than economic solvency"[138] he assumes that arcologies will have a form of market economy based on *frugality*. Frugality, he believes:

> ...is a more effective and equitable path into the future [for] a planet with limited resources...Opulence is not only the privilege of parasites [but] also the *deux ex machina* of waste, destruction, [and] pollution.[139]

Soleri's organic metaphor supports his view that the city must exhibit frugal qualities. Organisms optimise efficiency in their use of resources to perform specific functions. Frugality ensures the balance between the organism's health and well-being and its supporting

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[137] 78,000 square metres of solar panels with photovoltaic cells are located at the top level of the exedra producing 1o megawatts of low voltage electricity per hour for use in low voltage lighting throughout the building. Windmills produce a further 10 megawatts. A field of solar power generators consisting of 5000 hydrogen conversion units are designed to take full advantage of the extended hours of sunlight, producing an estimated 175 megawatts per hour and meeting the bulk of the household electricity demands within the Hyper Building

[138] Soleri, *The Bridge Between matter and Spirit* (1973), p. 96

[139] *Ibid,* p. 217

environment. Equilibrium underpins the whole notion of sustainability. The fact that an arcology is intended to be semi-autonomous and self-reliant, producing much of its own food and energy means that it is better placed to sustain an economy of frugality. This frugal imperative is not only the basis of an arcology's economic system but it becomes a generative principle in its physical design. In a compact, three-dimensional structure, based on optimising performance in the most efficient way, there is no room for that which is superfluous.

Soleri does not prescribe what kind of economy will operate within an arcology. Economic forecasting, he says, is in any case full of uncertainties. "It is ...impossible for our economists and politicians to prognosticate what is going to happen the following year, let alone in the next century".

Soleri also professes to have no preconceived plans about how to organise the civic administration of arcologies. In a sense, he says, he is not even interested in this aspect of their development. As an architect he sees his role, in a traditional sense, as attempting to provide "shelter" to social and cultural institutions, not in trying to develop new political laws. He believes his task is akin to that of making a musical instrument, like a piano, and he distinguishes between the production of the "instrument", or a planning system, and the "music" that is going to be played on it. He is much more concerned about the performance of the instrument than the preferences or skills of the performer. He does insist, however, that society needs and seeks a truly urban instrument. An arcology, he argues, will generate a better economic and political system, because it is a better instrument.

While this metaphor is seductive, it does tends to disregard important aspects of the social production of the instrument - how the piano, for example, expresses the collective values and tastes of those people who invent and construct it. It requires a sophisticated and complex society to build a piano, and only a certain type of individual can develop the skills to play it well. To succeed, not only must it be designed and built but players need to be trained, concertos composed, concert halls built, and audiences educated.[140]

Soleri justifies the political vagueness and lack of definition by describing it as a virtue. In an arcology, he argues, the idea of integrating the three main components of life - living, learning and working is to create a system in which "planning the lives of the residents will be avoided". Excesses of legislation, laws, codes, norms, and restrictive practices would be shunned in favour of providing people with a "specific grid of environmental resources (an "instrument") within which to act and play out their lives (the "music").[141] He suggests that:

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[140] Luke, (1997), pp. 153-243
[141] Soleri *Arcosanti*, (1983), p. 46

> [City] dwellers do not realize that what they are missing is almost all of what they unconsciously seek: a friendly, blossoming urban life, not coerced into fringe performance by an obsolete layout,...bad logistics, the squalor of the laissez faire, [or] the economic imperative.[142]

Although he suggests that an overhaul of the political and economic order of society would follow on from the restructuring of the urban system , Soleri does not believe that he is qualified enough to describe what the political and economic landscape of such a society might be like. In refusing to be drawn into an economic and political quagmire he is essentially following the precedent established by other urban visionaries of the twentieth century, such as Howard, Wright and Le Corbusier, while leaving various possibilities open.

8.10 Responses to Soleri's work

Although the architectural establishment have had difficulty knowing what to make of Soleri he has been the recipient of a number of prestigious awards and honours granted by his professional peers since the 1960s. In 1963 he was awarded the American Institute of Architects (AIA) *Gold Medal for Craftmanship* for work done on the *Mesa City Project* (1958). He has been the recipient of various research grants and fellowships, both for his theoretical work on the arcology concept and for more practical research in ecological architecture, including those form the Graham foundation (*Mesa City,* 1962), the Guggenheim foundation (*Architecture as Human Ecology,* 1964 and *Arcology*, 1967) and the Xerox Corporation (*Two Suns Arcology: the City Energised by the Sun.* 1975). In 1976, in Vancouver, Canada, he was a principle speaker at the United Nations First Global Conference on Human Settlements: *Habitat I.* In 1977 he was presented with a Design Citation from *Progressive Architecture* for the design of the East Crescent Complex at Arcosanti, in Arizona. He received a Gold Medal at the World Biennale of Architecture held in Sofia, in Bulgaria in 1981 and a Silver Medal from the Académie d'Architecture in Paris in 1984. In 1989 he was awarded a Special Prize by the Congress on Utopia at the Universita Degli Studi di Genova in Reggio Calabria, in Italy. In 1996 he was made an Honorary Fellow of the Royal Institute of British Architects (RIBA).

Soleri has written ten books since 1970, has published numerous articles and chapters in books on subjects ranging from the design of bridges to environmental ethics, has organised eleven major national and international exhibitions of his work[143], and has lectured in countless

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[142] Soleri, *The Bridge Between Matter and Spirit* (1973), p. 97

[143] These are as follows: *Visionary Architecture,* Museum of Modern Art, New York (1961); *Two Urbanists: The Architecture of Buckminster Fuller and Paolo Soleri,* Braneis University, Waltham, Massachusetts (1964); *The Architectural Vision of Paolo Soleri*, Corcoran Gallery, Washington, DC (1970); *2 Suns Arcology: The City Energized by the Sun*, Xerox Centre, Rochester, New York (1976);

universities around the world. He has taught for many years at Arizona State University, where his silt-casting architectural workshops have been accredited since 1964. He has also received Honorary doctorates from Dickinson College in Pennsylvania, Moore College of Art in Philadelphia, and Arizona State University.

The public reception to Soleri's ideas has changed over the last thirty years or so, broadly reflecting significant shifts in the focus of his work. The post-war economic and population boom in the United States created a wave of optimism and confidence in the future that encouraged a rash of building construction and the outward expansion of American cities via the accelerating process of urbanisation supplemented by suburban sprawl. By the early 1960s, just as the impact of this growth process was beginning to become apparent, Soleri began to publish his urban and philosophical ideas, along with his built works and early exhibitions. Due largely to the publication of, *Arcology: The City in the Image of Man* (1969) and the national travelling exhibition, *The Architectural Vision of Paolo Soleri* (1970) which opened at the Corcoran Gallery in Washington D. C., and his work started to attract the attention of the general public, the media, and academics alike. The exhibition, then the largest of its kind, attracted hundreds of thousands of visitors. Soleri was highly praised by the popular press. When his theoretical work was increasingly being cited by a diverse group of academics and architectural critics (Cook, 1969[144]; Huxtable, 1970; Moholy-Nagy, 1970[145]; Kostof, 1971[146]; Skolimowski, 1971; and Sharp, 1972[147]) his appearance was described by Reyner Banham as "ascetic enough to be an early Renaissance John the Baptist, even in frayed shorts and a stone mason's grubby singlet".[148] Ada Huxtable, in a review in the *New York Times* (1970), suggested that he was dealing with "the natural and man-made world, in a very special mutual relationship".[149]

For Soleri urban sprawl remains the 'utopian dream'. It doesn't work 'because it is endless matter which is flat, amorphic, tenuous. It creates "the myriad of the golden cages, the place where the ecological suicide of the wealthiest nations in history goes on, it is the place for non-action that stands suspended between intensity and naught…the place for hibernation and

Envision Cities of the 21st Century, Miami-Dade Community College, Florida (1980); *Utopian Visions in Modern Art,* Hirshhorn Museum, Washington, DC (1983); *Yesterday's Tomorrows,* National Museum of American History, Washington, DC, (1984); *Space for Peace: Architektur Vision,* Graz, Austria (1984); *Space Models,* Union of Architects, Moscow (1989); *Paolo Soleri Habitats: Ecologic Minutiae,* New York Academy of Sciences ; and *Cities: Architecture for Planet Earth and Beyond* (Cosanti Foundation, Scottsdale, Arizona (1994)

[144] J. Cook, 'Paolo Soleri' in *aaq* 1 (1969), pp. 216-223

[145] S. Moholy-Nagy, 'The Arcology of Paolo Soleri' in *Architectural Forum* 132, (1970), pp. 70-5

[146] S. Kostof, 'Soleri's Arcology: A New Design for the City' in *Art in America* 2, (1971), pp. 91-5

[147] D. Sharp, 'Soleri: The First Arcologist' in *Building* 223 (1972), pp. 75-82

[148] Monczunski, (1998-99)

[149] A. L. Huxtable, "Prophet in the Desert' in *New York Times Magazine* 2 (1970), p. 26

desensitization".[150] His alternative proposed structures containing populations of millions and leaving the rest of the Earth as wilderness. Initially many radical environmentalists were sympathetic, because the arcology concept seemed to "quarantine (destructive) humanity from (life-giving) nature".[151] Certainly in his work, derived for his doctoral research in "architecture as human ecology", Soleri spoke of ecological principles of 'community' and 'ecosystems', of the need for 'equilibrium', the importance of 'habitat' and 'energy efficiency'. The alternative lifestyle community that he advocated conformed to the minimum criteria for being green (Table 5.1) and to the basis of a green political agenda. but through the strong anthropocentric current that runs through all of his writing Soleri has made it consistently clear, that his priority lay in the arrangements of human life within the urban structure. Here within a "neonature" he sees a new stage of human community evolving and insists that:

> When it becomes fashionable to discredit "man" and to proclaim the felicity of a nature freed from his presence, we insult nature and man both. We are part of nature, but we seek that which nature cannot yet deliver: equity, compassion, the work of the mind. Part of the technology of transcendence is the action of the *homo faber* When need be, such action must define a neonature, a "divine" component to an albeit astonishing process, the evolving cosmos.[152]

[150] Soleri, *The Bridge Between matter and Spirit* (1973), p. 18 and p. 233
[151] Le Gates and Stout, (1996), p. 453
[152] Soleri, *Arcosanti* (1983), p. 58

9

The Arcosanti Laboratory

Chapter 9

9.0 THE ARCOSANTI LABORATORY

If it is true that there are structural priorities that every civilisation must define for itself, then to make sense out of our physical environment has a very urgent call for priority. Macro-Cosanti will be a testing ground for environmental concepts that seek coherence between aims and ends. Macro-Cosanti will apply arcological concepts. I call it Arcosanti, and we are now actively working at the initial phase.[10]

Figure 9.1 Arcosanti: East Crescent under construction, 1999

[10] Soleri, *Arcology* (1969), p. 120

9.1 A new urban setting

On top of a low mesa above the Agua Fria river, in the central Arizona desert 70 miles north of Phoenix, *Arcosanti,* a unique laboratory devoted to testing a new ecological alternative to the modern city, has been developing slowly over the last 30 years. A project of Paolo Soleri's Cosanti Foundation, Arcosanti is a working prototype for a new kind of city, one that is being designed, built, and inhabited as a three-dimensional, highly concentrated urban structure. Described as a "permanent experiment in urban intensity"[2] when complete it will house an environmentally benign "learning/doing" community of five to six thousand people, occupying only fifteen acres of land in the midst of an 860-acre nature preserve containing orchards, agricultural fields, canyons and high desert hills. The compact structures of Arcosanti, which face the sun to gather its energy, will stretch no more than quarter of a mile on any one side, but they will rise to as much as thirty stories tall. Inside the structures will contain the economic, cultural, and social infrastructure normally scattered around the modern city, while providing residents up to two thousand square feet of living space per family. A series of orchards would line the north side of the structure, creating a unique fusion of urban and agricultural environments. Outside there would be expansive views of another three thousand acres, leased from Arizona State, to be kept as undeveloped open space. An integral part of the design will be five to seven acres of south facing sloping greenhouses, an "energy apron" acting as a central system for producing food and collecting energy to support the prototype town (See Plates 20 and 21).

Since 1970 Soleri has used Arcosanti to rethink the totality of modern urban design and planning. Instead of accepting the logic of two-dimensional cities, and what he sees as the inherent wastefulness of suburban sprawl, he has developed Arcosanti as a laboratory to explore the idea of urban "implosion", where the city infrastructure contracts and intensifies in order to become more efficient, ecological, and sustainable. Soleri believes that cities can be designed in such a way that the vitality of urban life can be increased, without destroying the surrounding environment that sustains the habitat. The *arcology* concept from which Arcosanti derives, bans the motor car from operating within the city in favour of pedestrian walkways aided by fixed mechanical people movers (lifts, escalators, and moving walkways). Because of the compact nature of the urban structure, most journeys by foot would take around fifteen to twenty minutes (about the same time as it takes typically to walk from inside a shopping mall to the outskirts of the car park in cities like Phoenix and Los Angeles). The "controlled implosion" at Arcosanti

[2] I. Altman and M. M. Chemers, *Culture and Environment* (Cambridge University Press, Cambridge, 1980)

would stabilise the community at around 350 people per acre – ten times the population density of New York City.

Now listed on the state map of Arizona, Arcosanti is now officially a small town. As such it is faced with the challenges of daily existence but, at the same time, its aim is firmly fixed on the future. By trying to anticipate it and attempting to plan for it, Arcosanti strives to keep the road to the future open, while recognising that paradise here on earth can only ever be an imaginary condition.

9.2 Soleri's ecological architecture

Ecological design is defined as "any form of design that minimises environmentally destructive impacts by integrating itself with living processes".[3] It explicitly addresses the design dimension of the environmental crisis and involves the effective adaptation to and integration with nature's processes. According to Van der Ryn and Cowan (1995) ecological design offers three critical strategies for dealing with the depletion of the Earth's natural resources: involving issues of *conservation*, *regeneration* and *stewardship*. Conservation slows the rate of the problem down by allowing scarce resources to be stretched further but it cannot lead to sustainability because it continues to imply resource deficit. Regeneration involves the repair and renewal of a world deeply wounded by environmentally insensitive design. It not only preserves but restores and amounts to an expansion of natural capital through the active restoration of degraded ecosystems and communities. Stewardship requires a quality of care in our relation with other living beings and with the natural landscape, with careful maintenance and continual reinvestment.

Some argue that Paolo Soleri's architecture is a 'parody' of Wright's in the sense that his building are an organic outgrowth of its site but to Soleri Wright's prairie houses represent a "spurious and superficial way of being 'in sympathy with nature'".[4] Soleri's architecture has long embraced the notions of conservation, regeneration and stewardship within ecological design. His arcology concept is premised on the kind of reduction of energy and material flows that would allow human communities to be re-integrated within their surrounding ecosystems. Arcosanti is growing out of a specific context and a real place that presents the design constraints for the project. In the two years directly following his departure from Taliesin, at a camp site in the desert, Soleri collaborated with another of Wright's apprentices, Mark Mills, on the development of a specific construction method in proposals for a series of earth house

[3] S. Van Der Ryn and S. Cowan, *Ecological Design* (Island Press, Washington, D.C., 1995)
[4] Soleri cited in Ostler, (1994), p. 12

designs.[i] This early work still informs Soleri's approach and through the years he has attempted to respond to Wright's critique of 1948 and tried to create an architecture '*of* the earth' by setting his buildings into the ground rather than on it.

9.2.1 The cave creek dome house

Shortly after his design for the *Beast Bridge* had been published, alongside one of Wright's, in Elizabeth Mock's *The Architecture of Bridges* (1948)[5] Soleri and fellow apprentice Mark Mills set up a camp, a few miles from Taliesin. They collaborated on a commission for Leonore Woods, the Cave Creek *Dome House* (1949), a partially subterranean building with a glazed dome section over the living area, incorporating a passive heating and cooling system ideally suited to the extremes in temperature experienced in Sonoran desert (see Plates 1 & 2). No doubt partly in response to Wright's critique the *Dome House* was, very much '*of* the plateau', being submerged into the desert landscape. Reputedly when he visited it (in some ways similar to his own bermed house in Wisconsin) Wright wandered around pointing out which details were based on his ideas.[6]

Now registered as a historic landmark in the state of Arizona the building has two main areas, the living area and the sleeping area, are spatially connected to exploit the topography of the site and the thermal inertia of a structure embedded in the earth. The main living area is located directly below the glazed dome section, which was built in two halves (one with transparent and the other opaque glazing), which rotated on tracks allowing the dome to be either fully or partially opened. In this way the temperature inside the living space could be modified quickly to react to the external environment. The sleeping space is below the ground line, and constructed of concrete embedded with natural rock. The space reacts more slowly to any fluctuations in external temperature above ground and the thermal mass means that the walls slowly warm up throughout the day and gradually loose their heat during the night. The house was in effect a passive solar energy device.

The method of construction and approach to thermal comfort employed at the *Dome House*, and the extensive use of concrete both externally and internally, made it unique in many ways, and considering its period it is hardly surprising that it was cited in Henry Russell Hitchcock's and Arthur Drexler's *Built in the USA: Post-War Architecture*.

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[5] E. Mock, *The Architecture of Bridges* (useum of Modern Art, New York, 1948)
[6] '25 Years of Arcosanti & Arcology: The Works of Paolo Soleri' in *Heartland Journal* (1996) at www.pg. net/users/c/charconet/heartland-arcosanti.htm

9.2.2 Ceramica artistica Solimene

In 1950 Soleri returned to Italy, where they toured around in a self-built caravan with a water tank on the roof to provide naturally heated water for their shower, and supported themselves by selling ceramics which Paolo designed and made. They travelled to the small town of Vietra sul Mare on the Amalfi coast to visit the ceramics factory owned by the Solimene families. A mutual interest in ceramic techniques led to Soleri's commission to design a new larger factory, the *Ceramica Artistica Solimene* (1951-2) his only built project to date outside of the United States . Built on a steep and constricted site Soleri's design followed the process of ceramic production by placing the various stages, from the delivery of the clay at the top level to the final packaging of the green-glazed ceramic pots, along a continuous ramp. Like Wright's Guggenheim Museum (1944-57) in New York, the ramp descends five storeys around a central sky-lit atrium. Both the ramp and roof are held up by angular tree-like reinforced concrete supports.

The form of the structure allows light to descend through the central well of the building but also allows for the definition of a series of smaller, more private spaces, shaded form the sun, where individuals can get time away from others to concentrate on their own work. The optimal use of the sun for both practical and aesthetic purposes is a dual theme that Soleri has continued to develop in the buildings at Arcosanti. *Building Design* featured *Ceramica Artistica Solimene* in 1984 when it reported that the building's:

> ...architectural qualities lie mainly in the structure and in the handling of light. The architectural element is intrinsic rather than applied, and ornament assumes as much a signifying as a decorative function to give clues on the façade as to the nature of the products sold and made inside. It is by no means an overbearing building but its architect has not failed in his responsibility to produce a work of art.[7]

Set against the high undulating cliff that forms its immediate context the main scalloped façade clad with 36,000 green ceramic pots set in cement and punctured by square metal windows on the diagonal, give the building a reptilian appearance and recall Gaudi's Expressionist structures at Guëll Park. But the external form and appearance of the building is in keeping with the clay manufacturing process and the general characteristics of the region. Its striking apparently futuristic form is tempered by its vernacular use of faience in an abstract manner that echoes the dome of the local church.[8]

In what has become the norm for Soleri's executed works, economic constraints meant that the construction work was carried out by unskilled workers (the factory's own employees), rather

[7] J. Loach, 'Clay Pot Construction' in *Building Design* (March 16, 1984), pp. 18-19

than by outside labour and rough formwork was used for casting the concrete. *Ceramica Artistica Solimene* took a year and a half to complete but fifty years after its construction, it is still owned by the same family, and is still functioning as the largest ceramics factory in the region.

The work on *Ceramica Artistica Solimene* consolidated Soleri's interest in the ceramic production process, an interest which would lead eventually to the production of the ceramic and bronze wind bells and chimes. These have helped to fund Soleri's experimental construction projects and their production has formed the basis of the working culture at Cosanti since the 1950s and Arcosanti since the 1970s.

9.3 The experimental buildings at Cosanti

In 1955, Soleri and his wife Colly, bought five isolated acres of land in Paradise Valley, just outside Phoenix (about fifteen miles southwest of Wright's Taliesan West) and, a year later established the Cosanti Foundation, a non-profit organisation dedicated to pursuing the research and development of an alternative urban environment. They began workshops experimenting in the construction of a series of earth structures, based on the same techniques used in casting ceramic artifacts:

> I began working with earth and silt in the 1950s. Originally I became interested in using the desert soil and the silt abundant in the dry Arizona river beds because of their inherent properties and availability. Experimentation proved the usefulness of earth and silt as molding materials as many types of crafts projects. Clay and plaster were the first materials that we cast in earth and silt molds. We produced ceramic windbells from earth molds, and plaster architectural models from originals, which had been carved in silt. The use of earth and silt for making forms on which to cast concrete was the logical next step.[9]

From 1956 to 1974, ten of the structures at Cosanti (the *Earth House* [1956]; *Ceramics Apse* [1958]; *North Studio* [1961]; *Metal Studio* [1964]; *Pool Canopy* [1966]; *Pumpkin Apse* [1967]; *North Apse* [1964]; *Cat House* [1965]; *Student Apse* [1968]; and the *Antioch Building* [1974]) were "earth-cast" using silt-casting methods and involving architecture students in Siltpile workshops throughout the 1960s.

The result is a complex of buildings that are used as craft studios, a foundry, work areas, offices and residences (see Plate 22). Soleri describes the Cosanti complex as a combination of "ancient craft techniques, new variations on these techniques, scrounged and donated materials, aesthetic perceptions, unorthodox architectural concepts, and the sweat of many workers".[10]

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[8] *Ibid*
[9] P. Soleri and S. Davis, *Paolo Soleri's Earth Casting* (Peregrine Smith Books, Salt Lake City, 1984), p. 2
[10] *Ibid,* p. 4

9.3.1 The silt-casting method

Silt-casting, derives from an ancient craft and involves the use of a very fine type of earth, called silt, to make moulds and forms for the casting of various materials. Since silt has a homogenous quality it can be used for moulds that can be made into almost any shape allowing for the casting of a large variety of shapes and forms using different kinds of materials, including clay, plaster, wax, and concrete.

At Cosanti since the 1950s Soleri has used the silt-casting technique to produce a number of craft items using earth, silt and plaster moulds, including architectural models and the, now famous, bronze and ceramic wind-bells.

9.3.2 The earth house

The unusual viscous property of the desert sand, and its abundance in Paradise Valley, gave Soleri the means to explore, what Victor Papanek (1984) describes as a "a radically new building method". The method is simple. In *Design for the Real World* (1984) Papanek describes how the technique was adopted for the first structure to be built at Cosanti, the *Earth House* (1956):

> Selecting a mound of desert sand, Soleri criss-crossed it with V-shaped channels cut into the sand, making a pattern somewhat like the ribs of a whale. Then he poured concrete in the channels forming, when set, the roof beams of the house-to-be. He added a concrete skin for the roof and bulldozed the sand out from underneath. He completed the structure by setting in car windows... from automobile junkyards.[11]

The spaces within the *Earth House* are arranged around a central unit of services, cooking and bathroom. For Papanek, the method of its construction represents a *'tour de force'* in its "creative and honest use of tools, materials, and processes".[12] The earth and silt-casting technique has been used widely at Arcosanti since 1971.

After *Mesa City* (1958) which was a relatively two-dimensional urban environment Soleri developed a more self-contained three-dimensional structure which he called *Cosanti II* (1962), the forerunner for Arcosanti, Its overall structure and appearance at this time reflected both Soleri's pre-occupation with the idea of miniaturization and his experimentation with the apse form. The apse shape as adopted by Soleri adopts a south exposure in a Northern Hemisphere to shade itself in the summer and cool itself in the winter. Using concrete as the primary building material allows for durability and heat sinking (the accumulation of heat within the structure).

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[11] V. Papanek, *Design for the Real World: Human Ecology and Social Change* (Thames and Hudson, London, 1984), pp. 9-10

The benefits and limitations of the *apse effect* as both a solar device and spatial enclosure had been explored at Cosanti since 1963 in early "earth-cast" (or "siltcast") structures including the *North Apse* (1964), the *Pumpkin Apse* (1967), and the *Student Apse* (1968).

9.3.3 The north apse

The *North Apse* is a silt-cast concrete shell about 6 metres high in the shape of a quarter sphere ("bandshell"). It was the first of Soleri's structures to use the apse shape to allow the structure to act as a passive solar device, receiving the low winter sunlight and blocking the sun's high summer rays, The construction involved the casting in place of eleven individually reinforced panels in a sequence. It adopts the Roman arch as a basic model for its engineering and construction method, where each separate section effectively leans on the others and the top piece acts as a keystone. The *North Apse*, the first structure to be completed by the summer Siltpile Workshop students from Arizona State University in 1964, forms the main entrance to the working spaces at Cosanti.[13]

9.3.4 The pumpkin apse

A large mound of earth was piled up and then shaped and carved with ribs and facets by hand to form the mould. At the top of the mould a timber form supported a concrete collar above a fluted skylight. Various colours of pigment were painted onto the mould in certain places to give a polychromatic effect on the underside of the completed apse. Concrete was then poured onto the mould, and allowed to cure. Finally the earth was dug out from under the concrete shell by hand leaving the structure intact. The *Pumpkin Apse*, along with the *Barrel Vaults* (1971 - cylindrical buildings resting on the ground built of concrete conduits and timber cross-ties) house the Cosanti Foundation's offices (see Plate 23).

9.3.5 The student apse

The same process was used to form the basic mould for the *Student Apse* but this time the earth was refined and carved in horizontal sections in sequence. Each section could then be poured and cured independently in a sequence as that part of the mould was completed. The first layer of concrete was poured onto the top section and overlaid with reinforcing bars. The section below, which included the chimney, was formed next, and so on down the structure.

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[12] *Ibid*
[13] Soleri and Davis, (1984), pp. 80-3

Horizontal and vertical groves were carved into the mould to form ribbed panels on the inside of the apse. The 'Student Apse" derives its name from the students who built it during a Cosanti summer seminar. Each participant created their own individual designs on the vault panels formed by the ribbed pattern. These were cut from waxed paper, which was tacked onto the earth mould acting as masks when the concrete was curing. The process created grey patterns against the brown of the earth-cast concrete interior and gave the apse its distinct character.[14]

9.4 The buildings at Arcosanti

In *Arcology: the City in the Image of Man* (1969), Arcosanti was the 30th, and last, of the arcologies to be presented. In the book Soleri describes it as a "self-testing school in urban studies" which aims at the "betterment of man's condition and in conservation of nature, inasmuch as they both depend on the creation of efficient and humane cities". Because of the "physical, cultural, and ethical impasse" that he believed society had reached he proposed the investigation of new urban patterns and structural systems within the construction of a complex that would apply and test these at the modest end of the urban scale.[15]

Arcosanti's guiding parameters are those in which the city is viewed as a "biomental organism" of a "thousand minds". The contraction of the urban container is seen simply as a response to the enormous forces of complexification at work within the social organism. From the outset, since many of the activities were to be developed in "sheltered -but-open spaces", the main physical problem was how to "tame the sun by selecting those radiations that are 'kind' and rejecting those a that are 'unkind'. [The Sun's] curved trajectory demands curved traps".[16] The apse form has characterised Arcosanti's appearance ever since its inception, the "curved trap" idea having influenced the design of many of the buildings now completed. What exists at Arcosanti today is a cluster of various structures and spaces, the highest rising to five storeys, which cling to the edge of a south-facing mesa (see Plates 24 & 25). These are the *South* and *North Vaults* (1971-75); the *Ceramics Apse* (1972-73); the *Foundry Apse* (1972-74); *East Housing* (1972); *West Housing* (1973); the *Crafts III Building* (1973-77); the *Lab Building* (1976-77); the *Colly Soleri Music Centre* (1983); the *East Crescent Housing* Units 1, 2 and 3 (from 1975) and the *East Crescent Amphitheatre* (1975-89), the *Soleri Office Drafting (SOD) Unit, Library and Office Greenhouses* (1975-87); and the *Swimming Pool* (1974/78).

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[14] *Ibid,* pp. 84-6
[15] Soleri, *Arcology* (1969), p. 119
[16] *Ibid,* p. 121

Construction work at the Arcosanti site began in 1971 and the construction of the first main structures involved extensive silt-casting using the silt from the Agua Fria River bed that runs throw the land. Unlike the buildings at Cosanti, those at Arcosanti are mostly constructed above ground using a similar, but more sophisticated earth-casting technique. Arcosanti's concrete structures are either cast-in-place or pre-cast using one, or a combination of three basic techniques:

- pre-silt-cast curved panels;
- pre-silt-cast flat;
- cast-in-place on scaffolding.

Much of the construction at Arcosanti has utilised pre-siltcast concrete panels with steel plates on the edges as part of the reinforcing. Once the panels are fitted onto the various structures the edges are then be welded together.[17]

9.4.1 The south and north vaults

Begun in 1971, the *South Vault* was the first structure to be built on the mesa at Arcosanti and the first of two adjacent structures, which together form the *Main Vaults* (see Plate 26). The *North Vault* was built in 1975. These are two arched concrete shells, open to the north and south, which act as a large, covered, multi-use area. Each vault is 9.5 metres long, 28 metres wide, and 11 metres high and covers around 2300 square metres of floor space.

The construction of each was similar. Foundations were laid using conventional methods to support curved beams at either end. These were pre-cast in sections at ground level and then lifted into place to form a frame to hold twelve individually pre-siltcast curved panels. Designs were applied to the silt using liquid concrete pigment and rubber stencils. Since, when it is curing the concrete takes an almost photographic impression of whatever material it is cast against, it can absorb colours, patterns and designs made on the silt prior to pouring (see Plate 27). Patterns for circular windows were made out of wood and placed in the appropriate places on the silt moulds. When the casting process was complete the panels were lifted into place by a crane.[18]

9.4.2 The ceramics apse

The *Ceramics Apse* has a 7 metres radius shell that covers a 325 square metre floor area. The construction, that took place between 1972 and 1973, was similar in some respects to that of

[17] Soleri and Davis, (1984), p. 93
[18] Ibid, pp. 94-6

the *South Vault,* in that the arched concrete frame that forms the buildings façade was pre-cast on the ground and then lifted into place, to provide support for the siltcast shell that was then constructed on a wood and steel scaffolding system. Nine coloured concrete discs, which would become decorative details on the inside of the completed apse, were pre-cast and placed on the formwork before the concrete was poured. After it had set, the scaffolding and plywood were removed, and the silt dug and washed out.[19]

As a small scale example of the *urban effect,* the structure functions as ceramic studios, a stage for music and dance, and a small amphitheatre for tour guides, performances and presentations. The *Ceramics Apse* also exhibits the *apse effect* as a "passive solar machine" where shading can produce a summer daytime temperature differential of 15°F cooler, and in the winter, the temperature can be as much as 15 - 20°F warmer inside the apse (see Plate 28).[20]

9.4.3 The foundry apse

The construction of the *Foundry Apse* followed the same method as that of the Ceramics Apse and since it also has a 7 metre radius shell the same template system was re-used to cut the silt to the correct curvature and the same ribs used to hold reinforcement bars and articulate the structure of the shell. Concrete pigments were then painted onto the silt. The Foundry Apse covers an area of 465 square metres, which also includes rooms that were built around the rear perimeter of the apse to provide accommodation for foundry workers. Arranged symmetrically in pairs and half-buried into the ground these have a folded roof structure, which was siltcast in - place at various heights to articulate the different spaces inside.[21]

Bronze wind bells are cast in the foundry using a method called 'split form moulding', an ancient technique for creating sand moulds into which liquid molten metals, in this case at a temperature of between 2,000 and 2,400°Faranheit, can be poured. Once poured the metal solidifies almost immediately and, when sufficiently cooled the sand block can be broken open and the bells cleaned. The hot air rising from the furnace is channelled from the hood along a tunnel, which runs around the rear of the apse ceiling. Heat energy exchanges through the structure and radiates into the rooms behind. Water pipes on the front of the apse direct rainwater from the roof to cisterns at ground level. This is intended as a source of irrigation for the greenhouses (see Plate 29).[22]

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[19] *Ibid,* pp. 99-101
[20] Arcosanti Residents, 'The Ceramics Apse' (Unpublished Cosanti Foundation Paper, 1980)
[21] *Ibid,* pp. 101-3

9.4.4 *East and west housing*

These two structures are connected to the *South Vault* on the east and west sides. They are mirror images of one another, and were constructed employing the siltcast in-place technique for their curved ceilings similar to the vault panels and the *Ceramic* and *Foundry Apses*. The pre-silt-cast method was adopted to construct the oddly shaped wall panels for the north and south façades. These were lifted into place with a crane.

Each of the houses are around 9 metres wide , 15 metres long, and 6 metres high These two wings are currently the largest housing units at Arcosanti, although in the *SuperCritical Mass* proposal these simply form the links between the two larger residential areas in the *East and West Crescent Complexes*. The circulation is provided by external staircases at the ends of the buildings. At *East Housing*, the first to be completed in 1972, the stair gives access to the *Sky Suites* - raised apartments with views over the surrounding desert (see Plate 30). The *West Housing* staircase allows access to the roof of the *South Vaults*.

The south entrance to both *East and West Housing* is an adaptation of the *apse* and *greenhouse effects,* where the large eight-panelled windows hung like doors, can be closed in winter to create a sun space at the front of the house allowing for the passive radiation of heated air into the internal communal living space. These are swung open during the summer months to help ventilate the structure. Balconies above gather rainwater. When it reaches a certain level this empties into cisterns below and is used to water the gardens at the front of the house.[23]

9.4.5 *The crafts III building*

The *Crafts III Building* has perhaps the most conventional form of all the structures at Arcosanti the yet is the best practical example to date of arcology's principles of integration, three-dimensionality and complexity operating within a single structure. It is located at the most western edge of the site and visitors enter Arcosanti across a bridge into the building at an upper level. It is a multipurpose, multi-storey complex housing residential, commercial and recreational activities including single apartments, family apartments, a bakery, a café and restaurant within an atrium space with terraces that look south over the valley and east across the site (see Plate 31), a gallery exhibiting Arcosanti products including the Soleri wind bells produced in the Ceramics and Foundry Apses, and an where visitors gather around a model of *Babel Canyon* (1969) to discuss the arcology concept prior to being taken on a tour of the project. The name "Crafts III" is taken from Soleri's 1973 book *The Bridge between Matter and*

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[22] Arcosanti Residents, 'The Foundry Procedure' (Unpublished Cosanti Foundation Paper, 1980)
[23] Soleri and Davis, (1984), pp. 104-5

Spirit is Matter Becoming Spirit in which he describes humanity's three basic needs as "food, living and the arts". The foundations for the building were dug by hand in 1972, then construction primarily using the pre-siltcast flat panel method carried on until its completion in 1977.[24]

9.4.6 The lab building

Located at the north end of the *North Vault*, in what will eventually be the main access to Arcosanti, is currently a covered work site for the wood and metal workshops, called *the Lab Building*. Built between 1976-7 it is an example of "tilt-up" construction, typically used for industrial buildings where the enclosure of a large space is needed quickly and economically. The walls are pre-siltcast flat panels, which were welded in place. The ceiling and the upper floors (designed as offices or craft studios) were poured in place over formwork, tying the structure together and providing it with integral strength. The interior is trussed and has large skylights.

The building utilises a very basic form of passive solar energy. The laminated glass ceiling is whitewashed in summer to provide shading and cooling. In the autumn the whitewash is removed and the sun penetrates the glass warming the air inside as well as heating the exposed concrete surfaces. The *heat-sink effect* means that the heat is retained and collected by the structure during the day and radiates into the building by late afternoon and in the evening. The interior remains at a reasonably constant 60-65°Faranheit during the winter days.[25]

9.4.7 The Colly Soleri music centre and east crescent amphitheatre

The music centre was founded in February 1982 in memory of Colly Soleri. As a small indoor theatre, conference and concert venue and practice rooms for resident musicians. The extrados of the backstage on the roof of the building is designed as a *Sky Theatre* complete with concrete columns acting as the structure for *garment architecture.* Completed in 1990, this space at the centre of the *East Crescent* is used for various kinds of activities and performances. Since the completion of the seating and the installation of the temporary roof, the 500-seat venue it has hosted a number of events including the first "Minds for History" conference in 1989 and the "Paradox" conferences in 1997 and 1999. Eventually a canopy supported by the surrounding housing units will provide shade to the amphitheatre (see Plates 32 & 33).

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[24] Arcosanti Residents, 'Crafts III' in *The Visitor Centre Tour Guide* (Unpublished Cosanti Foundation Papers, 1988)
[25] Arcosanti Residents, 'The Lab Building' in *The Visitor Centre Tour Guide* (1988)

9.4.8 East crescent housing

In total *East Crescent Housing* comprises ten residential units, each of around 250 square metres of usable floor space, provide living and working accommodation for up to 60 residents, were planned within two large concave residential components that enclose the *East Crescent Amphitheatre* (see Plate 32). Service areas are connected and symmetrically arranged around the axis of the *Colly Soleri Music Centre* that forms the circulation path leading to the amphitheatre and the *Sky Theatre* beyond. The units are programmed vertically with studio space on the ground floor, shared living space on the first floor, and leased apartments on the second floor. The ground floor studio spaces are seen as semi-public spaces for craft workshops and display areas. This portico and work area acts as a spatial boundary between the living and performing aspects of the complex. Soleri believes that the inclusion of these studios enhances the *urban effect* and could help lead to the recognition of Arcosanti as a community in its own right.

Today half of the crescent has been constructed and seven of the units have been occupied since 1994. Co-housing is located on the first floor and is available for both individuals and families with shared facilities. The second floor spaces are subdivided into 1 to 2 person apartments with separate facilities. While the formal access is via a public walkway to the rear of the complex there are also semi-enclosed shared balconies at the front (see Plate 33).

Solar power is advocated in Arcosanti on a community wide scale. The housing units at the East Crescent are designed to have their heating provided by the *energy apron* and their hot water supplied by an active solar hot water system. Hot air is to be drawn up from the greenhouses on the south facing edge of the mesa below and into a heat tunnel that wraps around the rear of the crescent with openings into each of the residential units, under the first floor. In the winter the building is 'fed ' with warm air during the day which is stored in the structure and keeps the units warm during the night. In the summer nights the warm air absorbed during the day is ventilated to the outside. This *heat duct tunnel* also serves as ducting space for all electrical, water supply, sewage and storm drainage. Hot water is provided by centrally located gas-fired boilers. This allows for the future use of solar panels for pre-heating. Storm water is collected from the roofs in basins to be used in the *energy apron.*

9.4.9 The east crescent complex

The *Colly Soleri Music Centre,* the *Sky Theatre* and the *East Crescent Housing* and *Amphitheatre* together constitute the *East Crescent Complex,* which exemplifies and emphasises the mixed-use concept proposed by the arcology theory (see Plates 32 & 33). At its most intense

the *East Crescent* complex, which was given a *Progressive Architecture* award in 1979, will be an urban enclave steeped in living, making, learning, performing and exhibiting. It is designed as a place where the performing arts and group activities will produce music, plays, dance, recitals, conferences, and celebrations. Most of these activities will take place on the stage surrounded by three-storey houses. Placing the emphasis on housing provides the mixed-use notion with a different accent. Because the living and working spaces physically focus on the performance area residents are able to experience an environment largely dedicated to the arts (and more conducive to *esthetogenesis*).

9.4.10 Soleri office drafting (SOD) unit, library and office greenhouses

Situated on the eastern edge of the East Crescent complex is a hybrid building accommodating the studio, drafting room and model-making workshop. Begun in 1975 the west ground floor consists of a few small offices as well as the library and archives and a lecture /meeting room. At the east end of the unit an open plan drafting area sits underneath a greenhouse which is heated by means of a passive solar system. The drafting area can be opened, via large sliding doors onto to a small, enclosed garden to the north-east. Overlooking the drawing area is Soleri's own studio and apartment, completed between 1980-82.

9.4.11 The swimming pool

Set into a plateau of basalt rock, downhill from the *(SOD) unit,* which at one time held a basin of water, there is now an open-air swimming pool, excavated in 1974. This is used by residents to cool off during work breaks on hot summer days and as a venue for pool parties. The rocks above act as an unofficial diving platform. A small circular kids pool sits alongside on the west end of the concrete terrace.

9.4.12 La loggia

Housing units are to be included as part of the *energy apron. La Loggia* was designed as a four storey, 27 unit apartment building to be used as a guest facility for visitors. The roof of the stuccoed masonry structure is level with the swimming pool deck. Large silt-cast panels cap the vaulted third floor ceilings, while the lower level units will incorporate a frieze consisting of silt-cast modules produced, by students, visitors and guests. The foundations for *La Loggia* (Phase 1) were dug in 1990. A further phase includes the construction of the first one-acre section of the tiered south facing greenhouses, which will provide the source of heating to the apartments and

the *East Crescent* complex. Cross-ventilation between balconies and corridors will cool the internal spaces.

9.5 Unfinished business at the urban laboratory

Like Raymond Williams (1973), Paolo Soleri has long been convinced that humankind is in the midst of a transition into an urban form of global existence, but that the kind of thought that needs to be invested in our urban future has, in many ways, not even begun. He argues that technology, politics, economics, sociology, or religion alone cannot provide the framework of imagination that we need to move closer to a sustainable urban future. However by focusing our thoughts and actions on the city we might bring together these hitherto disparate elements of human society and see them within a much more coherent vision than any other social paradigm could provide.

Arcosanti is intended to be an *urban laboratory* for the purpose of investigating the process of designing building and operating a functioning prototype arcology which will explore the ways in which the city infrastructure might contract and intensify in order to become more efficient, ecological, and sustainable. On the basis that there can be no learning without experimentation, the laboratory is the place where, through the trials and errors of lived experience, the basic tenets of the arcology theory are being tested. Although Arcosanti is not an experiment itself it is a framework, or container for different experiments, a place where ideas and processes can be conceived and tested to destruction in order to understand them better. Failure is recognised and acknowledged as an integral part of the life of such a place, simply part of the learning process (see Plates 34 & 35).

As an urban laboratory, Arcosanti is involved in research within the Complexity-Miniaturization-Duration paradigm and within the field of environment and habitat. The premise of the research work is that, since the urban phenomenon is seen as a process of increasing complexity, one which must take place in proportionally shrinking spaces then "a miniaturization of its structure become s indispensable".[26] The project aims to become a catalyst for the focused search for urban alternatives that are currently ignored or dismissed. More specifically it aims at constructing a living demonstration of a compact three-dimensional town as a proposed alternative to suburban sprawl. Soleri wrote of the priorities of Arcosanti in 1969:

> The subject is the city. The aim is:
> - A historically sound concept of the morphology of the city as an evolving organism.

[26] Soleri, *Arcology* (1969), p. 121

- A testing of the conception by a verification process, transferring ideas into the actual construction of a micro-city.
- To proceed from beginning to end of the program, already under way, in the manner of an open-ended process to be lived in and experienced by some thousands of apprentices and students.

The collective work constitutes ideas and a processes, conceived within the *urban effect* frame of reference which:

- do not reject the existing technologies of energy production but try to define a more responsible and less intensive use of the resources that they make available;
- do not seek energy self-sufficiency since, Soleri believes this to be impossible practically and ontological nonsense;
- reject the two-dimensional planning grid of existing communities as wasteful in both human and natural resources and instead demand the exclusion of the car from the habitat and the reinstatement of the pedestrian;
- advocate greater integration and proximity of the diverse activities of people;
- seek to bring the urban landscape into the presence and action of the Sun according to its seasonal character;
- advocate the self-containment of the urban habitat for the sake of frugality; instantaneous access to open land; the reciprocity of the city and the countryside; the pedestrian or bicycle mode of the community; the desegregation of social, cultural, economic, and productive context of the community; countering the empty street syndrome and the danger of alienation; vandalism, violence and crime that it encourages.

Since it is largely self-financed, primarily through the sale of bronze and ceramic wind-bells, the project has, of necessity to be a "simplified, ambiguous, tentative, assessment of the urban phenomenon" as well as a modest attempt to contribute to it. Soleri argues that these characteristics constitute, in any case, the fundamental qualities of reality.[27] He believes that simplicity (limitation), ambiguity (dialectic), and tentativeness (probing), legitimise Arcosanti as a laboratory while, at the same time, offering guidance as to where the emphasis of the research should be: on energy and resource efficiency, food production, desegregation of living, working and learning, social-cultural intensity, self-reliance, a degree of autonomy, and the search for identity.

9.5.1 Ongoing programmes

There are a number of projects ongoing at Arcosanti which involve the community in a wide variety of activities ranging from project development, networking and media work,

research activity, exhibitions, drafting work, conference organisation to wind-bell production and site maintenance. These including *Construction Workshops; Arcosanti Organics; Energy Apron* and *Greenhouse Experiments; Minds for History; Paradox; Arcosanti 2000*; and *Arcosanti Super Critical Mass.* These are briefly outlined below.

9.5.2 Construction workshops

The seminar and construction workshops at Arcosanti have been ongoing since the project began and are based on the Siltpile Workshops held at Cosanti from 1962, initially for architecture students from Arizona State University.[28] In 1970, the Cosanti Foundation shifted the summer workshop program to the new Arcosanti site. The workshops today are designed to be a "learning by doing" experience in which participants are involved over a five to six week period with learning ways to approach a variety of tasks and problems, within the aegis of the *urban effect* - from lifestyle choices to urban design. There is an initial one-week intensive course introducing the Arcosanti project and discussing aspects of the arcology theory, largely as contained within the 63 topics outlined in *Arcosanti: An Urban Laboratory?* (1984). During this 'seminar week' participants attend lectures documenting development and construction history; take site tours and nature walks; discuss architectural plans and models of the project; produce silt-cast sculptures; and sample some of the ongoing construction work. From the remainder of their stay they take a hands-on approach and are actively involved with work on some aspect of the project on a regular daily basis. This could involve, for example, the continuing construction of the *East Crescent* complex, recycling duties (all paper, metal, plastic, and glass waste at Arcosanti is separated and removed for recycling), site maintenance, and cultural events preparation. The work assignments are made according to the project's needs and, as much as is possible, on the basis of interests and skill levels of the participants (see Plate 36).

The Siltpile Workshop was re-introduced at Arcosanti in 1984 and is now available to offer participates the opportunity to learn the silt and earth-casting techniques used to produce the wind-bells, bridge models and buildings at Cosanti and Arcosanti.

Workshop participants mostly sleep in individual 8ft by 8ft by 8ft pre-cast concrete cubes in the 'camp' at the eastern edge of the site, down by the Agua Fria River. The overall character of the 'camp' is that of a small farm village with the cluster of cubes, enclosed within trees and hedge growth set amongst gardens and crop fields. A few outbuildings include the experimental

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[27] Soleri, *Technology and Cosmogenesis* (1981), pp. 102-3

greenhouse and the "octagon", a community structure, complete with a wood-burning stove in the centre, a piano, and metres of bookshelves lining the walls.

Completion of the Arcosanti workshop entitles individuals to be considered for residency and volunteer work. Employment depends on the individual's performance and the availability of a staff position. All the residents are expected to share in site maintenance. Generally those who want to stay, and are seen to be of value to the community, become part of it. As in any close knit community strangers are treated with caution. It is the same at Arcosanti. There is a 'rites of passage' involved. Individuals gain acceptance by the actions of their lives and by the stories they tell. Then they tend to migrate to one of the shared habitats on the hill. The accommodation there is a little less basic, and in winter, it's a lot warmer. The notion of the shared habitats, such as *East* and *West Housing,* is of the 'cubes' clustered around a communal living space with a wood burning fire. Adjacent to this space are cooking and washing facilities. It is in these shared spaces, at the end of the working day, that people gather.

Those who have chose residency at Arcosanti adopt a lifestyle, which to many in consumerist society is unthinkable. There are sacrifices; no school, no library, no hospital, no cinema or shop. The place is too small to sustain these. But people stay. Being part of a community is part of the reward.

9.5.3 The Arcosanti internship programme

During recent years Arcosanti has offered an extended stay option in the form of an internship program. This program gives those with relevant experience, and who are able to give a three-month commitment, the chance to work within specific areas of the project:

- archives;
- agriculture;
- bronze foundry;
- ceramics studio;
- construction;
- landscaping;
- planning/drafting;
- woodworking.

The *archive internship program,* for example, now offers participants an opportunity to explore Arcosanti's development history, study Soleri's work and accomplishments over the last 50 years, while helping to preserve a part of architectural history. Administrative tasks involve

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[28] Six earth-cast concrete structures were built at Cosanti by the summer Siltpile Workshop students between 1964 and 1974. Today these structures comprise the Cosanti complex, and are used as craft studios, work areas, offices and residences.

cataloguing, labelling and filing sketches, drawings and models as well as written material, and maintaining a database of archive materials. The work also intermittently involves providing archival research and reproduction assistance and producing supporting materials for print and electronic media and publication, websites, events, exhibitions and special programs.

9.5.4 Arcosanti organics and greenhouse experimentation

Arcosanti Organics is the agricultural program at Arcosanti. It maintains two greenhouses, two gardens, a field, peach orchard, and a small vineyard (see Plates 37 & 38). The agricultural programme embodies Arcosanti's belief in stewardship while addressing a perceived responsibility to revive interest in growing food organically and provide the Arcosanti project with fresh produce. It is intended that an agricultural content is incorporated within future workshop programs, where participants interested in gardening could work towards improving the existing systems.

The two greenhouses are part of a sustainable food production system. Although the production levels currently fall far short of the consumption demands the aim is towards a greater degree of future self-reliance at a basic level of nutritional provision. The large greenhouse faces due south and has a recessed concrete base. The 150 square metre area contains four terraced growing levels over rock bed storage and heats and ventilates an attached 12metres by 3 metres residence and office. The rock bed acts as thermal storage set within concrete beds. In combination with a simple system of manually operating vents it helps regulate the temperature within the greenhouse via the *heat-sink* and *greenhouse effects.* During the summer the vents are kept open continuously and shade cloths are stretched over the experimental greenhouse to protect the plants from the scorching summer heat. A mister system also lowers the temperature. The structure also includes a potting room, a seed and tool storage room, and a dehydrating loft. The smaller greenhouse is connected to the camp's shared bathroom.

9.5.5 The energy apron

In the *Two Suns Project* Soleri had discussed the theoretical potential of the urban scale of the *greenhouse effect.* At Arcosanti he has been working towards a large-scale practical demonstration of this idea. The area covered by the greenhouses is described as the *energy apron.* Locating the greenhouses lower than the habitat structures and spaces means that the naturally accumulating warm air can be passed through tunnels up into the living areas. Because of convection no additional energy is required as long as there is a chimney at the end of the

tunnel. Cooling using evaporation is also being explored, whereby cool air created by misting at cooling towers at the top of the structure, forms moist air which falls back through the tunnels. With his design staff and external consultants he has undertaken greenhouse research and design development since 1974. The conceptual work involving the design of a large central system for food and energy production was carried out from 1974-1976.[29] Extensive research, carried out from 1976-1978, resulted in the construction of a prototype greenhouse in 1979. This facility has been operating in a passive mode since March 1979, generating both agricultural and climactic data necessary for further greenhouse development, specifically aiding in the designs of the first full-scale segment of the *energy apron*. Soleri wrote about the Arcosanti greenhouse research project in 1985:

> If the greenhouse is on a flat area, quite definitely you need energy and equipment to ventilate the greenhouse in the summer, but if you slope the greenhouse, you introduce the chimney effect, and the greenhouse is self-ventilating. One can take the greenhouse and make it into a wafer, a sun collector, then you can incorporate the sun collector in the roof. This is the normal way of going about producing hot water. Or you can make the greenhouse with two effects: one as a sun collector, and the other as a food producer. Warm air can be pumped into the house and can produce some vegetables, as a form of energy, which is, let's say, the warm air, automatically through the chimney effect. If one takes the house and transforms it into a multiple kind of aggregate like a village or a town, and then one enlarges the greenhouse proportionately, one begins to see the possibilities of having a solar town.[30]

The greenhouses are designed to benefit from:

- *heat collection* - curved surface retaining walls are designed to collect maximum winter sun and create a warmer environment in the greenhouse;
- the *greenhouse shading* - deciduous plants growing from the membrane support columns will shade the greenhouse during the hot summer months. Winter leaf drop will allow maximum sun penetration;
- a *membrane system* - the greenhouses will be covered with a polythene film anchored on four sides and tensioned by jacks to eliminate tearing of the membrane by wind flutter. The film will be used instead of glass for both economic and aesthetic reasons.

In addition to the practical aspects Soleri observes that the greenhouses will be "a demonstration of ways to touch on global issues: food inequity, climate change, and how to produce food in an ecologically sane way".[31] Most of the world's arable land is already under cultivation. The remainder is deemed largely unsuitable, being too cold, wet, arid or

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[29] This work was made possible by a grant from Xerox Corporation, with matching funds from the Cosanti Foundation, the American Revolution Bicentennial Administration and the Environmental Research Laboratory at the University of Arizona.

[30] Soleri, *Technology and Cosmogenesis* (1985), pp. 138-9

[31] P. Soleri, *Double Exedra: the Indian School Proposal* (Unpublished Cosanti Foundation Paper, 1991), p. 12

mountainous to sustain current agricultural methods. Increasing global food production by improving the productivity of land already under cultivation is one method of obtaining higher yields. Another is to explore methods of bringing marginal lands, generally ill-suited to agriculture due to adverse climatic and topographical conditions, into production. Arcosanti's experimental work on the passive *energy apron* addresses both of these areas of investigation. The experimental greenhouses aim at gathering conclusive data as evidence of the benefits of their wider application as part of an integrated urban design strategy.

Arcosanti is located in the semi-arid desert highlands of Arizona. Similar climatic conditions are common to around two-thirds of the world's marginal. In such an arid climate the greenhouse allows frugal water management by using only a tenth to one thirtieth of the amount needed for open-filed irrigation. Within the desert environment, which has a high percentage of sunny days throughout the year, this is clearly a significant factor. Because of Arcosanti's altitude cold winters are problematic to crop growth but, within the greenhouses the growing season can be extended all year round, doubling the yield. During the winter, crops in the greenhouse grow much faster and without the stress of frost. A larger variety of food can also be grown which can supply the cafe and residents with salad greens which grow quickly and remain tender because of protection from temperature extremes and winds. The greenhouses also contain flowers, herbs, and tomatoes year round and keep a variety of crops planted successively for continuous harvest.

Successful food production methods, thoroughly researched and tested, in a living/working environment such a s Arcosanti could prove to have a much wider application. In 1990 the *energy apron* project received funding of $100,000 towards the estimated construction cost of $540,000.

9.5.6 The minds for history institute

The *Minds for History Institute* was established at Arcosanti in order to generate and develop a comprehensive program for "salvaging, probing, revealing and documenting" the thinking processes of some of the most influential thinkers of our age. This enduring process of "recording minds for history" began with the first *Minds for History Conference,* which was held at Arcosanti in 1988, and has carried on since. The aim has been reach deep into the stock of knowledge that society generally stores away in fragmented forms within a variety of subject areas, but focusing less on the disciplines as such, and more on the "living generators" of the thinking process - the 'minds' that 'make history'.

The institute is structured along the following lines[32]:

- *minds directory* - this is the first document to be produced and contains a concise statement of each participant's (mind's) thesis. This is submitted to the other participants in advance of the conference and becomes the basis of the discourse. The directory, containing 20-40 statements per volume is made publicly available before the conference.
- *theatre of the mind* - eight participants share a stage for 2-3 days of in depth discussion which develops from their prior statements. An audience of around 300 observers from academic, corporate, religious, environmental institutions are allocated time to join in the dialogue. A 'moderator' and a 'jester' complete the theatrical format.
- *minds biographies* - this second document consists of one volume (and a videotape) for each participant. The contents are an organised and edited account of the "probing of the mind" preceded by the original thesis. Each biography is therefore 'co-authored' by those engaged in the dialogue, including the best of the interactions with the observers.
- *mind-brain-artificial intelligence convergence* - when a large number of biographies have been developed Soleri predicts a need for an evaluation of the knowledge generated and its significance in history. Part of the institute's mandate is to facilitate the emergence of an "artificial intelligence" which, Soleri suggest, might eventually find convergence within the comlexity-miniaturization paradigm. In this way, he argues, "the interdependence of *Minds for History* and micro-technology will emerge clean and strong".
- *minds encyclopaedia* - the third document is constructed around the sciences and current technologies dealing with the brain, intellect, mind, time, space, and memory. The encyclopaedia aims at the integration of the individual human mind with a wider conception of the notion of mind (including what Soleri calls "the mind-fullness of reality").

Past participants, as well as Soleri's suggestions for future 'minds' within a variety of subject areas include[33]:

- *moderator* - Walter Cronkite, Phil Donahue and David Frost;
- *jester* - Bill Cosby, Lily Tomlin and Alan Alda;
- *aesthetics/arts* - Federico Fellini, Sam Sheppard, and Philip Johnson;
- *economics/business* - Kenneth Boulding, Maurice Strong and Kirkpatrick Sale;
- *health* - Benjamin Spock, Christian Barnard and Martina Navratilova;
- *futurism* - Isaac Asimov, Paul Ehrlich and Jane Jacobs;
- *law and social order* - Betty Friedan, James Farmer and Mel Roman;

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[32] P. Soleri , 'Minds for History: An Arcosanti Institute' (Cosanti Foundation, Arcosanti, 1988)
[33] *Ibid*

- *literature*- Maya Angelou, Alan Ginsberg and David Mamet;
- *media management* - Rupert Murdoch, Alistair Cooke and Michael Korda;
- *performing arts* - Jane Fonda, Placido Domingo and Chou Wen-Chung;
- *history/biography* - Bruno Zevi, Lewis Mumford and Vincent Scully Jr.;
- *philosophy* - Doris Lessing, Susan Sontag and Elie Wiesel;
- *politics* - Jessie Jackson, Jerry Brown and Mario Cuomo;
- *inorganic sciences* - Fred Hoyle, Fritjof Capra and Freeman Dyson;
- *organic sciences* - James Watson, James Lovelock and Lynn Margulis;
- *technology* - Lee Iacocco, James Burke and John Allen;
- *theology* - John Cobb Jr., Raimundo Panikkar and Harvey Cox.

9.6 Arcosanti 2000

Arcosanti 2000 is the most current design proposals for the completed project. The design dates from 1990 and involved proposals for a cluster of structures planned along the Agua Fria Canyon Rim directly north of the existing site (see Plate 21). The structures were structured separately to allow for a phased development, although for ease of access all the buildings are connected. The energy efficiency is to be achieved through:

- southeast exposure;
- cool air misting;
- solar access due to the tall central structure;
- possible photovoltaics.

The main purpose of the proposal is as a learning and cultural centre with a permanent population base in the region of 30-50 percent. The construction cost at the time was estimated at $500 million.[34]

9.6.1 Super critical mass

More recently, Soleri has defined a step on the way to the larger scheme in, what he terms *Super Critical Mass* (1995) in which a smaller community of 1,500 people are to be accommodated within three double exedra that embrace and partly enclose the existing south facing structures on the site (see Plate 40). Although much smaller than those structures proposed for *Arcosanti 2000,* the Super Critical Mass phase of the project includes all the physical effects of the *Two Suns* approach that would promote the notion of the "energy city", as well as the social and philosophical concepts envisioned within the arcology theory. Among the

buildings planned for this phase are the *Greenhouses*; the *Exedra* enclosing residences and office, retail and commercial space, adopting a *green mantle* and exploiting *garment architecture*; a conference centre named in homage to the main sources of Soleri's philosophical heritage the *Teilhard de Chardin Cloister;* the *West Crescent complex* for 200 guests; and a market area with a covered pavilion and amphitheatre;

In the *Super Critical Mass* stage the greenhouses provide residents with a basic supply of fresh vegetables and fruit. Together with the produce from the lower valley farming lands this offers the basis of an essential diet. The greenhouses extend the growing season at Arcosanti from 6 months to a full year. By locating them on the sloped side of the mesa a number of different micro-climates are created which allow the possibility of a wider variety of crop production. Part of the greenhouse roof is used as surface area for solar collectors to generate electricity and water heating.

9.6.2 Double exedra

The three main *double exedra* are concentric, open to the south and define an internal curved area as the 'main mall' and public space. These three curved spaces interconnect and have a variety of functions: as gardens, walkways, meeting areas, open market places, areas for cultural activities, or special community events and gatherings. At the ground level there is a combination of retail and commercial units, and small business workshops. The inner exedra are only partially residential at the upper levels.

The outer exedra contain most of the residential accommodation with a typical apartment totalling 200 square metres with a floor to ceiling height of about 7 metres. Residents can adapt this space according to their individual needs, either by retaining the height or adding another floor level. The additional spaces may be used as residential, offices, commercial space or a combination of these. As is the case throughout Arcosanti circulation is fully pedestrianised. The main east-west axis of the town is to the front of the double exedra but the outer exedra are also connected by a 'street' at upper levels. Vertical movement is through elevators on the northern side of the outer exedra (see Plates 39 & 40).

9.6.3 Green mantle

The exedra offer residents both the intensity of activities on its inner (south facing) side as well as the view and privacy of the outer side (north facing) with its views over the desert. On this north side, fruit trees are planted on each garden terrace, scaling down to form a *green*

[34] Arcosanti Residents, 'Arcosanti Alumni Bulletin' (Cosanti Foundation, Arcosanti, October 1990)

mantle. The trees, which provide food, are irrigated by an automated system that releases mist over them creating a 'heat filter' (see Plate 39). The hot, dry air passes through this moist quilt of green canopies which traps the heat within their foliage. The air that arrives inside is 20-30° F cooler than the outside temperature.[35] Another advantage of the green mantle is that, as part of the daily watering routine, a down-draft cascade of air cooled by atomised water will diffuse onto the lower terraces and the public malls.

9.6.4 Garment architecture

Attached to tensile cables stretched between the inner and outer exedra transparent or opaque membranes can be opened or closed depending on the environmental conditions required within the public spaces. Similar to the system proposed for the *Hyper Building* the *garment architecture* utilises the *greenhouse effect* (through transparent membranes that draw warmth into the structure during cold evenings and in winter) which can then be channelled through the residences via warm air convection using chimneys located on the northern side of the external exedra. Shade can also be provided from the Sun by using opaque membranes during the hot summer months (see Plate 39).

Soleri believes that the exedra form has great potential in terms of energy efficiency and in coordinating the various physical effects previously developed within second generation arcologies:

> The synergistic combination and the locality of activities... in the Double Exedra, the climate transformations via the Apse effect and others - the Energy Apron (warming up), the "green mantle" (cooling down) - will generate an intense social-cultural milieu sustained by the market and economic enterprises of the town.[36]

9.6.5 Teilhard de Chardin Cloiste/Complex

This is designed as a nondenominational religious centre to be used for ceremonial activities of different faiths as well as a centre for research and education in theological studies (see Plate 42). This complex will house a minimum number of dwelling units ("cells") for the residence of scholars pursuing a more monastic lifestyle. Foundations were laid for the *Teilhard de Chardin Cloister* in 1975. The site is currently used as a Siltcast Studio for workshops hosting a variety of courses on the techniques of earth-forming cement. A pergola structure also acts as mounting for evening slide show projections on the rock wall of the opposite mesa.

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[35] Soleri, *Double Exedra* (1991), p. 12
[36] *Ibid*

9.6.6 West Crescent complex

Due to the experimental nature of the urban laboratory and the shifting nature of the population at Arcosanti, a hotel facility is included within the West Crescent complex. This contains individual rooms on the first two floors and a youth hostel on the upper level.

9.6.7 Market

Light canopy structures create the marketplace open to both Arcosanti residents and the neighbouring communities. In addition to augmenting the economy of Arcosanti, Soleri hopes that weekly markets will encourage social and cultural interaction between the communities and will strengthen Arcosanti's role in the Cordes Lakes region. The market area, along with the pavilion and amphitheatre will be used as the venue for celebrations and annual events.

9.7 The paradox project

Paolo Soleri proposed the *Arcosanti Paradox Project* in early 1997 (see Plate 41):

> Since Arcosanti is a place in search of the miniaturized by way of complexity, and since cyberspace is a non-place in search of the complex by way of miniaturization, I am proposing an internship which will bring these two places together via the practice of building and living in a non-virtual environment frugally imprinted, a habitat dedicated to urbanization.[37]

The project has two main aims:

1. To explore the fundamental issues raised in the intersection of arcology (the miniaturisation - complexity - duration paradigm) and Internet (the World Wide Web).
2. To support new funding initiatives for Arcosanti targeted at members of the cyberspace community.

Soleri believes that the global expansion of the Internet during the 1990s has created a new subculture of relatively young and affluent "cybrarians".[38] He argues that these cybrarians represent a fundamentally new potential source of support and funding for Arcosanti.
There are already hundreds of millions of people using the Internet, and the uptake, is expected to continue to grow exponentially over the next few years.

To realise its potential it was recognised that the Arcosanti community must interact with this fundamentally new community in the virtual place where cybrarians meet and learn - in cyberspace itself - by using the means and language that its members respond to. The most

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[37] P. Soleri, 'The Paradox Project: Draft Proposal' (Cosanti Foundation, Arcosanti, January 1997)
[38] N. Negroponte's term for Internet users

effective means of promoting such new initiatives is via the World Wide Web, using a combination of web sites, virtual online communities, real-time chats, and email. The five main initiatives of the *Paradox Project* are the *Arcosanti Website*; the *Paradox Virtual Community (PVC);* the *Virtual Arcosanti Model (VAM);* the *Paradox Workshop;* and the *Paradox Conference* series:[39]

- Arcosanti already has a high-quality web site, which continues to evolve under the current direction of Rob David, Arcosanti's Webmaster. The site can be accessed at http:www.arcosanti.org/html.
- The *Paradox Virtual Community* (PVC), is in the process of being designed and implemented as an asynchronous virtual community, which includes real-time chats, and email capabilities. The Arcosanti web site and the PVC have complementary roles, with the web-site providing multimedia information about Arcosanti, and the PVC providing a two-way interactive communication and project planning/co-ordination capability for those interested in Arcosanti and Paradox.
- The *Virtual Arcosanti Model* (VAM), now underway, is the third element of the Paradox Project. Its purpose is to provide a virtual experience of living in the completed *Arcosanti 2000* arcology. Using VRML (Virtual Reality Modelling Language), users can take a self-paced walk-through parts of the *Arcosanti 2000* model.
- The *Paradox Workshop* has recently been successfully tested, and will run concurrently with the standard Arcosanti Workshop Program. Participants, with prior computer skills, spend half of their workshop time working on the *Paradox Project.* Those who are willing to make a minimum 2-month additional commitment to implementing a particular element of the project may be selected to stay on at Arcosanti as "Paradox Associates". The intention is to gradually assemble a team of skilled cybrarians at Arcosanti to fully implement the *Paradox Project.* Being able to spend part of the day working physically and part of it working virtually in a place such as Arcosanti is attractive to many, but some will find it difficult to disengage themselves from their own professional life long enough to do this, especially if it means taking time away their area of expertise. In the world of IT things move very quickly and it is not difficult to fall behind and have to scramble to catch up. A current proposal is that the Teilhard de Chardin Cloister becomes the physical centre for the Paradox Project at Arcosanti. It will take a long time to build the cloister, so whatever benefits are to be gained once it is built, they will not be available to the people who build it. Marcos Novak argues that more detail is needed to make this a workable proposal. For example, how will this

[39] P. Soleri, 'The Paradox Project' (1997)

place be equipped? Is the proposal itself sustainable? High technology fast becomes obsolete so the problem will be "how to maintain an insane, fast, high external pressure, high-capital facility within a sane, slow, high internal discipline, low capital complex".[40] Unless this is answered, he believes that few people will join the effort and many will be disappointed by the inevitable inability of the reality to live up to the promise of the vision.

- The fifth element of the *Paradox Project* is the annual *Paradox Conference*, held each autumn at Arcosanti. The first such conference took place in October of 1997and was attended by around 150 cybrarians, many of whom are now involved in various aspects of the *Paradox Project*. The second Paradox Conference, dubbed "Paradox II: Cyberspace Embodied," co-sponsored by several departments at Arizona State University, took place in September 1999 and had over 300 participants. It was billed as an inquiry into the integration of cyberspace, virtual reality, and habitat, in the context of Teilhard de Chardin's hypothesis on the formation of the noosphere as a critical stage in human evolution. Panelists included a cross-section of high-level cybrarians who are professionally involved in creating cyberspace, virtual reality, and artificial intelligence technologies. Informed critics of the potential "dark side" of cyberspace and artificial intelligence (AI) also attended.

Teilhard de Chardin's notion of the *noosphere* [1.1] has influenced many innovators of cyberspace technologies (for example Paradox II panellists Marcos Novak [RealityLab]; Mark Pesce [VRML co-inventor]; Erik Davis [author of *TechGnosis* (1999)]; Michael O'Rourke [Dimension 7]; Nathan Vogel [MindsEyeMedia]; and Stephen Perrella [Hypersurface Systems]). They also claim to have been influenced by Paolo Soleri's ideas and the work at Arcosanti. Over two days numerous speeches, seminars and debates were held on such topics as quantum mechanics and the future of digital television; the role of 'Alpha' or 'Omega God'; the Internet as the future of mind, the biological and physical identity of consciousness at the beginning of the twenty-first century. Many questions were posed during the conference such as: If space is made intelligent through ubiquitous computation, communications, pervasive embedded sensors, the global positioning system, augmented reality, and so on, how should we build? If there are cities in cyberspace how would Arcosanti relate to them? Where does Arcosanti go from here? And more importantly, what - and who - becomes Arcosanti from this point on? After his visit to Arcosanti, Mark Pesce wrote:

[40] The Paradox Project (Homepage, 2000) <http://www.arcosanti.org/paradox/panel.html#paolo>

> Coming back to Phoenix after three days in Arcosanti I saw in full the idiocy of it all. All of the endless, wasteful sprawl, around making some mythical quality of life possible, which they inevitably lose in inevitable travel from home/school/office/shop/life. Paolo's ideas have been very influential, perhaps far more so as ideas than as implementation.[41]

Marcos Novak suggests that:

> [Soleri's] ideas need to be disseminated more widely and more dynamically. The present site is very useful, but it is still rather touristic. Browsing through Paolo's books, I was struck as much by his diagrams as by his written ideas and the designs of his arcologies. The diagrams respresent a living system - something that should be presented as an active simulation with real-time inputs.[42]

He advocates the construction of computer simulation models, "one for the American Dream as it is and one for Paolo's alternative", allowing the sustainability of each to be examined on a real time basis. He believes that Soleri's ideas about the physical city are as pertinent as ever but that there is a much larger intellectual and philosophical ambition at work. In addition to the physical arcologies, he argues that Soleri's concepts must be applied within virtual arcologies and digital communities as part of the virtual world now being constructed:

> I am not speaking of making walkthroughs of potential physical arcologies, though this too is necessary, I am proposing that the principles that guide the design of the physical be brought to bear on the design of the virtual. At present we are bringing the worst of the physical into cyberspace. Nothing describes cyberspace as is it developing better than the notion of the 'strip-mall' - and endless proliferation of small and not-so-small commercial interests with no larger goal in mind than the hijacking of attention through loudness. There is an assumption that, because it is spatially unlimited, cyberspace must sprawl forever outward. This assumption can be questioned by the disciplines of miniaturization, complexification, duration: a better cyberspace can be produced if we realize that we need the urban effect in virtual as much as in physical space. Paolo's *Space for Peace* proposal may be the perfect place to start. I am proposing that Paolo and the Arcosanti community write a new chapter to the ongoing story of arcological thinking.[43]

Other participants, such as David Traub, were surprised that "in violation of his own rather strict almost eco-fundamentalist, hands-in-the-earth ideology, Paolo Soleri let this conference happen at all". The greatest paradox was seen as the *Paradox Project* itself:

> The old versus the new; those set in their ways, versus those seeking the way; the pouring of concrete versus the running of code; the debate for building versus the debate for meaning; the search for a cogent and utopian business model versus the fact that all around us was Paolo's - his land, his buildings, his heritage, his legacy.[44]

But Erik Davis, author of *TechGnosis* (1999), perhaps best articulates the overarching spirit amongst the majority of attendees at the conference:

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[41] *Ibid*
[42] *Ibid*
[43] *Ibid*
[44] *Ibid*

> A turning is in the air. Slowly, tentatively, a 'network path' arises from the midst of yearning and confusion, a multifaceted but integral mode of spirit that might humanely and sensibly navigate the technological house of mirrors without losing the resonance of ancient ways or the ability to slice through the greed, hate, and delusion that human life courts. [45]

The fact that the *Paradox Project* is yet another initiative to emerge from Arcosanti says a great deal about the project's ongoing commitment to the future and as much about the energy and creativity of those who continue to work there. Funding the construction costs of Arcosanti has been an ongoing struggle since its inception in 1970. Since then the philanthropic support has fallen far short of the amount required to significantly increase the pace of construction. This situation has continued, in spite of several major funding initiatives supported by professional quality business proposals. It is hoped that the emergent property from these cyberspace initiatives will be an ongoing interactive participation in the *Paradox Project* by a growing number of cybrarians. Such ongoing collaboration between Arcosanti and the cyberspace community may provide the necessary impetus for the sort of outreach, involvement, and growing personal commitment that can lead to the levels of support and realisation of funding potential that might see Arcosanti move, more quickly, toward completion. Novak is upbeat about the potential of the *Paradox Project* to accelerate Arcosanti's progress:

> Arcosanti must contend with the issue of non-locality in any case, why not begin here? Do this first, so as to expand your visibility worldwide. Register what is relevant to the present and near future and address it with lucidity, vision and courage. Become relevant to the information age in a way that millions can understand. Do this well and you will not be lacking for people to do either the physical or the virtual work - or both.[46]

Soleri would love the new affluent Internet millionaires to support the completion of Arcosanti but for him the *Paradox Project* has even wider significance. His message to the entrepreneurs at the conference was simple - Don't put all your passion and creativity into cyberspace if it means turning your back on the real world, where your body must live in the coming millennium. At *Paradox II* he promoted the idea "that we need a lean alternative." He took the opportunity to sow the seeds of a more evolved world, based on community, creativity, frugality. He argued that 'lean' does not mean deprivation: "we would be more alert, more lively, more aware and more equitable". In cyberspace, he said, "people tend to communicate through the machine...not as a person. The Internet is almost a magic kind of thing now. Only when we can get past the 'magical perception' of technology can we make sense of it".

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[45] E. Davis, *TechGnosis: Myth, Magic & Mysticism in the Age of Information* (1999)
[46] The Paradox Project (Homepage, 2000)

> *Paradox* in its moments of intensity seemed to me to be probing and groping for universal animation. That is why I am so grateful to all those hyper-wired minds on the podium and all the minds of the group assembled for the occasion. We must ground our exultation on the immense travail that has made the pride of being here and now possible and, sooner or later, we must seek the storm of equity and beauty that might eventually emerge in that singularity I call the *Omega Seed.* To nudge reality toward self-revelation is to be on the road we must construct and follow. To devise the steps that will bring about *Paradox* is now one of our tasks, while we try to make a coherent ensemble of that which is still only a promising and energetic cacophony.[47]

Paolo Soleri has long advocated the need to redefine the American Dream before it spreads too far across the overpopulated developing world. His own version of the dream attempts to reconcile individuals and community needs, and economic realities and motives; with ecological awareness and cultural achievement, and aims to bring us back from the brink of an impending and insane attack on our Earth's ability to sustain us. The project is now represented at the EXPO 2000 in Hannover, Germany. The theme of the Expo is "Humankind-Nature-Technology: A new world arising." Along with Curitiba, in Brazil , Arcosanti has been chosen to be one of the featured 'Projects around the World'.

Soleri has, through the years, been variously described as either a madman, a practitioner of some obscure religious order, or a visionary.[48] His writing is cryptic, his style complex and philosophical. In 1991, in describing the *Edge City* Joel Garreau identifies a common problem in the interpretation of his ideas:

> Soleri is still out there in the desert in Arizona building Arcosanti...But he keeps talking about eschatology and nobody can understand...a thing he says, so he has had little practical influence in current urban planning.[49]

There is some evidence that this is now changing and that, while we may not understand or agree with everything he says, more people, particularly those involved in shaping the built environment, are moving some way, towards his way of thinking. Today there is renewed interest in ecology and people from around the world continue to be inspired by arcology.

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[47] P. Soleri, 'The Paradox Project' (1997)

[48] See, for example, P. Plagens, 'A Visit to Soleri's Eldorado' in *Art in America* 67 (1979), pp. 65-71; J. C. Glen, 'Prototype Communities of Tomorrow: Arcosanti' in *The Futurist* 14 (1980), pp. 35-43; J. T. McFadyen, 'The Abbot of Arcosanti' in *Horizon* 23 (1980), pp, 54-61, ; M. B. Pennington, 'Arcosanti Monastery No, 1' in *America* 144 (March 14, 1981), pp. 207-9; N. M. Bloom, 'Human Beehives: Paolo Soleri's Arcosanti' in *Science Digest* (March 1981), pp. 42-7; M. Grossworth, 'Arcosanti: A Laboratory for the Living' in *SciQuest* 54 (1981), p. 11-15; D. W. Dunlap, 'Future Metropolis' in *Omni* 7 (October 1984), pp. 116-24 P. Weingarten, 'Futuristic City: a Radical Vision Still Out of Focus' in *Chicago Tribune* (July 10, 1988); L. David, 'Paolo Soleri : Man for All Seasons' in *Ad Astra* 1 (November 1990), p. 31; 'Paolo Soleri's Arcology: Updating the Prognosis' in *Progressive Architecture* 72 (March 1991), pp. 76-8; M. Pastin, 'For Selfish Reasons, Arizonians Should Look Again to Arcosanti' in *Business Journal* (May 20, 1991)

Governments in China, India and Japan are seeking out Soleri's advice on urban development matters. Environmentalists have nominated him for a Nobel Peace prize. The world is increasingly becoming aware of ecological limits and the need for sustainability but it seems it does not yet have the understanding that would allow it to give the kind of support and encouragement that could long ago have seen the prototype arcology at Arcosanti completed.

> If the price that is put into an aeroplane was given to us, for some reason, then we would have an arcology. That's not possible so we are trying to do what we can with the means we have, and the know-how we have. This is very limited in many ways. We are not very professional in any direction but that's part of the pioneering - non-professionalism. So we are pioneering and...we'll see.[50]

Although Arcosanti is far from complete, Paolo Soleri trusts in the validity of his arcology model. Daily he perseveres, dreams, designs and slowly builds in the hope that one day the first arcology will be built. When construction work started at Arcosanti he believed it would be completed within ten years. At over 80 years old he now reluctantly accepts that he may not be around when "critical mass" is reached but he says he is proud that the community founded in the early 70s has survived this far. He stresses that, "survival is very critical. It's an indication that we're serious".[51]

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[49] Garreau, (1991), p. 249
[50] Soleri cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[51] Soleri cited in Ostler, (1994), p. 12

Conclusions

Figure 10 The Hyper Building

Conclusions

> Architects have a duty beyond the daily round of consultation and individual projects to participate in the human debate, to bring their vision, their energy, their flair, their intuition to work for mankind. The profession does not deserve to survive unless it does. The planet will not survive if it doesn't.[1]

Theoretically, at least, the city is loved. It is where the majority of us live and where, across generations, our enlightened culture has polished the essential achievements of human civilisation. In such a tradition the city contains a society distinguished from the rest of nature. We can bear witness to the separation of, "territory from kinship, rationality from custom and myth, the civic compact of individuals from the archaic group cemented by the blood oath".[2] In a truly urban setting, ideally conceived, the city delivers the kind of social proximity, from which it promises to forge the self, identity and individual destiny. Within such an idealised arena compression may well produce radiance. This is where urban theory and utopian thought begin to merge together.

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[1] RIBA President Marco Goldschmied's inaugural address, Tuesday 5 October 1999

Marx said that urbanisation spoke, not so much about a city's dominance, as its lack of identity. Today the formless urbanity of megalopoly that sprawls out across endless landscapes of development, devouring energy and resources and destroying people and land in its wake, has also destroyed the ideal of the traditional city and turned the notion of city planning into a myth.

Through time architectural taste has varied in line with historical shifts in religious order and political regimes. But the art of building has been able to evolve, through stylistic changes, while maintaining its general individual identity within the built environment. The profound changes in our modern lives, born of the 'scientific revolution' initiated by Copernicus and the mechanistic conception of nature; reinforced in Cartesian dualism and the Baconian creed; fuelled by the Industrial Revolution and economic and cultural imperialism; and sent into hyperspace with the globalisation of capital and culture, have created a new social condition. The overlapping challenges of environmental decline, technological revolution and population explosion require us to look upon the built environment in new and different ways. But, as Mumford warned, our bricks of reconstruction will come to nothing, if we don't place solid foundations under them.

> Men are suddenly nomadic gatherers of knowledge, nomadic as never before, informed as never before, free from fragmentary specialism as never before – but also involved in the total social process as never before; since with electricity we extend our central nervous system globally, instantly interrelating every human experience.[3]

At the beginning of the twenty-first century we know a great deal about information. We can compress it digitally, pipe it into every home via satellite communications and terrestrial broadcasting, package it in forms that people understand; in words, pictures, diagrams, films, print and music. We have developed intimate systems like the telephone and videophone, the fax and the Internet, enabling people to exchange information rapidly around the world. We have invented machines that can record changing weather, land-usage and other global patterns from space; and with developments in digital media we are creating systems that will allow access to the accumulated information and stored wisdom of our entire history. A new knowledge based economy and information order is emerging from the proliferation and use of computer technology. This is changing the way many people work and how they spend their leisure time. A large proportion of the global economy is focused on the development of new cyberspace markets (the so called "dot.com economy"). Industries that that were previously discrete, such as those involved in computing, consumer electronics, telecommunications, and the broadcast and

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[2] Bookchin, (1980), p. 135
[3] McLuhan, *Understanding Media* (1964)

publishing media, find their interests converging – just as their means of production are converging in the binary code of digital information.

During the twentieth century technical inventions like electricity, telephones, cars, aeroplanes, radios, televisions, and more recently the personal computer and mobile telephone have profoundly altered how people live. There have been people in every generation, at least since the start of the Industrial Revolution who have believed that they were witnessing the most rapid changes ever seen in history. They have all been right. What distinguishes our own age is the rate of change and the time it has taken for new technologies to proliferate into the mass market .

Karl Benz built a three-wheeled car powered by a petrol engine in 1885 but it took until 1940 for cars to spread to 25 percent of the American population. The lag between the invention of the aeroplane (1903) and its mass-market proliferation was just as great (around 54 years). Household electricity was invented in 1873 but it was not until after the First World War that it spread to a quarter of the population. Cars, aeroplanes and electricity were all adopted slowly by consumers and therefore their impact on economic change was gradual. Even less expensive technology, like television and radio, took around a quarter of a century to spread to 25 percent of the population.[4] The computer and its invasion into the daily lives of Americans (and to a lesser extent the Japanese, Germans, and British) has been different and much more dramatic. The personal computer was invented in 1975.[5] It took just 15 years to reach a quarter of the U.S. population. Currently, lower prices of computers, combined with the fact that access to the expanding global Internet is free, is now further accelerating the pace of penetration of personal computers into the U.S. mass-market. It is hard to predict the consequences of this relatively new technology but it is clear that the world is changing. The Internet is now the largest computer network in the world with hundreds of millions of users.[6] The increasingly global use of the

[4] Bunch and Hellemans, (1993)

[5] The 'personal computer' is a generic term for a single user computer based on a microprocessor with all the hardware and software required for a user to work autonomously. The term was coined by Alan Kay in the 1970s when the majority of computer users worked on mainframe terminals (terminals connected to large centralised multi-user systems)

[6] Internet inter-links an enormous number of local networks operated by universities, research centres, government departments, non-government organisations (NGOs), non-profit and commercial organisations worldwide. It origins lie in the *ARPAnet* experimental network created in the 1970s by the U.S. Government Department of Defence, in which various 'catastrophe-proof' networking options were developed. The result of the experiments was the Internet protocol – designed to let any computer communicate with any other computer, through different kinds of networks, so that in the event of partial failure in the network, data can be re-routed to reach its destination. The Internet, as we now know it was constructed in the 1980s to provide shared time on supercomputers for universities and research establishments and eventually grew to encompass the huge number of users 'online' today (an estimated 500 million)

Internet is leading to all types of changes for the world economy but in the less developed nations of the world there is a huge portion of the global population living in poverty. They are being excluded from the Information Revolution.

The embrace of information technology in general, and the attachment to the computer in particular, has fuelled a technological revolution in the workplace. Over the nineties companies have invested heavily in information processing equipment and computers and, as a result, have increased manufacturing productivity, boosted the economy and increased the global competitiveness of some industrialised nations. In the developing nations the use of computers, is limited. Although they contain around 80 percent of the world population and account for almost half of world GDP, these developing countries are home to a new 'cyber underclass'. With more than a billion people, China's share of world wide computers in use, for example, was 1.7 percent in 1997; with a slightly smaller population, India's share was even less.[7]

For the title of his book on the coming of the information economy and society, Barry Jones, the Australian academic/politician, borrowed a title from a Bach composition: *Sleepers, Wake!* He argues that the watchman on the heights is calling, but that his message could spell doom for all of us in the informational city, unless the sun also rises on the city of darkness just outside the gate. There is a riddle here, so far unanswerable by the wit of orthodox urban planners or social engineers and, as the new millennium dawns, it is casting a deep chill.

As cities around the planet reach unprecedented sizes, their increasing social and environmental problems need to be addressed if we are to avoid catastrophe. In his arcology theory Soleri has proposed a different way of urban life within a new form of city - one that he believes will prove to be more sustainable. Despite the obstacles, rejections and disappointments Soleri tenaciously holds to his philosophy. In attempting to define how society might change the arcology concept straddles both conventional values and reformist and radical methods associated with various shades of environmentalism. The realisation of a 'neonature' requires a radical transformation of the urban condition and yet Soleri, by endorsing the view that 'nature' exists apart from, (and largely for the benefit of) human societies is fundamentally human-centred in his outlook, upholds a fairly traditional (*conservative green*) approach to environmental issues. This is further reinforced by his support of the Romantic rebellion against the utilitarian, materialistic values of the "American Dream" and his advocacy of a more frugal alternative, within self-reliant communities modelled on natural ecosystems.

He shares with *mainstream greens* the rejection of the politics of both the left and the right, preferring to direct his aim 'straight ahead' via the agency of the urban system, while

emphasizing the importance of the individual and his or her need to revise values, lifestyles, and consumer habits. This idealistic tendency, a common characteristic in radical green thinking that can be traced through St. Francis of Assisi, Spinoza, Emerson, Thoreau, de Chardin, Leopold, Heidegger and Mumford, is interpreted in Soleri's urban philosophy as a form of *structural-functionalism*, in which societies are conceptualized as social systems (arcologies). The social structure (the *urban effect*), in turn, exhibits features that contribute to the maintenance of the system (the *apse, greenhouse, horticultural, chimney* and *heat-sink effects*). Arcology, in these terms, can be understood as an agency for the kind of collective action that recognises the need to review existing social-economic structures as part of an ongoing modernisation project which aims at, the transformation of the fundamental processes by which societies become developed, including industrialisation and urbanisation. Soleri also conforms to the mainstream green advocacy of a lifestyle of voluntary simplicity based on the idea of inherent scarcity and limits to growth.

Soleri also appears to share some of the radical ideas of the *anarchist greens*, believing that within an arcology people should organise themselves and have responsibility and power over their own lives. But although the individual is important he /she can only achieve fulfilment (*esthetogenesis*) in relation to the wider community (through the *urban effect*) . Decentralised economy and politics is the way forward in rural and urban co-operatives and communes (within arcologies).

Within the arcology theory there are similarities with the radical green position. Just as there are different positions associated with environmentalism, there are conflicting ideas in arcology. In the same way that we can identify a core of green values within ecologism [Table 5.2] it is possible to detect in various texts by Soleri since 1969, a number of the key ideas and beliefs within arcology relating to humans, nature, science and technology. Table 10 summarises these.

TABLE 10

ARCOLOGICAL VALUES COMPARED WITH GREEN VALUES

Arcological values	*Green value*
About nature	
1) Humans are part of nature but distinct from it. The distinction is important and should be reinforced.	Humans are part of nature.

[7] Quinlan and Stevens, (1998)

2)	Nature can and should be used for human benefit.	We must respect and protect nature for itself, regardless of its value to us, and live in harmony with it.
3)	We can and should also use science and and technology to aid human development but we must work within the laws of nature and the biosphere's limitations.	We must obey the laws of nature (e.g. the law of carrying capacity, which means that there is a limit to the number of people that the earth can support).
About humans		
1)	Humans can be co-operative.	Humans are naturally co-operative.
2)	Although currently human societies organise themselves hierarchically, true democracy and social equality will be achieved at some point in the distant future through the agency of the *urban effect.*	Social hierarchies are unnatural, undesirable, and avoidable
3)	You cannot measure our social standing by our material possessions. Society should progresses through *esthetogenesis* and be based on frugality, not on the continuous cycle of production and consumption and by inventing more complex technology.	Spiritual quality of life and loving relationships are more important than material possessions. We reject the latter, and live simply.
4)	Through a process of *complexity* and *miniaturisation* matter is being transformed into pure spirit. The ultimate aim of this process is to make "reality mindful" at a point of radiance called the *Omega Seed.* The function of arcology is to facilitate this process by giving meaning and direction to the human condition and putting the responsibility of transcendence collectively on human beings.	Logical, rational thought is more valid Emotions and intuitions are at least as important and valid as any other form of knowledge.
	In such a process facts and scientific evidence are only useful up to a point .	There is no such thing as 'objective' facts
About science and technology		
1)	Science and technology can solve many environmental problems, but it has to be a technology to come. The technology of transcendence is beyond our current imagination. Compared to biotechnology ours is almost beyond redemption.	Science and technology cannot be relied upon. We must find other ways to solve environmental problems.
2)	Progress in technology largely determines social and economic changes. It needs to be controlled.	We humans determine society and economics. Technology should be servant not master. Harmful technology should be banned.
3)	We need to guard against the simplification of reality by simple minded technology (like monoagriculture, oil refining, and atomic energy). Large scale 'high' technology is not, of itself a mark of progress.	Appropriate, and democratically owned technologies (e.g. renewables – solar, wind, etc.) are a mark of progress.
4)	'Soft' technologies involve a more frugal use of resources and are environmentally more benign. The co-ordination of a number of physical effects (*greenhouse, horticultural, apse, chimney, and heat-sink*) around the	

urban effect could save on resources like land, water, time, energy, minerals, and have a better ecological sanity. The application of the technology that supports these effects within a compact, three-dimensional urban structure promises a reduction in pollution, segregation, waste, bigness, bureaucracy, isolation, and alienation.

Sources: P. Soleri (1969, 1973, 1981, 1985) and D. Pepper (1996)

In the 1970s, when the 'ecological crisis' was still in its infancy two aspects fundamental to Soleri's work - the idea of 'planning' and the form of sociological analysis within 'structuralism' - were rejected in favour of the postmodern notion that we could choose to live our lives wherever and however we pleased. According to Soleri, it was during this period that architecture and its education system began to collapse. "Design freezes something...and people wanted to be able to choose at any moment of their lives".[8] In more recent years we have begun to realise that there are ecological limits to population and economic growth that are 'locked in' to physical and social problems of the urban environment and our attempts to define a sustainable society. We are less convinced that free-market solutions, characterised by unsustainable patterns of production and consumption, increased motorization and inefficient waste management, will optimise urban forms. The environmental imperative is rendering the whole notion of planning acceptable again and it has become more acceptable to explore the deeper structures that determine social relations within the built environment and develop related responses. The work of anthropoligists, like Claude Lévi Strauss[9] and cultural semiologists Roland Barthes[10] are, once again, fashionable in architecture schools

Critics have argued that Soleri's arcologies take Sant'Elia's and Le Corbusier's 'machine-age' cities to another level, suggesting populations of millions living a "beehive existence" in massive multi-cell units that "resembled the cooling towers of nuclear power plants".[11] Some have pointed out that they would need a technically advanced centralised society for their construction and maintenance. To Kevin Lynch (1991) the arcologies drawn in 1969 are "...marvellously compact and intricate. The large community and its high fashioned shell

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[8] Soleri cited in Stanishev, (1993), p. 61
[9] C. Levi-Strauss, *Structural Anthropology,* translated C. Jacobson and B. G. Schoepf (Basic Books, New York, 1963)
[10] R. Barthes, *Mythologies* (Paladin Books, London, 1973)
[11] Le Gates and Stout, (1996), p. 453

become a coherent super-organism, replacing the individual as the organized living entity"[12] but suggests that, like Le Corbusier's cities, arcologies would be alien places:

> ...the separations, the oversimplification, the pure aesthetics of the working machine, seem cold and repellent if we imagine ourselves actually living in these ideal places. They are founded on a conception of the city which seems basically wrong".[13]

Opponents explain away Soleri's arcology as a "communitarian nightmare: an environmentalist's anthill"[14] based on an ecofascist regime where no one can own a car, water their own lawn, or build their own house because these are deemed to be unsustainable activities. They are, of course, but these sort of activities have underpinned modern industrial culture for the last 250 years. And yet to others he is the perfect example of the "poet architect"[15] who is simply advocating a re-orientation of modern urban life towards, what he believes, is a more sustainable alternative.

Today, within the emerging ideology of ecologism, the relationship between sustainability and urban form is being recognised as of critical importance. This has re-awakened interest in Soleri's work and signals the most recent shift in the reception of his ideas. There are signs that his work is moving towards the centre of the new debate on sustainability. But there are certain 'problems' and contradictions within Soleri's thinking which tend to act against a more widespread acceptance of his theory, particularly in a cynical postmodern age that denies the sort of certitudes and rigid oppositions that Soleri bases his ideas upon: matter and spirit, growth and evolution, compaction and sprawl, Dionisian and Apollonian, gigantism and miniaturization. The Teilhardian tone, although it is central to his philosophy, can be a distraction to those who are intimidated or remain unconvinced by the theological dimension.

But although the 1960s frame of reference for staging his arguments is now rather dated, many of Soleri's ideas seem more relevant now than they have been in the past:

> The [arcology] idea is valid. It was valid 30 years ago when Paolo was a crackpot and it's valid now. Even more so when all his ideas are starting to come together. There are so many aspects of what he has talked about that are now happening: recycling, energy awareness, pedestrian access, mixed-use activities. All the parts are already there in society but they haven't been pulled together. To me it all seems so obvious that if you tie all of these together in the concept of arcology then it's going to work.[16]

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[12] Lynch, (1991
[13] *Ibid*
[14] Luke (1997), p. 165
[15] R. C. Smith in Borden and Dunster, (1995), p. 236
[16] Neil Urban cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)

The importance of his underlying ideas on the relationship between ecology and architecture, and urban form and sustainability is now apparent but Soleri's anthropocentric outlook is clearly at odds with the general tendency within environmentalism, drawing on a view of nature held by philosophers like Spinoza and Heidegger that every being had the right to express its own nature, to reject the dualistic view of humans and nature as separate and different, and grant extended and deepened care for non-humans and humans alike.

This view has been promoted within *deep ecology* as the philosophical basis of truly green practices and lifestyles which aim not only at eradicating the harmful effects on human life of problems like 'pollution and resource depletion' but also express a deep concern for ecological principles like complexity, diversity and symbiosis. These are the same principles that underpin the arcology concept. The chief difference is that Soleri focuses on these as a way of supporting social structures and systems within an entirely new 'neonature' or human landscape.

Although arcology proposes a more collective means of transforming society, than deep ecology's transformation at the level of individual attitudes, values, and lifestyles, and Soleri would be at pains to distance his own approach from the 'millenialist' spiritual hotch-potch of *new ageism* he would, no doubt, enthusiastically endorse the broad thrust of the deep ecology platform in its desire to motivate supporters towards the depth of social changes needed to overcome the environmental crisis and to unite concerns for nature with a desire to transform society. He would also support the formulation of policies that will reach deep enough to ensure a global change from increasing to decreasing ecological unsustainabilty.

The arcology theory attempts to offer a pragmatic and meliorist model for radical social and environmental change. In Leo Marx's (1970) terminology it can appear caught between a *conservationist* viewpoint (where nature "exists apart from, and for the benefit of mankind"), and an *ecological* perspective (in which the built environment is inextricably "embedded in the tissue of natural processes").

If as Worster (1977) suggests, our fundamental task is to choose between an "arcadian" tradition with its simple (frugal) rural lifestyle in harmony with nature, or an "imperial" tradition and the deployment of science and technology as a means of extending our power over nature as widely as possible, then here again the arcological thinking suffers from an "identity problem" which sees ecology as *both* a "science of control and manipulation of the non-human" world *and* a "philosophy of interrelatedness". Soleri refuses to be forced into Rifkin' s (1983) rather simplistically stated choice between an engineering approach to the age of biotechnology or an ecological approach. Arcology aims at both and attempts, in its synthesis, to uphold the values of both.

O'Riordan's typology (1976) distinguishes between *technocentric* and *econcentric* approaches to environmental issues. In his terms of reference the arcology concept would fall within the technocratic ideology that upholds an "arrogant assumption" that we humans are able to understand and control events to suit our own purpose and improve the human condition by technological means. This would suggest that the arcology approach conforms to the dominant set of attitudes towards nature held in modern Western society. But according to O'Riordan, technocentrics foresee no radical changes in the current social, political, or economic structure. They accept the existence of environmental problems but either endorse the 'cornucopian' view that, they can be resolved and unlimited growth can be achieved within the current form and structure of society, or they can be negotiated by economic and environmental management. Central to both views is a faith in classical science, technology, and in conventional economic thinking. This is where Soleri parts company with the technocentrics. He sees human society as part of a global ecosystem that is subject to ecological laws and endorses an ecologically based morality. The arcological perspective endorses the ecocentric sense of respect for a nature in its own right as well as for pragmatic reasons. Soleri argues for 'soft technology', but is not against technology *per se.* He decries bigness (advocating miniaturisation) and impersonality in the city (promoting the urban effect) and aims at an urban system based on ecological principles of diversity and homeostasis. Arcology is, like ecocentrism, concerned with *ends* (eschatolgy) and the proper kind of *means* (the technology of transcendence). Conceptually it tends towards decentralised, democratic, communities while emphasising the idea of limits to growth. It advocates the use of 'alternative' ('soft', 'intermediate', and 'appropriate' technologies) considering that these are both environmentally benign and democratic.

Soleri's designs go against many contemporary environmentalists notions of living in harmony with Nature, and the traditional green interpretation of sustainable ecological development. He suggests that around twice the current global population could be accommodated on the planet if only the urban infrastructure could be altered to fit arcological specifications. While arcologies have been criticised for their "anthill" characteristics, Soleri has actually changed only a couple of the conventional assumptions of urban design: firstly he has removed the car from inside the city and prioritised pedestrians, and secondly he has shifted the urban structure into the third dimension from two-dimensional sprawl. His changes could signal a radical alteration of the city's ecological footprint but this needs to be proven. A million people in an arcology, might represent (or even ease) the same destructive global flows of capital, labour, energy, material, and ideas, as its deviant two-dimensional counterpart in Pheonix, or

Los Angeles. It may alter the local ecology, even improve immediate urban environmental problems but, in the end, leave the global environmental problems untouched.

Soleri apportions the blame for the two-dimensional sprawl of cities like Los Angeles and Phoenix almost entirely on the technology of the motor car, largely ignoring the impact of interventionist state policies during the Cold War era. The high-technology industries (space, aircraft, electronics) that have rested at the heart of the Fordist American defence economy and which have encouraged a particular kind of urban growth, escape Soleri's critique. The state subsidies which made possible the construction of roads for urban transportation, dams for electricity and water supplies, the availability of cheap housing, and met the escalating demands for food through inexpensive agriculture is drying up. The mass mobilisation of the human population has resulted in a new form of urbanised space. But it is one that lacks any real sense of organic community, of place, or of identity. Urban sprawl becomes the transitory habitat for a new nomadic society shifted from place to place under the directive of transnational corporations or governments in order to sustain the growth machines of the global economy. But the increasing migration of people and capital into the suburbs means that in many cities in the developed nations the urban core is being starved of economic and human resource. As the tax base leaves the cities for the suburbs, two-dimensional cities are struggling simply to survive.

The concentration of population and production in compact, three-dimensional urban structures could offer a form of settlement appropriate to the needs of a Post-Fordist political economy. To respond to the demands of global, rather than national, modes of high-tech production cities will require compact, flexible, inexpensive workspace and industry near to their population centres. The economic (wasted time/waste space) disadvantage, and the social and environmental degradation associated with urban sprawl and the infrastructure and architecture of the car culture will need radical rethinking. A modification of Soleri's arcology could be a step toward generating a more rational and sustainable relationship between production and consumption. By completely re-thinking the twentieth century industrial city from its infrastructure upwards, and beginning to reconsider the dynamics of human ecology, Soleri's marriage of technology with ecological conviction may offer, in the form of the arcology theory, one of the more realistic communitarian responses to the environmental challenge of our age.

Ecological design is not a new idea. Ecological architecture must learn from the past and needs to guard against the notion that we must 'destroy the village in order to save it'. Many different cultures within widely varying conditions around the world have, through necessity, refined approaches to integrating with the surrounding environment on which they depend for their sustenance. Even during the uncritical growth eras of the industrialised nations, there have

been strong movements for ecologically sound planning, healthy building, organic agriculture, appropriately scaled technology, renewable energy, and interdisciplinary approaches to design. William Morris's Arts and Crafts Movement, Ebenezer Howard's garden cities, Patrick Geddes's and Lewis Mumford's regional planning, Antoni Gaudi's organically inspired reinterpreation of the Gothic, Erich Mendelsohn's search for new Expressionist forms, Frank Lloyd Wright's organic architecture, Rudolph Steiner's *biodynamic* design methods, Buckminster Fuller's Dymaxion (*dynamism plus efficiency*) proposals, Wright apprentice Richard Neutra's *biorealism* linking architectural form to human health, Alvar Aalto's regional approach reflecting climatic and traditional imperatives, Bruce Goff's architectural experiments with geometries and materials.

By the 1960s resistance to the unfettered growth of industrialisation crystallised into the first modern generation of ecological design. The house was the most familiar place to start defining a new kind of architecture based on alternative lifestyles. The development of independent energy sources from wind, sun and water was recognised as being essential. Research into these technologies that had been conducted for years within the military establishment, was disseminated through such publications as *The Dome Book* and Stewart Brand's *The Whole Earth Catalogue.* John Todd at the New Alchemy Institute designed Solar Arks that grew their own food, provided their own energy, and recycled their own wastes. A group at Cambridge University School of Architecture, led by Alex Pike, developed a research project looking into the design of a self-sufficient house. The *Autarkic House* sought to create a model dwelling that could provide a lifestyle appropriate to the late twentieth century but with minimal external support. It utilised all the latest technological developments, including solar collectors for space heating, wind and methane generators, and greenhouses for food and oxygen production. And Paolo Soleri, with the help of students from Arizona State University, was building his Earth Houses at Cosanti and drawing up proposals for Arcosanti.

The early experiments in ecological design were small in scale. Many of the pioneering technologies, such as alternative building materials and techniques, renewable energy, organic food production, conservation, and recycling have been adopted in recent years in a piecemeal fashion in different parts of the world. We now stand at the threshold of a new generation of design that must effectively draw together all the strands of ecological thinking from many different disciplines, practical experiments and theoretical propositions, and offer holistic alternatives that operate within a new paradigm that seeks a sustainable future. Engineers, social scientists and architects need to work alongside local authorities, businesses and communities to develop a new from of comprehensive urban planning that could initiate a new and dynamic

equilibrium between society, cities and nature. There now exists considerable consensus about the kind of things that need to be done - improving energy conservation, reducing car dependence and in a shift towards more compact city forms, with higher residential densities and mixed land uses.[17] The search is underway for different approaches, models and forms that can respond to the variety of existing settlement patterns. We need as working examples as possible.

Such practical, ecologically aware projects, are important both for their role as prototypes and in resolving specific problems within laboratory-like conditions. They offer the possibility of not only of theorising but of demonstrating how we might move towards a more sustainable way of life. Simply looking to alternative ideas and ideals will not of itself be sufficient. The political challenge within ecologism must be to combine ecological ideas and values with proposals that are practical and workable. This is why working models, particularly those with some degree of experience and history, like Arcosanti, are of real value. As our understanding of the damage we are inflicting upon ourselves becomes clearer, current assumptions regarding what is the most environmentally benign materials and construction methods may alter but we need laboratories where we can test current and future criteria against specific criteria. Where we can make mistakes and learn from them. In any case it is likely that no absolute or universal solutions exist. Because we are something essentially "on the way" perhaps ultimately it is more a question of moving in the right direction.

The *urban laboratory* at Arcosanti is where, by trial and error, the basic physical and cultural tenets of the arcology theory are today being tested and refined. The stated priority for the experiments lies in the definition of a physical structure, which would be indispensable for the "social organism" that would eventually inhabit it. The aim of the architect has been to design the best possible urban instrument. This has involved the creation of an environment where the social, cultural, agricultural and industrial processes, and the associated production of energy, are being intensified while, at the same time, limiting the impact of the settlement on the natural environment and minimising its consumption of natural resources. It is a place within which a whole range of social experiments are taking place. Arcosanti represents an attempt to address questions of the ecological sustainability of cities, while demonstrating a deep commitment to ecological ideas. Whether the project represents a workable alternative with a wider application, in effect, a step closer towards a more socially and environmentally sustainable city or the illegitimate foolishness of a megalomaniac, will depend upon testing the conceptual foundations

[17] Haughton, (1999)

of arcology. Since Arcosanti has existed as a working prototype since 1970, it should be possible to examine how successfully the theoretical response has been implemented.

Construction work has been, at times, painfully slow and has largely been financed by the sale of the bronze and ceramic wind-bells (15,000 produced per year) and tourism. This sustained effort has been undertaken by the 'unskilled' Arcosanti community themselves, which has variably numbered between 50 and 100 residents supplemented by the labour of around 20-30 'workshoppers', arriving (and departing) every few months throughout the year. This grassroots approach to building has allowed Soleri to keep a close control of the project's development but independence has come with a price. The political economy of democratic capitalist societies does not support or encourage community living. The practical exploration of this kind of model requires a new method, which invariably means going against the grain. Problems with conventional sources of finance are inevitable.

While it lacks ties to other industries, markets, and other sources of information it cannot become a real city. Arcosanti remains more of a village and is still struggling to become economically self-sustaining. Although Soleri has chosen the independent path he expresses disappointment that there has not been more support over the years:

> When we started I thought that there would be the beginning of a response through a number of things - finances, corporations, people, and so on. This hasn't happened. Part of the reason is that I am not exactly advocating the American Dream, quite evidently from the very beginning. So it's very difficult to go to someone and say 'You're mistaken. I'll tell you what the truth is. Give me money'. It doesn't work that way.[18]

While Arcosanti's orientation is towards transcendence and the achievement of an end in "a fully conscious Universe" it is not a countercultural, sectarian or religious establishment. Neither is it a meditation centre or a neo-monastic retreat. Since he adheres to the hypothesis that reality is a process of creation, and "truth is in the making" (is yet to come), Soleri argues against "idolatry, intolerance, fanaticism, or cultism" and sees no use for the notions of "the chosen people, the perfect society, the Garden of Eden, utopia, paradise".[19] If it were to be, or pretend to be, that which it seeks it would be "senseless, insane, and moronic".[20] Rather, as an urban laboratory, Arcosanti tries keep "its ear to the ground physically, theologically and aesthetically" as it attempts to define at a working model, a prototype, that might be influential in changing the social and environmental conditions of the present while aiming at an ideal and unknowable society that might inhabit it in the distant future. Arcosanti, in Umberto Eco's (1986) terms might

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[18] Soleri cited in Mayne, *Soleri's Cities: Architecture for the Planet Earth and Beyond* (1993)
[19] Soleri, *Technology and Cosmogenesis* (1981), p. 75
[20] *Ibid,* p. 105

be seen to exhibit the symbolic importance of architecture by accommodating both its "variable primary functions" (its conventional use as living/working/learning community) and its "open secondary functions" (symbolically as a prototype arcology).[21] Arcosanti is "a quest for what it does not have".[22] In this way the laboratory becomes both the "media" and the "message". But while it fulfils the secondary function of architecture in acting as a symbol it's also a real place where people will have a future simply because they are building one. Those who live, work and learn there know that they're in the middle of something that is essentially 'on the way'. After thirty years, volunteers are still there, still pouring concrete. There's no desperate rush. There's no evidence of the bandwagon of despair, just a daily work program and a quiet pervasive hope.

Sustainability, Arcology, Arcosanti and Utopia

Humankind is now entering a new stage of development in which a reformulation of the relationship between society and the environment is taking place. There are the first signs of a new ecological era as different levels of government, industry, and various social and economic institutions are mobilising for a sustainable future. In the growing awareness of the importance of environmental problems, in an expanding willingness to act in the interests of the environment, and in the growth of environmentally sound behaviour, we seem to be witnessing a process of social mobilisation against the deterioration of the environment, i.e. the basis is being laid for the restructuring of society in the direction of an ecological society.

Social reconstruction implies a redefinition and remodelling of all that, until now, was considered 'normal' and 'usual'. The idea that industrial production and economic growth could last forever and that we could carry on indefinitely extracting natural resources and burning fossil fuels is giving way to a new way of thinking that recognises the existence of limits and consider that the wasteful use of energy and resources and the emission of environmentally polluting substances constitutes 'deviant behaviour'. This process of redefining of our 'normal' modes of behaviour is impacting on all aspects of our lives; production, consumption, transport, leisure, and housing. But because there are signs of hope does not mean that we are near to reaching our goal of a sustainable future. Without doubt the signs of despair, witnessed by an increasing number of global and local environmental and social problems, are more numerous than the signs of hope. We have it seems simply reached the beginning.

Most political parties in Western Europe acknowledge that environmental problems are serious and numerous, and that policy must be directed towards sustainable development. But,

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[21] Eco, (1986)
[22] Soleri, *Technology and Cosmogenesis* (1981), p. 105

since the concept has a variety of meanings and divergent interpretations, it remains unclear which direction society must take in order to achieve sustainability. Indeed the idea of sustainable development remains so vague, and it contains so many contradictions and paradoxes, that it is still uncertain whether it can be used as a guideline for policy making. Confused definitions, a limited understanding of the range and scope of environmental problems (both globally and within cities), and research that has tended to focus on individual parts of the problem, like energy or transport (rather than taking an holistic approach), mean that we have yet to provide adequate responses to the question of a more sustainable urban form. In considering the restructuring of existing cities and conurbations, Hildebrand Frey (1999) has recently presented and evaluated six different city models (Core City, Star City, Satellite City, Galaxy of Settlements, Linear City, and the Regional City) based on the work of Kevin Lynch (1985), John Minnery (1992), and Peter Calthorpe (1993). Frey tests the viability of these models in terms of their potential performance based on the sustainability characteristics described earlier in Volume One. These include :-

- degree of containment of development;
- population density relative to land need;
- viability of public transport;
- dispersal of vehicular traffic;
- viability of mixed uses;
- access to services and facilities;
- access to green, open spaces (parks, countryside);
- potential for social mix;
- potential for self-sufficiency;
- imageability of the city (the physical entity) as a whole;
- sense of place and centrality.

Frey concludes that all of the models may well play a part, on their own or in combination, in defining a sustainable city region. Strategies for improvements will, however, be dependent upon the characteristics of the particular city or region and might have to be different in each case.[23]

In offering a methodology for the reorganisation of urban sprawl into dense, integrated, compact city structures, Paolo Soleri's arcology model shares many characteristics with Lynch's Core City model (1985, pp. 373-4) with respect to high density levels and the intense peak of

activities in the urban centre. Reminiscent of the medieval city, although much larger in scale, an arcology would be highly imageable and provide a strong sense of community. If its size and population remained relatively low an arcology, such as that slowly emerging at Arcosanti, would have undoubted advantages in terms of travel distances, increased access to facilities, and proximity to the countryside. But if grew beyond a certain dimension and size of population, major problems could arise involving massive congestion and pollution (Frey, 1999, p. 47).

At least in theory, the arcology model promises to respond favourably to many of the more technical environmental problems described in Volume One. The employment of combined energy and waste systems within such compact urban agglomerations offers the potential of large-scale reductions on energy use, waste and pollution. The problem remains one of evaluation and Frey acknowledges the need for multi-aspect and multi-disciplinary research in the field of the 'sustainable city'. He argues that the complex issues of a sustainable city will not become more tangible unless we can develop laboratories to test micro- and macro- structures of the city and test sustainable parameters. Without such centres of investigative research, he suggests, the complex issues of sustainability will continue to rely on assumptions.

The 'urban laboratory' at Arcosanti offers this kind of environment but its setting, in the wilds of the Arizona desert, appears to be at odds with its primary function, as a locus of *urban* research. Nevertheless since 1970, Arcosanti has attempted to test the validity of the arcology theory through architectural, environmental, and social research on a micro-level. It follows in the tradition of a multitude of experiments in libertarianism , from the Owenite and Fourierist experiments of the early nineteenth century to the libertarian counter-cultural communes of the 1960s, such as *Drop City*, Colorado and *The Farm* in Tennessee, to the profusion of ecovillages, organic farms, and cohousing communities around today. While it my be a source of frustration and disappointment to many closely involved with the project (not least Soleri) that progress has been slow, the 'small experimental' nature of Arcosanti is in keeping with the contemporary Green movement's idealist strategy of change through 'force of example' to pave the way for wider social and environmental change.

From the Centre of Technology (CAT) in Wales to the New Age community at Findhorn, Scotland, much of the practice of much Green politics takes the form of a series of small experiments. Ronald Creagh, in his study *Laboratoires de l'Utopie* argues that there are problems that can only be faced through investigation on the micro-social level.[24] He shows that intentional communities confront a multitude of questions related to interpersonal relations and

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[23] Frey (1999), pp 37-68

[24] R. Creagh, *Laboratoires de l'Utopie: Les Communautés Libertaires aux Etats-Unis* (Payot, Paris, 1983)

everyday life. But this also raises the problem of persuasion that confronts the whole environmental movement. People are required to think in global terms and with respect to events that may, or may not, take place in the future. It might be argued that it is only those people who already live in sustainable communities that think like that. If they constitute a vanguard, it is difficult to see how they are, under present conditions, going to attract large numbers of people to their cause. Porrit (1984) suggests that Green strategies for change have not yet brought about the fundamental shift that might have been expected. In terms of the questioning of current social and political practices and the presentation of alternatives, the growing middle class may well have a central role to play here.

Soleri's view that Arcosanti is largely an informational construct is perhaps born of necessity rather than desire. Physically it continues to be built by unskilled volunteers and largely funded through the sale of the wind bells that are made there. Over the last 20 years the number of residents has decreased so that today a small community of around fifty or sixty people is occupying spaces planned for five to six thousand. The lack of human and material resources and the "unprofessional" level of operation means that it is proving difficult to be convincing when offering Arcosanti as a prototype of urban sustainability. The slow pace of progress and the modest nature of the construction programme has led some to liken Arcosanti to some bizarre living history village from the 1960s vividly demonstrating everything that modern consumerism associates with the 'cliché' of the "small is beautiful" and "voluntary simplicity" ethos of the hippie generation.[25] The real paradox is that, while it may be experiencing something of a 'virtual renaissance' on the Internet, physically Arcosanti is languishing. Unless it can attract a living society to maintain it by putting its energies into its construction, and an operational political economy that would help in its realisation Arcosanti may yet prove how limiting a purely informational economy may be. Jean Baudrillard (1988) wrote of Arcosanti that it "gathers together all the 'soft' technologies in the heart of the desert" [26] The intended scale of Arcosanti, particularly since it offers potential solutions to the challenges of urban sustainability would seem to require corporate, or state agency to raise the capital, labour and materials that would see it operate, and would demonstrate on a larger-wide scale some of the ecological principles inherent in the concept. Unfortunately under current conditions, neither Soleri nor Arizona State are willing to allow this to happen.

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[25] Luke, *Ecocritique* (1997), pp. 152-243

[26] J. Baudrillard, 'New York' in *America C. Turner* (translation), (Verso, London, 1988), pp. 2-3

The issue of Green social change is dogged by the necessity to distinguish between various manifestations of the environmental crisis. Clearly there are problems of a global nature that require a different strategic response from those of a personal, immediate and local nature. It also appears self-evident that actual sustainable communities are vital as sources of inspiration for the rest us to learn how to live in a more environmentally benign way. But the scale of global and urban social and environmental problems is such that bringing about a sustainable society is an infinitely more complex and difficult task than simply placing environmentalism on the political agenda. We need visions of what a sustainable future might be like.

In *Virtual Light* (1984) William Gibson describes 'The Bridge' as a place within which a whole range of social experiments can take place.[27] Gibson raises the issue of how to imagine alternatives to current urban trends which appear to lay the dead hand of 'zero tolerance' on any form of difference from prescribed social norms. These are questions which are neither often nor successfully dealt with in urban theory. An overemphasis on the social rather than the physical landscape of the city makes vision, in the sense of what can be seen, difficult. A social vision for the city has to have some sense of the physical sites, how they might look and what they might symbolise. Gibson's 'Bridge' represents an attempt to redefine the goals of modernity and address questions of the sustainability of cities.

Soleri's position states that, 'life is in the thick of things'. The "living process" is immensely complex and ever intensifying and creates conditions in which particles of physical matter begin to act in ways which are organic and living, and eventually instinctive, self-conscious ad spiritual. He believes that, in the transformation of the organism from the simple to the complex, matter is becoming spirit. His own 'bridge' involves an architecture which speaks of the "supremacy of aesthetics over structure and technology" (Moholy-Nagy, 1969). For Soleri, *The Bridge between Matter and Spirit is Matter Becoming Spirit.* It is essentially something which is 'on the way'. This aspect of his theory is clearly a utopia of transcendence.

From Plato's *Republic* and Lao Tzu's *Tao te Ching,* utopias have had a long history both in art and literature and as political practice aiming at vast social transformation. In offering alternative visions of the future, many artists, architects and planners have approached the problem of defining a better society from their own unique point of view. Through the ages, many have attempted to re-define society by starting from a physical rather than an ideological base. During the twentieth century architects such as Tony Garnier (*Une Cité Industrielle,* 1917); Le Corbusier (*La Ville Contemporaine*, 1922 and *La Ville Radieuse*, 1933); Frank Lloyd Wright (*Broadacre City,* 1934), Consatantin Doxiades (*Ecumenopolis*, 1969) and Paolo Soleri

(*Arcology*, 1969) have been committed to the discovery of the 'ideal city' through their architecture, rather than trying to express other people's visions.

In *Collage City* (1978), Rowe and Koetter distinguish between two principal versions in the "classical" utopia "inspired by universal rational morality" and in the "activist utopia of the post-Enlightenment". The vision of the Renaissance ideal city with its basis in rational order and geometric purity, offers the model of the classical utopia as essentially a "city of the mind", or a reference point, but not necessarily a prescription or blueprint. Such utopias are appealing in part because they allow the reader to fantasise about an ideal world. In this context, Karl Popper, one of the harshest critics of utopias, speaks about 'aestheticism' as a deep longing to imagine a society that is not only more rational than the existing one, but one that has been relieved of all ugliness and constitutes a truly beautiful new world.[28]

Soleri's anticipatory model of perfection , in which art is seen as an agent of transformation, promises not only the emancipation of the human spirit via metamorphosis ("esthetogenesis"), but the infusion of the non-living world with spirit (via the "complexity-miniaturization-duration" paradigm). But just exactly how it is that a painting, or a piece of sculpture, or a building, or a city (via "the urban effect") can bring about the transfiguration of "matter into spirit" is not explained in his mingling of theological speculation, construction theory and eschatological design. Clearly Soleri's intention is that ideas of ecology and architecture need to be re-thought as conjoined pieces of our theological and technological evolution, wherein the 'ecological city' becomes an integral part of the human evolutionary process. But he tries to invest in architecture and urban design a form of sacredness, which seems utterly alien to the urban complexes of the modern city. At Arcosanti the experiments in alternative urban technology (energy conservation, waste recycling, the use of renewable energy) or even the expression of communitarian resistance can become subsumed within an ethical struggle for the physical enactment of spiritual enlightenment.

Despite its theological dimension, it is in the re-casting of the relationship between society and nature that arcology conforms to the "classical" utopian typology. And here, the positive utopian energies of Soleri's work need to be acknowledged and affirmed. Perhaps his most important contribution is in beginning to rethink human ecology and encouraging us to re-conceptualise the extent of the human impact on the natural environment. A special power of the utopia is its ability to present political and social ideas in an unusually imaginative way, functioning as bearer of a vision and offering inspiration for those with a desire to look forward

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[27] W. Gibson, *Virtual Light*, (Penguin, London, 1993).
[28] K. Popper, *The Open Society and its Enemies* (routledge and Kegan Paul, London, 1974), p. 165

and gain insight into a feasible imaginable future. Despite the economic, social and technological uncertainties, utopias dare to paint a futuristic picture of society and offer readers a glimpse into 'their own ' future. But perhaps their greatest attraction is that they stimulate us to think in a participatory way, and therefore encourage reflection. The reviewer is forced to take a stand and critically reconsider his opinions about the most desirable way in which the economy, society and the state should be organised. Utopias, in this sense, act as a 'critical norm', developing criteria with which to measure current social development. They can stimulate theoretical experiments, encourage attempts to break through fixed patterns of thinking and test unorthodox combinations of ideas.

Soleri offers arcology as instrumental in achieving a different social order and, in so doing, encourages a wholesale re-evaluation of the extent of our impact on the natural environment. [29] By promoting a different kind of urban model, Soleri envisions the possibility of re-naturalising the natural environment. In this sense, and in combination with the recent focus on information technology through the *Paradox Project*, it can be argued that arcology is contributing to radical ecology's mission of world disclosure.

The idea that there is value in inventing a detailed model of a society without the shortcomings and disadvantages of the current political system has been popular since Plato described *The Republic* (427-347 BC). The utopian philosopher attempts to construct an ideal society at some distance from present reality, in order to discover untried and unprecedented possibilities for the future. Utopia is literally 'nowhere land', a perfect society in 'another place', where justice prevails, everyone is happy, and sadness, pain, and violence are banished. Utopias are characterised by a detailed description of the envisioned society that often includes a 'blueprint' for a completely new state, along with a critique of the current society. Urban utopias express above all the need to construct a conceptual framework, from which a better reality than the current one can be physically shaped. Rowe and Koetter (1978) describe the "activist utopia of the post-Enlightenment" as the Neo-classical vision of the ideal city that, unlike the "classical" version, is meant to be implemented by applying rules that will make the city work better. This activist tradition has influenced the utopia of the Modernist City, through the

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[29] In the *Neuromancer* trilogy of 'dystopian' novels the author William Gibson describes the city of the future as "*corporate arcologies*" [my emphasis]. These he describes as highly integrated urban structures standing in opposition to the "Sprawl" that stretches over continents.[29] Indeed such transnationalised high-technology structures already exist but, in their current form, they consume huge amounts of land and energy transporting people and goods over their vast expanses and are the major protagonists in the ongoing degradation of life on Earth. Their own megamachineries have so transfigured and disfigured the natural world that, for the majority of humans and an increasing number of plant and animal species, *they are the environment.*

Futurists, Garnier, CIAM and Le Corbusier but has been found wanting in its formal and functional naivety, its simplicity, and its inadequacy to deal with the pluralist complexity and creative contradictions of the Post-modern world. Such utopias have been particularly at odds with a period that has been characterised by pragmatism, and a lack of belief in ideologies and idealistic political visions. In *The Open Society and Its Enemies* (1974), Karl Popper criticised utopianism for attempting to devise a 'blueprint' for the Ideal State, to which all political activity should be subordinated. Today the notion of utopia as a blueprint or a fixed model of the future has been rightly rejected.

Paolo Soleri was awarded a special prize by the Congress on Utopia in Italy in 1989.[30] His response was to write a paper saying why it is that he rejects utopia. He wrote "utopia is for everybody or it is nonsense".[31] Science and religion tell us that we cannot isolate a phenomenon and consider it autonomous, self-sufficient and perfect. Soleri is critical of the idea of 'self-sufficiency'. "...the difference between utopia and what we are trying to do", he says, "is that I do not believe in perfection".[32] But there are contradictory elements in arcology and Arcosanti where various ideologies and utopias intermingle. The 1969 arcologies, which at first seem to offer the, as yet, unrealised dreams of a new society, when examined in more detail can be viewed as ideological narratives that reinforce some of the myths of the present social order. Although described in the context of 'miniaturisation' these early projects appear as megamachines, designed for the efficient and rational restructuring of urban economies and societies within a new metabolism that is bigger and intended to last. Rational and logical construction on such a massive scale, is difficult to imagine, and appears shocking and alien. In the tradition of other hi-tech megastructural solutions like those of Buckminster Fuller, the Japanese Matabolists, and Archigram, Soleri's early arcologies are clearly technocentric, suggest a rejection of the genus loci, are based on a spectacular degree of technological progress and the benefits of industrial production. They therefore offer an unconvincing path for society's ecological salvation.

In casting arcologies into 'unspoiled' bioregions (i.e. the Arizona desert) and presenting the arcological alternative as a futurology for tomorrow, Soleri seems to be picking a fight that cannot be won and at the same time revealing a lack of appetite for the battle that must be won in

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[30] The *Utopus Award* was presented by the Third International Conference of Utopian Studies at the Universita Degli Studi di Genova in Reggio Calabria, Italy.
[31] P. Soleri, "Transforming the Urban Condition" in C. Zelov and P. Cousineau, *Design Outlaws on the Ecological Frontier* (Knossus Publishing, Philadelphia, 1997), p. 245
[32] P. Soleri cited in Stanishev, (1993), pp. 58-63

the existing city. He ignores the possibility of materially improving existing cities and conurbations by, for example, directing arcological thinking towards retrofitting existing cities with 'arcological implants'. There are opportunities for transformative experimentation within existing mega-cities that would benefit from this kind of arcological retrofitting. A series of smaller interconnected arcological structures could be proposed which would attempt to address the ecological recovery of the existing environment. Rather than avoiding confrontations on the prevailing approaches, and appropriate policy measures needed to address agreed sustainability criteria, why not become part of the political struggle for social and environmental change by trying to force the existing urban structures to become less irrational and more idealised and concentrated 'arcologies'?

Arcosanti has been dismissed as a "true" utopia because it has been located in the middle of nowhere with no industries, little arable land, few transportation links, and hardly any people. Soleri argues that it will be in harsh and difficult environments, such as this that the new settlements of the future will be constructed. As it stands however, and even when complete, it will be the antithesis of all the benefits of modern suburban living (mobility, luxury, consumerism). Arcosanti will lose out every time against Phoenix because, while it may be what an ecological society needs, it is not what the customer wants. The myths of modern life in the city, when seen from an ecological viewpoint, may well be full of false promise but Arcosanti's misfortune may be to stand as tangible proof of an ideology of frugality that most of today's suburbanites fear most. In this sense, for many it may well be an undesirable utopia.

Despite the reservations there are, however, positive benefits within the utopian tradition that need to be acknowledged and affirmed. Rather than take the existing order for granted utopias offer a break in historical continuity and the promise of a fresh start. They avoid halfway measures, modest compromises and cautious plans of action. They start with a more or less clean canvass and defiantly paint a new society that claims to eliminate all the deep-seated causes of social malaise and so create a better world right from the start. By reflecting a happy world in the imagined past or the distant future they also hold up a mirror to their contemporaries to draw attention to the injustices and shortcomings that may have gradually become ingrained in society and which, we have long failed to notice. In this way utopias can help us to observe more accurately and therefore foster a heightened insight into our social reality.

Now that the relationship between sustainability and urban form is being recognised as critical, Green parties might be better placed to contribute to the wider social debate on sustainability by referring both to classical and recent "ecotopian" thinkers. Looking to

alternative ideas and ideals, however, will not of itself be sufficient. The political challenge involves the combination of ecological ideas and values with proposals that are workable. Eckersley (1992) in *Environmentalism and Political Theory* recognises the value of the utopian tradition and the importance to the search for a sustainable society of both theoretical reflection and practical experimentation:

> To be realized, the aspirations released by utopianism must be critically related to one's knowledge of the present, thereby uniting desire with analysis and leading to informed cultural, social and political engagement. The ecocentric Green movement needs idealists *and* pragmatists, creativity and critical analysis, grassroots activity *and* institutional support if it is to achieve its long-term aims.[33]

The environmental movement will be letting an opportunity pass by, by not recognising the value that lies in the utopian tradition. Seeking out hopeful visions is particularly important in an age when we seem to have lost faith in the future. In an address to the Fifth Alvar Aalto Symposium in 1991 Juhani Pallasmaa contrasted the optimistic spirit in the artistic and cultural avant garde within La Belle Epoque, Art Nouveau, and De Stijl, a hundred years ago with our recent pre-occupation with 'endism'.[34] Now, he said, "...we simply do not know what to expect and what to hope. We have lost sight of our horizon and our curiosity about the future. Instead of being excited we are worried". At a time when choices need to be made and reflection about the future is imperative, utopian-ecological insights can lend support to the consideration of alternative futures and the search for a more sustainable form of society.

Today Green political parties, in addition to analysing the causes of environmental problems, are concerned with the development of renewable ecological visions and in putting flesh on such concepts as 'sustainable development'. But much of their energy and attention currently goes on preserving the government's environmental policies and devising concrete solutions and suggestions for highly specific problems. It is possible to find holistic visions, as well as evocative images of a sustainable society, in the so-called 'utopian tradition' within the history of political theory.

> ...the utopian vision provides the indispensable fundamentalist well of inspiration from which green activists, even the most reformist and respectable need continually to draw. Green

[33] R. Eckersley, (1992), p. 186

[34] American philosopher Arthur C. Danto, in 1990, announced "the end of art'. Hans Belting has spoken of "the end of art history". In 1990, Alvin Kernan, the American professor of the humanities published *The Death of Literature.* In 1967 the French composer and conductor Boulez said, "Blow up the opera houses." More recently, in 1989, the American political historian Francis Fukuyama brought the notion into a wider context in a controversial essay, *The End of History.* And in architecture Peter Eisenmann brought the discussion of the end towards its ultimate topic, in his article, *The End of the Classical: the End of the Beginning, the End of the End."*

> reformers need a radical alternative picture of post-industrial society, they need deep ecological visionaries, they need the phantom studies of the sustainable society, and they need, paradoxically, occasionally, to be brought down to earth and to be reminded about limits to growth.[35]

A common misconception about Paolo Soleri's work is that years of introspection have produced some kind of fixed solution to the problems of the city and that he has spent the rest his life trying to convince us of his approach. Instead, as described in Chapter 8 (8.6), he has been developing a methodology and through the years has been attempting to illustrate it. Soleri now emphasises the experimental nature of Arcosanti and the need to understand the city's role in redefining the American Dream, by making it more frugal and less materially orientated. But rather than support the idea that communes or utopias can break away from society, he now favours the notion that, through investigation and experimentation within a living, working and learning community (an 'urban laboratory'), new and useful patterns for society can be identified and used as a guide towards new action. Arcosanti is not being constructed according to a fixed predetermined plan but has evolved, as the theory that underlies it has evolved. While its function remains consistent with the stated aim in 1969 of providing "a self-testing school of urban studies", efforts have, since the *Two Suns* approach , been concentrated on defining various architectural effects that, when combined, offer a response to many of today's environmental problems. Over the last ten years, as the criteria of urban sustainability have become more widely accepted and understood, in short, the relevance of the Arcology model has become clearer.

If our society is to be sustainable, human imagination, ingenuity, energy, and labour must be directed to the building (and reconstruction) of cities that future generations can inhabit within an improved ecological setting. As governments, eager to deliver major environmental improvements, press on with as yet untried and untested 'centrist' urban policies, there is a need to research relevant models of compaction. Arcology's methodology recognises the need for the radical reorganisation of urban sprawl into dense, integrated compact urban structures in which material recycling, waste reduction and the use of renewable energy sources are part of a sustainable strategy aimed at reducing the flow of resources and products through the urban system. New social movements, environmentalists and existing urban communities, in an attempt to construct a more sustainable society, might look to these ideas as they are being tested at Arcosanti.

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[35] Dobson, (1990), pp. 206-7

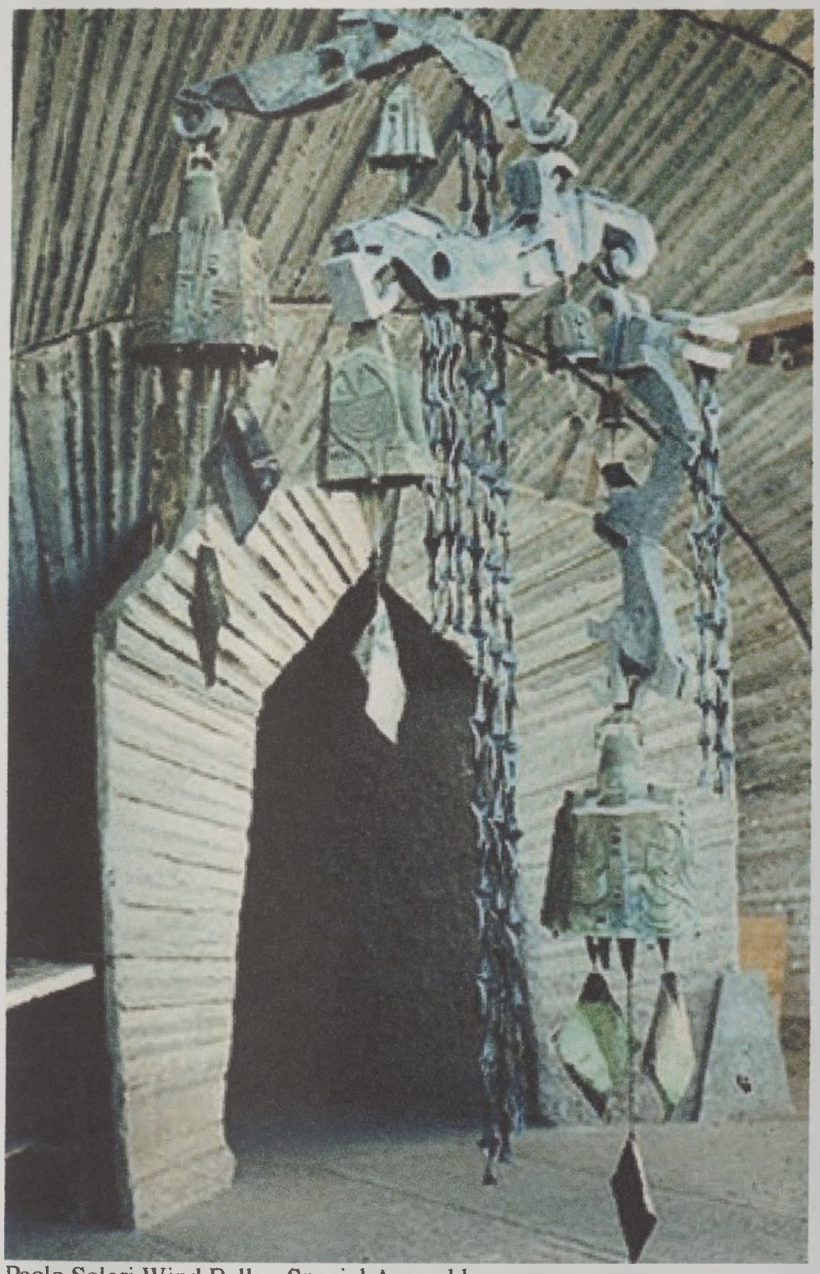
But because it currently lacks the level of funding and resources that would see it grow in scale as a fully operational living, working community of five to six thousand, it is difficult to be convincing. The real value of what Soleri is doing at Arcosanti is, therefore, not so much in defining a specific prototypical *solution* but in offering both a 'critical norm' against which we can measure existing urban milieus, and an activist engaged strategy that advocates the possibility of building our dreams and visions. In a world plagued by so many problems, with so few alternatives, this may be the most important lesson of all. Arcosanti offers a beacon of hope for a sustainable future.

So this morning at a meeting held around dawn in front of the project's *Main Vaults* a small group of people will have been discussing the daily work programme. Others can decide whether the work is experimental or utopian, "a science fiction fantasy, an Orwellian nightmare, or a new evolutionary stage in the progress of the human spirit"[36] For them it is unfinished business and they will measure their own "progress" by the amount of concrete they will manage to pour today (see Plates 43 & 44).

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[36] Le Gates and Stout, (1996), p. 453

Arcology and Arcosanti
Illustrative Plates



Paolo Soleri Wind Bells - Special Assembly

The following plates have been included to illustrate the various aspects of the arcology model discussed in the text and to show examples of the architecture at Cosanti and Arcosanti. They are reproduced here along with a cautionary comment. These do not constitute a visual "blueprint" for the sustainable city. Rather they exemplify one alternative to the current pattern of urban sprawl. Due acknowledgements for the use of the images go to Paolo Soleri, Tomiaki Tamura,, and the Cosanti Foundation.



Plate 1 Turnsole House (1948) Elevation

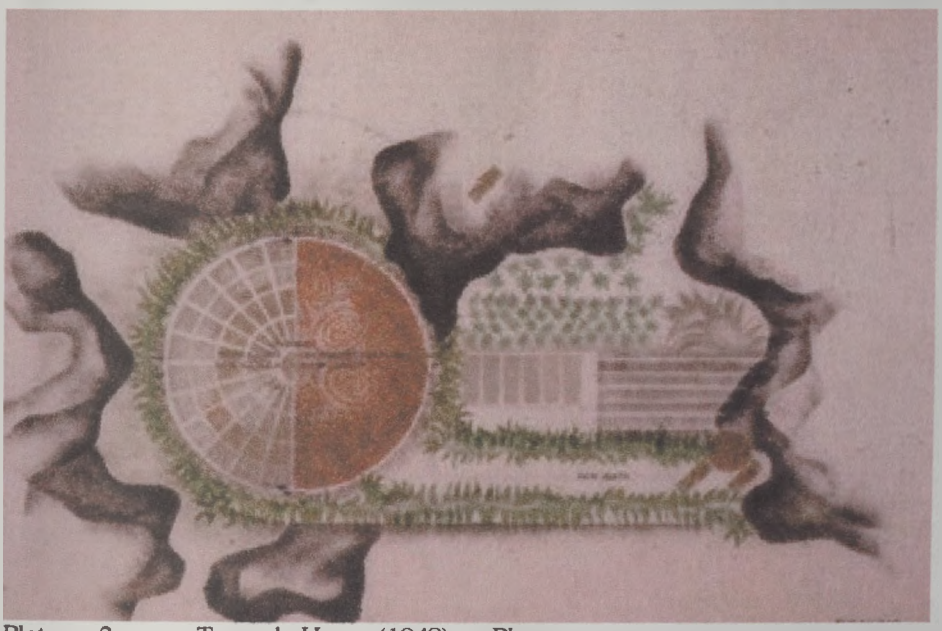


Plate 2 Turnsole House (1948) Plan

Designed by Soleri in 1948 the drawings of the*Turnsole House* indicate a glazed dome section over the living area. This would later become a major design element in the passive heating and cooling system developed for the Cave Creek *Dome House* (1949)(see*9.2.1*). Frank Lloyd Wright criticised Soleri's early work for being "all *on* the plateau, not *of* it" and saw him as more the brilliant painter than the Architect" (see 8.3).

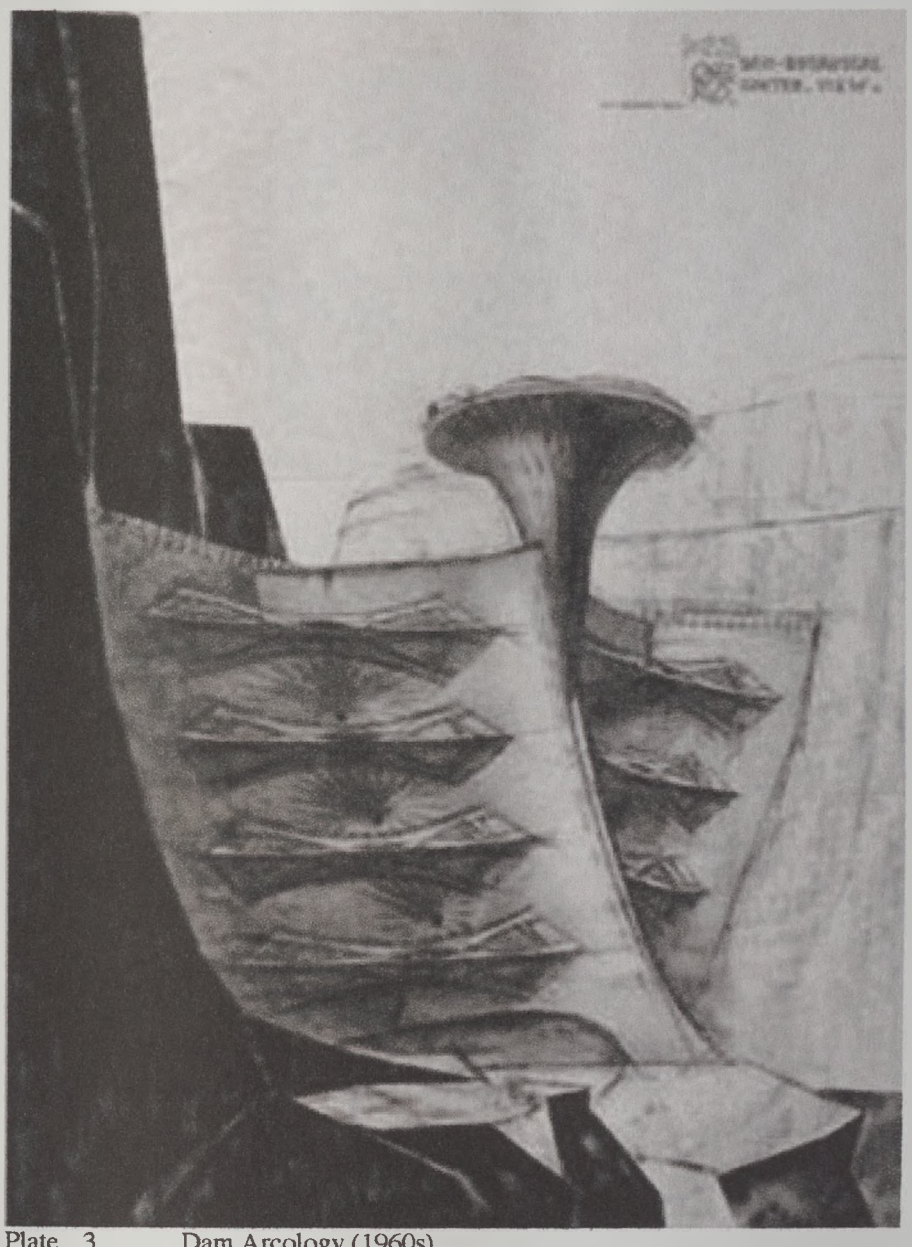


Plate 3 Dam Arcology (1960s)

Unlike Constantin Doxiadis' *Ecumenopolis* (1969), which proposed that the solution to urban problems lay in the continual expansion of the present form of the city in a single global settlement (see *8.4*), Soleri's *Arcology* (1969) advocates the development of a revolutionary new kind of human environment. Within highly integrated and compact urban structures such as the Dam Arcology, Soleri argues a new "neonature" can evolve (see 8.5).

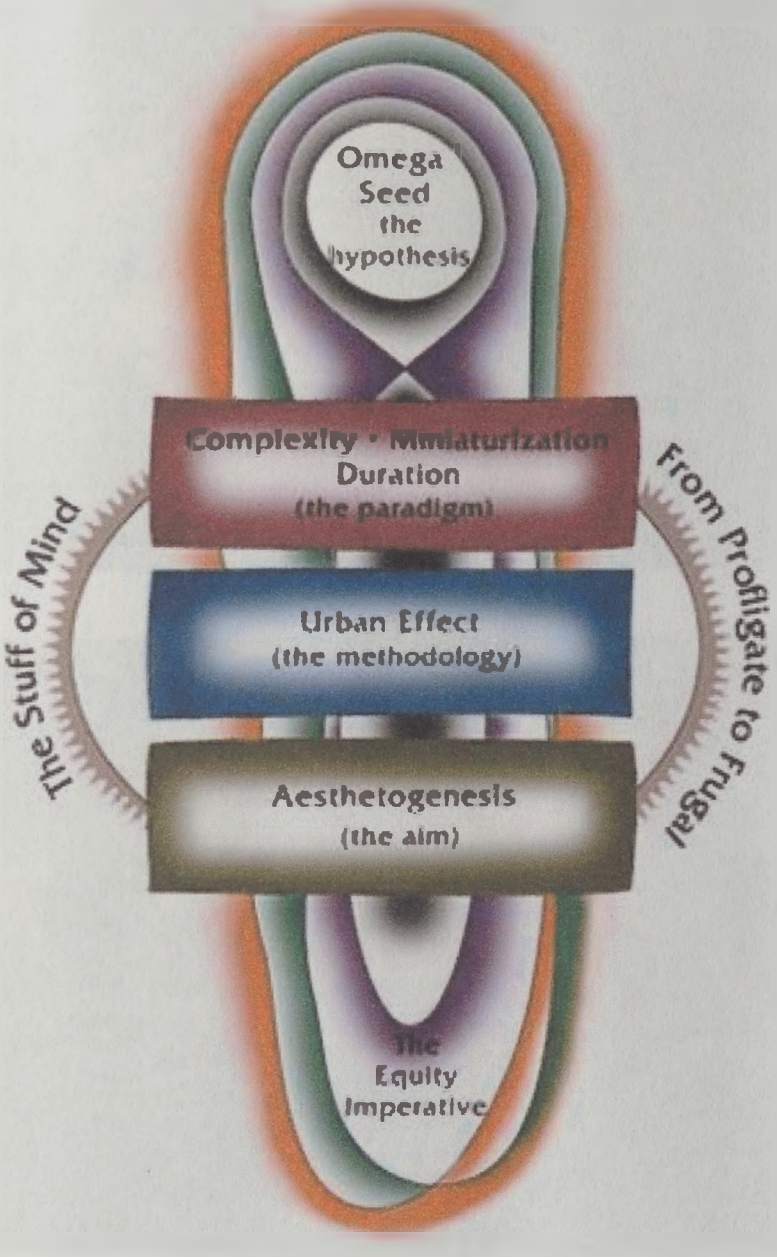


Plate 4 The Arcology Theory

In the arcology theory (see 8.5) Soleri argues that the catalyst of evolutionary creativity should be a city coherent with the *C-M-D paradigm* (see *8.5.1*), one that seeks to maximise the urban effect by raising humanity's collective consciousness. Soleri argues that the city has a role not only in maximising ecological potential but is instrumental in a process that gives meaning to life by helping to transform the human condition (see *8.5.5*).

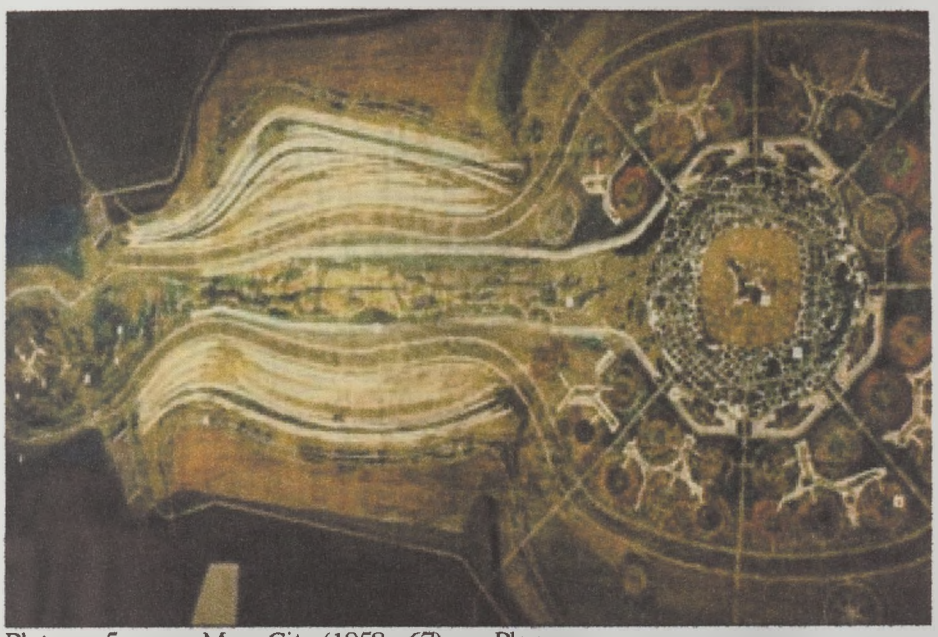


Plate 5 Mesa City (1958 - 67) Plan

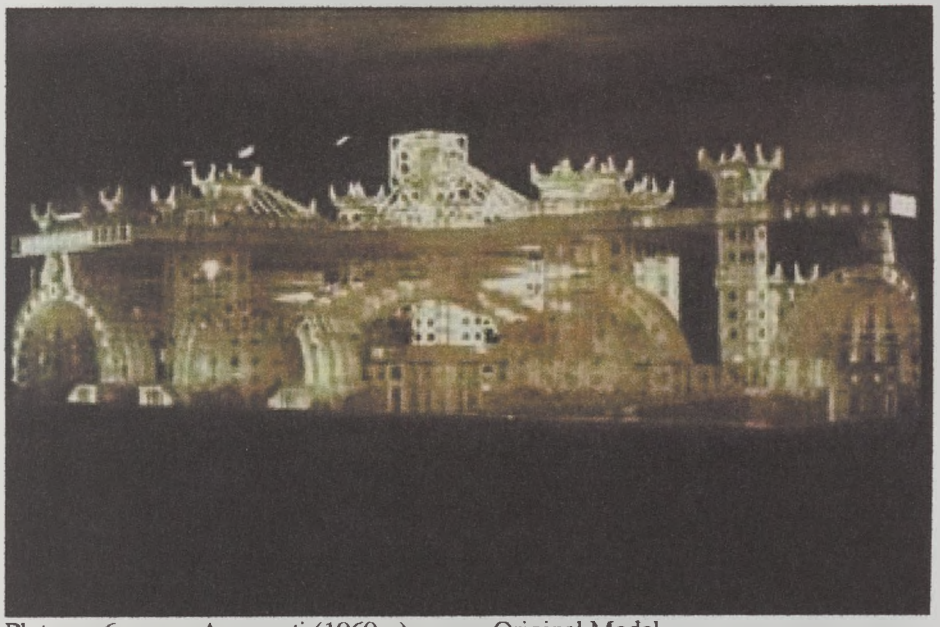


Plate 6 Arcosanti (1969 -) Original Model

The arcology concept has fluctuated between the Dionysian (free form) character of Mesa City (see *8.6.1*) to the Apollonian (simple geometric) character of many of the *first generation arcologies* designed during the 1960s and published in *Arcology: City in the Image of Man* in 1969 (see *8.6.2*). Arcosanti, originally conceived of as a first generation arcology, has gone through various evolutionary stages as the theory has developed (see Plates 20 and 21). Today the arrangement of the various buildings is much more context-driven than the original design proposals suggest (see Plates 24 & 25).

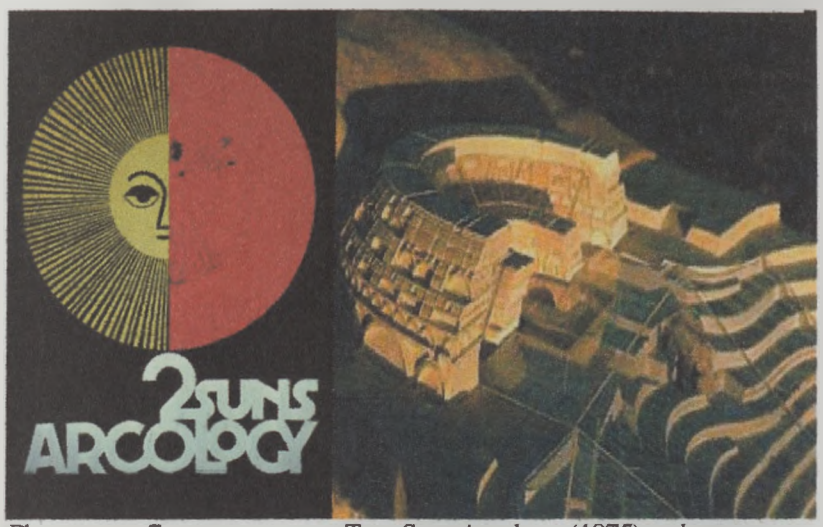


Plate 7 Two Suns Arcology (1975) and the Climate Zone Arcology (1975 - 80)

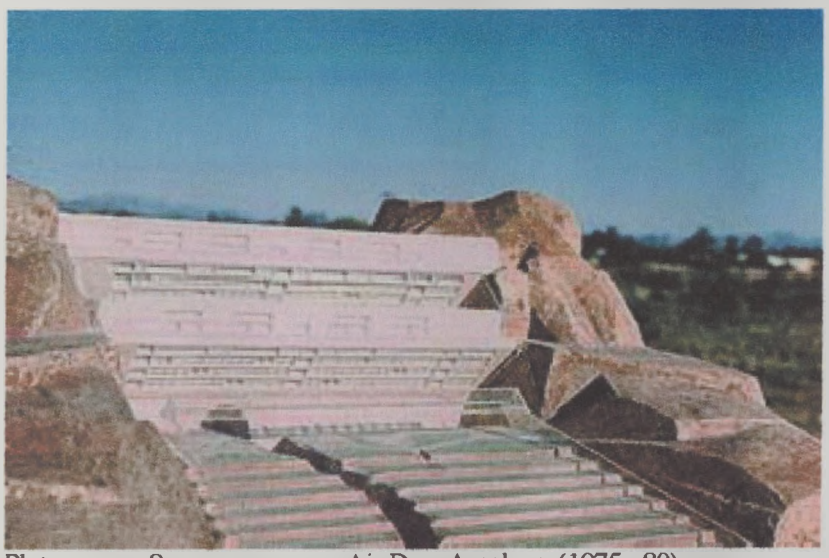


Plate 8 Air Dam Arcology (1975 - 80)

In the *Two Suns Arcology* (1975), in responding to the growing energy crisis of the mid-70s, Soleri split the architectural concept of the first generation structures in half "exposing the core to the sun" (see *8.6.3*). This produced some highly significant related effects, which were combined in a series of designs, such as the Air Dam Arcology, which gave greater priority to the Sun as the main source of renewable energy. The ideas that emerged within this concept of the "energy city" served to reinforce the relationship between architecture and ecology and placed the arcology model much more firmly into its own ecological context.



Plate 9 Maryland Arcology (1975 - 80)

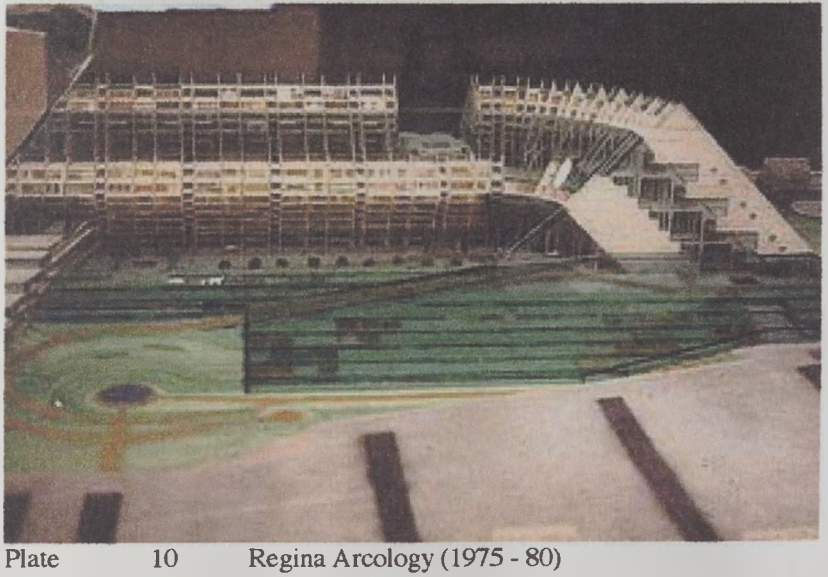


Plate 10 Regina Arcology (1975 - 80)

In *second generation arcologies* the entire form of the urban structure, along with an expanse of south-facing greenhouses that enable large scale food and energy production within an "energy apron" (see *9.5.5*), are designed to maximise the use of solar energy while reducing dependence on non-renewable sources of energy. The *greenhouse effect* provides a membrane that helps extend the growing season. The *horticultural effect* involves intensive agriculture and the limited use of water. The *apse effect* provides solar heating and cooling (see Pl. 39) and the *heat sink effect* exploits masonry's capacity to gather, store, and radiate heat. When combined these various architectural effects offer a response to many of today's environmental problems (*8.6.3*).

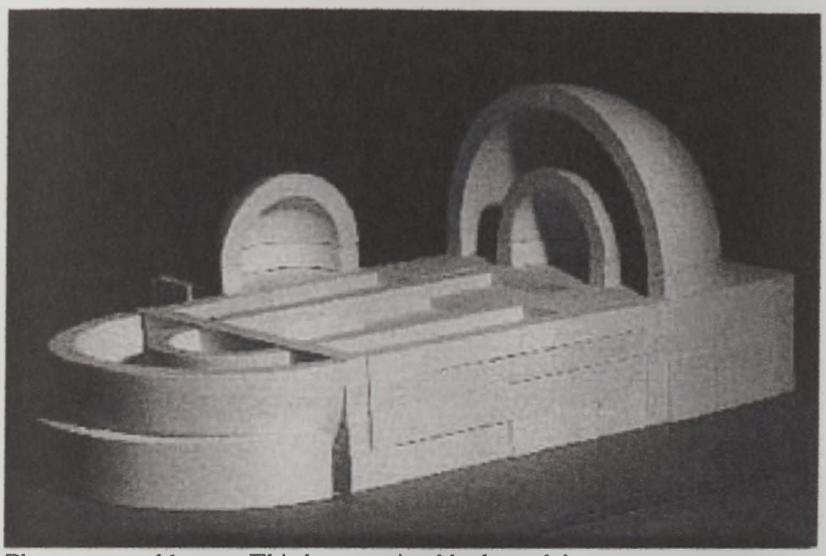


Plate 11 Third generation block model

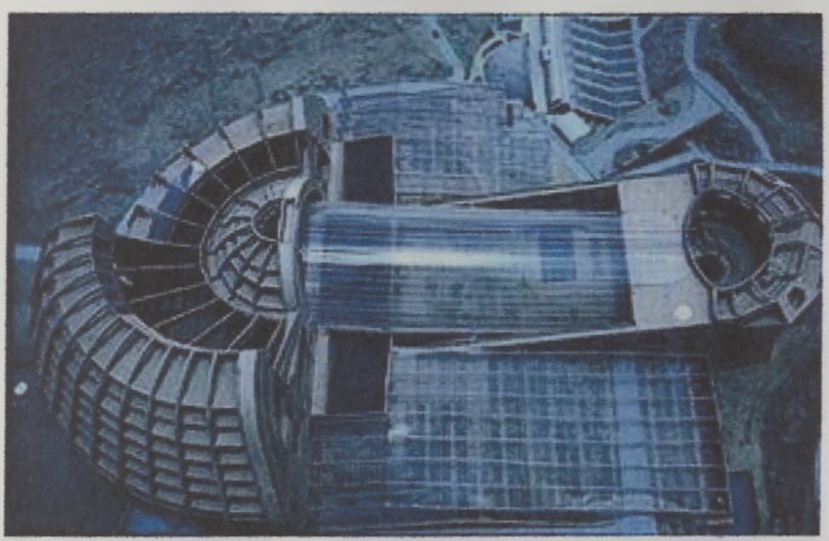


Plate 12 Valetta Spring Complex (1980 - 85)

In *third generation arcologies* the combined effects of the second generation were set within modularised and standardised structures that could be adapted to suit various social and environmental conditions (see *8.6.4*). The apse form became the design generator for what Soleri describes as the "post-slab" habitat. Here the slab is manipulated to envelop space and act as a passive solar device. When orientated toward the sun the structure allows for the retention of heat in the winter and provides shading and cooling in the summer. The shift from the slab (Plates 8, 9 & 10) to the apse form signals a significant shift towards an environmentally responsive and resource efficient design, while providing a strong social and spatial focus for the intended community. The Valetta Spring complex demonstrates the main principles.

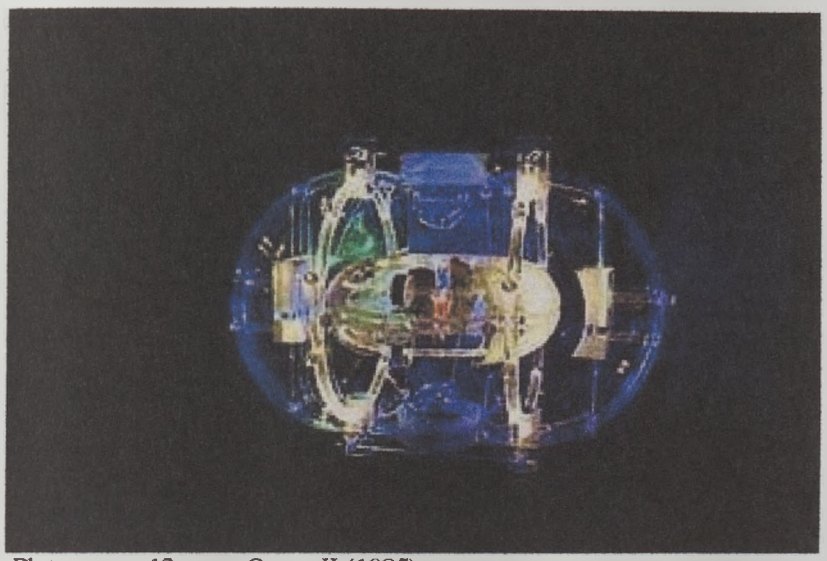


Plate 13 Ovum II (1985)

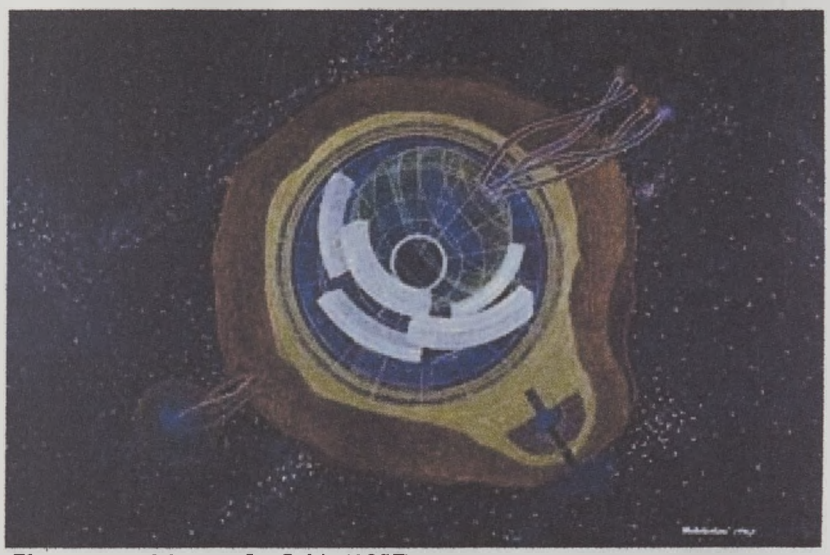


Plate 14 In-Orbit (1987)

The *third generation arcologies* focused on the notion that space will eventually be the locus of new kinds of cities or colonies (see *8.6.5*). The Space Arcologies were designed to illustrate how asteroids could be mined and transformed into small habitats. The proposals were meant to test the conceptual foundations of the arcology theory by exploring ideas of containment, ecological balance, self-reliance and independence within a hostile environment. Ovum II and In-Orbit contain activities in science and research and an urban core with residential and commercial facilities for 5 000 -15 000 thousand inhabitants. The protective bubble encloses a reconfigured landscape inside with a fraction of the earth's gravity and provides a shield to protect the habitat from space dust and radiation.

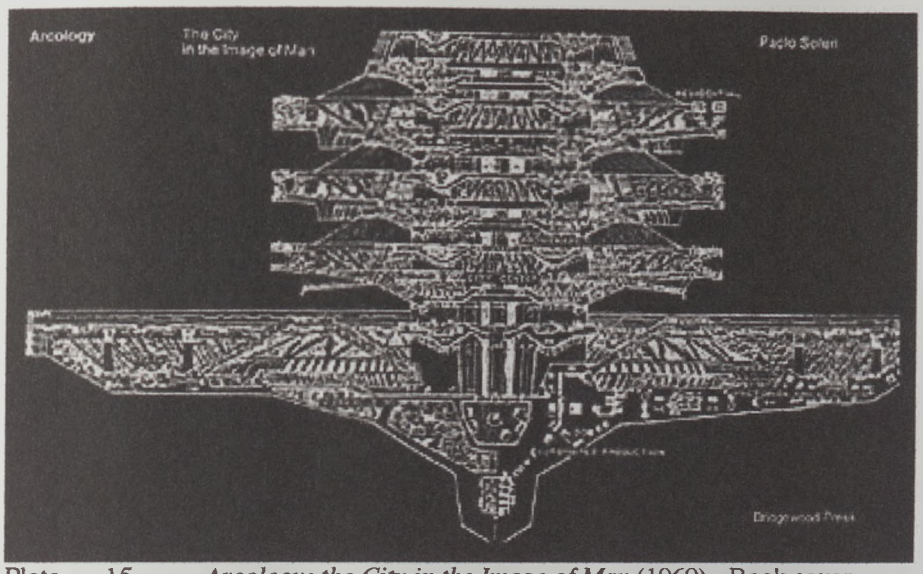


Plate 15 *Arcology: the City in the Image of Man* (1969) - Book cover

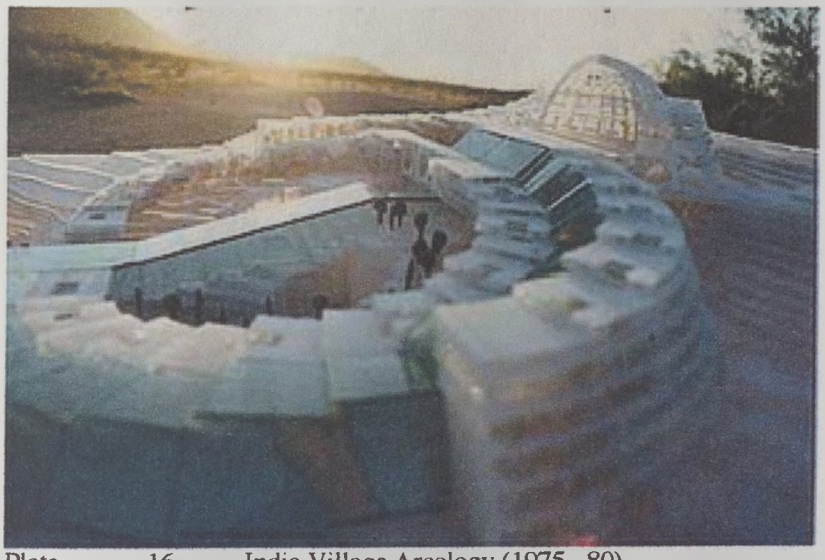


Plate 16 India Village Arcology (1975 - 80)

Arcology is dedicated to the notion of urban containment rather than sprawl. The metaphor of "the City in the Image of Man" emphasises the idea of self-containment. Just as we have a complex system within a body that allows us to interact with the outside world, Soleri argues that the city cannot perform effectively without containment. Ecological sanity, he says, demands intense centres of life that contain and provide for the bulk of the planetary population (see *8.7.1*). Through a higher concentration of land use derived from the sort of mixed-use development advocated in the *India Village Arcology* a settlement's negative impact on the natural environment can be reduced. Arcology offers a fundamental form of mixed use - a variety of uses within a single structure (See *8.7.2*).



Plate 17 Arcosanti Library Greenhouse

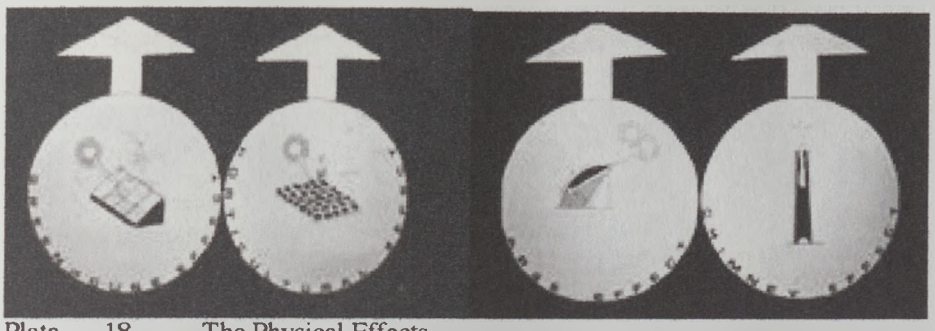


Plate 18 The Physical Effects



Plate 19 (a) The Valetta Spring Complex

From the *Two Suns* approach the arcology theory conceives the city as a complex in which living, working, learning, and playing are integrated with food and energy production (see *8.7.4*). The aim is that through a blend of energy and land use efficiencies, and recycling systems, the ecological integrity of the region remains intact since fewer demands are put on land, water and soil, and fewer resources are needed to maintain the "energy city" (see *8.7.5*).

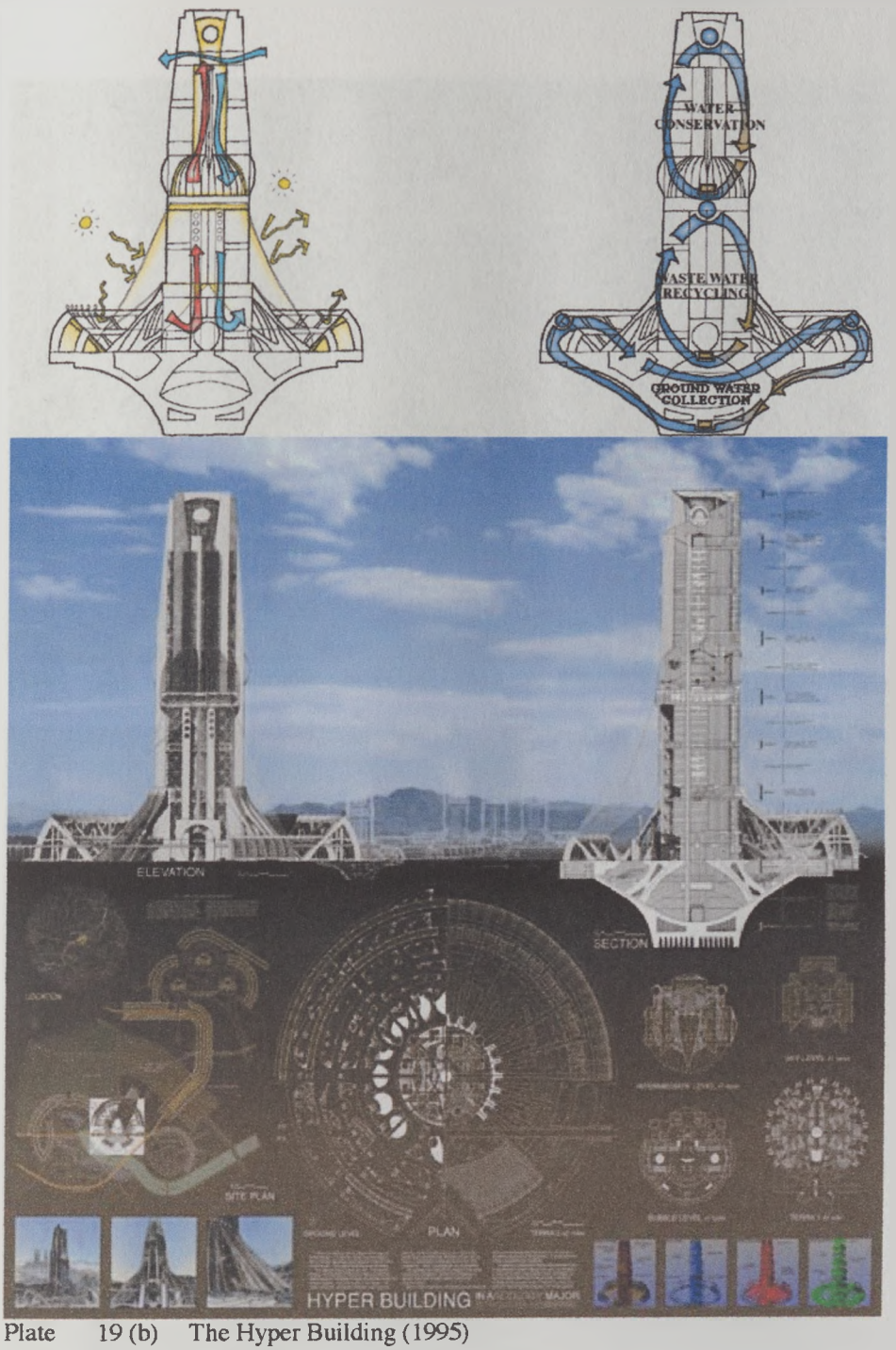


Plate 19 (b) The Hyper Building (1995)

Many of the physical effects and environmental benefits described under the aegis of the *urban effect* have been drawn together in designs for the *Hyper Building*, a 1000 metre-high tower surrounded by a 500 metre-wide multi-level concentric *exedra* (see 9.6.2). Containing a large spectrum of urban activities, the designs, commissioned by the Japanese government, provide for a permanent population of 10 000 and a commuting population of 140 000 (See 8.8)



Plate 20 Arcosanti Model (1980 - 85) Plan view

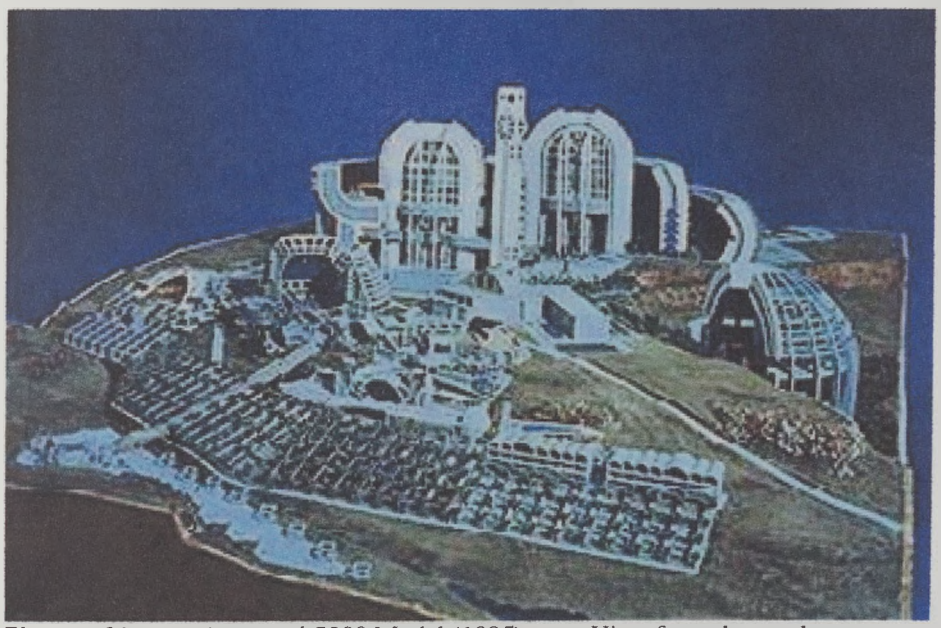


Plate 21 Arcosanti 2000 Model (1995) View from the south east

When complete it is intended that Arcosanti will house a community of five to six thousand people occupying 15 acres of an 860-acre land preserve. The buildings which face the Sun to gather its energy, will stretch no more than a quarter of a mile on any side but will rise to 30 storeys (see 9.1). An integral part of the project will be up to 7 acres of south-facing greenhouses described as an "energy apron" which will act as a key system for producing food and collecting energy to support the town (see *9.5.5*).



Plate 22 Cosanti (1956 -) Aerial view



Plate 23 The Pumpkin Apse and Barrel Vaults (1967 - 71)

In 1956 the Cosanti Foundation was established to pursue the research and development of an alternative urban environment. Over the next two decades a complex of silt-cast structures and buildings including housing, craft studios, a foundry, workspaces and living areas, was constructed on 5 acres of land (see 9.3). The casting technique derived from an ancient craft, uses river silt as a moulding material that allows concrete to be shaped in a variety of forms. Patterns can be carved into the silt and colour pigments added, which are absorbed into the concrete during the curing process (see Plate 27).



Plate 24 Arcosanti (1990s) View from the opposite mesa



Plate 25 Arcosanti (1990s) View from the west

Arcosanti is listed on the official Arizona State map as a small town. It is a cluster of structures and spaces positioned on a south-facing mesa in a semi-arid desert region. The curved form predominates throughout. Many of the structures, designed to take around six thousand people define sheltered-but open-spaces that accommodate the social and work places for the 60 who now live there. The lack of resources means that Arcosanti is physically languishing, even although there has been a resurgence of interest in the project via the Internet and the Paradox Project (see 9.7)



Plate 26 Main Vaults (1971 - 75) View from the south



Plate 27 Silt cast designs on the Vault interiors

The south section of the *Main Vaults* was the first structure to be completed in Arcosanti in 1971 (see *9.4.1*). The Vaults are intended to form the entrance to the completed Arcosanti 2000 project, positioned between the public space of the *double exedra* and the *energy apron* (see Plates 21 & 40). Currently they are used for social gatherings and morning meetings, held to discuss the daily work programme. The interior has been decorated using paint pigments set into the silt. These are absorbed by the concrete as it cures.



Plate 28 The Ceramics Apse (1972 - 73)



Plate 29 The Foundry Apse (1972 - 74)

The Apses shelter and shade the main working spaces at Arcosanti. It is here that the wind bells, that fund the project's ongoing construction, are fired and cast. Both apses have a 7 m radius and act as passive solar "machines" - shading provides a cooler working area in the summer and warmer spaces in the winter (see *9.4.2*). Tensile cables allow opaque membranes to be opened and closed to provide a degree of environmental control. The channels at the front of the Foundry Apse (Plate 29) direct rainwater into cisterns below. The cisterns will be used later to irrigate the cultivated crops in the greenhouses (see *9.4.3*).



Plate 30 East Housing (1972)



Plate 31 The Crafts III Building (1973 - 77)

East and West Housing provide shared living accommodation. Both units are entered via a sun-space to the south. Large windows, hung like doors, are closed in winter allowing for the passive radiation of heat into the common spaces. In the summer the windows are left open to ventilate the house (see *9.4.4*) The same technique is adopted in the *Crafts III Building*, which also provides Soleri's most complete example to date of a mixed use, multi-storey structure, containing residential, commercial and recreation activities. The building aims at demonstrating the arcology model's key principles of complexity and three-dimensionality (see *9.4.5*).



The amphitheatre space behind the Colly Soleri Music Centre provides a 500-seat venue for events such as the Minds for History Conference (1989) (See *9.5.6*) and the Paradox Conference (1997) (9.7). Eventually the garment architecture will be supported on the piers of the surrounding housing units.

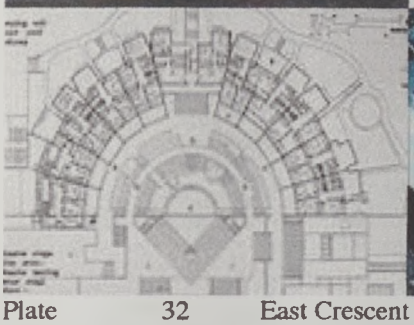




Plate 32 East Crescent Plan, model and amphitheatre



Plate 33 East Crescent Housing (1975 -)
Units 1 and 2

East Crescent Housing, when complete will provide living/working accommodation for around sixty inhabitants. The units are designed to heating provided by the *energy apron* (*9.5.5*) and hot water supplied by a solar system. A heat tunnel wraps around the rear of the crescent with openings under the floor into each of the residential units. Warm air is drawn up into the units, warming the structure, which radiates heat during the cool evenings. Half of the crescent is now complete.

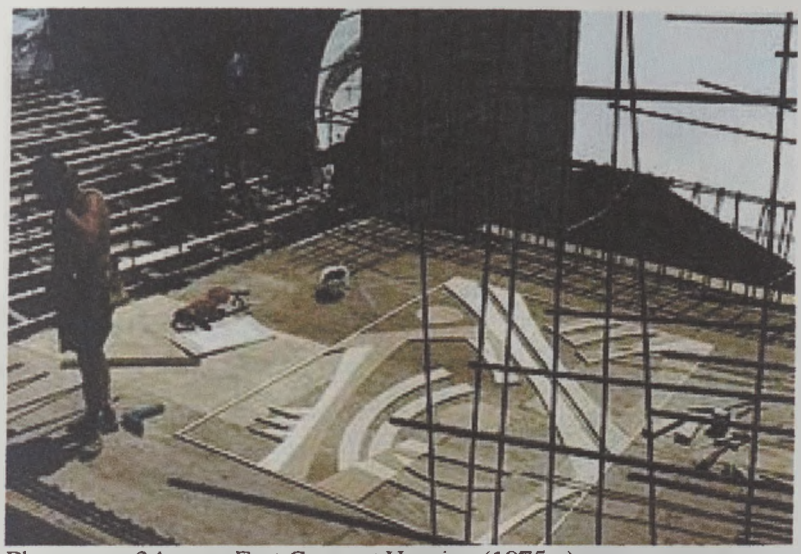


Plate 34 East Crescent Housing (1975 -)
Silt cast panel for unit 3

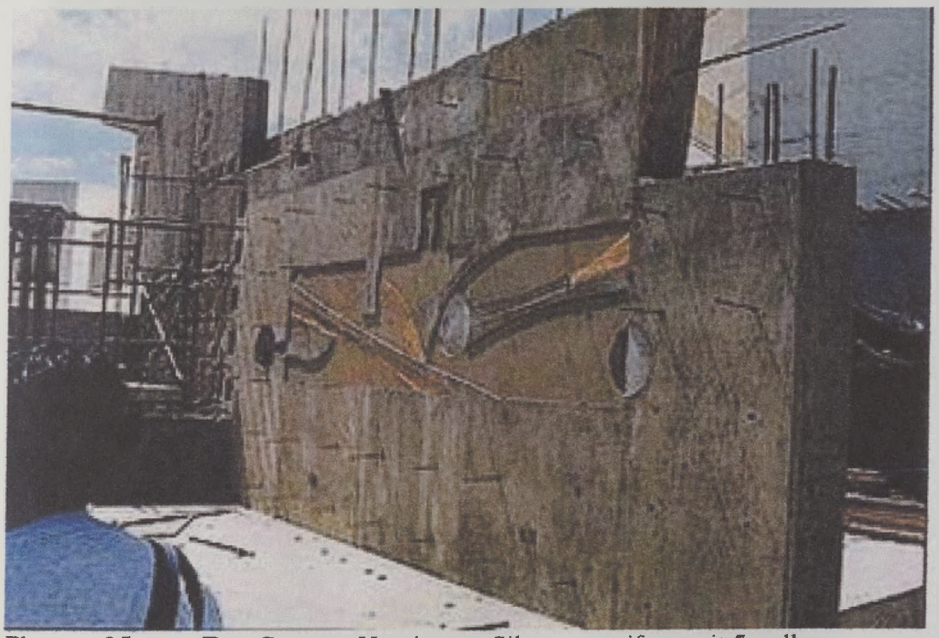


Plate 35 East Crescent Housing Silt cast motif on unit 5 wall

Arcosanti is intended to be an *urban laboratory* for the purpose of investigating the process of designing, building and operating a functioning prototype arcology. It aims to explore ways in which the city infrastructure might contract and become more intense, in order to become more efficient, ecological and sustainable. The laboratory is the place where, through the trials and errors of lived experience, the basic tenets of the theory are being tested. Failure is seen as an integral part of this process (see 9.5).

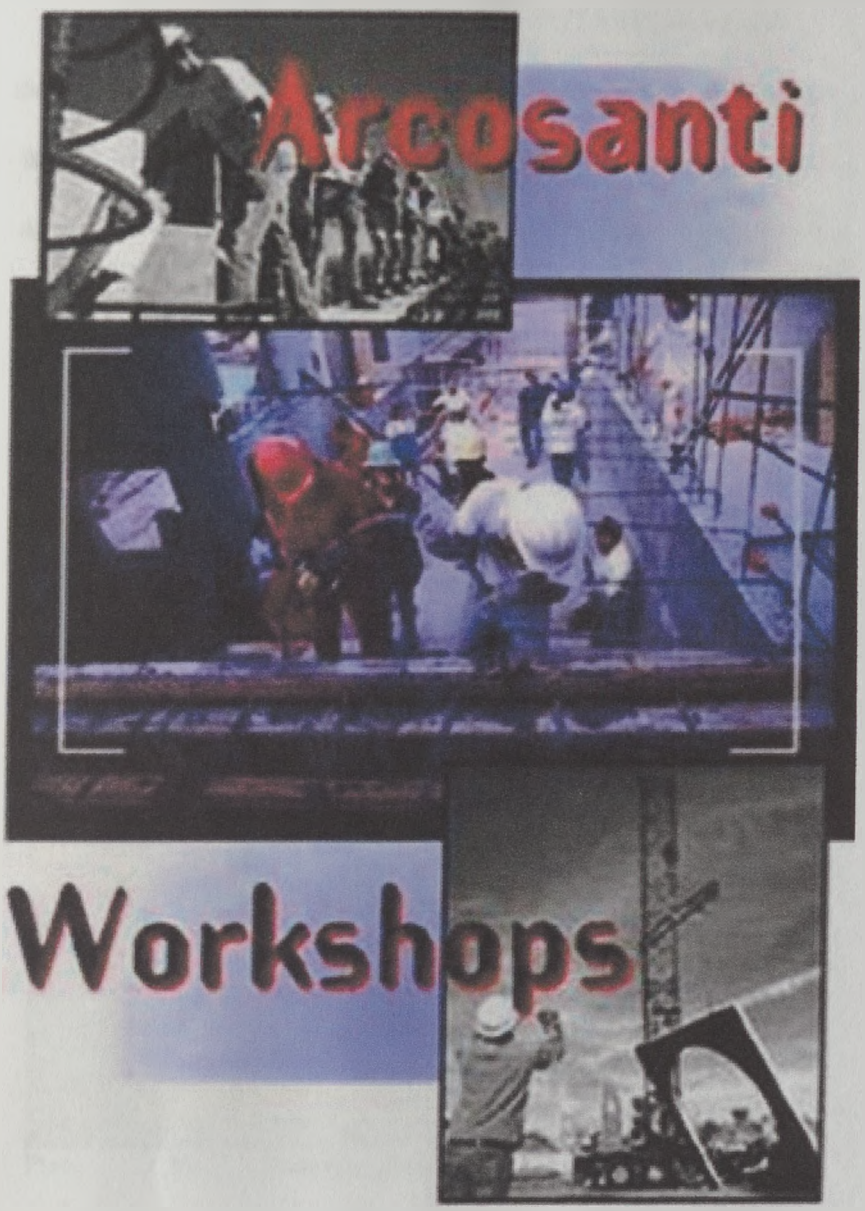


Plate 36 Construction workshop poster

Construction workshops at Arcosanti offer participants the opportunity to "learn by doing". During a five or six week stay they are involved in a range of activities, involving theoretical discussions on arcology, lectures on ecology, sustainability, building construction, and participate in the ongoing construction programme. They are also involved in aspects of site maintenance and recycling duties. Participants sleep in 8ft by 8ft by 8ft concrete 'cubes' in the 'camp' down by the Agua Fria River. Completion of the workshop entitles individuals to be considered for longer periods of residency and employment (see *9.5.2*).

FIGURE 1. MONTHLY MEAN TEMPERATURES INSIDE (——) AND OUTSIDE (- - - - -) THE GREENHOUSE

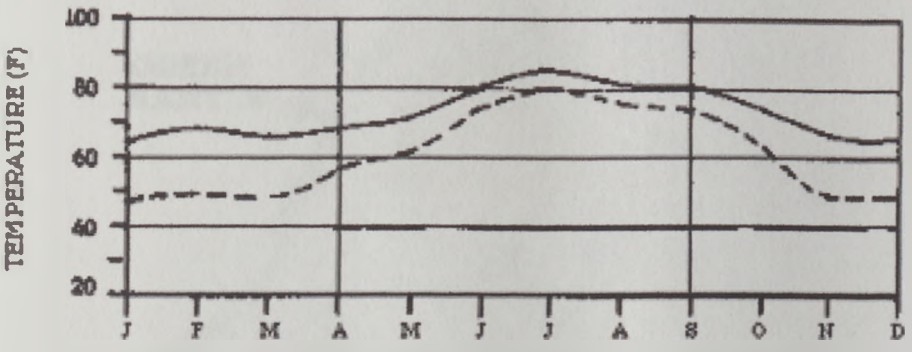


Plate 37 Temperature differentials due to the greenhouse effect



Plate 38 Prototype greenhouses at Arcosanti

Arcosanti organics maintains two prototype greenhouses at the site. These are part of a sustainable food production system which aims at providing the Arcosanti project with fresh produce and a greater degree of future self-reliance at a basic level of food production (see *9.5.4*). The greenhouses are designed to benefit from:-

- *heat collection* - curved retaining walls provide the heat sink effect;
- *greenhouse shading* - deciduous plants during hot summer months, while winter leaf drop ensures maximum seasonal sun penetration;
- *membrane system* - the use of a tensioned polythene membrane is being explored for both economic and aesthetic reasons. (see *9.5.5*)

The greenhouses can extend the growing season to a full year.

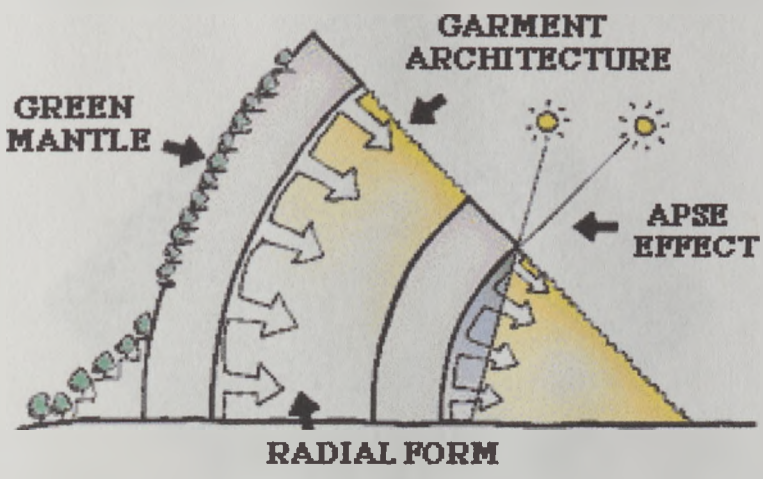


Plate 39 The Exedra Effects

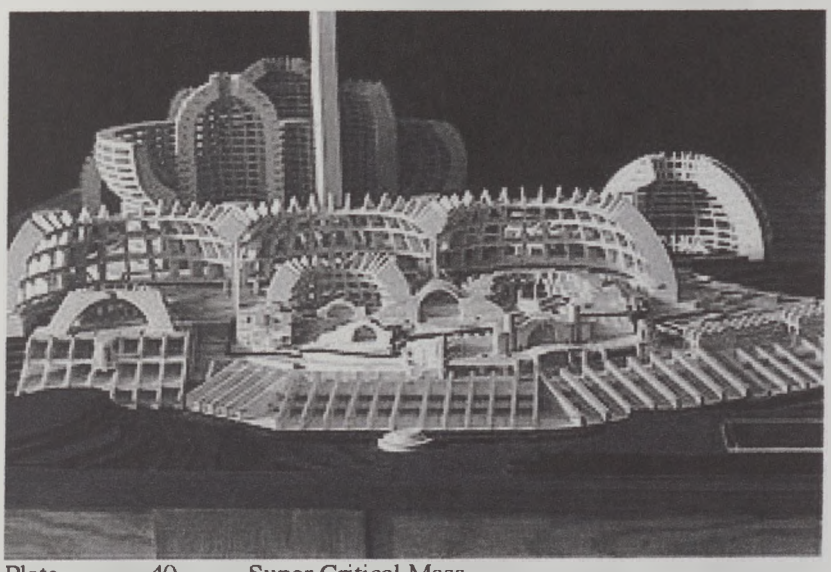


Plate 40 Super Critical Mass

Arcosanti 2000 is the most current design proposal for the completed project (see Plate 21 and 9.6) showing a series of large-scale structures along the Agua Fria Canyon Rim, north of the existing site. A step towards the larger scheme was described in 1995 as *Super Critical Mass* (Plate 40). This involves proposals for 1 500 people to be accommodated within three *double exedra* structures which embrace and partly enclose the existing south-facing buildings on the site. The *exedra*, a development of the apse form, contain residential, office, retail and commercial space and exploit a *green mantle* and *garment architecture* as part of the sustainable design strategy (Plate 39). (see *9.6.2/3&4*)



Plate 41 The Paradox Project



Plate 42 The Teilhard de Chardin Complex

The Teilhard de Chardin Complex is designed as a non-denominational religious centre to be used as a centre for research and education in theological studies (see *9.6.5*). More recently it has been proposed as the location for the Paradox Project. This recent initiative aims to explore the fundamental relationship between the arcology model and the issues raised by the proliferation of the Internet. It is hoped that members of the cyberspace community will support new funding initiatives for Arcosanti (see 9.7).



Plate 43 Morning Meeting in the Vaults



Plate 44 The Daily Concrete Pour

This morning at a meeting held around dawn in front of the project's *Main Vaults* a small group of people will have been discussing the daily work programme. For them Arcosanti represents unfinished business. Others can decide whether the project is experimental or utopian, "a science fiction fantasy, an Orwellian nightmare, or a new evolutionary stage in the progress of the human spirit". For them it is straightforward. It is simply a question of how much concrete they can manage to pour today.

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