Exploring Accounting and Accountability in Scottish Salmon Farming: An Industry in Crisis. The Importance of Risk Perception, Risk Communication and Reflexivity

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Abbreviations

A: Large fish feed producing company, vertically integrated in salmon farming activities

AAA: American Accounting Association

AAssoc1: "A" Islands Association 1

AAssoc2: "A" Islands' Association 2

AED: "A" Islands Council – Department of Economic Development

AEH: "A" Islands Council – Department of Environmental Health

"A" Islands: The locality where this research was focused

AL: "A" Islands Council – Department of Law

AMA: Area Management Agreement

B: Multinational group involved in salmon production

C: Fish-feed producing company owned by the Co11**-Group

CAP: Common Agricultural Policy

CE: the Crown Estate

Co1: Salmon producing company

Co1*: Marketing company owned by Co1

Co2: Salmon-fry producing company

Co3: Salmon producing company diversified also in mussel production

Co4: Salmon producing company

Co5: Mainstream-salmon producing company

Co6: Smolt producing company subsidiary of Co6*

Co6*: UK subsidiary of Co6**, specialising in vertically integrated production of Atlantic salmon

Co6**: Norwegian multinational involved in salmon production with operations in Norway, UK, Spain and Chile

Co7: Salmon processing company

Co7*: Salmon producing company, subsidiary of Co7**-Group

Co7**: Multinational group with fish-feed producing and fish farming activities

Co8: Subsidiary of Co8*-Group integrated in salmon production from egg to mature salmon

Co8*-Group: Large multinational

Co9: Salmon producing company

Co9*: The selling agent of Co9

Co10: Smolt producing company

Co11: Salmon producing company (organic and mainstream fish)

Co11*: Larger fish producing company owning Co11 and Co13 with operations in the Scottish islands and mainland, Chile, Canada and Norway. Subsidiary of Co11**-Group

Co11-Group**: Norwegian multinational group involved in salmon production in Scotland, Chile and Canada under the names of Co11***-Scotland, -Chile and -Canada respectively. The previous name of Co11***-Group was Co11****

Co11***: See Co11**-Group

Co11****: see Co11**-Group

Co12: Organic salmon producing company

Co12*: Organic smolt producing company collaborating with Co12

Co13: Salmon producing company, subsidiary of Co11*

Co14: Salmon producing company

Co15: Salmon producing company diversified in mussel production

Co16: Salmon producing company diversified in cod and mussel production

Co17: Organic salmon producing company

Co18: Organic salmon producing company

Co19: Salmon producing company (organic and mainstream fish)

Co20: Salmon producing company (organic and mainstream fish)

CSR: Corporate Social Reporting

D: Multinational group involved in salmon production

DEFRA: Department of Environment, Food and Rural Affairs

E: Salmon producing company. It was the largest in the "A" Islands and it was described as the earliest entrant in organic salmon production. It was later bought by Co11*

EIA: Environment Impact Assessment

EMEA: the European Agency for the Evaluation of Medicinal Products

EPA: Environment Protection Agency

FCS: Food Certification Scotland operating the Smolt Quality Scheme

FFSCS: Freedom Food Salmon Certification Scheme operated by RSPCA

FIFG: European Financial Instrument for Fisheries Guidance

FOE: Friends of the Earth Scotland

FRS: Fisheries Research Services; one of SEERAD's agencies

FSA: the Food Standards Agency

FTE: Full Time Equivalent Employment

GMO: Genetically Modified Organisms

HIE: Highlands & Islands Enterprise

HSC: the Health & Safety Commission

HSE: the Health & Safety Executive

IFOAM: International Federation of Agricultural Movements

ISO: International quality certification scheme

LECs: Local Enterprise Companies, part of HIE

LRM: Label Rouge Quality Mark within the SQS scheme

MCA: the Maritime and Coastguard Agency

MIP: Minimum Import Price

MSA: Micro Satellite Analysis technology

MSC: Marine Stewardship Committee

NDPBs: Non Departmental Public Bodies

OFF: the Organic Food Federation

PO: Producers' Organisation

QDA: Qualitative Data Analysis

REN: Regional Enterprise Network

RQS: Regional Quality Scheme

RSPBA: Royal Society for the Protection of Birds – "A" Islands' branch

RSPCA: The Royal Society for the Prevention of Cruelty on Animals

S½: Salmon or sea trout smolting at approximately six months after hatching

S1: Salmon or sea trout smolting at approximately one year after hatching

S2: Salmon or sea trout smolting at approximately two years after hatching

SA: the Soil Association

SAC: Scottish Agricultural College

SEA: Social and Environmental Accounting

SEERAD: Scottish Executive Environment & Rural Affairs

SEERADASD: Scottish Executive Environment & Rural Affairs Analytical Services Division

SEERADFG: Scottish Executive Environment & Rural Affairs Fisheries Group

SEPA: Scottish Environment Protection Agency

SEPAA: The Scottish Environment Protection Agency's branch in the "A" islands

SEPAD: Scottish Environment Protection Agency Dingwall Headquarters

SF: The Strategic Framework for Scottish Aquaculture

SFM: Salmon Farming Monitor

SFQC: Scottish Food Quality Certification scheme

SGA: Scottish Growers Association

SMEs: Small & Medium Enterprises

SNH: Scottish Natural Heritage

SQA: Smolt Quality Assurance scheme within SQS

SQS: Scottish Quality Salmon with the Tartan and Label Rouge quality marks

SQSS: Superior Quality Shetland Salmon certification scheme operated within SSQC

SSB: Scottish Salmon Farmers' Marketing Board

SSFA: Shetland Salmon Farmers Association operating SSQC

SSGA: Scottish Salmon Growers Association; the official PO of salmon producers in Scotland operating SQS

SSQC: Shetland Seafood Quality Control certification scheme

SSSA: Scottish Salmon Smokers Association

SWT: Scottish Wildlife Trust

TAC: Technical Advisory Committee of the SQSS certification scheme

TQM: Tartan Quality Mark within the SQS scheme

UKAS: The United Kingdom Accreditation Service

UKROFS: The United Kingdom Register of Organic Food Standards

VMD: the Veterinary Medicines Directorate

WHO: World Health Organisation

WWFS: World Wide Fund Scotland

Abstract

The thesis draws upon an arena study on the accounting and accountability processes used within a business sector under intense public and regulatory scrutiny in terms of its social, economic and ecological risks. It investigates the importance risk perception and Social and Environmental Accounting had on the business decisions made in the context of operations of the salmon farming industry in Scotland and specifically how these affected the decision making criteria of some salmon farmers to switch into organic forms of production.

Risk is conventionally defined as the product of the probability and the utility of some future event. Objective measures of risk obey all the formal laws of combining probabilities. Perceptions of risk, however, are inherently subjective and subject to cultural shaping and do not necessarily accord with objective measures. Social and psychological factors are clearly important considerations when translating technical assessments of risk into the terms of everyday language and experience and when formulating procedures for controlling risks in the domain of public policy. Some subjective perceptions are incorrect. Others however reflect real differences in political or ethical positions, or in the choice of the desired balance of risk and reward. Some objective measures, on the other hand, have been shown to be statistical artefacts or the results of unconscious experimental bias.

In this light this research builds upon previous findings, which highlight the influence of culture, communication and reflexivity in risk perception in contemporary societies. The research took the form of an arena case-study on the salmon farming industry in a certain geographic area of Scotland and examined the inter/intra-relationships of the industry with the regulatory bodies involved and the other stakeholders in order to explore the accountability practices. The interviews and documentary analysis revealed an active accountability network and a set of discourses ripe for Social and Environmental Accounting which is not there. However, the accountability network was far from reflexive and could be seen as legitimating the status quo rather than governing the risks associated with salmon farming.

This evaluation of accounting and accountability processes within this specific context demonstrated the importance of locating social and environmental accounting responses within wider accountability discourses. It is suggested that all accounting practices should become more reflexive in nature if they are to remain relevant in these wider societal accountability discourses.

Introduction

1. Nature and scope of the problem

The sustainability of the post-war agricultural production regimes[1] adopted in Europe has been seriously challenged. Post-war food shortages were the initial motive for EC support of intensive farming practices as these were deemed the best production regime for ensuring rapid increase in supply. The long-term effects of the Common Agricultural Policy (hereafter CAP) are now seen in a different light. The current combination of government subsidy and intensive cultivation is seen to be responsible not only for the 'mountains and lakes' of excess output but also, for environment-related problems like soil pollution with fertilizer's chemical ingredients (Hg and P), water pollution by NO^-_3 ions, continuously falling of soil productivity, development of new plant diseases (pests, viruses, bacteria, fungi, etc.) and animal contaminations, use of dangerous chemicals for the public health, and others.

Clear evidence that the post-war emphasis on supply is unsustainable is found in policies adopted in the fishing sector. Regimes have been adopted that have led to the exhaustion of fish populations and the loss of biodiversity. Fisheries are used under open access conditions and companies have an incentive to over-fish (*Perman, et al, 1999*). In response, governments have proposed significant changes in the production regime, including the operation of fisheries under private property conditions and/or subsidising fisherman for "not fishing" similar to CAP set aside subsidies for not farming. However, objections to such solutions focus on costly administration and the creation of the same perverse incentives that have arisen from CAP set-asides. Thus, the main problem of sustainability confronts policy makers, with special force in the fishing sector (*O'Riordan, 1994, p 5*). The structure of incentives arising from both market forces and regulation is such that even though industry-wide practices pose an immediate threat to the viability of individual producers, individually they face strong disincentives to change their behaviour.

The current crisis in sea fishing has led some to regard increasingly fish farming (aquaculture) as a transitional source of supply while open sea fishing is closed and fish stocks are rebuilt. The problem is that the production regime adopted in fish farming as represented by salmon fish farming, the largest single source of farmed fish is debated both as unsustainable and dangerous

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[1]The notion of sustainability will be briefly introduced in section 1.3 and further discussed in sections 4.3.2.2 and 4.3.2.3. A production regime is perceived as the complex interrelations of direct production practices involving incentives (and disincentives) arising from market forces and government regulation.

for the public health[2]. The sector is one currently under pressure and in the media spotlight. Product quality issues, international competition, health scares, scientific controversy, environmental pressure groups, animal welfare groups, regulators, bankruptcy, collapsing prices are only some of the related issues. A recent scientific study (*Hites et al, 2004*) for example identified Scottish salmon as so heavily contaminated that eating more than six portions a year could result in cancer. Farmed salmon is constantly under attack as being ecologically destructive, damaging to health and has become an important symbolic battleground between business, regulatory agencies, and environmental pressure groups[3].

2. The rationale of the research

The Scottish salmon farming industry is relatively new. The first salmon farms emerged around 30 years ago and since its inception the sector has experienced substantial expansion, becoming an important source of economic and social development in the most remote parts of Scotland. This growth has been achieved in the context of intensifying international competition, pressure to meet changing and tightening environmental standards and problems of maintaining healthy stocks of fish and disease control (*Highlands & Islands Enterprise and The Scottish Office, 1998, p vii*). The intensified domestic and international competition experienced by the industry over the last ten years has led to increased consolidation. The bulk of the Scottish farms are now vertically integrated and under foreign ownership with very few small producers remaining. The future of Scottish salmon farming as it is presently structured is extremely bleak.

The industry is very different (in terms of volume, ownership structures, raw materials used, location of operations) from other types of industry that have become targets for pressure groups, (e.g. Nuclear Energy, Chemical Companies, Oil Companies, Car Manufacturers, Fast Food Chains)[4], yet the debate over salmon farming is characterised by extreme polarised positions. One possible solution to this conflict would be to move towards more sustainable salmon production, in particular organic salmon farming, mirroring the structural changes in land-based agriculture. However, there are a number of systemic problems with equating

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[2]See for example: "Tainted salmon: farming methods turning health food into poison", THE OBSERVER, 17/1/2004; "Scots salmon farming jobs on the line", THE SCOTSMAN, 12/1/2004; "Scottish farmed salmon is full of cancer toxins", THE TELEGRAPH, 16/1/2004; "Toxins found in farmed salmon", ASSOCIATED PRESS, 9/1/2004; "Scottish salmon sales fall 20% in health scare", THE SUNDAY TIMES - SCOTLAND, 15/2/2004; "Fish farms must cut costs to thrive", THE HERALD, 10/2/2004; and numerous others.

[3]For more information see www.salmonfarmmonitor.org

[4] See for example Beck (*1992a*), Klein (*2001*), Monbiot (*2001*), and the film: THE CORPORATION (*2004*).

organic with sustainable in the context of salmon farming, given that salmon are effectively carnivorous[5] and in some ecosystems they are top of the food-chain. It would be like trying to classify a lion as organic. Salmon production is heavily reliant on industrial fishing. On average it takes 3kg of fishmeal to produce 1kg of salmon[6]. There are other approaches to more sustainable salmon farming, such as salmon ranching for example, but at present the predominant industry response in Scotland is organic farming. Whilst it is one of the main industry responses, organic salmon farming is still a small and developing niche market.

There are a number of different definitions for organic salmon. Organic tends to be defined according to different certification standards, but in general organic salmon farming is linked with non-genetically modified fish, using better quality fishmeal (sourcing from Pacific fish stock), eliminating flesh-colouring additives, larger fish cages, lower stocking density, avoidance of preventative blanket treatment of parasites and diseases (*ORGSAL, 2000, Sutherland, 2000*). Organic salmon farming is less unsustainable than conventional salmon farming but at present cannot be regarded as sustainable. However, organic salmon farming does present a compromise between those parties opposing and supporting salmon farming, by removing many of the symptoms of their criticisms. It cannot be overlooked that organic salmon farming offers the opportunity to move into a more profitable market segment based on pessimistic forecasts into the future of salmon farming in general.

The research took the form of a case study[7] focused on the context of the salmon farming industry in a certain geographic area of Scotland (which for confidentiality reasons will be called the "A" Islands) and examined the inter/intra-relationships of the industry with the regulatory bodies involved and the other stakeholders. The aim had been to examine the

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[5] Technically the term is piscivorous.

[6] The industry claims that aquaculture has a better conversion rate (1.1/1 to 1.2/1) than agriculture (chicken, pork, cattle), and if that is combined with the facts that 2/3 of the planet are covered by water and the limitations of agricultural production in certain parts of the world, means further growth of fish farming globally (*SSGA* – see chapter 5 for a description of the participated in this study organisations). However, local environmental groups argue that this is dried feed and the aforementioned ratio is totally different.

[7] The concept of case remains subject to debate and the term study is ambiguous. However, a case study is both the process of learning about the case and the product of the learning. Some cases are qualitative (such as this thesis is) and some are not. The case study is not a methodological choice but a choice of object to be studied and as a form of research it is defined by interest in individual cases and not by the methods of inquiry used (*Stake, 1994, p 236 – 237*).

accountability relationship between the main actors[8]; the risk construction and risk communication in salmon farming, and to provide an evaluation of the effectiveness of government policies and regulatory frameworks.

3. Research Questions

Under the pressure of the difficult economic environment in which salmon farming companies in Scotland operate it was deemed of particular interest to examine:

a) How and why some fish-farmers made the transition into organic fish farming[9]; and in specific, how their decisions concerning moves to "greener" production regimes were affected by the perceptions of other stakeholders.
b) Who are the important players in the risk-arena[10] and how their risk perceptions influenced the fish farmers' decision-making process;
c) Why and how the stakeholders involved, think the industry should change and which is the underlying rationale for that change;
d) The risk construction for all the parties involved; and
e) The individual understanding of the governing process.

Analysis was focused on:
a) What risk is for the salmon farmers (both mainstream and organic producers);
b) What it means for the rest of the involved parties; and
c) How risk communication (messages on risk communicated back and forth between the involved into the debate parties) affects/has affected the decision-making process of the salmon farmers.

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[8] Given the contested nature of the salmon farming sector, in particular the debate over its environmental risks and social benefits, it was felt that studying decision-making in this sector would offer valuable insights for social and environmental accounting.

[9] In this thesis the decision making process in new business ventures (organic salmon or other) will not be examined but will be briefly reported. The amount of information collected for the purposes of the respective research allowed only the presentation, analysis, and evaluation of some only of the initial research questions investigating the "risk debate" over the Salmon Farming industry and specifically those related to risk construction, communication patterns and messages between the involved actors. The reader could find more information about the actual decision making process in the sector and the rationale behind the transition from conventional to organic salmon in Georgakopoulos and Thomson (*2004 and 2005a*).

[10] See section 3.3 for a discussion on the risk arena metaphor (*Renn 1992b*).

The study has a particular focus on the organic sub-sector of the Scottish aquaculture industry, which is mainly located in the "A" Islands in Scotland. Following a number of initial interviews with fish farmers, and a postal survey it became clear how embedded the fish farms were in the local community, local and national regulatory schemes, local economics and local governments, and that it was important to extend the analysis to include a number of key actors. Salmon Farming in Scotland is concentrated into three rural areas. The "A" Islands were selected for the in-depth stage of this project. In that part of the study, interviews were held with key actors of the respective Salmon Farming industry to provide contextual insights into the factors shaping and driving the salmon farming sector.

4. Initial expectations and research methods overview

The project was based on trying to understand how and why farmers have (or have not) adopted organic fish farming technologies. Given the environmental sensitivity of this sector it was initially expected that there would be uncovered examples of environmental accounting and environmental reporting, as conditions would appear to exist that would give rise to stakeholder accountability responses (see for example: *ASSC, 1975; Gray et al, 1996; Bebbington et al, 2004*) and legitimacy actions[11] (see for example: *Gray et al 1996; Gray and Bebbington 1993, 2001; Gray 1990*).

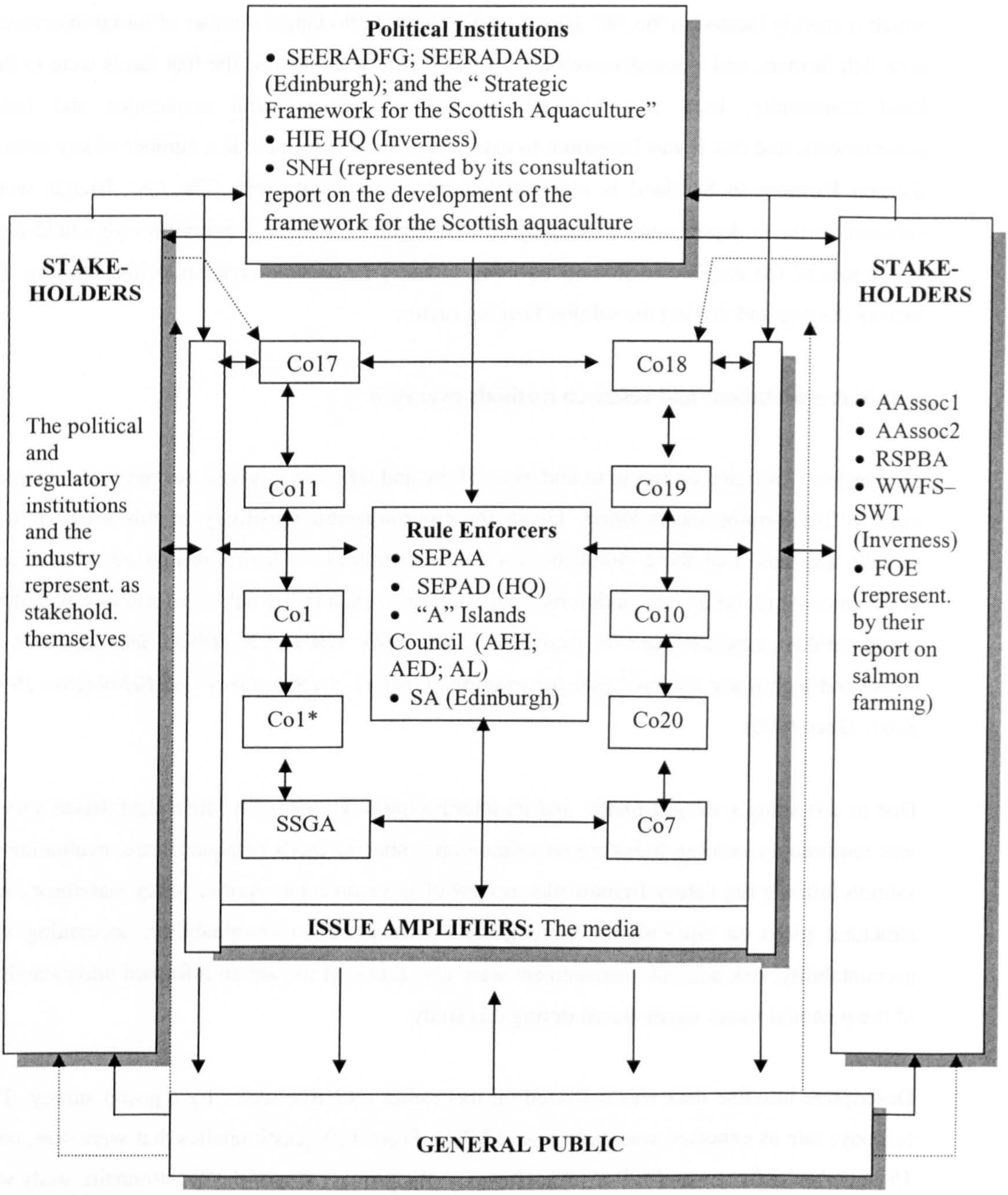
Due to this study's subject matter and its interdisciplinary nature, an initial desk-based survey was required concerning literature on salmon and other methods of aquaculture, evaluation of salmon farming regulatory frameworks, review of governmental reports, policy statements and structural plans on aquaculture. More generally literature on sustainability, accounting and accountability, risk and risk management were also accessed to gain an informed understanding of the potential issues encountered during this study.

Descriptive baseline data was collected on this rather secretive sector by a postal survey. The response rate as expected was quite low (13.3%). From 120 questionnaires that were sent, only 16 came back after several follow ups. However, the primary aim of the questionnaire study was not the gathering of the descriptive data but the identification of possible interviewees. The results of the questionnaire were coded and the quantitative information was analysed in conjunction with the qualitative information provided.

This questionnaire was then used to construct a set of interview protocols and to identify potential farms for interviews. A series of pilot interviews were undertaken and these interviews

[11] More information on stakeholder, legitimisation, and political economy theories can be found in section 3.2.1.

Figure 1: *Adaptation of the arena metaphor for the purposes of this thesis*



Note: Solid arrows show communication flow; dotted arrows the direction of social mobilisation.

led to the selection of the "A" Islands as the main focus of the research project. The wider project was based on the assumption that incorporating Sustainable Development into Scottish Aquaculture is critical to the future viability. However, only a small number of farms have begun this process. Understanding how and why farmers have adopted "organic" fish farming is important part of this transition. Understanding risks, their construction, measurement, communication and management, offers a valuable contribution in this area. For this reason a series of interviews was undertaken, mainly in the "A" Islands, where the main bulk of the organic fish faming sub-sector is located[12], as well as in other fish farming communities with a range of external stakeholders been interviewed in order for valuable contextual data to be provided. In addition to that, in the "A" Islands one can easily identify an independent, closed community with its own structures both at the level of the salmon industry itself as well as at the level of the participatory regulatory bodies, environmental and other stakeholder organisations[13].

The companies and organisations that were identified as important stakeholders and agreed to participate in the interviewing part of the programme, are presented in figure 1[14] using the risk arena framework (see *Renn, 1992b*), which is discussed in chapter 3. It should be noted that for reasons of simplicity in this representation all the communication routes between the different

[12] According to information provided by the Soil Association (*SA*), in July 2003 there were 15 companies in Scotland licensed for organic salmon production (smolts, salmon, or both). Those producers were dispersed in: Argyll and Bute; the Scottish Mainland; the Orkney Islands; the Shetlands; and the Western Isles.

[13] One could argue that the definition "stakeholders" does not clearly represent the specific non-governmental/regulatory organisations identified and participated as such in the context of this study since all the actors involved in this research can be described by such a term. It could be argued that a name like "public interest representatives" for example might have been more appropriate. However, the researcher's view is that since the specific for the purposes of this research organisations termed as stakeholders, have been defined and described as such (see section 5.6.3) the term should not really confuse the reader since it is as good as any name that it could possibly have been given.

[14] At this point a note should be made on the use of the notions of "political" and "sub-political" in this thesis as these are discussed in sections 1.2.2, 1.5.5, and 1.6. "Political" is taken to represent those organisations with regulatory statutory remit over the salmon farming industry. Organisations without such remit are taken to be "sub-political" entities. However such a distinction cannot be always that clear-cut as in the case of the Soil Association (SA) for example. Even though this organisation is self described as a "sub-political" entity (*"...an independent charity with stake-holding, non-regulatory remit"* – see section 5.6.2 and at *www.soilassociation.org*), acts and it is accepted as a regulator of the organic sector in the UK: an issue that was pointed out by most of the interviewed rule-enforcing and political representatives. For that reason in figure 1 the SA has been grouped together with the rest of the regulatory organisations that participated in the respective research. In chapter 6 it is examined under the category "certifiers".

involved parties have not been highlighted. These communication routes and the messages involved are presented in chapter 6. Due to the purposes and constraints of the respective programme the research was undertaken at the levels of the industry, political institutions, rule enforcing agencies and stake-holding organisations involved, as those were identified through the interviewing process. All the companies, which operate in the "A" Islands with the exception of Co1, are engaged in organic salmon production. The rest of the companies operating in other localities (i.e. the Western Isles, the Scottish Mainland, and the main representative body of the industry in Scotland – SSGA in Perth) were chosen to provide important contextual information for the rest of the industry. The same reasoning was followed with the other stakeholder or regulatory organisations/agencies.

All of the interviews took place in the work place and normally involved a site visit. All interviews except two were recorded and partially transcribed. A mind-map was constructed on each interview and this was used to derive a set of codes to evaluate the data. The approach to analyse and make sense of the data adopted the protocols described by O'Dwyer (*2003*).

At this point it should be noted that because of the small number of firms participating in the current research project, even though all the firms of the specific geographic locality as well as additional companies/organisations in other regions were interviewed for contextual information, caution should be taken during the interpretation and generalisation of the results.

5. Structure of the thesis

By providing a brief overview of each chapter regarding its aim and how this aim is fulfilled, the reader will be able to gain an initial understanding of the existing links between each chapter and how these are connected to the ultimate aim of this dissertation; an investigation of the importance of risk perception and Social and Environmental Accounting (SEA) on the business decisions made in the context of operations of the salmon farming industry in Scotland.

- Chapter 1: Overview of the thesis

The main aim of this chapter is to present an overview of this study. This thesis is interdisciplinary in nature bringing together complex notions such as sustainability, social and environmental accounting, risk perception and organics in a study exploring the reasons why some fish farmers decided to move into organic salmon production. All these notions are rather complex with each of them being the subject of many studies. As a result it was deemed important to provide the reader with the necessary linkages between these meanings early on in this work to aid understanding. More information on these issues is further given in the

methodology and literature review chapters. However, the focus of this thesis lies in the field of risk perception and how the latter affected the decisions of the specific fish farmers who switched into organic production to do so. For that reason extensive discussion of the other notions will not take place.

- Chapters 2: The salmon farming industry

Chapter 2 attempts a pilot presentation of the issues involving the salmon farming industry (both mainstream and organic) and a description of the arena as revealed via questionnaire responses of fish farmers. These views are enriched with factual information provided by governmental reports and statistics in an attempt to give a more detailed picture of the sector. A skeletal exploration of the producers' views about the arena in which they operate takes place at the end of the chapter.

- Chapter 3: Methodology

Chapter 3 functions as an introduction to the rationale behind this work. The latter is further developed in the following literature review and research methods chapters. Chapter 3 examines the field of risk research through the methodological positions taken from the various schools of thought with a particular focus on the views of the social sciences. The overall position adopted is that of critical realism[15] (*Tsang et al, 1999*). The important question when studying issues of risk is not whether the ontology of the latter is real or mere construction, but there is a need to understand risk construction as a practice of manufacturing particular uncertainties that may have harmful consequences to life in the broadest sense of the term (*Adam et al, 2000, p 2*). Through the premises of that epistemological lens the framework of the arena metaphor for risk debates, which has been adapted for this study, is presented.

- Chapter 4: Literature review

Chapter 4 is predominantly concerned with presenting an overview of the associated literature in the field of risk perception research. Prior to such a discussion a connection must be established between the notions of sustainability and accounting. Accordingly, the chapter begins with a more detailed presentation of the linkages between the different issues that are brought together in this thesis (i.e. risk, sustainability, and accounting). However, the overarching aim of the chapter is the description and critique of the most influential and appropriate, as deemed by the researcher, theoretical positions on risk, that could potentially explain the findings of the associated fieldwork. The chapter concludes with a presentation of the arena framework

[15] A more appropriate position is that of critical structuralism (see chapter 4 below), which is a subset of critical realism.

enriched with the insights of the risk society and critical structuralism perspectives as the most suitable paradigm for analysis in the salmon farming arena.

- Chapter 5: Research methods

This chapter aims to describe the methods of data collection (salmon price data, postal survey, interviews, documentary reports) and data and documentary analysis used for the purposes of this thesis. At the same time a selective picture is given of the Scottish Salmon Farming Risk arena through the presentation of the participating in this study, organisations. The different levels of interview and documentary analysis are available on request.

- Chapter 6: Empirical evidence

Having explained the rationale behind this thesis in the previous three chapters and established the most suitable theoretical positions for the conduct of this study, the chapter aims to give an arena-perspective of the industry as constructed from those within the sector, from the perspectives of the involved regulatory/political institutions and other stakeholder organisations. The aim is to report on the findings of the main fieldwork conducted in the form of a series of interviews (and documentary analysis) held with salmon farmers, and other stakeholding organisations (government, political institutions, NGOs, etc.). Such fieldwork was carried out in an effort to reveal the underlined rationales behind a heated scientific-based risk debate associated with the so-called industry's "acceptance" as a legitimate sector with a huge significance for the covering of the consumers' needs in fish protein in view of the global decline of the wild marine populations as well as a major employer in rural areas. The chapter concludes with a summary of the examined risk positions and risk communication routes and messages.

- Chapter 7: Conclusions – future research

The main findings and conclusions of this study are brought together. The chapter starts with an evaluation of the examined arena and continues with a discussion/critique of the accountability processes and environmentally enlightened practices observed. The contribution to the knowledge is reviewed and areas for future research are suggested while the main conclusions of this study are briefly presented. The chapter finishes with a summary of the work.

6. Limitations of the study

The interdisciplinary nature of this thesis attempts to bring together notions such as sustainability, accounting, risk perception and organics in a study exploring the reasons based on which some fish farmers decided to move into organic salmon production. Each of these complex notions is the subject of in-depth study in its own field of inquiry. As a result the work

undertaken could be characterised as somewhat "high-level" or "superficial" in the examination of the issues attached in the attempt to link all these ideas together within the context of the industry under investigation.

Another issue involves the arena "construction" itself at two levels. Firstly, a certain selective number of organisation representatives were chosen for the purposes of this study and even though this was dictated by primarily "access", and secondly financial constraints, attempts were made to provide as complete a representation of the salmon industry in the respective geographic vicinity[16]. At the same time a certain number of organisations outside this region were interviewed in order to provide contextual information. However, this work could be challenged by arguing that a more complete "picture" of the industry could have been provided if the number of the interviews had been increased to include higher levels of representation in terms of the salmon industry, regulators and other stake-holding parties in other regions. Of course such scenario would have increased the cost and the time scale of the study, in terms of data collection and analysis even more so but beyond that it wouldn't necessarily have added anything new to the issues explored or to put it in Solomon and Darby's (*2005*) words "*interviews were conducted in the specific context until it was felt that a theoretical saturation had been reached and no new issues were arising" (ibid.:32 - 33).*

The second issue involves the level of investigation undertaken through the lens of the arena itself. It could be argued that within that arena a smaller one was constructed, and investigated, in order to serve the purposes of the inquiry. A fuller examination would probably be to directly identify and investigate the issue amplifiers (i.e. the media) and the general public. However, in order for this project to become more manageable this "reduction" of the working framework was decided in the early stages of this work.

The nature of a case study[17] is contextual, temporary, and spatially bound. As a result the respective work "suffers" from the same limitations that this more general method of inquiry bears. The picture given is a small snapshot of the issues attached and even though this might be seen as "sufficient" for researching and interpreting certain social phenomena, fuller examination of the latter within that mode would have to mean follow ups of the initial research in order to examine their progression with possible repercussions and extensions on the original findings of the research.

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[16] This did imply a level of bias in the interviewee sample, but in agreement with Solomon and Darby (*2005*) this was considered as being balanced by the knowledge and close involvement of the different organisation representatives with the issues investigated implying that the validity of their views in response to the respective questions was taken as quite high.

[17] See Stake (*1994, p 244 -245*).

A final issue involves the examination of the existence of accounts at the specific level of the study. Even though these appeared not to exist or not to be significant for the decision makers, they do exist and might be used in other arenas. Co1[18] for example produces this type of information but this was not a major input in the farmers' decision-making. The lack of investigation in deeper organisational levels could be seen as a limitation which would/could have altered the conclusions of this study.

[18] See sections 5.3.2 and 5.6 for descriptions of the participating organisations.

Chapter 1: Overview of the thesis

1.1 Introduction

Salmon farming[1] in Scotland emerged around 30 years ago and since then it has grown substantially, supporting economic and social development in the most remote parts of Scotland. During that same period it became an important symbolic battleground between business and environmental pressure groups. Salmon farming is perhaps an unusual environmental cause-celebre, as it differs in terms of volume, ownership structures, raw materials used, end product, location of operations from other environmental hate figures, e.g. nuclear energy, chemical companies, oil companies, car manufacturers, fast-food chains (see for example *Klein 2001, Monbiot 2001*). Much of the debate on salmon farming takes place under the media's gaze. The newspaper headlines presented in section 1 are part of the media response to a recent scientific study (*Hites et al, 2004*) that reported Scottish Salmon heavily contaminated and dangerous for the public health.

There is general consensus that salmon farming has the potential to negatively impact on sensitive marine coastal ecosystems and consequently is subject to a complex network of laws, regulations, and voluntary certification schemes. SSGA has identified 369 pieces of European legislation affecting aquaculture. However, there is considerable disagreement on the effectiveness of this regulatory regime.

Much of the discourse surrounding the salmon sector is concerned with the safety of consuming farmed salmon. Chemical additives and pollutants in salmon-feed, chemical residues from disease and parasite treatments, artificial flesh colouring pigments are the subject of constant debate over their impact on human health. The quality of the farmed salmon relative to wild salmon in terms of taste, texture, vitamins, fat content, essential fatty acids, is also hotly debated (see for example "Ten reasons to boycott farmed salmon this Christmas", *www.salmonfarmmonitor.org*). Debates also rage on the use of genetically modified salmon and the use of genetically modified soy oil in salmon feed.

The contested nature of salmon farming exhibits many of the characteristics described by Beck's Risk Society thesis (*Beck 1992a, b, 1995, 1996 see also Giddens 1991, 1994a, b, Lash 1993, 1994a, b, 2000, Lash & Wynne 1992, Wynne 1989, 1992, 1996*) and the interviews undertaken for the purposes of this thesis revealed risk as a recurring theme. This study does not

[1] Salmon Farming includes hatcheries, smolt production, on-growing of smolts in sea-water, processing, (including smoking), packing and marketing (see for example *Laird et al 1988, Mills 1989, FRS 2001*).

primarily aim to attempt to resolve the salmon farming problematique, but to examine how farmers perceive and manage their risks in the field and in particular why some of them adopted one specific risk management strategy (i.e. organic production methods).

Organic salmon production should significantly reduce environmental risks to the local marine ecology; it should be free from chemical residues, removing many of the health risks from its consumption; it should not be genetically modified nor consume genetically modified ingredients. As organic salmon should be reared in conditions as close as possible to wild salmon, differences in the quality should be minimised. On the surface organic salmon production addresses the criticisms of conventional salmon farming. This study investigates the decision processes of farmers regarding organic production and attempts to understand the absence of environmental accounting, subsequently suggesting how environmental accounting may improve risk governance in the salmon farming sector.

In the context of the wider thesis, chapter 1 is structured as follows; the next section presents the notion of risk through the premises of the "risk society thesis" exponents[2]. The notions of environmental risk, sustainability and accounting information are fundamentally intertwined. Arguably accounting information[3] exists to provide information to aid decision-making concerning environmental sustainability in the face of uncertainty. For this reason an introduction of the notions of sustainability and accounting, which are discussed in more detail in the literature review chapter of this thesis, takes place in sections 1.3 and 1.4 respectively. Section 1.5 gives an overview of organic production in fish farming focusing on problems of implementation and definition of the former within that context, alongside an overview of associated literature. The chapter finishes with an overview – discussion of the expectations the researcher had at the beginning of this work, and a flavour of the findings.

1.2 Salmon farming and risk – an introduction

At the beginning of this project the researcher was intrigued by the interpretive power and possibilities offered by the Cultural Theory paradigm[4]. Ways were sought on how to operationalise and perhaps measure the different cultures existing in the salmon farming risk arena in accordance to the grid/group typology described by Gross and Rayner (*1985, p 7*)[5].

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[2] The respective sociological school of thought is further discussed in sections 3.2.2.2, 3.2.2.3, 4.3.1.2, and 4.3.1.3.

[3] Accounting is the process of identifying, measuring and communicating financial information about an entity to permit informed judgments and decisions by users of the information (*Weetman, 2003, p 4*).

[4] Discussed in section 4.4.4.

[5] See also section 4.4.4.

Gross and Rayner (*1985*) in their book *Measuring Culture: a paradigm for the analysis of social organisation,* develop in detail an example in their effort to measure the different risk cultures, which is concerned with the reactions of people to high-technology risk. A similar method was initially seemed ideal for organising and interpreting the data gathered in the typologies described by Cultural Theory, since at least three different cultures could be identified existing in the salmon farming risk arena. Each of the interviewed organisations could more or less be grouped in one of the individualist, hierarchist, or egalitarians myths, whereas the fatalists could by definition lack existence (since anyway there is nothing they can do but carry on living and hope for the best[6]).

However, that grouping and the associated analysis and interpretation of the data was deemed by the researcher as perhaps not robust enough and particularly open to criticisms (see *Rayner 1992, p 98 -113)* especially when the stories "told" by the different in the arena actors seemed to be explained too well by the writings of the exponents of the "risk society" thesis (mainly *Beck 1992a, b, 1994a, b, 1995, 1996, Beck et al, 1994, and Giddens 1990, 1991, 1994a, b, 2002*[7]) who are primarily interested in the ways in which the concept of risk is related to the conditions of late modernity. This perspective offers an approach that considers the politics and macro-level of the current meanings and strategies of risk and focuses on processes such as individualisation, reflexivity and globalisation as converging in the risk society of western nations (*Lupton, 1999, p 58*). In the continuation of this section the risk debate described in Chapter 6 will be examined through these writings.

1.2.1 Risk society

Beck (*1992a*) in his seminal work *Risk Society* gives a clear picture on how contemporary risks can mobilise stake-holding parties in a risk arena. Application of Beck's thesis to the risk perceptions and debates occurring in the salmon farming arena provides insight and explanation of the a fight between a regulatory – industrial lobby and public interest groups on the grounds of environmental risks and science.

Beck starts his thesis by arguing that in the contemporary era (termed as advanced modernity) the social production of wealth is systematically accompanied by the social production of risks. Accordingly, the problems and conflicts relating to distribution in a society of scarcity overlap with the problems and conflicts that arise from the production, definition and distribution of techno-scientifically produced risks. People are no longer only concerned with making nature

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[6] Adams (*1995*).

[7] But also Lash (*1993, 1994a, b, 2000*), Lash & Wynne (*1992*), Wynne (*1989, 1992, 1996*), whose work is discussed in section 4.4.1.

useful, or releasing mankind from traditional constraints, but also and essentially with problems resulting from techno-economic development itself. Modernisation in that way is becoming *reflexive* in the sense that it is becoming its own thing; questions of employment and the development of technologies are being eclipsed by questions of the political and economic management of the risks of actual or potential utilised technologies. The promise of security grows with the risks of destruction, and it must be repeatedly reaffirmed to an alert and critical public through cosmetic or real interventions in the techno-economic development and practice. The social positions and conflicts of a wealth-distributing society begin to be joined by those of a risk-distributing society (*Beck, 1992a, p 19 – 20*).

The ecological and technological risks of the contemporary societies are seen as potentially catastrophic for all life, no longer tied to their places of origin. As a result the normative basis of their calculations, as it has been established by science and legal institutions, collapses. Dealing with the consequences of the modern productive and destructive forces (which often outlast generations) in the normal terms is perceived as a false but nevertheless very effective way of legitimising them (*ibid.: 22*). The public does realise that but the debate on the pollutant and the toxic elements as well as on the destruction of nature and the environment, in general, is still dominated by the terms and formulas of natural sciences (in technocratic and naturalistic ways concerned only about pollutant levels per se). Subsequently, by hiding the social, cultural and political risk dimensions of modernisation the public is misled with false notions of safety. Investigations starting from individual pollutants can never determine their concentrations in people. What may seem insignificant for a single product is perhaps extremely significant when collected in the consumers' reservoirs (*ibid.: 24*).

People's awareness and opposition is raised by personal experience and by gradual admission to the problems. Harmless things (for example, wine, tea, pasta, fish) turn out to be dangerous and are labelled carcinogenic. The once highly-praised sources of wealth such as the atom, chemistry, genetic technology, or the salmon farming industry in the Scottish rural areas for example, are transformed into unpredictable sources of danger, whose obviousness places more and more obstacles in the way of customary routines of minimising and covering up. The agents of modernisation in science, business, and politics find themselves placed in the position of a denying defendant with technological risks being not anymore a threatening possibility but a fact in abeyance. People in the western world are often prosperous, living in society of mass consumption and affluence; they are often well educated and informed but they are afraid. They feel threatened and organise themselves in order not to let the only possible test of their realistic-pessimistic visions of the future ever happen or to actually prevent it, because a confirmation of the danger would mean irreversible damage and perhaps self-annihilation. It is this argument that transforms the projected threat into a concrete one. The problems emerging

require either a focused and massive policy of counter-interpretation or a fundamental rethinking and reprogramming (*ibid.: 51 – 52*).

Technocrats still believe that the majority of the public reacts this way due to a lack of knowledge. As Beck puts it, the public is seen as behaving like engineering students in their first semester. They are ignorant but well-intentioned, hard working but without a clue. In this view the population is composed of nothing but would-be engineers, who do not yet possess sufficient knowledge. When they do they will share the experts' viewpoint and assessment of the technical manageability of risks and thus their lack of risks.

Protests, fears, criticisms, or resistance in the public sphere become purely a problem of information: If the public knew what the technical people knew they would be put at ease. Otherwise they are just hopelessly irrational (*ibid.:58*). Something that it is perhaps well demonstrated in the salmon farming risk arena from the industry's and the regulators' views that the stakeholders' reactions are only there because they do not really know what aquaculture and the associated monitoring science and regulation are all about; thus, what it is really needed is better communication with them (so that they could be persuaded).

The tri-partite and ministerial working group initiatives[8] were not brought forward to change the existing environmental science and regulation (though this may happen in the future). The Scottish Environment Protection Agency (SEPAD and SEPAA) admitted that there is always space for improvement, despite their confidence that current standards are good enough tools to base Scotland's environmental policy upon. However, as SEERADFG has put it, the solution is "to improve the communication between the industry and the environmental groups and reduce the existing noise[9]".

However, Beck refutes this confidence. Even in their highly mathematical or technical garb, statements on risk contain statements of the type that "*this* is how *we want to live*"; statements to which the natural and engineering sciences alone can provide answers only by overstepping the bounds of their disciplines. But then the tables are turned. The non-acceptance of the scientific definition of risks is not something to be reproached as irrationality of the population, but on the contrary it indicates that the cultural premises of acceptability contained in scientific and technical statements on risks are wrong. The technical experts are mistaken in their empirical accuracy of their implicit value premises, specifically in their assumptions on what

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[8] Collaborative forms between representatives of the industry, rule enforcers and other stakeholders at local and national level with an aim to discussing the impacts the salmon farming industry has (environmental, social, economic) in order to form a forward strategy for the development of the latter.

[9] See chapter 6.

appears acceptable to the population. "*The talk of a false, irrational perception of risk in the population underlines that mistake. Risk experts withdraw their borrowed notions of cultural acceptance from empirical criticism, elevate their views of other's people notions to a dogma and mount this shaky throne to serve as judges of the irrationality of the population whose ideas they ought to ascertain and make the foundation of their work and in that way falsify history of progress*" (*ibid.: 58*).

The origin of the critique of science and technology lies not in the irrationality of the critics but in the failure of techno-scientific rationality to address the growing risks and threats from civilisation. This failure is acute at present and threatening the future and it arises, not from the failure of individual scientists or disciplines, but is systematically grounded in the sciences' institutional and methodological approach to risks. As they are constituted with their overspecialised division of labour, their concentration on methodology and theory, their externally determined abstinence from practice, the sciences in their present form are entirely incapable of reacting adequately to civilisation risks. Since they are prominently involved in their origin and growth, they have become legitimating patrons through the "see no evil, hear no evil, smell no evil, know no evil" dogmas (*ibid.: 58*).

Beck continues by trying to explain the environmental risk debates that are dominated by the prevailing techno-scientific rationality, whilst exposing his beliefs about the legitimisation of environmental risks occurs at the level of regulatory agencies and science. *Economic blindness on risks*, results in *the voice of the side effects*, while at the same time *scientific causal denials of risks* and the *phony trick of acceptable levels* endanger all life. Laypeople understand all these, organise themselves and resist the established scientific thought.

It is argued that a type of productivity-raised knowledge interest prevails historically in scientifically directed technological development, an interest which is related to the logic of wealth production and it remains embedded in it. However, in the effort to increase productivity, the associated risks have always been neglected, with the first priority of techno-scientific rationality being utility for productivity with the hazards connected with it being considered only later if at all (*ibid.: 60 – 61*). While this mentality induces opportunities it has the potential to make people ill. Citizens join together in order to put pressure and face the reality scientists call "latent side effects" and unproven connections" because these side effects have voices, faces, eyes and tears. Yet they soon learn that their own statements and experiences are worthless as long as they collide with the established scientific establishment and accepted knowledge.

Therefore, people, out-with the scientific establishment, become small, private alternative experts in the risks of modernisation. For them risks are not just risks but suffering. Modernisation risks, for which no-one is really responsible in a highly professionalised system where everyone has his own small responsibility, now have an advocate. Individuals start to collect data and arguments. The risks which remained unseen and unproven for the experts quickly take form under that cognitive approach. People prove that measurement results only fall within the "acceptable" scope because the peak values from heavily impacted areas are averaged in with values from less contaminated areas and are thus calculated away (*ibid.: 61 – 62*).

Scientists, however, keep insisting on the quality of their work and keep their theoretical and methodological standards high in order to assure their careers and material success. Their denial of the lack of causal connections may be praiseworthy for them; but for the victims such a mentality multiplies the risks to which they may be exposed. One is concerned here with dangers to be avoided, which even at low probability have a threatening effect. If the recognition of a risk is denied on the basis of an unclear state of information this means that the necessary counteractions are neglected and the danger grows. By turning up the standards of scientific accuracy, the circle of recognised risks justifying action is minimised, and consequently, scientific licence is implicitly granted for the multiplication of risks. Insisting on the purity of the scientific analysis leads to environmental pollution and contamination; it results in a covert coalition between strict scientific practice and threats to life encouraged or tolerated by it (*ibid.: 62*).

The insistence on elevated validity criteria is seen as a highly effective and thoroughly legitimised construction meant to dam and channel the flood of risks but with a built-in screen that increases their growth in inverse proportion to their successful de-recognition. Under these circumstances, a liberalisation of the causality proof would be like a bursting dam and would imply a flood of risks and damages to be recognised that would rock the entire social and political structure. For that reason the prevailing regulatory mentality remains to the use of the so-called "polluter pays principle" as the channel for recognising and dismissing risk. However, that cannot generally be adequately interpreted according to this principle since there is not one polluter but pollutants everywhere for which, one can only consider a number of causes. Anyone who insists on strict proof of causality under these circumstances is maximising the dismissal and minimising the recognition of industrially caused contaminations and diseases of civilization. In that way scientists defend the "high art of proving causality", by blocking citizens' protests, keeping down costs for the industry, and keeping politicians' backs off the wall, but in reality they open the floodgates for a general endangering of life. In addition to that

anyone who insists on strict causality denies the reality of connections that exist nonetheless (*ibid.: 62 – 63*).

Beck continues his analysis by attacking the techno-scientific rationality on the grounds of the practices of scientists. He argues that "acceptable level determination" or "maximum concentration regulation", are both expressions for not having a clue. Acceptable values may prevent the worst from happening but at the same time are partly seen as "blank cheques" to poison nature and mankind. Acceptable levels are seen as nothing but the permissible extent for poisoning which disappears behind the "acceptable value" label and makes possible a permanent ration of collective standardised poisoning which is declared as harmless. The controversy therefore relates to the regulatory-scientific rationality's failing to question ethics in a wide context, instead such rationality focuses on how far one of the most minimal rules of social life (not to poison each other) can be violated. It ultimately comes down to how long poisoning will not be called poisoning and when it will begin to be called as such (*ibid.: 64 – 66*).

Behind the ethical issues though the way thresholds are determined for individual substances remains a scientific secret. Whoever would determine threshold values of toleration must take into account that people and nature are the collecting vessels for all sorts of pollutants and toxins and that there are summation and synergistic effects involved to which there is mainly indifference shown during their setting of the standards (*ibid.: 66 – 67*).

The risk consciousness of the afflicted which is frequently expressed in the environmental movement, and in criticism of industry, experts and culture (such as in the case of the salmon farming risk arena[10]) is usually both critical and credulous of science. Risk consciousness, thus, is neither a traditional nor a lay-person's consciousness but it is essentially determined by and oriented to science. For in order to recognise risks and make them a reference point of thought and action it is necessary that invincible causality relationships should be immunised against the objections that are always possible (*ibid.: 72*).

1.2.2 Reflexive scientisation - modernisation

When modernisation risks have successfully passed through the process of social recognition, the order of the world changes even if little activity occurs at first. The limits of specialised responsibility fall. The constructions for neglecting the dangers collapse. The public gets a say in technical details. Businesses previously seen as the benefactors of social units are suddenly under public scrutiny. Markets collapse, costs become due, prohibitions and trials loom,

[10] See chapter 6.

pressure develops to renew the technical production system from the ground up and the voters run away. Economic and technological details are investigated in the light of a new ecological morality (*ibid.: 76 – 77*).

Where modernisation risks have been recognised they develop an incredible political dynamic. Problems suddenly explode in the public domain creating challenges for action. People emerge from behind the conditions and objective constraints. Causes turn into causators and issue statements. Side effects speak up, go to court, assert themselves refuse to be diverted any longer. These dynamics of risk politicisation produce risk consciousness and conflict. This might not automatically help to counteract danger but it opens up previously closed areas and opportunities for action. A political explosion takes place with their recognition. Things that were possible yesterday suddenly face limits today. Acceptable exposures turn into intolerable sources of hazards. What was recently beyond the possibilities of human intervention becomes now a part of the scope of political influence. Where danger becomes normalcy it assumes permanent institutional form and a partial redistribution of power is thus achieved (*ibid.: 77 – 78*).

Solutions on modernisation hazards can only be provided through the reflexivisation of the scientific thought and the associated opening up of the established political system. As described earlier science is one of the main causes of contemporary risks. It is the medium of definition and the source of their solutions. In its reflexive phase, it is confronted with its own products, defects, and secondary problems. Scientific scepticism is applied to its inherent foundations and external consequences. In that way both its claim to truth and its claim to enlightenment are demystified and changes in internal and external relationships of scientific work come into being through the demarcation between experts and laypeople. Scientific civilisation subjects itself to a publicly transmitted criticism that shakes its foundations and its own self-conception. In that way it reveals a degree of insecurity with respect to its foundations and outcomes and a process of demystification of the sciences starts in the course of which its structure, practice and the public sphere can be subjected to a fundamental transformation. As a consequence a de-monopolisation of scientific knowledge claims comes about. Science becomes more and more necessary but at the same time less and less sufficient for the socially binding definition of truth (*ibid.: 155 – 156*).

Science as it encounters itself in both its internal and external relationships begins to extend the methodological power of its scepticism to its own foundations and practical results. The claims to knowledge and enlightenment are systematically scaled back in the face of the successfully advanced fallibilism. Demystification spreads to the demystifier and in so doing changes the conditions of demystification. At the same time the flood of conditional, uncertain and detached

detailed results increases and becomes impossible to survey. This hyper-complexity of hypothetical knowledge can no longer be mastered by mechanical testing rules. Even substitute criteria such as reputation, type and place of publication, institutional basis also fail. As a result the target groups and appliers of scientific results in politics, business and the public are turned into active co-producers in the social process of knowledge definition. Its objects also become its subjects in the sense that they must actively manipulate the heterogeneous supply of scientific interpretations. The respective choices can be played off against one another and they must in any case be recombined into an image suitable for action. In that way reflexive scientisation opens up new possibilities of influence and development in the processes of production and application of scientific results for the target groups and appliers of science (*ibid.: 156 – 157*).

Sciences can no longer remain in their traditional enlightenment position of taboo breakers but they must also adopt the contrary role of taboo constructors. The further scientisation proceeds and the more clearly risk situations and conflicts enter public conscience, the greater the pressure becomes to act and the more techno-scientific society threatens to turn into a scientifically produced taboo society by excluding more and more sectors, agencies and conditions from this expectation of change. Accordingly, these contradictory expectations stir up conflicts and divisions. Even the foundations of scientific rationality are not spared from the generalised demand for change. It is precisely reflexive scientisation which makes the self-imposed taboos of scientific rationality visible and questionable with particular importance on whether the power of that scientific specialisation will be discovered anew and be developed. It is important as to what extent when dealing with risks of modernisation the treatment of the symptoms can be replaced by genuine removal of the causes. That is to say that what matters is whether risks and threats are methodically and objectively interpreted and scientifically displayed, or whether they are downplayed and concealed (*ibid.: 157 – 158*).

Giddens' view[11] is in agreement with Beck's on environmental risks and reflexive scientisation as a possible solution. The key features for modernity are institutional and individual reflexivity combined with the reorganisation of space and time and the expansion of disembedding mechanisms. Modern reflexivity for both individuals and institutions involves awareness of the contingent nature of expert knowledge and social activity, their susceptibility to revision and change. The conditions of modernity depend upon trust, vested not in individual but in abstract capacities.

People cannot simply rely on "established" knowledge anymore, to conduct their everyday lives. Rather they must look principally to experts they do not personally know and are unlikely

[11] See for example: Giddens (*1990, 1991, 1994a, b, 2002*).

ever to meet to supply them with guidelines. The doubt about the validity of knowledge means that all knowledge is open to revision. Greater knowledge has led to greater uncertainty, hence the continual reflexivity of individuals and institutions, is needed. Local practices need to be examined and reformed in the light of incoming information about those very practices, thus constitutively altering their character. As knowledge is constantly being revised the processes of reflexivity are more complicated and uncertain. For this reason the reflexive project of self-identity requires consideration of risks as filtered through contact with expert knowledge (*Lupton, 1999, p 72 - 77*).

This highlights the importance of trust in everyday life. What can be called active trust becomes increasingly significant to the degree to which post-traditional social relations emerge. It is trust that has to be energetically treated and sustained and it involves the generating of community in a more active sense. Trust has to be won and actively sustained and in large organisational contexts depends upon a more institutional opening out with the autonomy involved be understood in terms of responsibility and bottom up decision-making. The prime influence has to be the expansion of institutional reflexivity. Even in the domain of expert systems active trust becomes more prominent. This happens partly because of the divisions within, and contestations of expertise. Wherever there is scepticism, wherever there is an awareness of the disputes that divide expert authorities, mechanisms of active trust proliferate. New forms of regulation affecting expert systems form a major area of confrontation in the area of sub-politics (*Giddens, 1994, p 186 – 187*).

The disembedding characteristics of abstract systems mean constant interaction with absent others, whose actions directly affect features of one's own life. However, if expert knowledge fails, the repercussions extend far beyond the local context. People are thus required to be more challenging of expert knowledge, where experts must win and maintain the trust of the public. Trust presupposes awareness of risk, offering reliability in the face of contingent outcomes and thereby serving to minimise concern about possible risk[12]. Without trust, people could not engage in the "leap of faith" that is required of them in dealing with these expert knowledge systems of which they themselves have little understanding or technical knowledge because they have not been trained in them (*Lupton, 1999, p 77 – 78*).

In addition to Beck's and Giddens's writings other theorists[13] have come to employ reflexive social dynamics in developing more explicit models of social change. For example, in

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[12] A theme that is clearly suggesting that if trust between stakeholders and regulatory and certifying mechanisms in the salmon arena is established through participation of the former in the setting up of the latter then relationships between the industry and other stake-holding groups will probably improve.

[13] For a more detailed analysis of reflexive modernity see Shenkin (*2005*).

"*Reflexive Modernisation: Politics, Tradition and Aesthetics in the Modern Social Order*" (*1994*), Beck, Giddens and Lash develop various notions of social reflexivity, and describe how these are involved in social reconstruction and the change processes of modernisation. Underpinning these different types of reflexivity are two themes: a) that reflexivity emerges in the wake of the freeing-up of social agents from the auspices of social structures; and b) that this process lays the foundations for reconstructing the social space around more flexible, adaptive, and self-monitoring systems.

Lash, for example, suggests that reflexive conditions arise as subjects become more autonomous, free from the historic structures of their social world. This freedom creates a theoretical space in which to consider the transfer of power. As these subjects join together normally via sub-political processes[14] (*Beck, 1992a*) they are able to assume powerful roles in processes of social change. As Lash suggests, reflexive knowledge constructions create new objects into new structures, creating means for individuals/collectives to participate in critical models of democracy and intervention. Alternative models are actualised in the field, and create new dynamics and new potentials for reform within its systems. Change dynamics are revealed by drawing on theories of reflexive modernisation, in particular the self-monitoring capacity of autonomous social spaces (*Bebbington and Thomson, 2005, p 3*).

In theories of reflexive modernisation, while challenges to the orthodoxy are often located in the reflexivity of systems of institutional control, they often come to bypass these systems, achieving effective enforcement within sub-political movements of social and political intervention. Giddens (*1991*) describes an alternative strand of self-reflexivity, where individuals come to adopt critical roles in their search for ontological security in an increasingly unpredictable social space.

Beck (*1992b*) develops this further, suggesting that the transitions experienced in recent periods of modernisation force individuals to take responsibility for social risks. As it appears the very processes of atomisation which transfer social responsibility away from institutional structures similarly constrain the potential for societies to externalise accountability. In Beck's "Risk Society" (*1992a*), accountability only becomes reinstated when individuals adopt new roles as the critical bearers of social inquiry. In a fully-reflexively society, processes of atomisation actually promote new modes of social cohesion by creating new spaces for socialisation, as in order to exercise critical stances individuals often affiliate themselves within peripheral movements, and thus are organised around collective structures of social organisation and intervention (*Bebbington and Thomson, 2005, p 3 - 4*)

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[14] See section 4 in the introduction for the meaning this notion carries in this thesis.

Within the context given through the premises of the risk society thesis the notions of sustainability and social and environmental accounting (SEA) will be briefly introduced in the continuation of this chapter.

1.3 What does sustainable mean?

The concept of *sustainability* was first introduced in 1987 by the Bruntland Report (United Nations World Commission on the Environment and Development) which was defined as the fact that humanity must: *"Ensure that [development] meets the needs of the present without compromising the ability of future generations to meet their own needs"* (*WCED, 1987, p 8*).

Since then it has become a core concept in any discussion of humanity's interaction with the physical environment (see for example: *O'Riardon, 1994, p 4 – 6; Bebbington et al, 1994a, p 2; Bebbington and Thomson, 1996, p 1; Marien, 1994, p 115; Gray, 1990, p 7 – 10*). Sustainability is seen as a benchmark against which to assess human actions. Such assessment is likely to be associated with one of the three elements of sustainability: environment, society and the economy, which will then be contained within a framework upon which actions can be evaluated. The environment is of particular importance because it provides physical resources and most importantly the ecosystem service upon which all of humankind depends.

Despite the concept's universal acceptance, disagreement exists concerning its meaning, the process whereby the concept could be enacted and the general implications for the way in which human life is ordered (*Gray and Bebbington, 2001, p 295*). Sustainability is connected to 'development', and this association has caused many debates surrounding the meaning of 'sustainable development' (see for example *Bebbington et al, 1994a, p 8; Bebbington and Thomson, 1996, p i*). However, the combination was necessary due to the concern that many activities undertaken in the name of development have squandered the resources upon which the development is based.

Gray and Bebbington (*2001*) believe that humanity is unlikely to ever know if a state of sustainability has been reached or can be maintained. This does not mean people should not strive towards the prospect of sustainability. However, a further barrier to ever reaching the utopian state of sustainability is the world's rapidly growing population. Therefore, although the end may not be in sight people should still try to make their lives as individuals more sustainable.

An issue involves the conceptualisation of the so called "sustainable development" as discussed by Gray and Bebbington (*2001, p 295,* see also *Bebbington et al, 1994a and Bebbington and*

Thomson, 1996). The negative connotations arising from 'development' (namely that of growth, exploitation and all the things that led to the call for 'sustainability' in the first place) could lead to the thought that 'sustainable development' can be viewed from a 'business as usual' point of view (see for example: *Cooper and Thomson, 2000; Cooper et al, 1992; Cooper, 1992; Tinker et al., 1991*). Sustainable development should be seen rather as the process whereby people move away from unsustainablity. Concerns about sustainability must be based on ethical and moral obligations towards future generations, not merely on personal self-interest. Sustainability ties together environmental, social and economic concerns, as well as generational equity, to become a concept to be used on a local and global scale.

Due to the introduction of the concept by UNEP (United Nations Environment Programme: *www.unep.org, 25/9/2002*) it could be argued that only large international organisations, such as the United Nations, must undertake the pursuit of sustainability. However, everyone is a part of society and all depend on the environment, thus everyone should be actively involved in the pursuit of sustainability, otherwise the environment and in turn society could be destroyed in the fight for short-term economic gain. If private sector involvement grows it is possible that such destruction could escalate as increased importance is placed on economic factors. Gray and Bebbington (*2001*) reiterate the fact that sustainability is a global concept, but they state it is unlikely that an international government agreement will ever be forthcoming. However, the authors do not discourage attempts to be sustainable, instead they state that any moves towards sustainability will be achieved by unilateral actions of nations, regions, corporations and individuals and action groups. It is important that people at all levels get involved in the move towards a sustainable existence, because benefits will be reaped along the way.

By placing importance on equity within and between generations, sustainability and its related development are dependent on people extending their time horizon, whereby they concentrate on the long-term benefits of development rather than short. Overall, the success of sustainability depends on the proper incorporation of environmental concerns into economic and social policy, rather than demoted in favour of economic factors (*Cooper and Thomson, 2000*). Without society or the environment, money and economies would have neither value nor meaning, thus sustainability is important because it attempts to merge the goals of economics with social and environmental issues, to benefit future generations around the world.

1.4 Sustainability, traditional accounting and social environmental accounting (SEA)

Sustainability is a complex notion involving many conflicting factors[15] conceived to possess economic, social, psychological, cultural, moral and political dimensions. As argued by the exponents of the "risk society thesis" knowledge is a critical part of the move towards a sustainable future and this knowledge base must consist of scientific, technical, political, economic, ethical, and philosophical elements. There is a need to evaluate the extent of the existing current knowledge, future knowledge requirements and how to activate and communicate that knowledge. Knowledge is required about the key economic, social and environmental problems, how serious these problems are, and what are the associated risks and causes. It will be necessary to clarify degrees of uncertainty and to identify critical areas of ignorance. Accounts form an important part of this knowledge-gathering and communication process.

Sustainability is not a scientific problem though and cannot be solved objectively. In practice many of the decisions will be made of the basis of estimates and guesswork. It is unlikely that there will be clear-cut good and bad alternatives instead choices will be made as a compromise between different benefits and costs for different people at different times. Such decisions involve value judgments concerning the priorities and actions of society rather than scientific and economic precision. Traditional accounting can be seen as a construction of a particular political-economic paradigm[16] that excludes many of the factors and concerns that could be embedded within a sustainable paradigm (*Cooper and Thomson 2000, p 3 – 4*).

Accounting has been traditionally linked with financial and manufactured capital, and has been used for the provision of economic information and the evaluation of the wealth generated from these types of capital. However, no such equivalent information generation or valuation had been undertaken for human or natural capital, thus ignoring the society and the environment upon which the economy is dependent. Instead, these forms of capital were viewed as externalities (being in abundance and/or problematic in their evaluation) and were not included within business accounts since financial wealth was deemed of greater importance, than society and the environment.

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[15] Sustainability can be characterised as: multidimensional, multidisciplinary, and multisectoral; with non-monetary and monetary dimensions; extending across politico-geographical boundaries and time; involving conflicts between interests and ideologies; and involving uncertainty and risk (*Cooper and Thomson, 2000, p 3*).

[16] One falling mostly within the boundaries of the techno-scientific rationale of risk perception as this is described in section 3.2.2.1 and in chapter 4.

Accounting was seen in the past as being primarily concerned with the identification, measurement, recording and communication of economic information about an organisation in order to educate interested parties. Emphasis was placed on the accumulation of profits, and the users of the information were solely those recognised by the agency theory (*Jensen and Mecling 1996)*, in other words managers and shareholders of economic organisations. The field was seen as an important one in providing information for decision making, but also as detrimental in the knowledge construction of an entity according to a set of boundaries, theories and practices (influenced by the ideological function of capitalism) with dramatic implications for the issues within and out-with those boundaries.

This above situation calls into question the neutrality of accounting, and accounting information (*Cooper and Thomson 2000, Tinker 1991*), when used to make decisions. The exclusion of certain information by observing that traditional accounting ignores the social costs of environmental pollution, of resource exhaustion, or of project impact on cultural and ethical values implies difficulties inherent in the traditional field to account for social and environmental factors.

In addition, accounting (in any of its manifestations) is further criticised as a non-objective, -rational, -comprehensive, and -scientific process. Conventional accounts as a part of a political process form the basis of different political rhetoric, silencing those without power and distorting the message of those who challenge existing hegemonies. Accounting information is simplistic and offers a partial view of the context under examination; subsequently, conventional accounting is seen as part of the political problem of unsustainability and its reform is deemed as an important part of the solution process. As it plays a part in policy decision-making, it is important that those using such information are aware of its omissions and inadequacies. The negative social environmental impacts of conventional accounting should be identified and reduced by reforming the techniques for costing and valuing social and environmental activities (*Cooper and Thomson, 2000, p 18*).

Accounting occupies a key space between social, environmental and economic systems. Conventional accounting has been used to defend practices and for justification of the status quo by providing a very selective but powerful representation of the entity's identity through the detailed language of accounting. In that way the categories through which policy makers perceive their territory are provided. Making the social and environmental impacts of political decisions more transparent through the existing accounting system is deemed critical for good political decision-making.

Conventional accounts do not inform about the future and potential social and environmental costs and benefits of decisions taken and they must either be reformed or ignored for decisions relating to sustainability. Many policy options relating to sustainability are systematically penalised or handicapped by the distortions of the existing accounting methods. The latter can never create a single set of figures that will wholly represent the sustainability problematique, which must be interpreted in conjunction with other accounting entities. However, conventional accounts must as far as possible reflect sustainability issues and users of these accounts must also be educated as to their partiality and often naïve simplicity if they are to play an effective part in the wider political process towards sustainability (*ibid.: 18 – 19*).

On the other hand, social and environmental accounting (hereafter SEA) does consider the social and environmental aspects of organisational behaviour (*Bebbington, 1999, p 150*). One of the expectations of this study involved the potential uncovering of such practice in the context of the salmon farming industry towards a transition to greener forms of production, however, this was found not to be the case[17]. SEA did not play an important role when deciding to venture into organic aquaculture production. There was however a general consensus between the stakeholders and the regulators for a need for improved accountability on the producers' side. Accountability that will perhaps not only inform the interested/affected parties (because of basic legislative needs) on the producers' practices thus legitimising them, but a form that will allow the sustainable development of the salmon industry at environmental, economical and social level.

In this light the contribution of Social and Environmental Accounting into the salmon risk arena as a move to a more environmentally sustainable production regime is examined in chapters 4 and 7. According to Dillard et al (*2005, p 1*) because of the devastated effects of unbridled industrial growth and development throughout the world, environmental issues are becoming significant societal risk factors. In the wake of countless disasters and the progressive degradation of earth's ecosystems society is beginning to demand a modicum of environmentally responsible behaviour on the part of business management. Traditionally the primary source for motivating environmentally responsible behaviour has been through regulation based on government mandate. However, recently there appears to be a growing willingness of some, albeit small, groups of consumers to demand that companies refrain from egregious and wantonly irresponsible and exploitative behaviour. As a result, the environmentally related issues with which a work organisation is held accountable have expanded beyond those associated with the failure to comply with regulation to include missed market opportunities from not accurately anticipating consumer demand, failure to live up to societal expectations with respect to environmental stewardship, and, in some cases, the

[17] See chapters 6 and 7.

destruction of sustaining resources. Prior to such a discussion however, the following section seeks to introduce the notion of SEA as an important addition to conventional accounting's practices.

Bebbington (*1999, p 141 – 185*) provides an overview of accounting's evolution from the first double-entry bookkeeping techniques to its current forms (such as SEA and accounting for sustainable development) and elaborates on the underlying theory and the associated critiques.

SEA differs from conventional accounting in its theoretical underpinnings and in the extent to which it views current societal structures as being socially and environmentally acceptable. Corporate Social Reporting (CSR)[18] can be defined as: "*the process of communicating the social and environmental effects of organisations' economic actions to particular interest groups within society and to society at large. As such, it involves extending the accountability of organisations (particularly companies), beyond the traditional role of providing a financial account to the owners of capital, in particular, shareholders. Such an extension is predicated upon the assumption that companies do have wider responsibilities than simply to make money for their shareholders*".

This definition can be interpreted to open up the scope of SEA to incorporate a wide array of possible accounts, not all of which would be recognisable as accounting. Particularly in this study one of the objectives was to try to identify the way(s) in which these social accounts are actually used and their relationship with what it is described as "more formal accounts" in an attempt to initial open up the analysis of the former possible accounts as a way to locate and evaluate the latter.

SEA, is usually restricted in four ways: first to formal (as opposed to informal) accounts; secondly to formal accounts that are prepared by organisations either for themselves or which are (less commonly) disclosed to others; thirdly the social accounting literature tends to assume that the reports are prepared about certain areas of activities (typically those which affect the natural environment, employees, and wider "ethical" issues which typically concentrate upon: consumers and products; local and international communities); fourthly, social accounts tend to assume that in addition to reporting to shareholders and other owners and finance providers, organisations should report to their "stakeholders" – the other internal and external participants

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[18] Terminology in this area is problematic with a variety of terms being used to encompass, broadly speaking, the same terrain. Therefore, it is common for SEA to also be described as corporate social reporting, corporate social accounting, social accounting (of which environmental accounting is viewed as a subset), or socially responsible accounting (*Bebbington, 1999, p 151*).

in the organisation who are normally assumed to be members of local communities, employees and trade unions, consumers, and the society at large (*ibid.: 153*).

A combination of the above definition and refining characteristics has led to the development of literature primarily concerned with the social and environmental effects of corporate activity and the impact of accounting in shaping corporate activity in a positive or negative manner; and the possible accountings which could emerge if the constraints of conventional accounting were relaxed. In this manner, SEA not only involves the provision of different types of accounts compared to conventional accounting, it also has a different conceptual base. In contrast to formal accounting's viewpoint that accounting information that provides a picture of the organisation which satisfies the information needs of shareholders, SEA adopts a neo-pluralist view of the distribution of power within society. A view which, once combined with the view that flows of information reflect the nature of society, raises three points: firstly, that CSR can be used to illuminate the extent to which our society is distorted in its power distributions and the way traditional financial accounting supports this essentially undemocratic structure and does so in a way that dismisses the social, ethical and environmental from consideration; secondly that CSR presents new ways of accounting that not only attempt to overcome these limitations but do so in a way that makes more about organisational life visible and, in so doing, makes organisations more transparent; and thirdly, that CSR should seek to achieve this in pursuit of enhancing a society's democracy via the development and discharging of accountability.

The focus on the provision of information concerning an organisation's impacts on its social and environmental surroundings may also be described as the discharging of an organisation's accountability. Accountability, therefore, entails the "*responsibility to undertake certain actions (or forebear from taking actions) and the responsibility to provide an account of those actions*" and provides the theoretical basis from which the content of SEA disclosures could be determined (*ibid.: 155*).

From the above discussion it is obvious that the success of SEA depends on a change in the underlying assumptions of accounting. This may involve the assertion that accounting can be involved in the process of identifying, measuring, and communicating information, but it does not have to be concerned with economics. It could adapt its outlook to focus on social and environmental issues and communicate such information to interested parties. In addition, by recognising that accounting does represent a certain stance (namely one associated with finance and economics), this latter could be altered to meet a more sustainable agenda rather than one linked to the pursuit of economic wealth. The success of such a transition would be dependent

on the explicit statement of the assumptions inherent within SEA and the engagement with criticisms of this new form of accounting, in order to move the debate forward.

In relation to the above, there is an assumption in the SEA literature that there is the existence of a "clear entity" and a "clear sustainable stakeholder". One of the areas tested in this study with further research implications was whether or not these notions exist in the context of the salmon arena. Questions investigated involved: "the entity" the stakeholders are concerned with; the nature of the "governance structure"; the notion of a "sustainable stakeholder".

The environmental debate is largely an epistemological debate which runs counter to the usual way of thinking about "economy" and thus "business" and "accounting". One could extend this argument and suggest that this debate runs counter the theory of capitalism, in its extreme form. Not everything can be sold in the markets and today, as the abundance of natural resources is depleted, sustainability may not be possible if the other forms of capital, upon which the economy relies, are not valued or accounted for. In the current economic world where perpetual growth is seen to be the ultimate goal, organisations cannot continue to ignore the services that nature and society provides. Therefore, the proponents of SEA must be aware of social and environmental issues and seek ways to educate business organisations and the public about the impact their respective activities have on the environment.

Boyce (*2000, p 53, as quoted by Ball and Seal, 2004, p 3*) argues there is a role for social accounting in "making public discourse, and ultimately, decision making more open, transparent, and subject to rigorous debate...."; and "...in its creation of ... social visibilities and exposure of values and priorities that become inputs to wider democratic processes of discourse and decision-making."

1.5 Salmon Farming and organics – an overview

In light of the research questions presented in section 3 of the introduction there was an initial expectation that examples of environmental account reporting and accountability responses to stakeholders' risk perceptions would be uncovered in the context of the salmon farming industry in Scotland. Before this discussion, however, an introduction to the notion of organics in salmon farming and a discussion of the associated literature will take place.

In recent years consumers' increasing concern over food safety, human health, animal welfare and the environment has led to a considerable increase in the demand and production of organic produce in many European countries. Until recently this attention had focused largely on terrestrial production, but with increasing seafood consumption consumers now take greater

interest in the ways their seafood is being produced or caught[19]. However, the principles applied in traditional agriculture are generally more difficult to implement in aquaculture; an area where there are many unresolved ethical and technical issues relating to animal welfare, chemical inputs and sustainability. Of fundamental concern is the extent to which the definition of organic might be applied to salmon and more importantly to the extent to which consumers perceive this to be applicable.

In contrast to the situation in most food sectors, volume growth in organic food has been dramatic. For example, between 1985 and 1990 the UK market grew tenfold. A similar trend has been observed in other European countries such as France where the sales of organic food rose by 30% between 1995 and 1997. In the EU and the US, the organic market grows annually at an estimated 25% – 30% and it is becoming more mainstream. Production of organic food has also been encouraged by the consumers willing to pay price premiums. In EU countries these premiums have been estimated to be in the range of 0% to 50% relative to conventional foods with most premiums being around 15%[20].

Despite this dramatic growth, in general, the organic market remains a small percentage of the overall food market, typically between 1% and 4%. The food industry's responsiveness to the growth of the consumers' demand for organic food has been hampered by inevitable long production times. Increased demand seems also, not to be met by suppliers. In some market sectors supply-side constraints have created trade imbalances. In the UK, for example, the trade imbalance has been exacerbated by a policy of organic agricultural support, less favourable than in most other EU countries. In Denmark, Germany and Netherlands the success of organic produce is due, partially, to greater assistance from the state.

The market for organic salmon, as highlighted, is relatively new, although organic salmon is commercially available in the UK and Germany. However, a critical issue concerns the criteria for usage of the organic term for farmed salmon. Economically, it seems that the success of organic salmon will largely depend upon the extent to which consumers perceive organic to be an applicable term and on the producers' ability to identify and develop segments that are willing to pay price premiums. However, issues of concern might involve that the existing organic food is generally more frequently consumed than salmon and it is uncertain how current or potential organic consumers will respond to organic salmon products. The distribution channel can potentially be longer than it is generally the case for organic food and the credibility

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[19] The emergence of organic salmon farms, albeit small scale, in Norway, Scotland and Ireland and the development of organic aquaculture legislation would suggest this to be so (*ORGSAL, 2000, p 2*).

[20] The reader can find in section 1.5.3 the results of the small-scale investigation carried out for the purposes of this research in the retailing prices of salmon products.

of organic salmon compared to organic foodstuffs that are produced closer to the consumers may be questionable. Also the final product will probably have to be distributed by agents who are generally not associated with organic products (e.g. fish importers), thus organic retailers or consumers may have less confidence in these suppliers (*ORGSAL, 2000, p 2 - 3*).

The development of organic salmon production is still at an early stage, with only a few salmon farms beginning to sell fish produced according to a set of interim organic standards. There is no appropriate data available to give a direct comparison between the physical or financial performance of salmon production under conventional and organic standards[21]. Only a limited amount of general information about what can be expected in organic production, from the experience of those who have begun to grow fish according to the interim standards is available. Due to that, there is potential only for a tentative exploration of the possible economic implications of the most significant aspects of the organic standards (i.e. the limits on the stocking rates; the constraints on the diets used; the constraints of the management of the broodstock and juvenile fish to artificially vary the seasonality of smolt production; the constraints on the fish-handling; and the constraints on the use of chemicals for disease control (*Sutherland, 2000, p 1*).

1.5.1 Organic regulation

Organic production started some 80 years ago. The first guidelines were established in 1928 by the bio-dynamic movement which developed in a response of a course to lectures that were given by Rudolf Steiner in 1924. The use of the symbol of the Greek goddess of agriculture, Dimitra, had been the first form of certification. A milestone in the development of the movement in the UK was the formation of the Soil Association in 1946. The latter laid down the first set of organic farming standards in 1967 and the International Federation of Agricultural Movements (IFOAM)[22] was founded in 1972.

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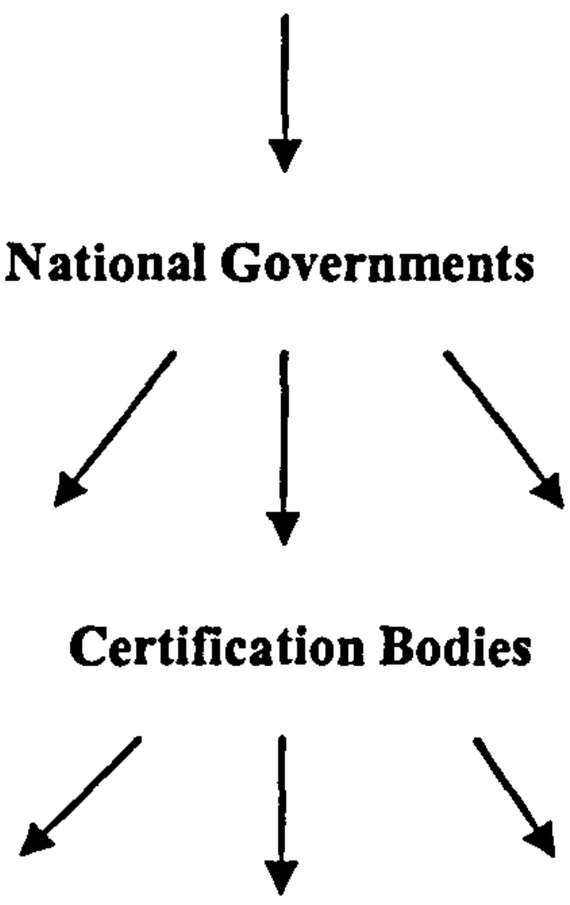
[21] The only existing study the researcher came across was that of Sutherland (*2000*) which tries to investigate how financial performance of conventional salmon farms will change if operations switch in organic aquaculture methods. However it was revealed by the associated fieldwork that salmon farmers had very little if at all knowledge of this governmental report. None of its issues of concern really bothered any of the producers who switched into organic production.

[22] IFOAM is a worldwide umbrella organisation of the organic agriculture movement, with about 630 member organisations and institutions in some 110 countries. It provides international organic production standards (IFOAM Basic Standards) which specify minimum requirements for organic farming and which influence the design of national regulation (*ORGSAL, 2000, p 3, 5*).

Figure 1.1: *The structure of organic regulation*



Source: ORGSAL *(2000, p 4)*

Legislative backing for standards for organic certification was provided first in France in 1980. The UK followed with the setting up of the United Kingdom Register of Organic Food Standards (UKROFS) in 1987. An official set of organic standards covering arable and livestock production, horticulture and the processing of organic products was compiled in 1993. (*Sutherland, 2000, p 1 – 2*).

During the 1990s EU regulations covering organic production came into effect. EC regulation 2078/92 covers agricultural production methods compatible with the requirements of the protection of the environment and maintenance of the countryside, and EC regulation 2092/91 covers the certification of organic food labelling. The EU legislation dictates the minimum standards for organic food production. However, these standards have been adapted from those that the various certification bodies support in certain member states. Particular key certification bodies (e.g. Naturland in Germany and Soil Association in the UK) originated as pressure groups. It was the evolution of these groups and the growth of the organic movement that made the requirement for standardised EU legislation an issue and necessity. A number of certification bodies have standards that exceed the minimum required under EU law.

Each member state government is required to oversee and enforce the EU legislation and each government is directly responsible to monitor the activities of the certification bodies[23]. These bodies are independent although they are beholden to EU and any national legislation regarding organic food and certification. Many of the larger and more influential certification bodies have close relations with comparable bodies in other EU or non-EU states. The number of such bodies in each country varies considerably. That fact raises questions about potential differences between standards. There are also issues of ambiguity, monitoring problems and consistencies involved. While all adhere to EU law, there is scope for considerable variation as these bodies do not use a universally agreed set of accreditation criteria to certify products but use various approaches, not necessarily all free from criticism.

Before 1999, there was no EU legislation concerning organic livestock and aquaculture. There were only standards for arable, fruit and vegetable production. However, in August 1999, the EC regulation 2092/91 was amended by regulation 1904/99 to cover organic animal husbandry, and came into force in August 2000[24]. But at the time of writing this thesis, fish had not been

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[23] The EU countries, the US and Canada all have certification schemes for production of organic food. Historically, regulations for organic production have been designed at the national level, with an independent certification body being responsible for certification and monitoring of farms (*ORGSAL, 2000, p 3*).

[24] Regulation (2092/91) came into operation in 1993 laying down European Organic Standards and required each EU member to appoint a Designated Inspection Authority to implement and/or police

officially included in the aforementioned amendments. So up to that point detailed EU regulation on the production of organic fish did not exist. This fact presented yet another source of ambiguity since the term organic had been coined to describe the production of crops and not livestock. The capacity for variance in terms of the rigor of standards exists for organic crops but the baseline regulations are enshrined in law (there is a lowest common denominator definition). Any variance in standards for livestock production or aquaculture is at the will and discretion of the various certification bodies and member state governments. The regulatory environment therefore is dominated by certification bodies with the prospect that national governments will become increasingly involved.

Some national standards do exist for organic salmon in some countries. For example, DEBIO (Norway) has certified at least one production unit. Naturland (Germany) has also certified at least one unit (in Ireland). In this sense the certification bodies are ahead of the EU and national governments. This mirrors the original development of the organic food market and is clearly potentially problematic. The umbrella organisation for national certification bodies (IFOAM) has recently initiated work on international guidelines, or more recently standards, for organic aquaculture. However, whilst Norwegian standards have been the basis both for the development of German standards and for the work being undertaken in IFOAM, there are instances of Norwegian exports failing organic product labelling in other countries (*ORGSAL, 2000, p 3 – 5*).

In the UK two certification bodies have actually produced standards for organic salmon: The Soil Association (*Soil Association 1999*); and the Food Certification Scotland Limited. The Soil Association drew up draft standards for aquaculture in 1989 in response to interest from fish producers. There was little actual development arising from that in the UK at that time, but organic fish farming initiatives did follow in the USA, Norway and Ireland. A resurgence of the interest in the UK since 1996, has led to the setting up of interim standards by the Organic Food Federation and by the Food Certification Scotland Ltd (the body responsible for the Scottish Quality Salmon certification scheme) in 1998, and by the Soil Association in 1999. An Organic Fish Producers Association was formed in 1999 (*Sutherland, 2000, p 3*). At present the Soil Association and the Food Certification Scotland Limited have submitted to UKROFS[25] their proposed Certification Schemes for Organically Produced Farmed Salmon. At the time of writing the main bulk of organic salmon was produced by companies situated in the "A" Islands which were licensed to produce organically farmed salmon in Scotland. However, more farms

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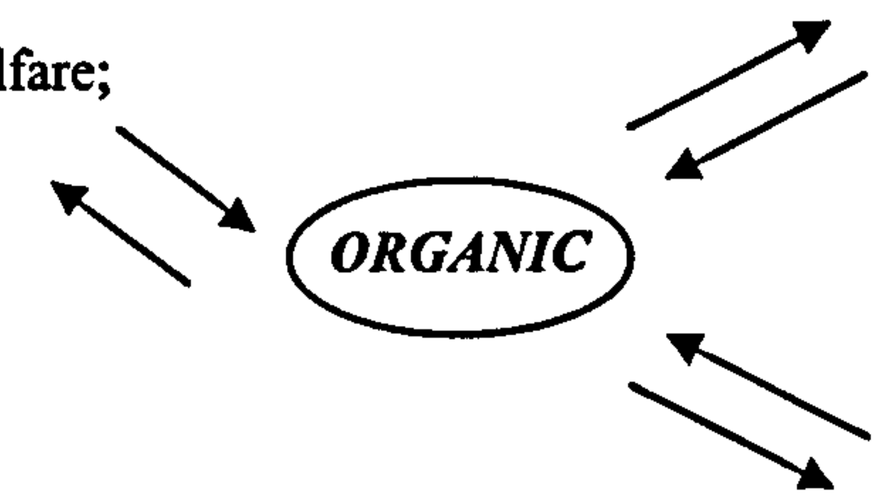
organic certification schemes to ensure that these standards are met. In the UK that role was given to UKROFS (*Sutherland, 2000, p 2*).

[25] However at the time of this project only the Soil Association had actually gone ahead implementing its interim standards (*SA*) and thus dominated the regulatory area of organic production in the UK.

Figure 1.2: *what does organic mean in terms of livestock production?*

Certification (institutional definitions).
- Adheres to four basic principles: welfare; natural inputs; safety; sustainability
- Certification



Consumer factors: concern for animal welfare & rights; no artificial chemicals and pesticides; safe, nutritious, unadulterated food; non genetically modified.

Production factors: non intensive; environmentally sound in balance with ecosystems; sustainable; labelling.

Source: ORGSAL (*2000, p 8*)

were thought to be in the process of conversion or at least considering the option as the market expands[26]. All the standards are interim and subject to revision in the future. This fact raises questions about the consistency of the currently used standards as far as the organic certification is concerned.

The general principles behind the currently available guidelines aim to avoid detrimental effects on the environment, restrict or ban the use of chemical/synthetic agents, ban the culture of genetically modified stocks and to maintain a high standard of animal welfare. The approaches taken by The Soil Association and the Food Certification Scotland Limited although they both aim to reduce impacts, they are slightly different. The Soil Association guidelines appear to be biased towards the health of the natural environment, whereas the Food Certification Scotland Limited guidelines take into account in a greater degree the salmon's producer perspective. Until these differences are standardised consumers may lack confidence about what is and what is not organic.

In addition to the ambiguities and inconsistencies of the current national organic aquaculture standards, there are complex definitional issues surrounding the term. Broad categories associated with "organic" can be seen in figure 1.2 and it can be identified an array of factors that potentially define the term. At the institutional level, the certification body is responsible for the labelling since this will impact on what organic means thereafter (so far the institutions have had the greatest say in what organic food represents and what should be). Issues of concern for consumers and other parties (such as animal welfare organisations and retailers) refer to whether these should have an input upon the production methods utilised, the labelling process, and the definitional issue of the organic term (*ibid.: 5 – 8*).

1.5.2 Implications of organic principles for "organic salmon"

1.5.2.1 Animal welfare

A key factor in the definition and regulatory framework of organic foods is the concern for animal welfare, rights and standards of livestock production. However, this is a complex issue in aquaculture as, at present, little is known about fish welfare and there is the question of whether fish should have the same rights as land animals.

Welfare is a general term embracing both the physical and mental well-being of the animal. It can potentially be defined with the use of the 'five freedom' principle. That is freedom from:

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[26] Information provided by the Soil Association in July 2003 showed 15 companies having been licensed to produce organic parr, smolts and on-grown salmon.

hunger and thirst; discomfort; pain, injury and disease; fear and distress; and freedom to express normal behaviour.

There are difficulties in applying welfare principles to fish and several points have been identified that need to be considered prior to designing regulatory frameworks. Perhaps the most immediate problem is how to measure fish welfare. Regardless of the precise definition of animal welfare, any single measurement is unlikely to provide sufficient information for a full assessment of an animal's welfare. Although stress hormones can be measured, they are not a significant measure of welfare and a combination of the level of these hormones and of the behavioural pattern is probably a better method to distinguish a useful concept of fish welfare. Approaches that combine various behavioural and physiological parameters could provide a more valid and balanced appraisal. However, further research is needed in this area before any realistic and meaningful regulations can be implemented.

It has been indicated that when key welfare considerations (such as reduced stocking densities and increased feed, handling and overall production costs) are taken into account, then production costs might rise depending always on the amount spent on additional feed and handling costs. Some farmers may switch to organic production regimes based on idealistic grounds. However, profit considerations are expected to be the dominant switch drivers (*Sutherland 2000*). For the organic product to be profitable, particularly for small producers, consumers will have to pay premiums. It is not known though whether the latter can differentiate that the salmon they purchase is organic. It remains to be seen whether consumers will pay price premiums for organic salmon.

Furthermore, even if consumers are willing to buy organic products it is not known if they will be willing to buy organic salmon. There may be a difference between consumer perceptions of agricultural and aquaculture products, meaning that they are not directly comparable. Improving fish welfare may not be deemed as important enough to purchase organic salmon. In addition, salmon may already be perceived as a wild or natural, therefore a healthy product, which may result in a lack of willingness to pay premiums. Consumers will have to be persuaded that there are benefits (which will outweigh price premiums) from eating organic salmon. This perception depends upon the credibility and marketing regimes of organic salmon and upon meeting consumer expectations. Analysis of sales of organic salmon by Norwegian producers, show that these premiums can be obtained[27]. However, they will vary significantly across countries, distribution channels and product categories. The evolution of organic farming will depend

[27] This is supported from the results of the survey on price data of fresh salmon products undertaken for the purposes of this thesis and presented in section 1.5.3.

upon producer's ability to identify and develop segments of the market that will be willing to pay the respective premiums (*ibid.: 24 - 26*).

1.5.2.2 Chemical inputs

The use of chemical substances is a controversial issue and is probably the most significant difference between organic and conventional production systems. Modern intensive aquaculture relies heavily on the use of chemical substances. There has been growing public concern over the number and types of chemicals used; in particular, chemo-therapeutants. One aim of the organic initiatives is to reduce the use of the latter and other chemicals. According to the principles for organic food, production pollution should be minimised and the food must not contain potential harmful substances to human beings. There are crucial questions involving the use of chemicals. Can they be omitted in industrial aquaculture? If not, are there any intermediate paths that can be pursued without undermining the credibility of organic labels?

Issues of animal welfare must also be considered, since restriction of treatments for disease and infections could lead to some level of suffering by organic salmon stocks. Although diseased animals can be removed and treated, these can not generally be marketed as organic produce. Further, the lack of drug control for disease and lice could not only pose a risk for farmed fish, but also infection risks for wild populations. However, stocking densities are likely to be considerably lower than currently used in intensive salmon production, implying that disease prevalence will be lower.

Another issue concerns the certification bodies who differ on the medications and treatments that are permissible under their regulations for organic status; raising important questions about the consistency of standards for organic salmon.

Strict adherence to the key principles of organic farming will limit the number of chemicals used in modern aquaculture; having several implications for organic salmon farmers. While the use of licensed vaccines is considered acceptable by organic certification bodies, organic salmon farmers will not be able to use those developed using genetic engineering, thus reducing the number of vaccines available to farmers. The use of feed additives such as vitamin and mineral supplements will not necessarily be of great concern to the organic farming movement, however the use of artificial pigments most certainly is. The development of micro-algae containing pigments would be of great benefit as the technology is already in place to produce such biota on a mass scale thus making it an economically viable alternative. The use of shrimp and krill waste raises the issue of sustainability and care would need to be taken to ensure their use would not adversely affect the wild stocks of these creatures. Alternatively, consumers

could be encouraged to accept a less pigmented flesh, eliminating the requirement for pigments as additives. This is arguably a more difficult task to achieve than the development of alternative pigment sources.

The development of natural products e.g. those that mimic the natural chemical signals produced between marine organisms which may prevent the settling of molluscs etc. on certain structures would be useful for organic farms. Without anti-foulants, there will be an increased labour demand on organic farms as the cleaning and/or exchange of nets will be required more frequently. It is possible that this may occur often enough to stress the fish sufficiently so to detrimentally affect their growth rate. Organic farms would not differ in their protection against unintentionally used chemicals and contaminants[28] than conventional farms; such protection is partly through careful site selection, vigilance and often, chance. Captured fisheries may also be exposed to the same phenomena. Perhaps the most significant conclusion is that lowering stocking densities is the management tool most likely to lower disease risk. This will obviously affect productivity per unit volume, resulting in the use of a less intensive production approach for organic farms.

The main question that perhaps has to be answered is how pragmatic can a licensing system be without losing its credibility. The certification bodies have met this situation within terrestrial animal production by implementing some compromises. For instance, there is no total ban on the use of antibiotics for organic cattle and poultry production. Instead a defined resting time is decided, combined with a surveillance and control system. With increased knowledge, similar systems could be implemented for organic aquaculture (*ibid.: 26 – 27*).

1.5.2.3 Sustainability issues

Sustainability, as discussed earlier, is a term subject to the same definitional problems as "organic" due to the wide and diverse number of issues it encompasses. The terms "sustainability" and "sustainable development" are widely used in discussions and analyses of economic development, environmental conservation, and socio-economic management of food production systems, especially those heavily reliant on natural resources. However, there are, as yet, no formal methodologies for defining or assessing sustainability with respect to a particular system. Aquaculture faces many sustainability challenges and several factors have to be taken into account to evaluate the sustainability of aquaculture production.

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[28] Unintentionally used chemicals may arise from environmental contamination, from industrial accidents or from feed contamination. The World Health Organisation (WHO) recently found that there is still little data regarding such contamination and its effects on aquaculture products (*ORGSAL, 2000, p 27*)

Arguably "organic" salmon farming has made substantial progress towards a less damaging production. Some issues however, remain uncertain regarding sustainability and environmental impacts. The feed issue is central to the problem of sustainability. According to organic principles it is required that all feeds are composed mainly of fish from sustainable sources. Although sound in theory, there are two main problems when implementing this.

First, many fisheries for the small pelagic fish used in fish meal and oil production are currently at their maximum harvest, or are over fished; thus, largely ruling out the possibility of using fish from sustainably managed stocks for fish-feed production.

Second, although the use of by-products from fish caught for human consumption, including by-catch, is feasible it could pose a threat for wild fish stocks. The retention of by-catch, currently discarded at sea, for sale and use to produce fishmeal and oil, could encourage fishermen to increase their harvest of previously unmarketable products. This would therefore undermine the current efforts to reduce by-catch rates. Several alternatives to by-catch could be used such as viscera and silage from fish processing plants. Sources of this kind would not encourage the depletion of wild stocks further than present levels.

The use of Genetically Modified (GMO) soy in fish feed is controversial, and not in line with organic production philosophy. In respect of consumer safety it should be less controversial than GMO products directly consumed by humans. Salmon is the intermediate receptor of the GMO soy and there is no conclusive evidence to suggest that it should present a health hazard to humans. Furthermore, extensive use of soy products in salmon feeds raises ethical questions because of its impact on the physiology and health of the fish. However, at least partial reduction in the inclusion of fishmeal into feed and subsequent substitution with vegetable alternatives would go a long way towards reducing dependence upon the exploitation of small pelagic fish-stocks but it could have welfare implications for the farmed fish.

Sustainable production requires effective use of resources and minimum pollution. Salmon utilise feed very effectively resulting in a comparatively low waste output. The organic waste that remains may not present a problem on a local level due to more exposed farming sites. However, it is generally accepted that salmon farming can have an impact on the fauna and chemical profile in the immediate area around a farm, and if the numbers of farms continue to increase, then these negative effects may increase in magnitude. Although organic waste from salmon farms could be a problem on a regional level, compared with the waste from other industries and agricultural production it is very small. The lower stocking densities of fish recommended for organic production may also help to dilute any effect of salmon farms on a local level. For example, the problem of waste has been addressed by the Soil Association by

specifying that discharges must not have any detrimental effects on the environment, and that suspended solids should be collected and recycled where possible. However, the cost and time involved in collection, transport, and treatment of wastes could make this economically unfeasible[29].

Escaped salmon and sea lice are probably the largest "pollution" problems for salmon farming today. Both problems have been identified, but have not yet been satisfactorily resolved. This is an area that came up repeatedly in the interviewing stage of this work and it is one of the main conflicts between the stakeholding groups and the salmon industry and associated regulatory agencies (see chapter 6).

In economic terms, organic salmon farming differs little from modern salmon farming methods. At the moment the organic market represents only a small proportion of the global food market, and although it can be a lucrative sector, profitability may be compromised until the product establishes itself. In terms of employment, the organic salmon farming industry may also be little different from normal salmon farming. Some indirectly associated industries may benefit, such as the fish-processing industries, whereas those such as the drug and chemical manufacturers may not.

The major advantage of organic salmon farming is its effect on the environment. In particular its stricter protocols on waste feed and metabolic waste discharges, minimise the effect on the local environment, and reduce the exploitation of natural resources. However, it should also be noted that the mainstream salmon farming industry is beginning to address all of these factors, and is becoming 'greener'. There may be problems with the nutritional value of farmed fish if fed on vegetable substitutes, and even if this is not the case, organic production is likely to inflate prices to those in need. Conversely, organic production may have welfare benefits in terms of local economy and the establishment of local associated industries (such as on-site processing and re-processing). There are also health and safety benefits associated with organic salmon farming as a result of decreased dependency on chemicals and drugs (*ibid.: 27 – 29*).

1.5.3 Price movements in the salmon market

In agriculture producers are often aware of periods when prices are depressed or are above the anticipated levels. They also have the impression that a long-run downward trend in prices for their products has been occurring. Part of the difficulty in interpreting and anticipating price

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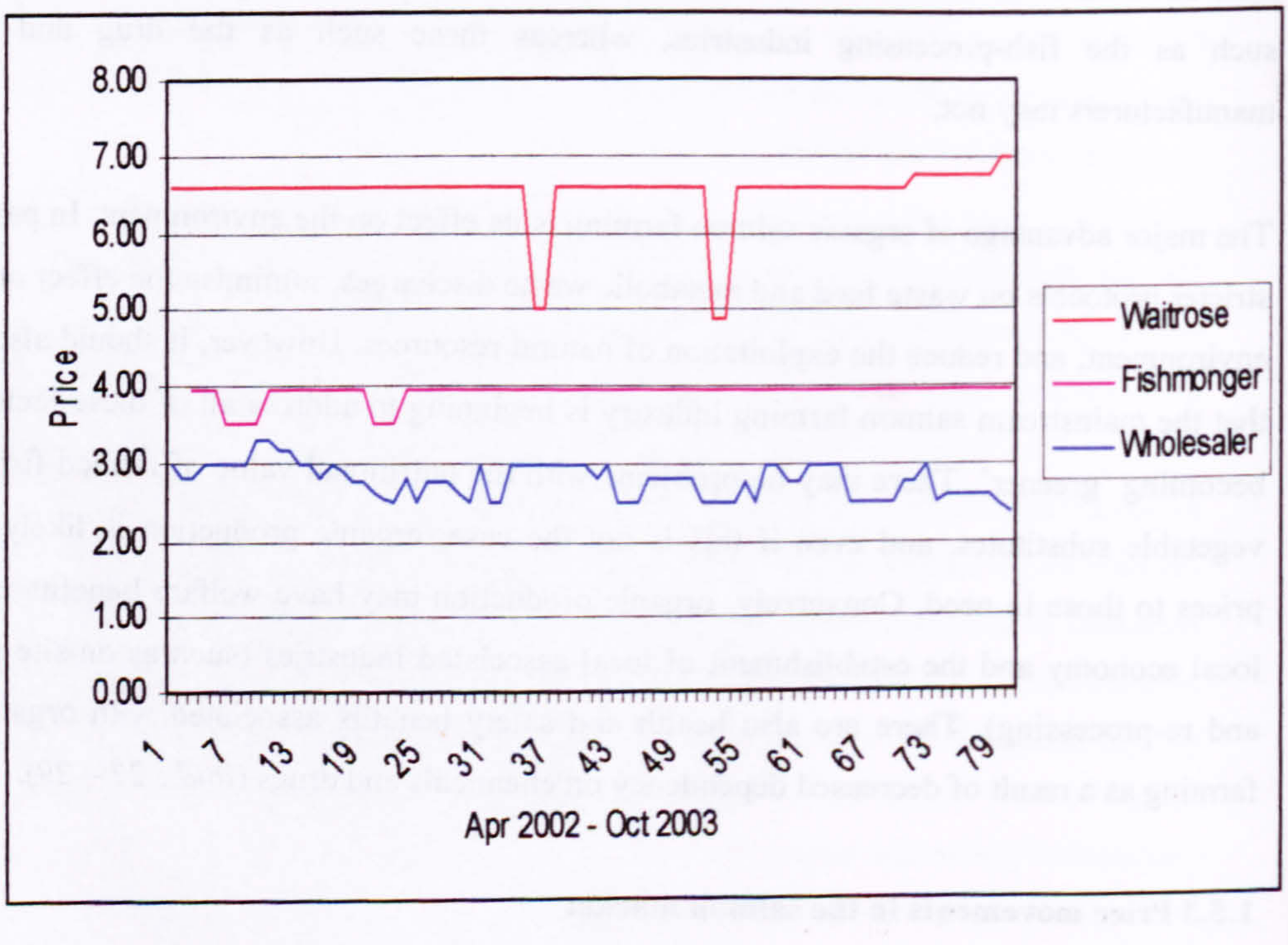
[29] One point in favour of organic operations is that the low stocking densities used should help to ensure that waste volumes are lower than for intensive cage farms, and will therefore be potentially less damaging (*ORGSAL, 2000, p 28*).

Table 1.1: *Average Organic Salmon Premiums April 2002 to October 2003*

	Organic	Conventional	Organic Premium
Whole Fish			
Waitrose	£8.74	£6.66	31%
Fish Wholesaler	£4.85	£2.78	74%
Local Fishmonger	£6.73	£3.39	99%
Fillets			
Sainsburys	£17.35	£9.89	75%
Waitrose	£15.18	£12.03	26%
Tesco	£15.05	£10.16	48%
Steaks			
Waitrose	£10.61	£7.34	44%

Figure 1.3: *Weekly price data (£/kgr) – whole conventional salmon*



movements is that the price mechanism reflects a number of changes which are different in cause but which are occurring simultaneously. Four separate types of price movement exist and the price of good or service at any one time will be a mixture by all these. These are the long trend, medium period, seasonal and daily movements. In aquaculture due to the long production cycle of salmon (around three years), the very little seasonality in farmed salmon and the predominance of forward purchasing contracts, the main price dynamics are the long and medium cycles.

The long-term trend in agricultural prices has historically been downwards in the developed countries. The expansion in agricultural products has been greater than the expansion in demand. Populations have increased and enjoy higher incomes, but a declining proportion of income is expressed in extra food demand. Rapid technological advances in agriculture have led to increased outputs from land, capital and human resources. The implications of these factors are: consumers have paid a progressively lower price for the raw material component of their food; drop in farm profitability causing a marked reduction in employment in agriculture; strong political pressures for governments to support agriculture; and serious problems in the least developed countries of rising food demand, from expanding populations, that exceed their abilities to produce food (*Hill, 1980, p 104 – 108*).

A long-term drop in the salmon price was reported by SSGA. In January 1989 the whole fish equivalent price for conventional salmon per kilo was around £3.90 and according to their data that price was at around £1.60 in January 2002, well below the industry's production costs[30].

What was strikingly impressive from the first weeks of the price data collection on salmon products that was undertaken for the purposes of this thesis[31] was the fact that despite the fluctuations and drop in wholesale salmon prices, the price paid in the UK supermarkets and fishmongers over an 80-week sample period was remarkably stable.

The data gathered support the notion of an organic premium as discussed earlier. It was suggested by farmers that the price premium they get from the supermarkets is 40% more than in the mainstream product (*Co20*). The farmers believed that the consumer price premium was around 10%, whereas the data gathered for this thesis estimates a fresh salmon organic premium range from 26% to 99% (table 1.1)

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[30] Indicatively it is mentioned that one of the interviewed companies spoke about production costs of around £1.70/kgr for the conventional salmon and from £1.80/kgr to £1.90/kgr for organic salmon. Value added through processing can increase the profit by an additional £2/kgr. This is one of the reasons why a lot of bigger companies have vertically expanded (*Co19*).

[31] See section 5.2.

1.5.4 Organic aquaculture – tentative conclusions

Both modern intensive salmon farming methods and organic salmon farming should become increasingly "sustainable" with time. Organic methods promote more rigorous efforts to improve water and habitat quality particularly through the more efficient use of feed, reductions in the use of chemicals and drugs, and reduced dependence on fossil fuels. However, as admitted by the Soil Association in their guidelines, some compromises have been made at least in the short term (such as the continued use of fishmeal in feeds) since there are no realistic alternatives at present. With increased consumer awareness and pressure for less intensively produced food products, it is likely that the appeal and marketability of organic produce will continue to increase, thus creating incentives for more farmers to turn to these types of production methods.

EU/EEA-wide legislation for salmon and other aquaculture products should be seen as a priority to prevent questionable standards being developed and to provide a touchstone for this developing sector. Whilst there are now critical flaws in the present system of regulation the advantages of legislative backup at the European level are self-evident and acknowledged by consumers and interest groups alike. Consumer confidence is largely influenced by their perception of the effectiveness of the regulatory system. Therefore if regulations are not subject to legitimising criticisms from the public, this can only lead to a lack of consumer trust and confusion over products such as organic salmon and indeed organic foods in general.

In terms of the conceptual perception and definition of organic salmon and other aquaculture products the differences in opinion between purists and pragmatists can potentially be divisive. The industry and regulatory institutions are moving in a pragmatic direction. However, the potential for some interest groups or consumers with purist interpretations of organic food and fish to undermine the product has to be acknowledged by the former. In some respects this issue might be attributable to the fact that the term "organic" is perhaps an inappropriate label for livestock production (since it is far more difficult to rear animals organically than crops, fruit and vegetables). However, the prospect of any revision in the use of the term for livestock-derived products is deemed unlikely.

There are many issues to be considered before organic salmon regulations are implemented; particularly those relating to the production of organic salmon, such as the appropriateness of the term "organic", animal welfare, chemical inputs and sustainability. At present, there is not enough knowledge about the definition, and measurement, of fish welfare and sustainability, which is something that needs to be addressed if regulations are to be scientifically involved

rather than anecdotal evidence and public pressure. In addition, methods of assessing fish welfare need to be refined to provide realistic and workable results. The use of chemicals in salmon farming also needs further consideration. Clearly, the restriction of chemo-therapeutants cannot be considered in isolation, as other issues such as animal welfare and sustainability must be taken into account. Perhaps the most difficult issue will be meeting consumer expectations of organic salmon. Consumers have high expectations for an "organic" product and appear sceptical when salmon is claimed to be produced organically.

Perhaps like any other pursuit, organic salmon farming has to remain a compromise between organic ideals and what is practically and economically achievable in the modern world. To a large extent this should be governed by consumer demands for 'clean, safe, sustainable' products and their willingness to pay increased premiums for such goods. While it is likely there will be an increase in the demand and production of organic salmon, it may well remain a niche market as producers wishing to convert to organic production can expect to encounter higher production costs (such as increased feed costs and lower densities). Possibly a more profitable strategy would be to modify conventional production practices in a direction that takes into account environmental, animal welfare and food safety considerations (*ORGSAL, 2000, p 30*).

1.5.5 The organic (salmon) paradox

Within the above context and as mentioned in section 1.5 given the environmental sensitivity of this sector it was initially expected that there would be examples of environmental accounting and environmental reporting, as conditions would appear to exist those that would give rise to stakeholder accountability responses (see for example: *ASSC, 1975; Gray et al, 1996; Bebbington et al, 2004), legitimacy actions*, and political economy responses (*Gray et al, 1996*)[32]. However, no evidence of environmental accounting techniques or practices was observed as a response to the risk perceptions of the rest of the stakeholders, or even lifestyle issues which in itself is interesting and worthy of further investigation given the nature of the "organics" label.

Organic agriculture is normally associated with a cultural change in the way farms and farmers understand how their operations interact with the soil, animals, ecology and society. The bodies promoting organic farming do not see it simply as a change in agricultural methods, but as a better way of life for all.

There is a strong link between the notion of "organics" in the Soil Association's (SA) case and Beck's Risk Society thesis as a notion of risk and risk management. In particular SA is

[32] See also section 3.2.1.

expressing concern about the existing food production/consumption regulations. These concerns question the scientific basis of regulations. SA's stated opinion, as Beck's, is that current regulations and their enforcement are permitting actual harm to social and ecological systems. They also recognise the anxiety of consumers and offer one solution to help manage these risks via a product certification label. 'Organic' labelling can be viewed as a technology that, in late modernity, compensates for our inability to perceive the dangers and risks in the food we eat only using our sensory perception. The assumption is that consumers can "trust" products labelled as "organic" by them to be less harmful to them and the eco-system (*www.soilassociation.org*). Organic labelling can therefore be seen as a technology to reduce social anxiety by moving away from intensive chemical based farming, de-commodifying farm produce and livestock, and addressing issues associated to animal welfare, sustainability from a wider social and ecological perspective, and beneficial to the health of the end-consumer.

However, there is some evidence to suggest that the organic practices in agribusiness have not followed all of these principles. Campbell and Coombes (*1999*) and Campbell and Liepins (*2001*) report on a number of different motivations for adopting organic production, including using health and food safety issues as an impediment to trade. They identify how different motivations affect the underlying definition of organic and how this affects agricultural praxis (*ibid.: 8*).

Specifically, Coombes and Campbell (*1998, p 127 – 128*) highlight how the increasing recognition that agriculture has become non-sustainable has led many food researchers to turn their attention to organic farming and the alternative agricultural movement. Some of these researchers promote organic agriculture as a credible replacement for the imploding conventional paradigm of input intensive agriculture (*Clunies–Ross and Cox, 1994*, as quoted by *Coombes and Campbell 1998, p 127*), while others claim that the wage and commodity relations of capitalism, which purportedly infiltrate the social and biophysical aspects of farming will also come to characterise organic production as agribusiness firms increasingly participate in the organic industry. According to this view, alternative agriculture (and in salmon's case aquaculture) is a soft target at least in some nations, for indirect forms of appropriation and substitution of organic producers with an ideological commitment to sustainable land management that characterises organic farming (*ibid.: 127*).

The problems "organics" face in the context of operations of large agribusiness companies have been outlined by Buck et al (*1997*), who report on a pessimistic outlook for small-scale organic producers in California. The authors argue that agribusiness firms view organics as a source of value-added profit and are now dominating the most profitable sectors of the organic commodity chain. Organic farming is said to be conventionalising with large firms from conventional agriculture commandeering the organic label. Accordingly the influence of such

firms is believed to have re-regulated organic certification, thereby debasing the meaning of organics to allowable inputs, rather than sustainable practices (*Coombes and Campbell 1998, p 128*).

Friedman (*1993 a, b, 1994*, as quoted by *Coombes and Campbell, 1998, p 129*) has claimed that the least sustainable practices in modern agriculture relate to its inherent time-space distanciation: a proclivity towards highly packaged, homogeneous, and shelf-stable food products which conform to the dictum of durability over distance. Such a delocalisation is fundamentally antithetical to the beliefs of philosophically committed growers in the alternative agricultural movement (*Tovey, 1997, p 23*, as quoted by *Coombes and Campbell, 1998, p 129*). Nevertheless, Buck et al (*1997, p 3*) claim that the Californian organic industry is also experiencing a similar delocalisation of the relationship between organic producers and consumers. Supermarkets in distant cities (or in salmon farming's case, countries) are more frequently the destinations for organic produce, reducing the peer accountability factor among growers and consumers, requiring vertical integration within the organic commodity chain (which marginalises smaller producers), and fuel-inefficient forms of distribution.

Buck et al (*1997, p 17*) argue that the above processes will marginalise small independent growers and co-operatives. Their argument is based primarily on the ability of capital to substitute (through control of downstream processing and marketing) and to appropriate (through the introduction of industrial inputs for organic farming) the products and profits of organic farmers, rather than the ability of capital to directly subsume organic production. Nevertheless the connotation is of imminent marginalisation of smaller organic producers, with such farmers becoming uneconomic because appropriation and substitution will reduce both their market share and marginal profits.

Friedman (*1993b*, as quoted by *Coombes and Campbell, 1998, p 129*) also describes organic producers as a soft target for capitalist agriculture. He attests that large companies usurp the ideological niche of the alternative agriculture movement by outward displays of a commitment to green ideals, but only minimally changing their production practices. This serves to satisfy the public that all is right with large food companies, leading the consumer to believe that there is no need for organic food, or that organic producers are extremists. In other words a further way in which agribusiness is shown to invade organic production is to marginalise by stealth the market share of small-scale producers through false imaging of both corporate and organic production practices.

MacRae et al (*1993*, as quoted by *Coombes and Campbell, 1998, p 129*) also argue that this process which they call corporate greening will negatively transform organic agriculture. They

are sceptical about the intentions of large corporations because such companies create an unwarranted illusion of sustainable practices through their adoption of organic food, thereby reducing public pressure for the necessary structural re-adjustments within capitalism and agribusiness to affect sustainable agriculture. Agribusiness is shown to have an unlimited power to resurrect its legitimacy with food consumers, leading to the intellectual marginalisation of the alternative agricultural movement. Furthermore, they contend that the mere involvement of agribusiness in organic farming corrupts that mode of agriculture because without significant changes to the organisation and behaviour of large agribusiness firms the characteristics of organic food that are consistent with sustainability are likely to be lost.

Likewise Clunies-Ross (*1990, as quoted by Coombes and Campbell, 1998, p 129*) argues that the likely result of an increasing number of large firms in the organics sector is a progressive dilution of standards for organic certification. In Britain, for example, a period of commercial interest in organic production was contemporaneous with the creation of a second tier of organic certification (*Clunies-Ross et al 1994*, as quoted by *Coombes and Campbel, 1998, p 129*). This additional tier of certification was intended to ease the transition from conventional to organic production for farmers, but included less rigorous standards which committed members to the alternative agriculture movement considered a threat to the integrity of the organic industry. This might be seen to support Buck et al's (*1997*) claim that agribusiness has the ability to substitute inferior organic standards and products for those of small scale producers. However, it is notable that pressure from Britain's longer established organic producers eventually removed the irregularity (*Clunies-Ross et al 1994,* as quoted by *Coombes and Campbell, 1998, p 129*).

Campbell and Liepins (*2001*) also report on the evolution of meaning of organic in the New Zealand context from an "on trust" basis to the hegemonic professionalisation of organic certification. The discursive process they describe exhibits many similar characteristics to the dynamics described in Beck's risk society, in particular the contest over naming and controlling organic. Their findings suggested that the greater the level of corporate involvement in organic agriculture the weaker the requirements for organic certification. Organic certification can therefore be seen as part of the current debate over food safety and needs to be positioned within our understanding of the global food system. Organic is a contested term, which has become politicised. We should recognise the possibility that the praxis of organic certification in specific contexts may have moved away from the central value-base of the organic pioneers something that has certainly been observed in the case of the salmon farming industry.

In addition to the above, another problem in organic aquaculture arises from the fact that the organic sector, at least in agriculture, was developed from Rudolf Steiner's bio-dynamic

movement concerning health and life style issues linked to alternative agriculture methods to the formation of the Soil Association in the UK, and the IFOAM in a period of almost 80 years[33]. There was a gradual and, perhaps reflexive, transition from a "proto"-political movement, to a sub-political (Soil Association formation), quasi-political (transformation of the Soil Association into a regulatory – certification authority with an ethical dimension), and finally political domain with the formation of national and international laws and regulatory institutions. These reflexive dynamics are at least in theory still in place in agriculture since the movement did not become entrenched with the formation of the political but is being preserved with the existence of the bio-dynamic school of thought. In the case of salmon farming however the previous transition did not take place. Organic salmon producers just borrowed and used the established organic notions almost immediately entering the "political" stage of the movement and circumvented the perhaps necessary course in a clear search for price premiums, a fact that seems to be explained rather well by the aforementioned literature in organics. However, by doing so questions have been raised about the legitimacy of their own motives and actions, and of those institutions involved into the associated regulatory process.

1.6 Overview – discussion

As mentioned in the introductory part of this thesis, this chapter's main aim was to present the reader with an overview of this study. This thesis is interdisciplinary in nature, bringing together complex notions such as sustainability, social and environmental accounting, risk perception and organics in a study exploring the reasons why some fish farmers decided to move into organic salmon production. It was initially believed that this move was the result of a process taking into account the notions of risk other stakeholders were bearing and examples of SEA were expected to be found. But that was not the case.

The strength of this work lies in the fact that all these issues are studied through a sub-political discourse surrounding the sector under investigation from an accounting background but without specifically investigating accounting (or more specifically SEA) as a potential solution and the study provides a unique access in different parts of the players within the arena. In that way the researcher tried to examine what those engaged in the associated environmental debate parties actually do, rather than going into the field asking the interviewees questions such as "Do you find accounting useful?" or "What is the role of SEA in your activities?". The latter path was deemed somewhat unreal since such a method of inquiry would probably construct/privilege the notion of social environmental accounts as being part of a discourse which might actually not be present in the field.

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[33] See section 1.5.1.

A discourse may be understood as a bounded body of knowledge and associated practices, a particular identifiable way of giving meaning to reality via words or imagery. Through discourses the social, cultural and material worlds are understood. Discourses both delimit and make possible what can be said and done about phenomena such as risk. Discourses are constantly in a state of flux; some come to prominence at certain times but then make way for others and this has implications for the understanding and response to phenomena. Discourse analyses of risk reveal the shifting meanings about risk phenomena and the struggles over those meanings (*Lupton, 1999, p 15*).

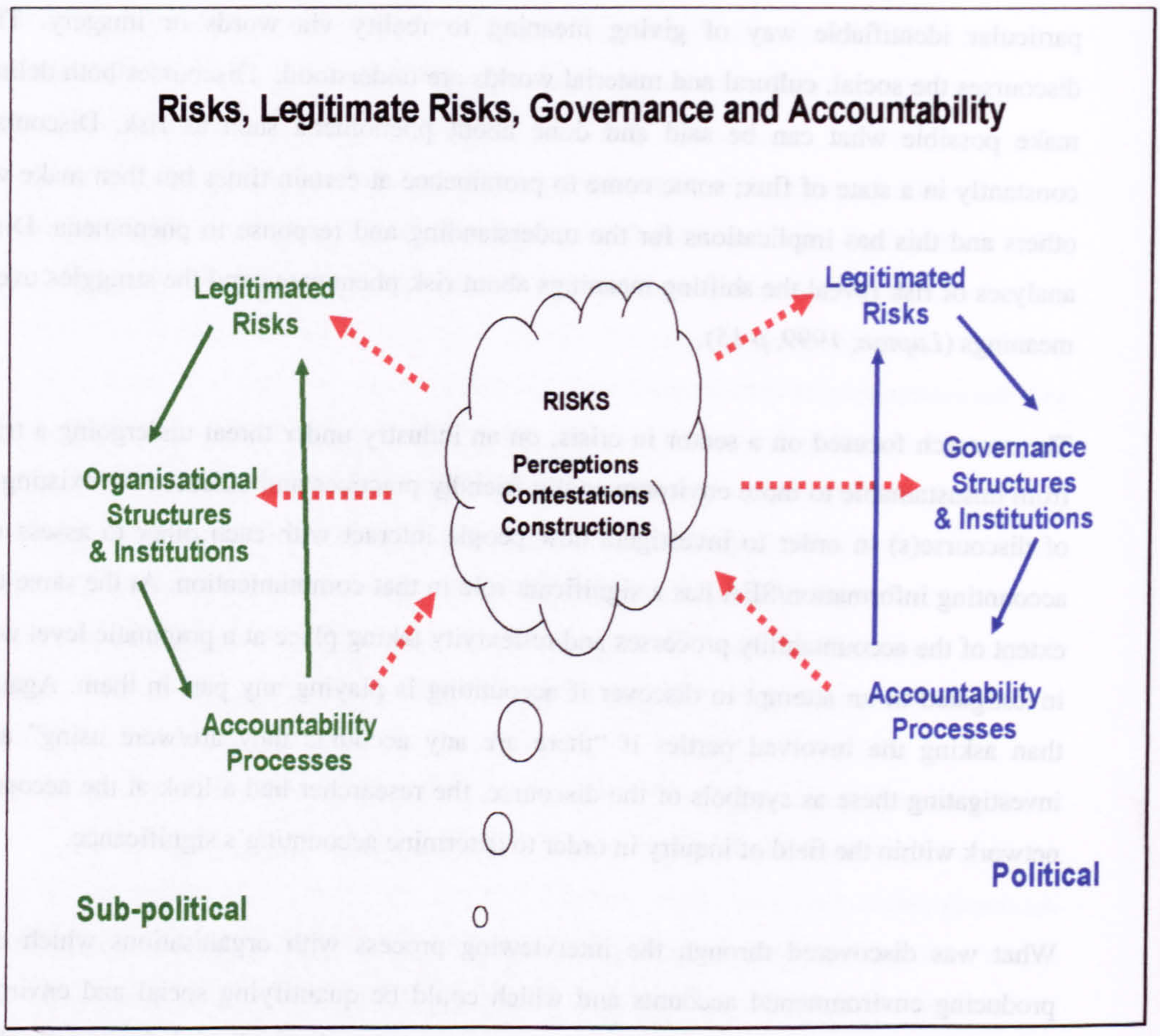
The research focused on a sector in crisis, on an industry under threat undergoing a transition from unsustainable to more environmentally friendly practices and examine the existing type(s) of discourse(s) in order to investigate how people interact with each other to assess whether accounting information/SEA has a significant role in that communication. At the same time the extent of the accountability processes and reflexivity taking place at a pragmatic level were also investigated in an attempt to discover if accounting is playing any part in them. Again rather than asking the involved parties if "there are any accounts they are/were using" and then investigating these as symbols of the discourse, the researcher had a look at the accountability network within the field of inquiry in order to determine accounting's significance.

What was discovered through the interviewing process with organisations which could be producing environmental accounts and which could be quantifying social and environmental impacts of their actions, stakeholders who could be demanding information about the environmental practices of the involved in the arena companies, and regulators who could be using accounting information in order to base their regulations upon, was the existence of an industry that should be producing accounts, regulators who should be using them, and stakeholders who should be demanding this information. It was found the existence of an accountability network and a discourse ripe for SEA which is not there however. It seems to exist in the field a different type of accounting process. Not an environmental but a fragmented one in which even costing and economics are not a part but their "perceptions" are likely to be.

The absence of formal or sub-political accounting processes though does not signify absence of accountability. Far from it there is an extensive accountability network in the field which is dominated by a struggle for accountability responses on techno-scientific bases (*Beck 1992a, b, 1994a, b, 1995, 1996, Beck et al, 1994, and Giddens 1990, 1991, 1994a, b, 2002*[34]). The same dynamics, as described by the exponents of the "Risk Society thesis", were found to exist in small rural settings mainly concerning small companies and echo big discussions for big regulatory institutions. The lack of evidence of SEA and the contested legitimising discourse

[34] But also Lash (*1993, 1994 a, b, 2000*), Lash & Wynne (*1992*), Wynne (*1989, 1992, 1996*).

Figure 1.4: *The "Ideal" accountability discourse*



relating to regulatory frameworks and techno-scientific responses that was discovered indicate that perhaps radicalised or reflexive techno-scientific data could act as the basis for social and environmental accounts than perhaps drawing upon the corporate accounting model as a starting point.

Another point concerns whether the decision of some farmers to shift towards organic production should have been influenced by the underlying risk perception of those making the decision as well as by those affected by the current operations of the conventional industry. Decision-makers' perception of risk is one way of understanding how certain factors were considered legitimate/illegitimate and therefore powerful/weak in influencing the decision. The risk perception is also important in legitimating the costs/benefits associated with the decision. Unless risks are considered "real" by the decision-makers the associated costs/benefits of doing or not doing something are not going to figure in their decision heuristics, regardless of the nature of their calculation.

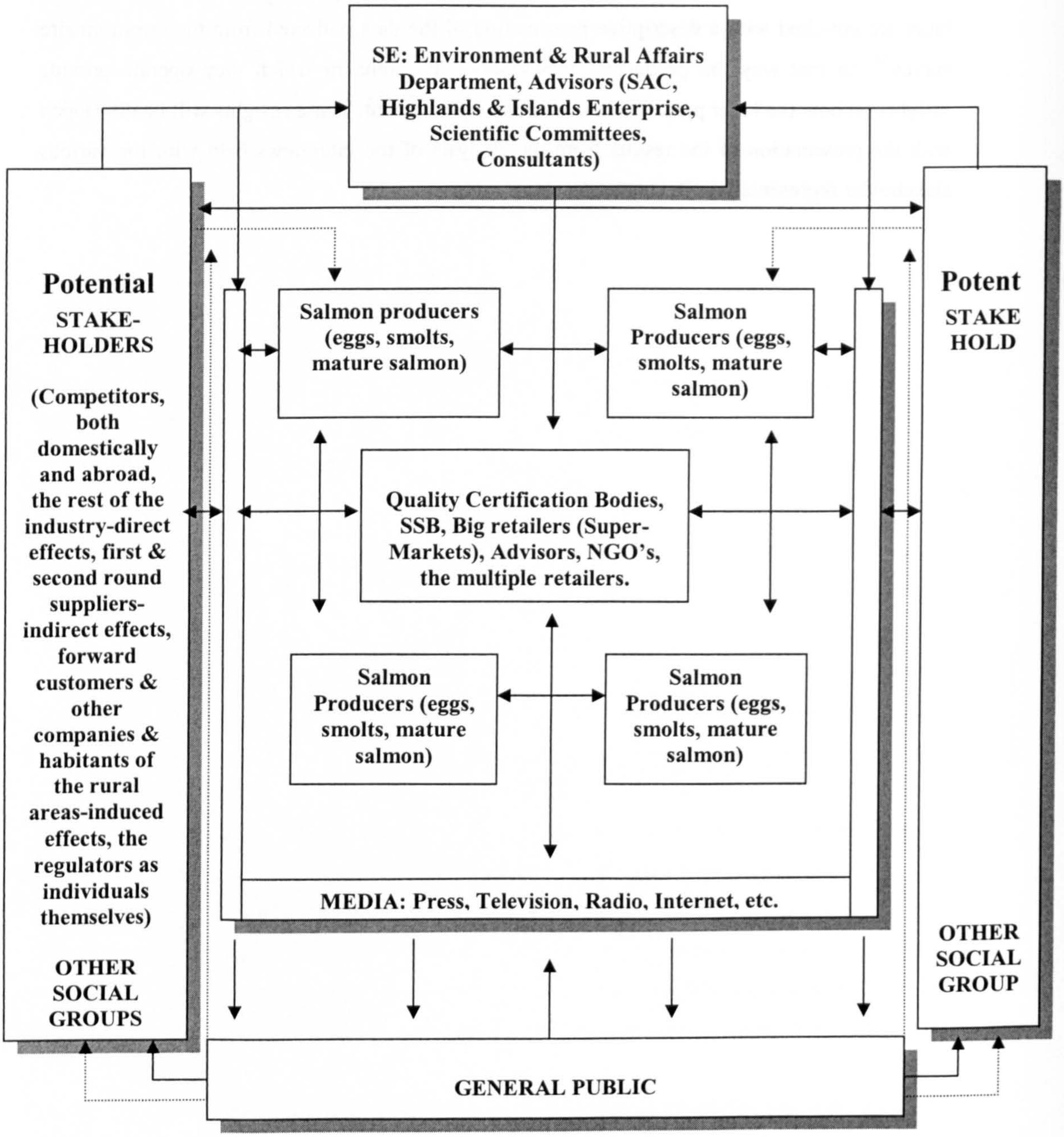
Risk perception/construction is one important factor to be considered in the development of social and environmental accounting thinking and practice. Risk can unite legitimisation and stakeholder theory in the context of the salmon farming industry. These two theories on their own are not perhaps suitable holistic frameworks for the study of accountability responses taking place within the context of the operations of the sector because they cannot include all the different risk perceptions held by the various stakeholders. This is something the arena framework can contribute to. It brings together those different perceptions and relationships between the different stakeholders and it is a useful tool to conceptualise the existing accounting network by mapping out the wider sub-accounting accountability issues. In that way it describes the sub-political by looking who is saying what to whom and highlights who the decision makers (the salmon farmers in this case) listen to. By looking at the existing communication routes there is a potentiality to recognise what is reflexive and perhaps bring about change by establishing more appropriate forms of Social and Environmental Accounting.

If SEA is seen as a sub-political domain that tries to be established in a pattern similar to that of the formal political through processes led by the latter then this will potential be a problematic situation. In order for such a process to be reflexive and successful the concepts coming from the sub-political should be allowed to be developed on their own first. The change potential exists at this sub-political level (see figure 1.4). Therefore a sound strategy would be to make the risk perceptions of the sub-political groups legitimate first and then to establish/incorporate them in the political domain.

This concludes the overview of this thesis which will be followed by an economic analysis of the sectoral structure of the salmon industry through governmental reports and statistics. The latter are enriched with a descriptive presentation of the data collected from the questionnaire survey[35]. In that way the producers' views about the arena in which they operate provide insights on how the latter perceive their working environment. These insights will be developed with the presentation of the results from the analysis of the interviews held with the various stakeholder representatives in chapter 6.

[35] See sections 5.3 and 5.3.1 for information on the conduct and data analysis of this survey.

Figure 2.1: *The salmon farming arena – a first conceptualisation.*



Chapter 2: The salmon arena – a first picture

2.1 Introduction

The previous chapter aimed to present the reader with an overview of the issues attached to this study. The Research Methods Chapter (chapter 5) provides a more detailed picture of the salmon risk arena in Scotland as constructed during this research with reference to information about the actors, regulatory and political representatives as well as other participant stakeholders.

Chapter 2 presents descriptive information, gathered from a postal survey (secondary survey[1] henceforth) of Scottish fish farmers, which will attempt to provide exploratory insights on how fish farmers perceive the arena in which they operate. These insights will be complemented with the most recent industry information at the time of writing[2], provided by the Scottish Executive Environment & Rural Affairs Department (SEERAD), in order to enrich the picture of the operational environment of the salmon farming industry.

Chapter 2 is structured as follows; the next section presents a short overview of the development and current economic and market conditions of the industry as this was put together through the interviewing process and initial desk research and it is followed by a discussion on the economic structure of the sector (section 2.3) through an adaptation of the risk arena metaphor (figure 2.1) integrating at the same time the information gathered for the salmon arena from the postal (secondary) survey. Information contained in the third section draws mainly from the Highlands & Islands Enterprise and the Scottish Office (*1998*) report. Section 2.4 then presents the respondents' evaluation of qualitative statements relating to: market issues; support provided to the industry; regulation and health of the farmed stocks; future prospects of the sector and organic salmon. The chapter concludes by drawing together all the issues raised and prepares the reader for the results of the interviews that are reported in chapter 6. Prior to this presentation, the theoretical rationale of this thesis (Chapters 3 and 4) will be introduced and it will be followed by a discussion on the research methods, data collection, and analysis techniques used (Chapter 5) in this work.

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[1] The survey conducted on behalf of the Highlands and Islands Enterprise and the Scottish Office (*1998*) is considered as the primary survey.

[2] The latest available data in 2003 were these of the Fisheries Research Services (*2001*) and SEERAD (*2002*).

2.2 The salmon arena – an overview

Salmon farming was created by government subsidies in order to protect and develop remote, rural communities suffering economic and social deprivation due to decline in traditional agriculture and fisheries. Start-up grants from the Highlands and Islands Enterprise of 90% of costs were common. In the initial stages of salmon farming it appears the ecological risks of this venture[3] were not fully recognised. Once the sector was up and running successive Governments have taken a hands-off approach and left this fledgling industry to cope in a market place increasingly dominated by the state-owned Scandinavian multi-nationals and UK supermarket chains. Over-production, price collapses, claims of dumping subsidised fish, health scares, environmental campaigns, changing regulations, company failures, mergers, acquisitions are just some of the factors that have resulted in a sector with pessimistic forecasts as to its future viability.

The industry that originated as small fish farms run by local communities, selling premium fish through co-operative networks is now dominated by large companies that operate in highly inter-dependent webs of contracts, agreements and certification schemes. Joint ventures are also a common picture in the sector.

The extent of consolidation in recent years has been considerable and a huge rise in volume of salmon production has created a number of different certification schemes to differentiate Scottish Salmon from the basic commodity fish to create a premium product.

The Norwegian producers are seen to have clear cost advantages due to the scale of their operations and Scottish[4] based producers could not compete on a cost-per-tonne basis. The Scottish sector has constructed a series of premium brands via product certification mechanisms. Product certification is a key strategy as it offers considerable added value.

Another strategy in the sector is reducing unit costs, normally by increasing output. SSGA identified this as a common response when a company has profitability problems. The problem is that this strategy is self-defeating if more producers adopt it, as it leads to a downward price spiral.

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[3] See chapter 6.

[4] The label Scottish becomes extremely problematic to defend given the ownership of actual farms/companies by Norwegian Corporations. Scottish is used to define the actual location of the farms rather than ownership structure as in the case of environmental damage geographical location is critically important.

Table 2.1: *Schematic Historical Overview of Salmon Farming in Scotland*

Economic	Structural	Perception of Sector
Initial High Price – low volume premium product	Small Independent Rural Farms	Actively encouraged by Government – high levels of start up subsidy
	Growth in number of small farms	
	Co-operatives, joint ventures	Saviour of remote rural economies
	Increasing volume	
Medium Term Price Cycles		Natural good cottage industry in the sea
Emergence of Selling Forwards		Emergence of fringe groups concerns over fish welfare, marine pollution, food colourings
	International Competitors enter market	
Gradual collapse of Spot Market, replaced with exclusive supplier contracts		Sector subjected to more intense scrutiny, due to a number of scare stories, incidents
	Increased planning / political role of Producer Organisations	
Spot market – the farmers last resort		
Extensive Price Competition	Defensive domestic mergers, take-overs – vertical and horizontal integration	Defensive reaction from Producers and producers organisation
	International take-over of domestic farms	Development of entrenched positions – Media / Science wars
Long Term Price Collapse	Supermarkets Chains dominant customers	
	Farms going out of business	Salmon farming becomes environmental cause celebre – eco-battle ground
Cost Reduction Imperative		Silence from government
	Complex network of interdependent companies	
Product Diversity – Quality / Organic Premium		Laissez-faire, hands off industrial strategy
		Increasing environmental regulations
Overproduction – pessimistic future for conventional salmon		Government Policy rhetoric supporting change to 'sustainable fish farming' – reliance on market to drive change
		Restrictive regulatory barriers to new farms
		Cancer-fish scare, renewed media-wars

The buyers of farmed salmon have also changed. Supermarkets are now the largest domestic purchasers of farmed salmon. Their current practice is to enter into exclusive purchase agreements with individual farms. They buy whole harvests at an agreed forward price. Current received wisdom amongst farmers is to have 'homes' for your fish before they are put in the water. Pre-selling fish in conversion is seen as preferable to the vagaries and uncertainties of the spot market, even when they sell forward at a discount. Currently the farmers are the weakest part of the salmon industry, dispersed in remote, isolated rural locations. The power lies with the buyers, dominated by the major supermarket chains and with the feed suppliers, also dominated by a small number of multi-national corporations. The initial switch to organic depended upon supermarket's agreement to pay premium prices for organic production and this premium is dependent upon the volume of organic salmon remaining small. The notion that market dynamics will drive the industry towards organic and thus towards sustainability does appear to be slightly problematic.

In table 2.1 is provided a schematic sequence of events in the development of the salmon industry along three inter-related dimensions: an economic dimension; industry structure; and external perceptions of the sector.

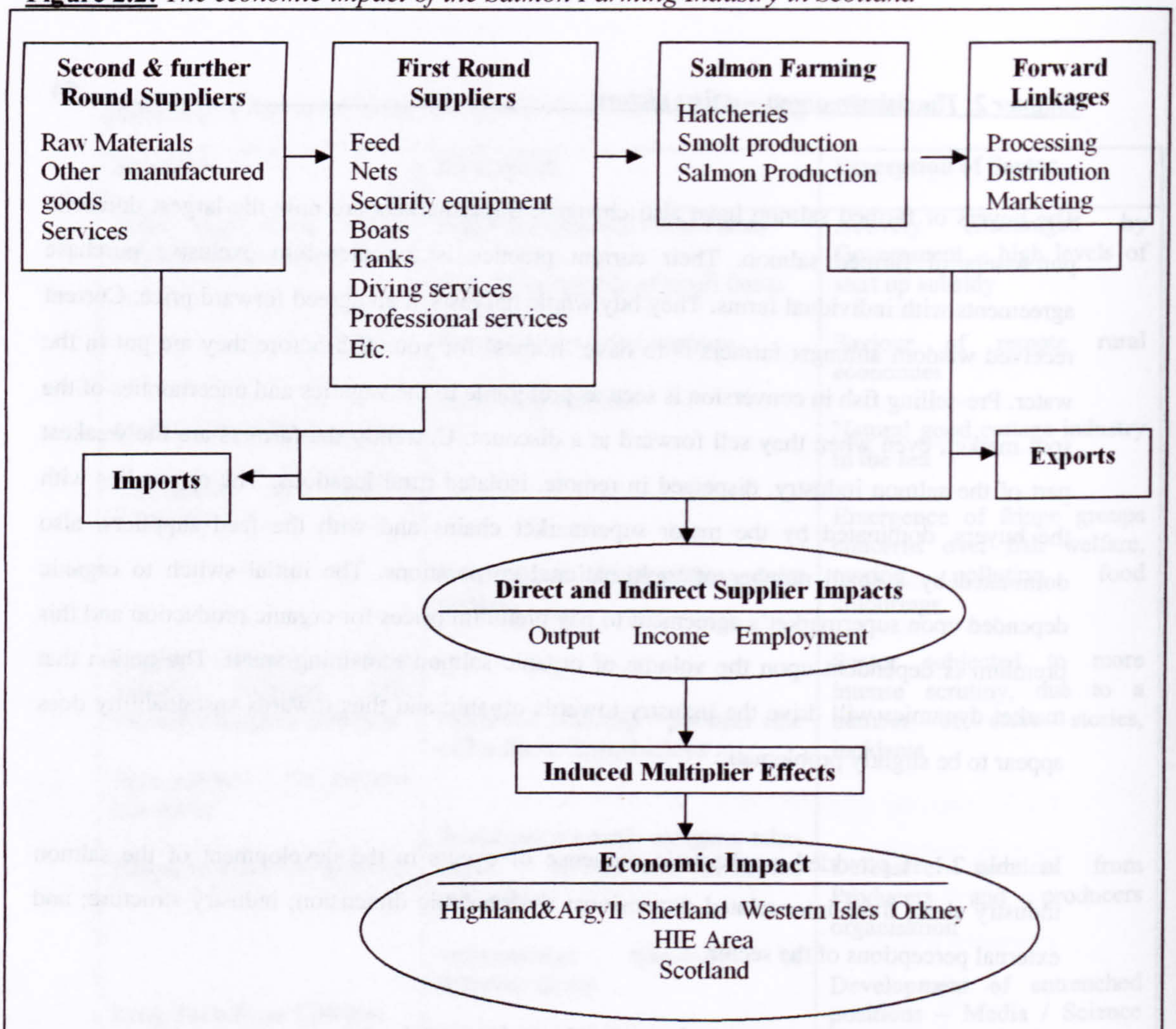
2.3 The salmon farming industry's economic environment

A skeletal picture of the salmon farming industry in Scotland is outlined in this section. This takes place through the presentation of the most recent existing information about the sector at the time of writing, complemented with the results of the postal (secondary) survey conducted.

The economic importance of the salmon farming industry for the rural areas can be ascertained by its impact on output, income and employment in Scotland. This impact arises as a consequence of a chain of activity encompassing the production of smolts and salmon, the processing of salmon, and, subsequently, its distribution and marketing to the final consumer. At each point in this chain, jobs are created and value added. In addition to these direct economic effects, indirect and induced effects are born. The former arise from suppliers to the salmon farming industry, processors and other parts of the value added chain. The latter result from the spending of the wages and salaries arising from the direct and indirect employment[5] *(Highlands and Islands Enterprise and the Scottish Office, 1998, p vii)*.

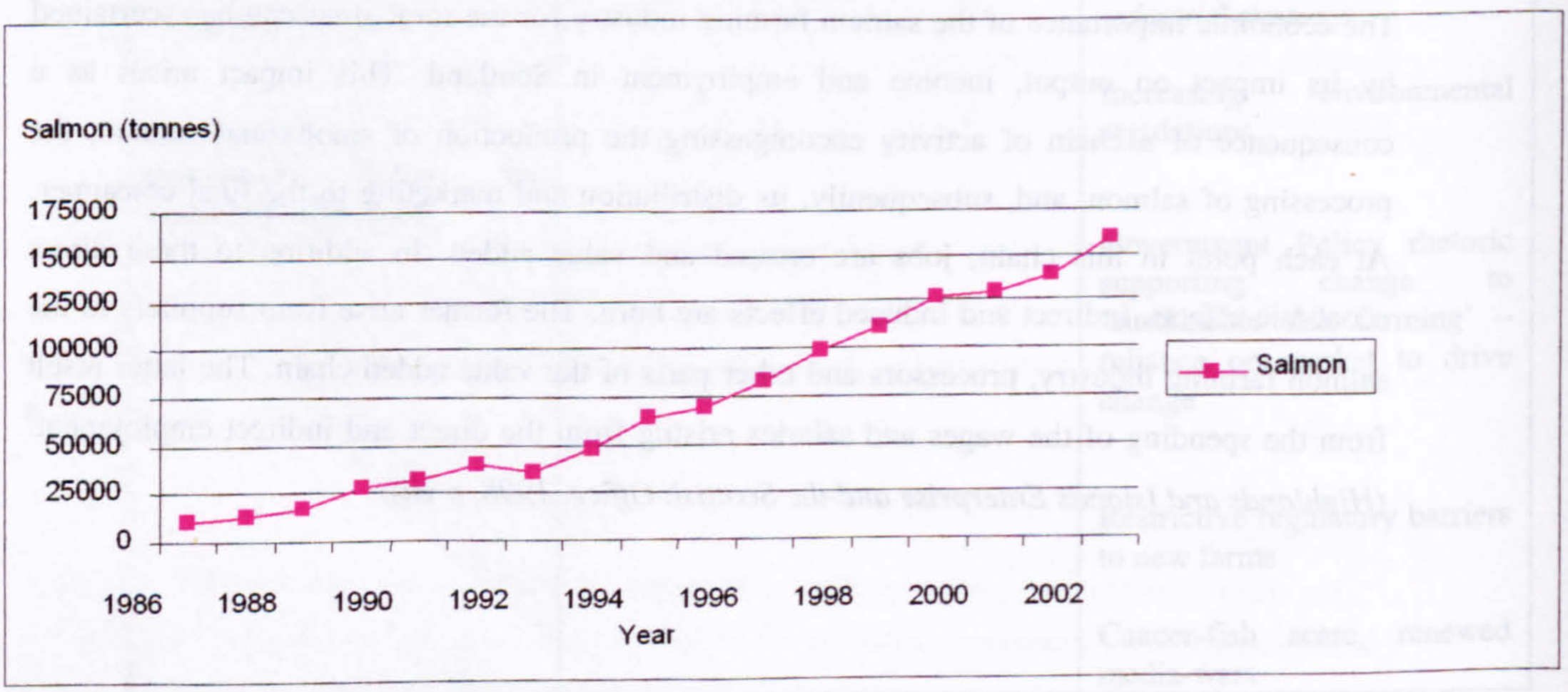
[5] Armstrong et al (*2000, p 35 – 63*).

Figure 2.2: *The economic impact of the Salmon Farming Industry in Scotland*



Source: Highlands & Islands Enterprise and The Scottish Office *(1998, p 3)*

Figure 2.3: *Annual production of salmon in Scotland (in tonnes), 1986 – 2001 and projected production for 2002*



Source: *SEERAD (2002)*

Figure 2.2 illustrates a comprehensive structure of the Scottish salmon farming industry, and the links between segments of the supply chain. Producers, processors, marketers, distributors, buyers and suppliers are considered as separate entities in that representation, it should be recognised however, that the larger companies are often vertically integrated and participate in two or more segments of the supply chain.

2.3.1 The salmon producers – main actors

The Scottish salmon industry was established with the opening of the first commercial farm in 1969, although it was another ten years before salmon farming was recognised as a viable area for investment and financial return[6] (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 56*). Although the Scottish industry started in the Highlands, it rapidly spread throughout the Highlands and Argyll and to the Western Isles, Shetland and Orkney. Sites are located in sea lochs on the west coast from the Kintyre peninsula to Unst in Shetland. These are supplied by hatcheries and smolt units, which are widely distributed throughout the Highlands and Islands.

Production rose steadily during the 1980s principally through quantitative expansion, reflected in the increased number of sites used, companies established, and smolts put to sea (*ibid.: 8*). Production increased steadily from 589 tonnes in 1980 to a projected output of 159,060 tonnes of seawater salmon in 2002 (*SEERAD, 2002, p 2*), with annual changes in farmed salmon production between 9% and 49% per year[7] (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 56*).

In figure 2.3 it can be seen that the annual production of salmon has increased in Scotland for each year since 1987, except for 1993 in which output fell due to disease. From 1993, output has increased from 36,101 tonnes to a projected output of 159,060 tonnes in 2002. The annual increase in output, excluding 1993, has varied between 9% and 49% (*SEERAD, 2002, p 2 – 3*). Between 2000 and 2001, production increased by 8%, and is forecasted to increase again in 2002 by 14.8% on 2001's total. The increases in seawater production are due mainly to an

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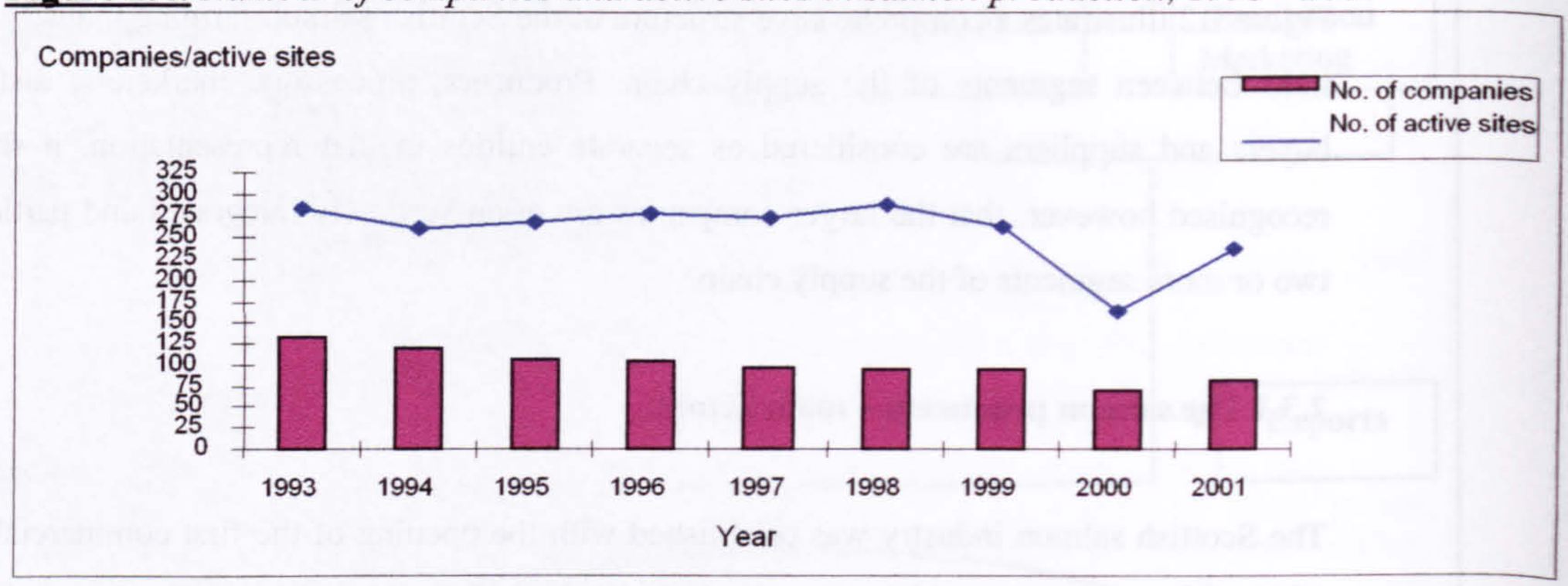
[6] Unilever played a pioneering role during this period with the establishment of Marine Harvest (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 56*), which is still one of the leading companies with operations in Australia, Canada, Chile, Ireland, Norway and Scotland (*www.marineharvest.com, 28/3/2003*). Marine Harvest is currently owned by Nutreco, a leading and highly successful international agriculture and aquaculture group with operations in 20 countries and some 13,000 people staff (*www.nutreco.com, 28/3/2003*).

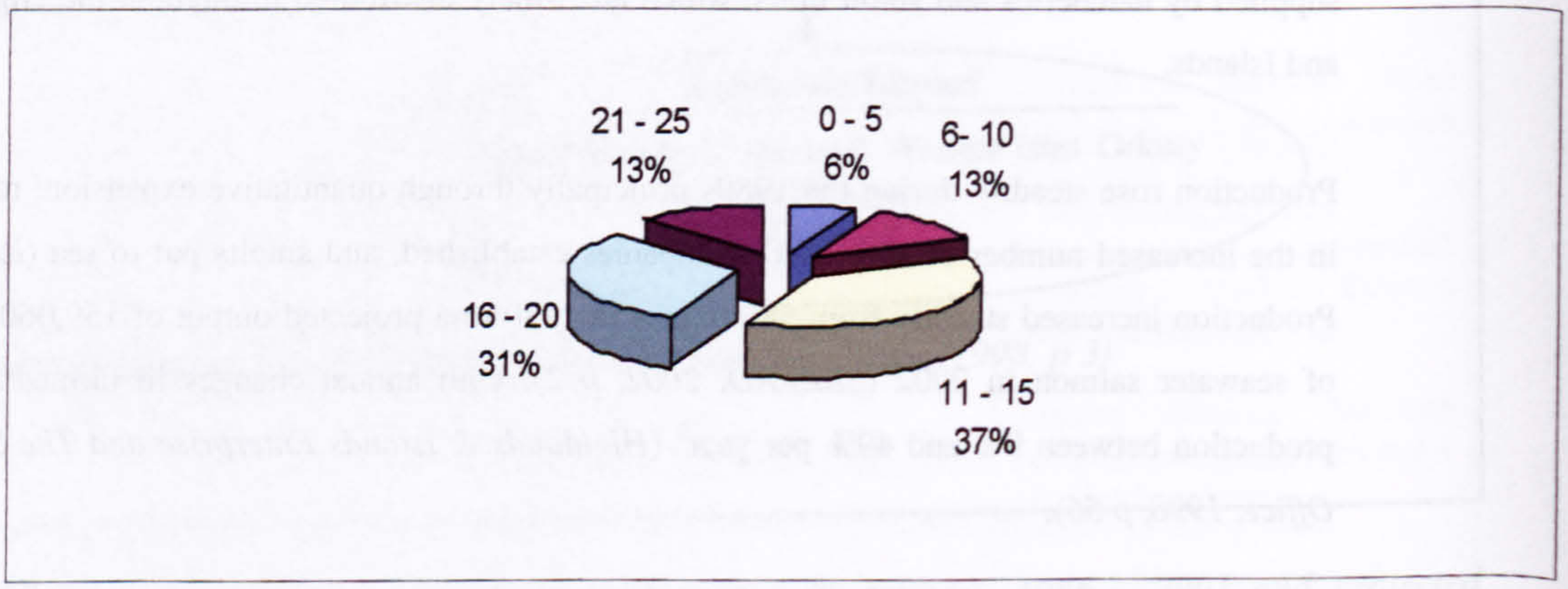
[7] Except in 1992, when production fell due to a combination of disease problems and loss of confidence in the market (*Highlands & Islands Enterprise and The Scottish Office, 1998, p. 56*).

Figure 2.4: *Number of companies and active sites in salmon production, 1993 - 2001*



Source: *SEERAD (2002)*

Figure 2.5: *Companies grouped according to the period of time (in years) that they have been in business*



increased average weight and increased survival giving a higher yield per smolt put to sea. The estimated smolt placement in 2002 is 49.3 million, which would indicate an increased harvest in 2003 and 2004, given improvements in average weight and survival rates (*Fisheries Research Services, 2001, p 41*)

Since 1990 site numbers have stabilised whilst the number of companies[8] has gradually decreased[9] mainly through larger companies buying out smaller ones when they have run into financial difficulties (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 8*).

Whilst conducting the secondary survey it became evident that many companies, despite having been acquired by larger organisations, continue to retain the same name and registration number used prior to their acquisition; suggesting that existing official data is an unreliable guide to the number of truly independent companies trading in Scotland. In the light of the survey (primary) made on behalf of the Scottish Executive in 1997, for the salmon producing companies in Scotland, in a sample of 84 respondents it was found that some 20% of farming companies are subsidiaries of larger organisations and 78% are of independent status (*ibid.: 8*).

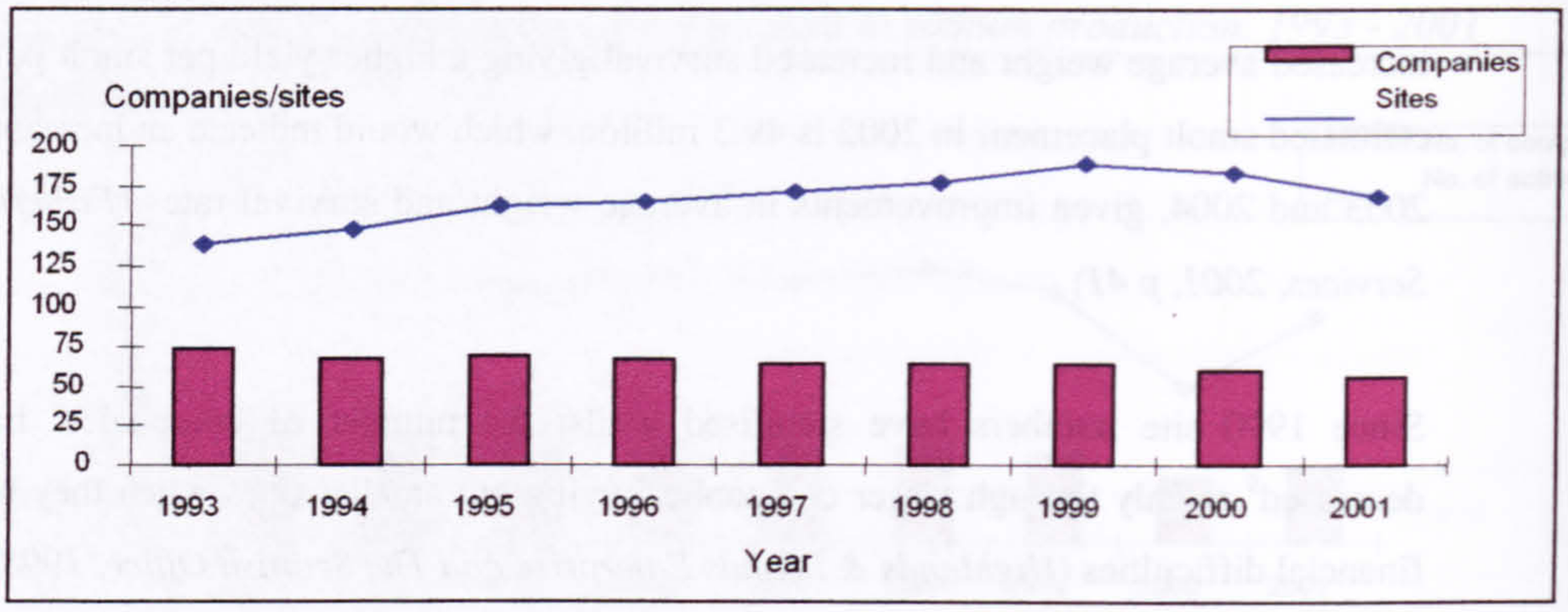
69% of the respondents participating in the secondary survey described themselves as independent owners/managers of the operating companies. At this point it is unclear whether these "so called" independent producers meant that they are of independent ownership status or that they are simply independent from other managers, part of a bigger corporation, in their decision-making on production issues. 20% of the previously independent producers work with one or more larger purchasers (multinational corporations). At the other end of the spectrum 29% of the respondents replied that they are a part of a larger corporation.

Very few companies from those responding in the secondary survey can be termed as new operators (see figure 2.5). Only one and two companies have been operating for less than 5, and

[8] Under the term of the Registration of Fish Farming and Shellfish Farming Business Order 1985, all persons engaged in the practice of fish farming in Scotland are required to register the details of their business within two months of the commencement of commercial activity. Fisheries Research Services is the Scottish Executive agency responsible for administering the fish farms business register and is the point of contact for farmers who wish to change registration details or register a new business (*Fisheries Research Services, 2001, p 14*).

[9] From a peak of 176 companies in 1989 to around 104 in 1997 (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 8*). Figure 2.4 shows the sharp decline in the number of companies actively engaged in the production of salmon in 2000 which has decreased to 68. In 2001 the number of active companies rose again to 81. The number of sites registered as active in 2000 was 163, a decline of 101 (38%) on the previous year. In 2001 the number of active sites rose to 238 an increase of 75 (46%) on the preceding year but still 26 down on the 1999 level and 51 down on the 1998 peak (*SEERAD, 2002, p 1*).

Figure 2.6: *Number of companies and active sites involved in freshwater production, 1993 - 2001*

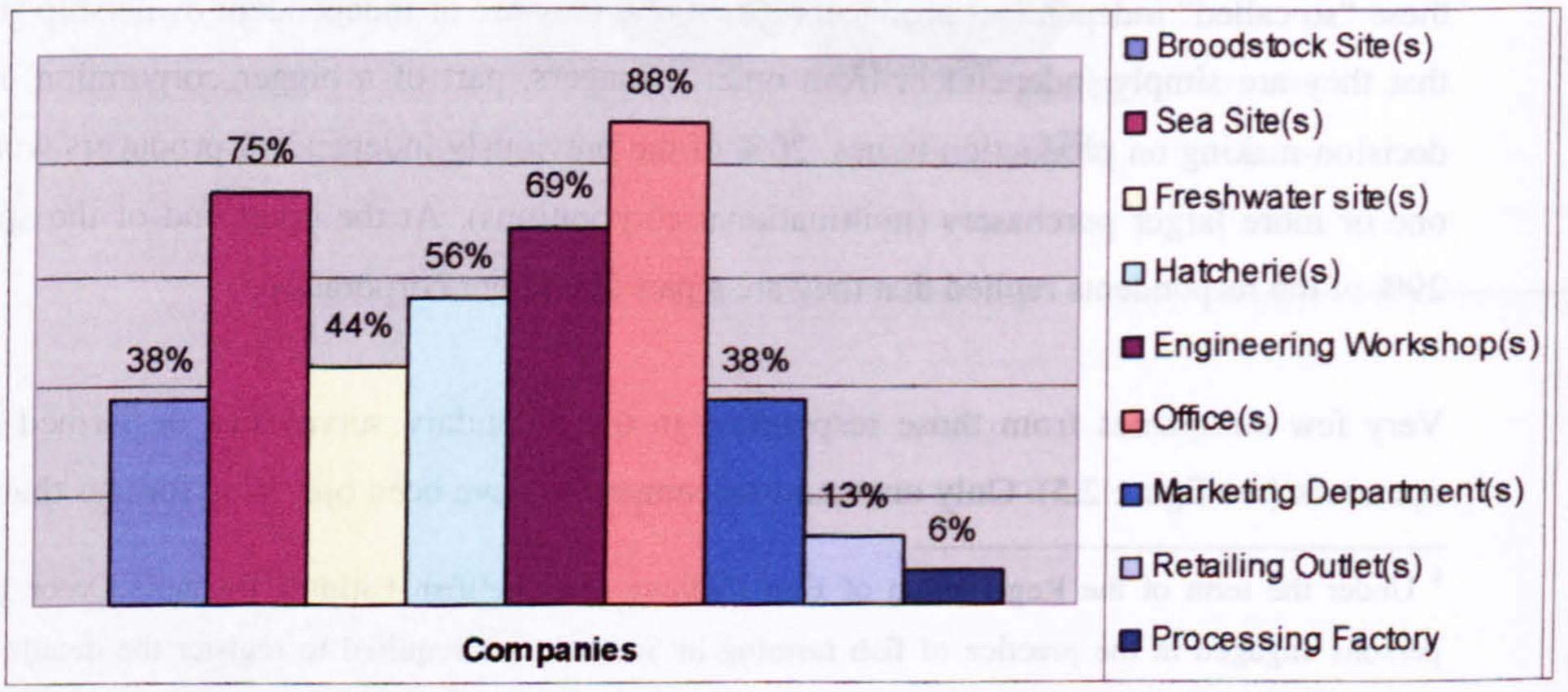


Source: *Fisheries* Research Services *(2001)*

Table 2.2: *Companies grouped according to their number of farms/sites owned*

Number of farms/sites	Companies	%
1 - 5	3	33%
6 - 10	3	33%
11 - 15	2	22%
16 - 20	1	11%
Total	**9**	

Figure 2.7: *Companies' usual premises*



from 6 to 10 years respectively. The majority of the participants (38%) have been operating from 11 to 15 years. 5 operators (31% of the sample) have been in business from 16 to 20 years and 2 (13%) for more than 20 years.

In figure 2.6 is presented the change in the number of companies and sites involved in freshwater production. The number of companies with freshwater sites reached a peak of 90 in 1988 (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 9*) falling to 56 in 2001. The number of active (freshwater) sites also decreased after 1988 reflecting the falling number of companies. However, this trend was reversed in 1993 (*ibid.: 9*) with the site numbers building up to a peak of 189 in 1999[10]. The number of freshwater active sites in 2001 was 169.

Table 2.2 illustrates the frequency distribution of companies (secondary survey) according to the number of fish-producing sites/farms owned.

In figures 2.7 and 2.8 the reader can see the most 'typical' premises mentioned by the respondents of this survey, as well as the type of operations taking place respectively. Note that the producers could include more than one category in their answers.

It can be seen that operations involve specialisation in the production of different stages of the salmon's biological cycle (i.e. mature salmon, salmon smolts, parr, fry and roe). At the same time some of the respondents had diversified to a lesser extent in the production of other (third species) such as: mussels, cod (fry and broodstock), halibut, and sea trout. Only 2 from the 16 respondents (14%) were involved in the on-growing of mature organic salmon.

In figure 2.9 the Scottish salmon smolt production[11] is presented. Smolt production has been increased by 4%, from the previous year, to 47.5 million fish with over two thirds (68.8%) being S1[12] and the majority of the remainder being S½[13] (30.9%) smolts. The number of smolts

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[10] In 1997 the Highland and the Argyll region had the greatest number of active freshwater farming sites dominating the hatchery and smolt activities (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 10*). Unsurprisingly as freshwater is relatively limited in Shetland and Orkney; there has been less scope in these regions for the development of hatcheries and smolt units. Those two areas therefore are net importers of smolts, mostly from mainland Scotland. For the Western Isles smolt supply and demand are in approximate balance (*ibid.: 58*). Major areas of imports in Scotland for ova, parr and smolts are: other EU member states; Australia; and Iceland whereas ova were exported in 2001 mainly to Chile (2,675,000) and to the rest of EU (8,542,000) (*Fisheries Research Services, 2001, p 22 – 23*).

[11] See Atlantic salmon's biological cycle in the appendix.

[12] Salmon or sea trout smolting at approximately one year after hatching (*Fisheries Research Services, 2001, p 47*).

Figure 2.8: *Species produced*

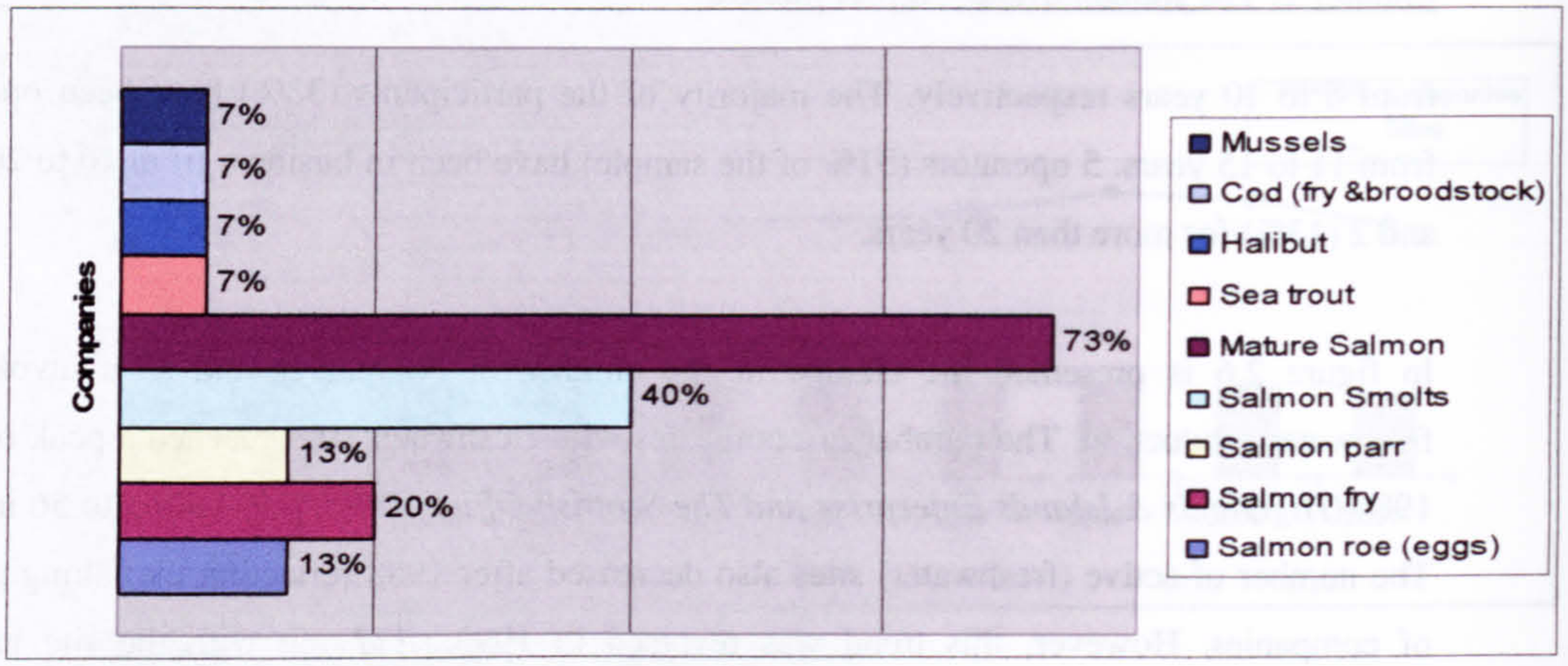
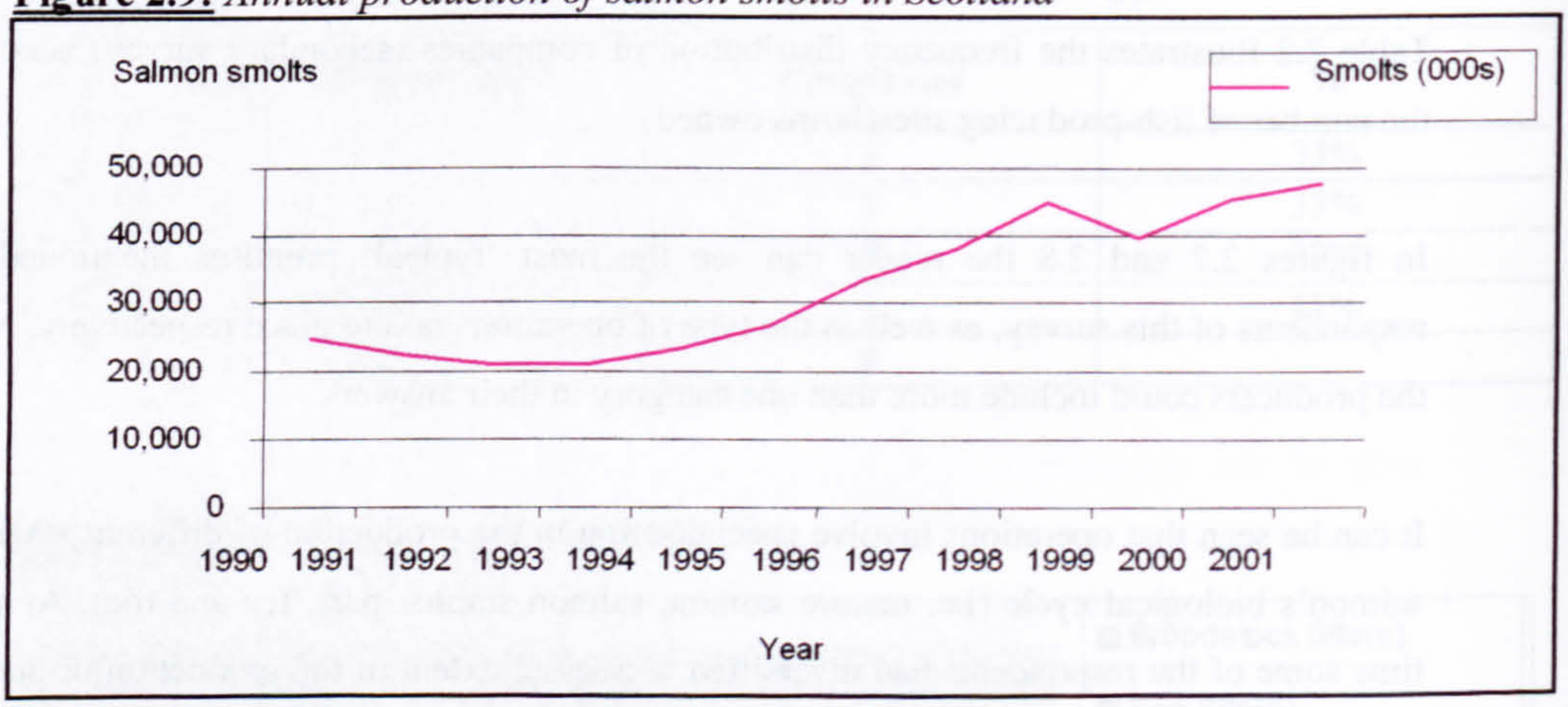


Figure 2.9: *Annual production of salmon smolts in Scotland*



Source: *SEERAD (2002)*

Table 2.3: *Salmon production by region (tonnes)*

Year	Region				
	North west	Orkney	Shetland	South west	Western Isles
1994	7450	780	4918	5653	3011
1995	7686	662	4352	5584	3632
1996	6469	910	8854	6371	1881
1997	5449	1667	11421	6303	2413
1998	7254	1073	5330	5915	2494
1999	7809	1232	16447	12350	2082
2000	6,957	943	19584	7484	1355
2001	6,594	2886	18269	10295	2710

Source: *SEERAD (2002)*

produced per egg[14] laid down has increased year on year and the ratio of eggs laid down to smolts produced has increased from 3.3 in 1993 to 1.8 in 2001. Projected estimates for 2002 suggest that there were more ova laid down to hatch, and that more smolts will be produced in 2002 and 2003 (*Fisheries Research Services, 2001, p 41*). In the early 1980s S1 to S2[15] smolts were used by the industry but over the past decade use of the latter was reduced. At the same time improved technologies have resulted in larger smolts being used and a greater proportion being produced out of season. This has the benefit that fish can be stocked to sea cages over a much wider period of the year (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 57*).

In table 2.3 it can be seen that in 2001 Shetland was, as it has been since 1999, the largest salmon[16] producing area. It produced 7,974 tonnes (77%) more than the next highest region, the south-west. Output in the south-west rose from 7,484 tonnes to 10,295 (37%) between 2000 and 2001. Production in the north-west was 363 tonnes (5%) down on 2000 in 2001. The largest percentage increase in production between 2000 and 2001 took place in Orkney where production rose by 1,943 tonnes, which represented a 206% increase. This is the highest level of production recorded in Orkney in the 1994 to 2001 period (*SEERAD, 2002, p 3).*

In the secondary survey, 40% of the smolt producing companies (table 2.4), produce less than 1 million fish, and another 40% produces more than two million. On the side of the on-growers (table 2.5), the majority of the respondents has an annual volume of production of less than 2,000 tonnes. 27% is between 2,000 and 5,000 tonnes and 18% has an annual volume of more than 5,000 tonnes of output.

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[13]Salmon or sea trout smolting at approximately six months from hatch (usually by photoperiod and/or temperature manipulation) (*Fisheries Research Services, 2001, p 47).*

[14] Almost all ova for the production of Scottish salmon was derived from Scottish farmed stocks, with 16% derived from non-Scottish stocks, an increase of 10%, from the previous year, on reliance from foreign sources. The export of ova to other countries within the EU decreased by 66%, whilst exports to Chile decreased by 68%. There was a 7% increase in the importation of foreign ova as a result of the use of Icelandic eggs (*Fisheries Research Services, 2001, p 41).*

[15]Salmon or sea trout smolting at approximately two years from hatch (*Fisheries Research Services, 2001, p 47*).

[16] Seawater production.

Table 2.4[1]**:** *Annual smolt production*

Salmon Smolts produced	Companies	%
< 1million fish	2	40%
1 - 2 million fish	1	20%
> 2 million fish	2	40%
Total	**5**	

Table 2.5: *Annual salmon production*

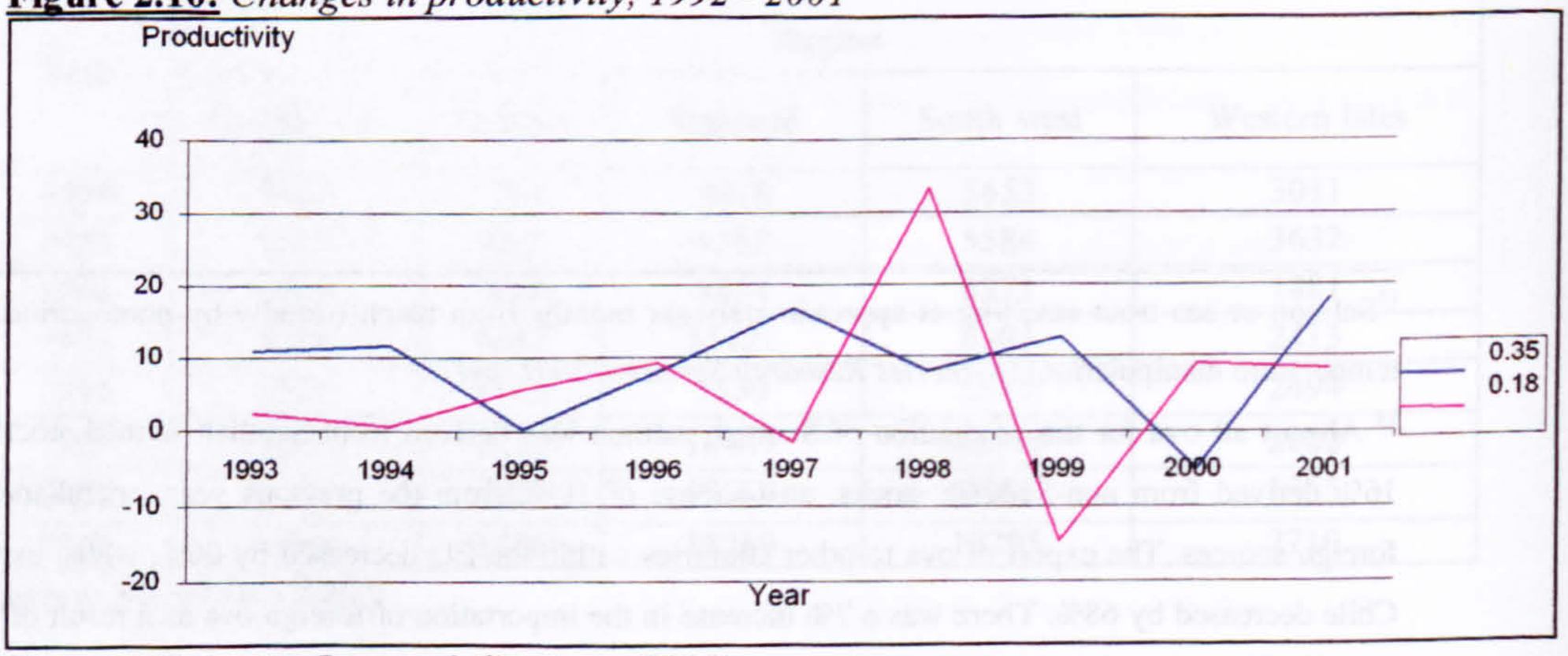
Mature Salmon produced	Companies	%
< 2,000 tonnes	6	55%
2,000 - 5,000 tonnes	3	27%
> 5,000 tonnes	2	18%
Total	**11**	

Table 2.6: *Number of staff employed and average productivity per person in salmon production*

Year	Salmon Production				Ova/Smolt Production			
	FT staff	PT staff	Total staff	Productivity (tonnes per person)	FT staff	PT staff	Total staff	Productivity (000s of smolts per person)
1992	985	275	1260	28.7	266	93	359	58.0
1993	976	248	1224	39.8	233	115	348	60.5
1994	1003	242	1245	51.4	245	133	378	61.2
1995	1104	251	1355	51.7	279	117	396	67.0
1996	1150	241	1391	59.8	308	133	441	76.2
1997	1088	207	1295	76.6	344	166	510	74.9
1998	1117	192	1309	84.6	318	96	414	108.3
1999	1036	268	1304	97.2	300	124	424	93.8
2000	1141	256	1397	92.3	341	103	444	102.7
2001	1066	191	1257	110.2	317	111	428	111.1

Source: *Fisheries Research Services (2001)*

Figure 2.10: *Changes in productivity, 1992 - 2001*



Source: *Fisheries Research Services (2001)*

[1] It includes only those respondents with comparable answers.

2.3.1.1 Productivity

Major gains in productivity have been achieved over the last 5 years[17] in the Scottish fish farming industry. Companies now expect over 95% survival at most sites. Harvested fish are also larger[18] than 10 years ago. This is partly due to larger smolts, but mostly due to nutrition and feeding improvements. Alongside this rise in the average weight of fish, the demand for smaller sized fish has also increased recently as domestic consumption of salmon has increased. However the demand tends to be relatively stable but with peaks observed at the Easter and Christmas periods. This is advantageous for the farmers as it increases the utilisation of space, reduces the risk of disease and enables them to increase their output.

The development of out-of-season smolts has been the most obvious advance in the hatchery and smolt sector, but also significant has been the increasing use of process control and water treatment equipment (particularly heating, oxygen supplementation and increasingly full treatment and recirculation) to optimise smolt production. This allows higher levels of production from a given external water supply. Although the first out of season smolts were produced from tanks maintained indoors or in dark poly-tunnels that allow complete control over light, it has also proved possible to produce photoperiod smolts in freshwater cages by using lamps to extend the natural daylight.

Another issue involves labour productivity. The gains in technical efficiency are reflected in sustained improvements in labour productivity in the industry (table 2.6[19]). It is also likely to be the case that gains in technical efficiency are associated with increased capital investment[20], further raising productivity. An analysis of the trends in labour productivity (figure 2.10) shows that the rate of increase for salmon production in 2001 was still in double digits with some

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[17] This is mainly due to: a) better utilisation of capacity through life-cycle manipulations; b) better health management leading to improved survival rates; c) higher energy and more digestible diets, which lead to faster growth rates; d) the use of selection and breeding to improve strain characteristics; e) better control of predators; f) improved equipment to minimise accidental losses; and g) the increasing of the seawater cage capacity which allowed substantial efficiency gains (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 59 – 61*).

[18] The average weight of salmon has risen at harvest by 50% from just under 3kg in 1985 to 4.5kg in 1997 (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 60*).

[19] It can be seen that the number of employees being involved in the industry has remained relatively stable, but the average productivity per person has increased significantly. The staff figures refer specifically to the production of salmon and do not include figures for staff involved with processing or marketing activities (*Fisheries Research Services, 2001, p 32*).

[20] For example there has been increased investment in mechanised feeding systems and new boats (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 62*)

Table 2.7: *Production – management issues for conventional salmon*

a/a	Very important	Important	Marginally important	Of little importance	Non-relevant
The diets in use	66.67%	33.33%	-	-	-
The health status of the stock	93.33%	-	6.67%	-	-
The fish handling	73.33%	20.00%	6.67%	-	-
The stocking rates in use	53.33%	40.00%	6.67%	-	-
The management of the seasonality patterns in smolt and mature salmon production	40.00%	40.00%	6.67%	-	13.33%
The use of chemicals for disease control	26.67%	40.00%	20.00%	-	13.33%
Environmental problems	25.00%	41.67%	33.33%	-	-

evidence of slowdown. (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 9 – 63).*

However, that rate is significantly lower for smolt production (with exceptions in 1995 and 1998). That difference between salmon and smolt production may be associated with the different behaviour of prices in the two sectors of the industry. The prices of smolts did not experience downward pressure until recently, in comparison to salmon which has experienced downward pressure since the early 1990s, causing producers to respond by cutting costs and adopting efficiency enhancing measures. It is possible that the smolt producers will begin to carry out similar cost cutting measures as they are forced to enhance their efficiency (*ibid.: 63).*

Productivity of labour in the marine ongrowing sector varies substantially by scale of production with the largest companies achieving productivity levels eleven times those of the smallest companies in 1997 (*ibid.: 65).* In 2001 the greatest productivity (137 tonnes per person) was achieved in those companies having a production in excess of two thousand tonnes and the least (less than one tonne per person) in the companies producing the smallest tonnages. In comparison with 2000 the average company productivity increased from 92 to 110 tonnes per person. Overall production was dominated by 15 companies in 2001, which accounted for almost 80% of the salmon production in Scotland (*Fisheries Research Services, 2001, p 34*). These differences in the levels and growth of productivity by size of company have potentially important implications for employment. As the average size of company increases with industry restructuring a given level of production will require fewer employees. Moreover, increased foreign ownership, which typically increases the average size of company, will also work to reduce employment, although the remaining employees are likely to experience enhanced job security. Companies exploiting economies of scale will, other things being equal, improve their unit output costs and profitability (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 66).*

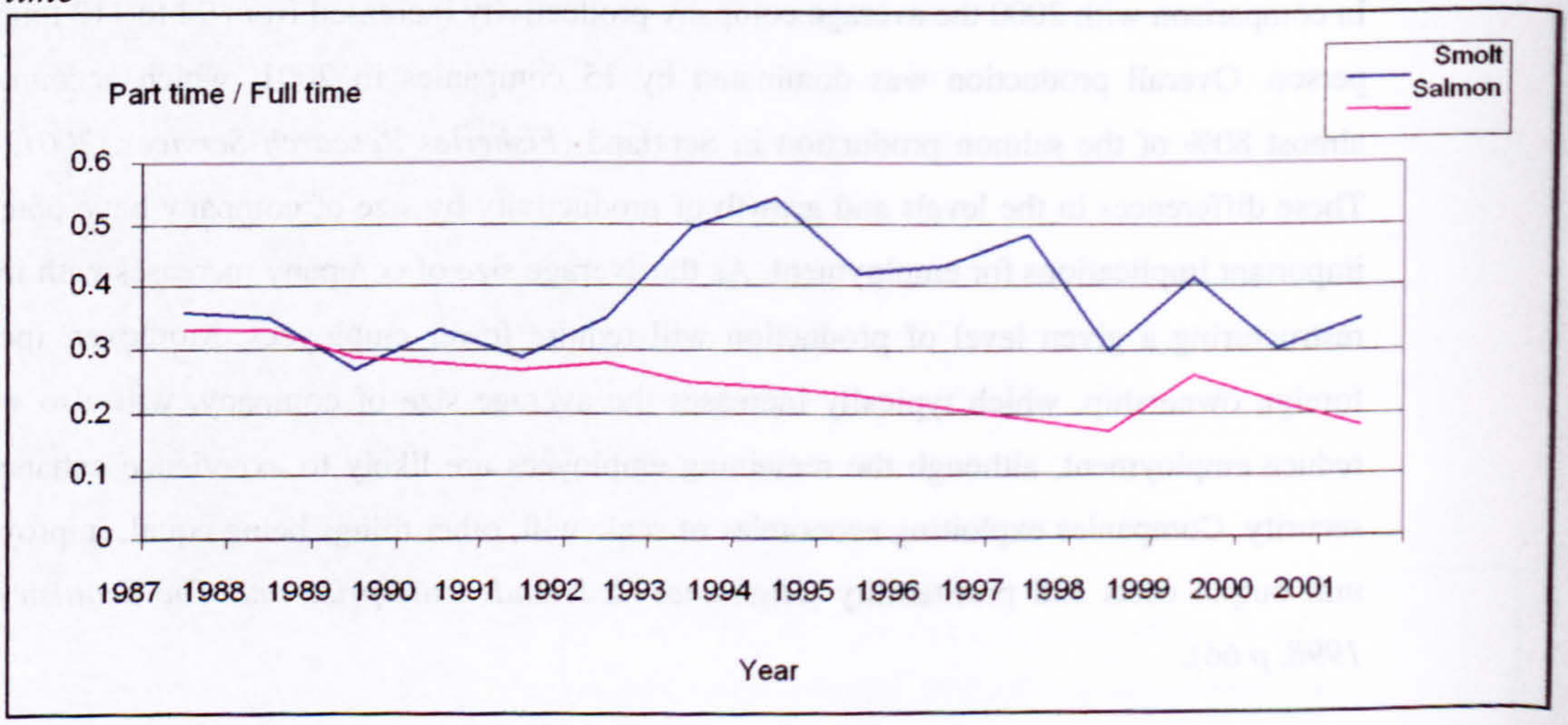
When was investigated the importance of management aspects in the daily operations of fish farmers the diet was perceived by the respondents in the secondary survey to be the most important issue[21] (see table 2.7). That is followed by the health status of the stock, fish-handling, and the stocking rates in use (93.33%). The management of the seasonality patterns in smolt and mature salmon production is also deemed important (80%), followed by the use of chemicals for disease control and environmental problems (63.67%). Other issues mentioned by some of the respondents were: the price of salmon products; environmentally sustainable methods of production; harvesting, economics, and staff motivation issues; and public community projects.

[21] Based on the scores of the "very important" and "important" categories if added together.

Table 2.8: *Production – management issues for organic salmon*

a/a	Very important	Important	Marginally important	Of little importance	Non-relevant
The constraints on the diets used	38.46%	46.15%	7.69%	-	7.69%
The health status of the stock	38.46%	38.46%	15.38%	-	7.69%
The limits on the stocking rates	46.15%	23.08%	23.08%	-	7.69%
The constraints on the use of chemicals for disease control	38.46%	30.77%	15.38%	-	15.38%
The management of the seasonality patterns in smolt and mature salmon production	30.77%	15.38%	30.77%	15.38%	7.69%
The constraints on fish-handling	15.38%	30.77%	30.77%	15.38%	7.69%
Environmental problems	7.69%	23.08%	46.15%	15.38%	7.69%

Figure 2.11: *Employment in salmon and smolt production, ratio of part time to full time*



Source: *Fisheries Research Services (2002)*

Similar results were obtained from the producers of organic salmon (table 2.8). The constraints on diets used was of most importance (84.62%), followed by the health status of the stocks (79.62%), the limits on the stocking rates and the constraints on the use of chemicals for disease control (69.23%). Unexpectedly, and in contrast to ideas from the relevant literature, the management of the seasonality patterns in smolt and mature salmon production, and the constraints on fish-handling were not rated as highly as expected given the nature of these operations.

2.3.1.2 Employment

Direct employment:

The latest data from the Fisheries Research Services (table 2.6) estimates direct employment in Scottish salmon production, in 2001, to be 1257 people, of which 191 were part-time employees. There are also a further 428 jobs in ova and smolt production from which 111 are part -time.

From 1985 to 1990, full-time employment in salmon production increased by 1,029 people. This was a period when the UK economy was growing very rapidly and the growth of productivity in salmon farming was relatively low by comparison with later years. This period was followed by a decline in employment and it was only in 1994 that full time employment followed a rising trend once again but decreased in 1997 (*ibid.: 69).* From 1997 onwards, employment in salmon and smolt production has remained relatively stable, with falls in some years being offset by increases in others. An increase in full time employment in salmon production between 1999 and 2000 was partially reversed by a decline between 2000 and 2001. Part time employment in salmon increased between 1998 and 1999. This rise was reversed between 2000 and 2001 (*SEERAD, 2002, p* 7).

There have also been differential trends in the pattern of part-time and full-time employment. Figure 2.11 shows the ratio of part time to full time workers. That ratio in 1985 was, for both salmon and smolt production, approximately 0.36. However, throughout most of the second half of the 1980s and the 1990s the proportion of part time workers in salmon production has declined and the ratio of part-time to full-time workers in salmon production was below 0.2 by 2001. This change may reflect the introduction of labour saving technologies in the industry displacing less skilled workers who were more likely to be part time. The picture for smolts is somewhat different with part time employment being significantly higher (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 69).*

Table 2.9: *Companies grouped according to their number of employees*

Number of Employees	Companies	%
1 - 14	8	53%
15 - 30	2	13%
30 - 45	1	7%
46 +	4	27%
Total	**15**	

Table 2.10: *The proportion of industry output (tonnes of salmon) by size of individual site*

Year	% of industry output by farm size groupings (tonnes)					
	1-50	51-100	101-200	201-500	501-1000	>1000
1992	4	10	20	37	27	3
1993	3	7	14	38	19	18
1994	1	4	12	33	31	19
1995	1	2	8	31	32	26
1996	1	3	9	27	22	39
1997	1	2	6	20	28	43
1998	1	1	4	21	23	50
1999	1	1	2	13	24	59
2000	<1	1.4	1.9	10.9	25.1	60.5
2001	<1	<1	2.9	10	20.8	65.9

Source: *SEERAD (2002)*

When investigated the employment status of the companies participated in the secondary survey (table 2.9), eight (53% of the sample) had up to 14 employees, two (13%) employed between 15 and 30 people, one company (7%) had between 30 and 45 employees, and four (27%) had more than 46 employees.

2.3.1.3 Trends in the industry

The industry is becoming increasingly concentrated. Whereas less than 20% of industry tonnage of salmon was produced by the six largest companies in 1988, by 1996 this proportion had risen to 53%. According to official statistics (*ibid.: 10*) 15 companies accounted for 70% of Scottish production with one third of production coming from just two companies, Marine Harvest and Hydro Seafoods. Forty five companies contributed only 4% of total production.

Increasing concentration is partly being driven by merger and acquisition activity in the industry often emerging from a variety of formal and informal collaborative agreements between companies[22]. A special case involves contractual arrangement between companies. Where this is the case, and no external ownership exists, firms are still considered to be independent but the output produced is owned by the contracting company and where the company is under foreign ownership the corresponding revenue does not accrue to Scotland.

There has also been a trend for companies to concentrate production at individual sites with a significant increase in the number of sites producing more than 1,000 tonnes per annum (*ibid.: 10 -12*). In table 2.10 the reader can see the aforementioned trend. There has been a continued increase in the percentage of production that is generated by farms that produce over 1,000 tonnes. This has increased from 3% in 1992 to 65.9% in 2001. A corresponding fall has occurred in the percentage of production that is produced in farms that come into the other categories, and particularly for farms producing 101 – 200, and 201 – 500 tonnes (*SEERAD, 2002, p 2).*

At company level, Scottish firms are adopting a variety of strategies in response to continued pressure on prices. The Norwegian-owned companies have invested in new equipment (e.g. larger cages and feed systems) leading to an overall reduction in the unit cost of production. For smaller firms without such financial resources, the strategy is often one of survival, with costs

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[22] Reasons for involvement in acquisitions are: a) increasing efficiency through reductions in unit costs of production; b) improved plant utilisation; c) improving market position; d) benefits from linking with suppliers or customers and e) access to sites (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 11*).

Table 2.11: *Participation in quality certification schemes(from secondary survey data)*

Certification Body	Certification Scheme	Number of Participant Companies	
		Currently	Previously
Scottish Quality Salmon	The Tartan Quality Mark	5	4
	The Label Rouge Quality Mark	3	4
Shetland Seafood Quality Control	Superior Quality Shetland Salmon	4	1
Food Certification Scotland	Smolt Quality Assurance Scheme	2	-
Soil Association	Soil Association Organic Standard	1	-
Royal Society for the Prevention of Cruelty to Animals (RSPCA)	Freedom Food Salmon	1	
Total respondents	**16**	**16**	**9 (56%)**

being controlled as closely as possible. Little if any, money is spent on new equipment or marketing. Farmers try to improve profitability by undertaking some form of diversification[23] (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 41 - 42*).

Certification is seen as one such "diversifying" strategy. When investigated, all the respondents of the secondary survey indicated that they participate in one or more certification schemes, highlighting the importance certifiers have in the arena. Table 2.11 presents the current and past participation in different certification schemes (from the secondary survey). The respondents in this case could choose more than one option relating to the schemes available.

Of particular interest are the reasons producers gave in this survey for the termination of participation in a certification programme as well as their intention for possible future participation in similar schemes. Specifically, main reasons that were given for the former were: a) the termination of the respective production line/species; and b) that the cost and relevance of such scheme did not justify the continuation of participation. For the latter, 75% of the respondents would participate in similar programs in the future giving as main reasons: traceability assurance of the finished product; in-house code of practice as well as supermarkets code of practice; consumer expectations of independent scrutiny of farming practice in order to assure that food is safe, wholesome and environmentally friendly; and because participation in such schemes is seen as the only way for the industry to progress. Only two of the respondents answered that they are not going to participate in a similar scheme in the future, while one indicated that this participation will be dependent on the price paid and the politics of the company.

The financial performance of salmon producers has been highly variable, but over recent years has been generally poor considering the relatively high-risk nature of the business[24]. Salmon

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[23] Middle size firms (and in particular those that are already vertically integrated) are investing more in value-added or other differentiated products. In some cases they are reducing their salmon farming operations to concentrate on processing, trading or perhaps smolt production; whilst others invest in alternative species (rainbow or sea trout, cod, halibut) (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 42*).

[24] Due to: the long production cycle (12 to 18 months for ongrowers and 6 to 12 months for freshwater growers, therefore approximately 2.5 years overall), which means that salmon producers are unable to react quickly to rapid changes in market conditions, as an adjustment lag is experienced; the high capital requirement of the industry, partly through the need to replace cages, nets and moorings at relatively frequent intervals (3 to 6 years), but particularly because of working capital needs for funding the long production cycle; and to the high levels of gearing (ratio of total borrowings to total equity) which is the main source of funding for the industry because of its high capital requirements (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 78).*

production was probably most profitable in the middle of the 1980s with relatively good prices and the increasing benefits of more reliable production systems. Disease problems during the late 1980s and early 1990s combined with falling prices, sharply diminished profitability and forced a number of companies out of business or into mergers[25] (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 78 - 79*).

Another issue involves the use of genetic improvements of aquaculture stocks. The latter has not been afforded a high priority by most of the industry but it is seen as a major growth area. Perhaps the longest established salmon selective breeding programme is the National Breeding Programme run by the salmon and trout producers in Norway, and carried out by AKVAFORSK (Institute of Aquaculture Research Ltd.). A number of private companies also have breeding programmes[26]. In Scotland, Landcatch (one of the leading Atlantic salmon hatchery companies) has announced significant investments in a genetic fingerprinting programme, using micro-satellite analysis (MSA) technology that will allow individual fish to be identified to its parents and siblings, allowing decisions to be made on breeding for desired traits. Few commercial producers have shown much enthusiasm for genetically engineered species although there has been significant success at a research level. Resistance is mainly due to concerns over public reaction to such products and the impact that might have on all aquaculture produce (*ibid.: 46*).

For the salmon industry in Northern Europe, the most important production problem is undoubtedly sea-lice[27]. Although sea-lice infestation occurs in wild fish populations, conditions within marine cages, where large biomasses of fish are held at relatively high densities, increase the potential for severe infestations. There is a range of chemicals[28] available, or are under investigation, as treatment for sea-lice. These are either used as baths, which can be labour intensive and very stressful for the fish, or in-feed, which producers prefer. The UK is much

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[25] Surveys carried out by the Scottish Agricultural College (SAC) at this time showed an average net profit of £591/tonne in 1987/88 turning into a loss of £826/tonne by 1990/91. Later on (1993/94), improved technical performance coupled with higher prices returned the industry to profit. Anecdotal evidence, backed up by the fall in price suggests that many producers have now returned to marginal or loss-making operations (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 79*).

[26] Including: Mowi (part of Norsk Hydro) and Norsk Lakseavl AS in Norway; and Marine Harvest in Scotland (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 46*).

[27] Infestation by the sea-lice, *Lepeophtheirus salmonis*, and to a lesser extent by *Caligus elongates*, has occurred since the beginning of the salmon farming industry and continues to be a major problem (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 46*).

[28] More information about available treatments can be found in Highlands & Islands Enterprise and The Scottish Office *(1998, p 47 – 48)*. Even though the industry has invested heavily in accelerating the development of effective therapeutants, access to these has been delayed (*ibid: 59*).

slower than other countries, such as Norway, in taking novel and more effective medications through to commercial application, and salmon farmers in Scotland are at a competitive disadvantage.

Whilst research is being conducted to develop a vaccine against the sea-lice there is little prospect of a product in the near future. Wrasse have also been used as a biological control method[29]. Unfortunately they have proved to be costly, difficult to obtain and are only effective during the first year the salmon are at sea. A number of other alternatives are also being developed. Much effort has also gone into developing management strategies to minimise the impact of sea-lice. In 1998 the SSGA announced a national strategy for the co-ordination of lice treatment throughout Scotland.

Key elements of that scheme include: continuous monitoring of lice populations; co-ordinating and synchronising treatment with neighbouring farms within appropriate biological areas and by exchanging information on lice burdens; making best use of available medicines and monitoring for resistance; assessing efficacy of treatments on every occasion; and taking advantage of known weak points in the life cycle of lice (*ibid.:46 – 49*).

2.3.1.4 Foreign ownership

Most of the larger salmon producing companies are subsidiaries of larger conglomerates, which are able to take advantage of vertical integration. Many in the industry are concerned with the increasing extent of foreign ownership. In 1996, 19 companies (18% of those operating in Scotland) with the 23% of sites were under foreign ownership, which accounted for 47% of total salmon production (*ibid.: 13 -14*). In 2003 SSGA reported "*...67% of the production in the UK to be dominated by the large companies...*"[30].

2.3.1.5 Competitors

The concentrated structure of the Scottish industry combined with limited opportunities for major product differentiation suggests that, for many of the smaller farmers, the main competitive threats are likely to come from the large producers with 200 or more employees

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[29] They act as cleaner fish, eating lice off the salmon (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 48*).

[30] See section 6.3.1.1, p 246.

Table 2.12: *Salmon products' purchasers*

a/a	Very important	important	marginally important	Of little importance	Non relevant
Smokers & Processors	75.00%	8.33%	-	-	16.67%
Wholesalers	16.67%	50.00%	8.33%	8.33%	16.67%
Supermarkets	45.45%	9.09%	9.09%	9.09%	27.27%
Associates & packing stations	36.36%	18.18%	18.18%	-	27.27%
Sales Organisations	18.18%	18.18%	-	18.18%	45.45%
Direct Consumers	16.67%	-	8.33%	33.33%	41.67%
Hotels	-	16.67%	25.00%	16.67%	41.67%
Fishmongers	-	9.09%	36.36%	18.18%	36.36%
Restaurants	-	8.33%	33.33%	16.67%	41.67%

Table 2.13: *Salmon products' exports*

a/a	Very important	important	marginally important	Of little importance	Non relevant
The UK	73.33%	20.00%	6.67%	-	-
France	38.46%	38.46%	7.69%	-	15.38%
Rest of Continental Europe	8.33%	41.67%	25.00%	8.33%	16.67%
Japan	10.00%	-	10.00%	60.00%	20.00%
The US	8.33%	-	25.00%	50.00%	16.67%

both at national and international level[31]. A large proportion of Scottish competitors were found to be small companies in comparison to non-Scottish competitors.

Whilst there is clear competition among Scottish producers, especially for premium sales, the dominant competitive forces are increasingly associated with the Norwegian Salmon Industry[32]. Of lesser significance to the Scottish industry are those producers from Ireland (14,000 tonnes in 1996) and the Faeroes (6,000 tonnes in 1996) producers, although they also export to Europe and the UK. Until recently North and South American production have not been considered as serious threats since these producers have mainly targeted North America and Japan. However, production has increased steeply in Chile (76,000 tonnes in 1996) and it is quite possible that because of the tariff barriers erected against Chilean salmon in the US that Chilean producers may turn their attention to Europe[33]. This may not be a serious threat to the fresh salmon market but has the potential to take market share in the processed sector, particularly frozen ready meals.

In addition to salmon from non-Scottish sources, Scottish salmon is also in competition with other high-value added foods (i.e. white-fish, cod, haddock, and chicken) where substitution is possible. For example the price of salmon has fallen sharply in comparison to other premium white fish species and chicken, subsequently this could open up opportunities for substitution by possibly increasing the market share for salmon[34]. To some extent, salmon is also in competition with premium meat and with the continued decline of the latter there could be increased opportunities for salmon to win market share (*ibid.: 14 – 18*).

In this highly competitive context it was deemed of particular importance to examine the respondents' customer base at individual (i.e. smokers, packing stations, etc. – see table 2.12) and country (i.e. exports – see table 2.13) levels.

The majority of the respondents evaluated smokers & other processors as their most important customers (83.33%), followed by wholesalers (66.67%), supermarkets, associates and packing

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[31] In this respect specific reference was made in the 1998 report, on behalf of the Highlands & Islands Enterprise and the Scottish Office to: Marine Harvest; Aquascot; Landcatch; Hydro; and Framgord.

[32]In 1996 the Norwegian industry produced 296,000 tonnes more than three times that of the Scottish Industry (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 15*)

[33] According to one of the respondents of the secondary survey conducted increased Chilean production has been indicated of creating problems in the Scottish market by inflicting a downward pressure to the global market price for salmon products.

[34] The prices of all three products have been declining but the fall is much greater for salmon (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 17*).

stations (54.55%). To a lesser degree, sales organisations (36.36%), direct consumers and hotels are also considered to be important outlets (16.67%). Fishmongers and restaurants rated the lowest in those assessments (9.09% and 8.33% respectively). The respondents also mentioned other salmon on-growers and smolt producers as well as multinational companies as important buyers of their products.

As expected the respondents' target sales market is their domestic one (93.33%), followed by France (76.92%) and the rest of the continental Europe (50%). Japan and the US were rated as the least significant of the export markets (10% and 8.33% respectively). Chile, Ireland and the Far East were also mentioned by some companies as significant for their operations.

2.3.2 The stakeholders

2.3.2.1 The Processing Sector

This sub-sector is to some degree split between primary[35] and secondary processing operations, which are carried out both by salmon farmers and companies purely concerned with fish processing.

The cleaning and packing operation is essentially seen as part of the production process by most traditional processors and this is supported by the fact that most primary processing operations are run by fish farming companies or by their co-operatives. Companies with primary processing facilities will often pack for other producers as well. However, with continued pressure on prices, most primary processors are becoming involved in secondary processing operations such as filleting, portion packing, and smoking.

The secondary fish processing sector in Scotland is dominated by the processing of fish from the capture fishery. However, as salmon production has increased, many processing companies have added lines for salmon products. Historically the main value-added processing activity for salmon has been smoking. This sub-sector has grown substantially in line with the growth of farmed salmon production. Other processing activities involve: filleting; salmon steaks;

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[35] It involves post-harvest cleaning and packing operations. Salmon are usually harvested from cages, killed and then placed in one tonne capacity plastic bins comprising 50% fish and 50% ice slurry. They are normally bled at this stage by cutting the gills. The bins are transported to the packing station (primary processor) where the fish are washed, usually gutted, sometimes de-headed and then packed with flake ice in 20 – 25 kg polystyrene boxes for onward distribution (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 20*).

gravadlaks; and secondary products from smoked salmon such as pâtés and cocktail pieces. Despite development of secondary products very few companies produce cooked recipe dishes.

The processing industry is quite fragmented but also positively concentrated. The smoking sub-sector consists of around 70 companies in Scotland and many of these are small. 82% of smoked salmon production comes from the 12 companies that are members of the Scottish Salmon Smokers Association (SSSA). A large number of companies (46%) process less than 1,000 tonnes and a small number (7%) process more than 5,000 tonnes.

Within the salmon processing industry, as with the producers, consolidation is taking place through mergers and acquisitions; in addition, processors are establishing collaborative partnership agreements. Reasons for consolidation accrue from increased market potential and improved efficiency[36] particularly through improved plant utilisation (*ibid.: 20 -22*).

Investment in processing capacity is continually being made to meet the higher output of the producers. The increasing year-round availability of uniform sized fish and growing markets have helped processors to justify the investment in new processing lines for value-added products. However, as with the production sector, the effects of investment tend to increase concentration. The larger companies are able to take a longer-term view and are supported by the purchasing policies of the leading multiple retailers, who prefer to deal with large companies that can make adequate investment to guarantee quality and supply.

The salmon industry has been criticised for not developing more value-added convenience products such as ready meals. This is essentially the role of the processors. Such dishes are being produced but there appears to be a number of constraints affecting development[37]. These include: the very significant development costs for any new product; and the often low proportion of salmon meat in these dishes does little to help increase total salmon sales (*ibid.:42-43*).

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[36] For most of the major processing companies in Scotland, salmon processing has remained profitable. Processors have successfully maintained their margins in spite of the falling retail price of salmon (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 79*).

[37] As the multiple retailers will only stock items that maintain adequate turnover, investment in a new product line can entail considerable commercial risk. It is therefore only the largest companies which can afford to invest in such development (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 43*)

Processing is a very labour-intensive activity, although the use of mechanised and automated systems is increasing[38]. Another important trend is the use of more sophisticated quality control procedures and monitoring methods. This is being introduced through a combination of regulation requirements and the increasingly strict product specifications of the major multiple retailers[39]. In order to achieve improved control over hygiene standards, plants are now more specialised, with less flexibility to substitute alternative species. This has been made possible through consolidation, which has given larger plant sizes and made it easier to monitor and control hygiene (*ibid.: 45*).

2.3.2.1.1 The competitors

The salmon processing sector is highly competitive where Scottish processors are in competition with those from England and other countries. For fresh cut product, there are quality advantages in processing close to the point of sale, mostly outside Scotland. For smoked or other cooked products there are potential advantages in processing close to the source of production. Competition from within Scotland is perceived to come from all size bands. The larger companies are the main non-Scottish competitors. In Europe, Denmark is the largest exporter of smoked salmon with the raw products mainly sourcing from Norway (*ibid.: 23*).

2.3.2.2 The retail sector (sales, marketing and distribution)

For primary sales, salmon producers either run their own operations or use agents[40] who charge a commission on salmon sold. In most cases producers retain ownership of the salmon throughout the primary processing and initial distribution, until the packed salmon are delivered to the purchaser. However, some primary/secondary processors will purchase fish "in the bin", whilst in other cases, producers may not sell the salmon until it has received some secondary processing.

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[38] Mechanical systems are available to cope with almost every aspect of the salmon processing, and most companies would at least use automated grading and weighting systems. Although filleting machines are widely used, many processors retain a labour force for this and similar jobs, as the flesh yield is higher and quality better. Portion packing is usually an automated process (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 45*).

[39] Technologies include improved temperature sensors and logging systems, portable equipment for measuring fat content and flesh colour, and increased use of computer databases and networks to record and collate information from every stage in the production and distribution chain (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 45*).

[40] The agents may be independent companies or owned by producer co-operatives (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 25*).

Although most farmers participate in the Scottish Salmon Farmers Marketing Board[41] (SSB marketing programme), some businesses make their own sales and distribution arrangements. This is undertaken partly by the largest companies, already vertically integrated with primary and perhaps secondary processing facilities. Most other farmers sell directly to a small number of processors, or use the services of an agent. There are three co-operatives that both sell and process salmon and around four independent selling agents (including one located in England).

Salmon is distributed in iced polystyrene boxes of around 20 – 25 kg, or after secondary processing, in appropriate cartons. This is mainly carried out using refrigerated articulated trucks. Also significant at this stage are the ferry services from the islands, which transport around 40% of the Scottish salmon production. Most companies are involved in road distribution at this point in the supply chain, often feeding into major processing and distribution centres such as Aberdeen, Inverness and Bellshill.

Long distance and continental haulage is provided by a small number of companies. There are also companies providing refrigerating facilities in the distribution centres until salmon is delivered to customers. In addition, other transport companies are engaged in the transport of live smolts, feed and general haulage equipment (*ibid.: 25 - 26*).

2.3.2.2.1 The competitors

Salmon sales operations are highly competitive, often targeting the same customers, and are in competition with companies selling Norwegian salmon. However, agreements and associations exist, constructing relatively stable relationships between specific producers and marketing operations. This is important in terms of providing some regulation on the quantity and quality of salmon reaching the market.

Salmon may be purchased at various points in the processing and distribution chain; specifically, at the farm gate (or packing shed gate); ex-packing station (or more likely delivered to the customer); ex-processing factory (or again more likely delivered to the customer); at a wholesale market; or at a retail outlet.

[41] See section 2.3.3.

Intermediate buyers include processors, wholesalers, traders[42], caterers and retailers where the processors get the majority of the salmon farming produce, whilst the remainder is bought by wholesalers and traders.

The UK food retailing business is becoming increasingly concentrated in the multiple chains. There are 8 chains (5 major) which stock salmon or salmon products and these account for approximately 65% of retail sales. The remainder passes through the 2,000 or so independent fishmongers, market stalls, mobile and other retail outlets. The multiples have dedicated refrigerated transport from their own central depots to individual outlets, but otherwise are not vertically integrated for salmon. However, the leading multiples, in particular, work to establish close working relationships with their suppliers (*ibid.: 27 - 29*).

2.3.2.2.2 Marketing issues

Despite market difficulties, further increases in the production are predicted. Companies with Norwegian headquarters are continuing to invest in production capacity because in their view the market for salmon is relatively underdeveloped. In the UK, for example, the price of salmon is now similar to that of beef and with the continued decline in the red meat market, there could be increased opportunities for salmon to win market share and occupy added-value sectors. However, this will require increased investment in advertising, to stimulate demand for consumers and capture the demand as it shifts away from beef and it could be proven very difficult for the salmon producers given the low market prices, as the squeeze on profits has limited funds available for advertising (*ibid.: 38*).

Marketing may be carried out by independent organisations or by industry bodies where it is generic, the latter representing the majority of marketing activity within the industry. The main generic branding is the *Tartan Quality Mark* (TQM) scheme in the UK and the *Label Rouge Mark* (LRM) in France, which are managed by the Scottish Quality Salmon (SQS) and the Shetland Seafood Quality Control (SSQC). The two schemes cover a variety of fresh and smoked product forms based on established quality criteria and regular inspection programmes (*ibid.: 39*). A few of the largest food groups produce their own labelled salmon products. However, a high proportion of retail packs of salmon are sold as label brands of the multiple retailers.

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[42] Traders are intermediate buyers who tend to service the smaller markets, such as fishmongers and the catering trade that require a mix of species. They normally do not have premises through which the fish pass (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 28, 51*).

Independent marketing organisations are largely acting on behalf of producers, so to some extent they are constrained by the strategies adopted by the producers. Key strategies of the marketing organisations are therefore to: increase their volume of sales by taking on new clients wherever possible; increase the value of sale through market targeting; widen their product range through the introduction of value-added salmon products or diversification into other species; and improve efficiency of marketing operations – possibly through the introduction of better information technology (*ibid.: 39).* The independent marketing organisations compete for business from the salmon producers on the basis of price (i.e. commission fee[43]), but also to other criteria. Their most important abilities are: to get the best prices available for their clients (for each size grade); and their administrative and sales efficiency which should ensure that there are no delays in distribution or payment (*ibid.: 38 – 41*).

2.3.2.2.3 Purchasing

With production outpacing demand, buyers have been able to demand increasing quality and consistency in terms of size grades, for example, subsequently eroding the premium that was once paid. The whole industry is affected by the buying policies of the major multiple retailers. Important trends include: a) shortening order time. Multiples are reducing the time between ordering from suppliers to stocking on shelves[44]. This puts considerable pressure on the producers and processors both in terms of logistics and requirement for flexibility; b) establishment of trading partnerships. As the leading multiples increasingly invest in quality control, they are building stronger relationships with their suppliers. This is beneficial to the companies selected as there is less risk of the buyer switching to another source. However, it tends to exclude smaller companies from the market place. The practice of building trading partnerships is also extending between processors and producers[45]; c) impact of consumer concerns. The multiple retailers are increasingly sensitive to the food safety concerns of their customers (and the media) and their influence on production practices looks likely to increase further as they come under increased scrutiny by consumer, environmental and animal welfare groups (*ibid.: 41*).

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[43] Commission fees have remained relatively stable (around 3%) as reduced sales values have to some extent been compensated by increased volumes. Nevertheless, there are indications that these fees (as a percentage of sales price) will tend to rise rather than fall, unless there are further efficiency gains in the sector (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 39).*

[44] Typical lead times may be as short as 24 to 36 hours for fresh produce and 72 hours for processed produce (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 41*).

[45] A key factor is the increasing requirement of the multiples for product traceability (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 41*).

Table 2.14: *Summary of service suppliers to the Scottish salmon sector, 1997*

Service	Suppliers
Diving	Around 9 independent companies (large companies have own teams)
Veterinary	3 specialists centres, plus independent vets, large companies have in-house services
Consultancy	Provided by a wide range of organisations including academic institutions, engineering companies, business and environmental consultancies
Accountancy	Two companies with significant involvement but many local companies also used.
Insurance	Three main companies involved in stock insurance, all based in England with Scottish offices

Source: *Highlands & Islands Enterprise and The Scottish Office (1998)*

2.3.2.3 The supplying sector (suppliers to farmers, processors, and distributors)

The suppliers to the salmon producers and processors can be separated in terms of those supplying manufactured inputs and services (although there are many overlaps). Purchases are made both from suppliers that are tightly focused on the Scottish salmon sector and from those that supply a wide range of sectors but within a limited geographic area. Items such as fuel, non-specialist vehicles and equipment, office supplies and services such as banking are all purchased by non-specialist suppliers. A summary of the number of specialist suppliers according to type can be found in table 2.14.

Many of the specialist companies can be classed as small and medium enterprises (SMEs). The largest companies are the four feed suppliers (owned by non-Scottish companies), who supply a range of feeds to cover all stages of salmon production. They also supply feed to the trout industry and, in some cases, to other aquaculture and livestock industries. Some of the companies supplying major equipment such as boats and cages are also members of larger commercial groups.

Transport is one of the most important bought-in services to the salmon sector. Apart from transportation of the finished goods that were described earlier, there are those services involving the movement of live and harvested fish. The former are carried in oxygenated tanks loaded on flatbed trucks, pick-ups, or boat decks. Smolts may also be transported in well boats, which allow water exchange during transit, or by helicopter using a specially oxygenated "bucket". Harvested fish are carried in one tonne plastic bins containing slurry of ice and water. Harvesting is usually carried out from a boat or work raft with the fish being placed directly in the bins. These are transported to shore where they are transferred to a flatbed truck for onward transport to the packing station. Both the truck and the boat may belong to the farm, but normally the former at least is provided by a local haulage company.

Vertical integration is relatively limited in the supply sector. The largest salmon producer companies are often partially self-sufficient for services such as transport, veterinarians, and divers. Most notable is the ownership by Norsk Hydro of both Hydro Seafoods GSP and Biomar (a feed company) (*ibid.: 29 – 30*).

Investment varies amongst types of suppliers. The feed companies continually invest in research and development to improve growth rates and flesh quality, and to reduce environmental impacts. They are also continuing to invest in production plant capacity as Scottish salmon production continues to rise. Investment in research is also carried out by some equipment

manufacturers, as the global salmon farming industry grows and becomes more attractive for investment in product development.

The feed companies, and to a lesser extent some other suppliers, are investing in value-added services[46] to encourage customer loyalty. Some other suppliers have invested in a broader product range in order to become a one-stop-shop for certain types of installation, or product category. They may also add value through customisation or bespoke manufacturing and installation services (*ibid.: 43*).

2.3.2.3.1 The competitors

Salmon farming technology has continued to evolve since the early 1980s. The main driving forces have been market demand for year-round supply of fish at particular sizes, the need to improve efficiency in order to remain competitive, and the impact of environmental and other regulation. Although Scotland has been very active in salmon farming research and development, it has frequently been Norwegian companies that have had the resources to bring new products to the market.

With more R&D funding available in Norway, and a larger domestic salmon farming industry, many of the technical developments come from there. This has been a source of competitive advantage for Norwegian suppliers to the Scottish farming and processing sectors. For example in the early 1980s the first steel cages were imported in Scotland from Norway, followed by plastic cages a few years later (*ibid.: 30*). The latter development lowered the cost per installed unit of volume. Other examples are: the development of centralised bulk feeding system that reduced labour requirements and the introduction of higher energy diets (*ibid: 44*).

As these technologies can be purchased from Norwegian suppliers, or have been quickly adapted and improved upon by Scottish suppliers, the availability of technology is probably not a constraint for the Scottish industry. More important is perhaps that Norwegian companies and financial institutions appear more ready than their Scottish counterparts to invest in new technology to counteract falling profitability (*ibid.: 44*).

2.3.3 The regulators

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[46] This includes free technical advice, and the provision of farm management software. The latter is usually installed and maintained free of charge for so long as the customer continues to purchase a certain percentage of feeds from the company (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 43*).

Through its representative bodies, such as the Scottish Salmon Growers Association (SSGA) and the Shetland Salmon Farmers Association (SSFA), the industry has adopted a strategy of maintaining prices through the Scottish Salmon Farmers Marketing Board (SSB) promoting the premium quality image for fresh Scottish salmon. This has become harder as the increasing volume of salmon combined with a relative high number of suppliers has tended to make salmon a general food commodity. The SSB and SSFA have worked hard to provide their members with a quality premium through the Tartan Quality Mark, the Shetland Seafood Quality Control Mark, and the Label Rouge mark in France. All of those certification marks can provide a premium for the Scottish products. The Norwegian industry also promotes its salmon as premium quality, although it appears to accept more readily the commodity status of fresh salmon, and expects differentiation to be with value-added products.

In 1996 the Scottish industry trade bodies drew attention to the Norwegian breaches of international and EU trade regulations and lobbied for greater controls and import duties on Norwegian salmon entering EU. The European Commission had imposed Minimum Import Prices (MIPs) at an earlier period and from an investigation clear evidence was found showing that the Norwegian industry had received subsidies in contravention of EU regulations, and had exported salmon at prices lower than the cost of production, damaging thus the Scottish and Irish producers.

The threat of anti-dumping and countervailing duties led to a negotiated settlement implemented in 1997, which established a new MIP scheme with a one-year duration period. The agreement also established procedures for monitoring compliance with the MIP and mechanisms enabling the MIP to be adjusted to take account of changes in market conditions. Sanctions in some Norwegian companies were also imposed for the remaining lifetime of the agreement. The EU intervention's impact resulted to the ceasing of the downward path of prices.

The SSGA in particular has also worked for the establishment of a mechanism to modify Scottish production (through co-operative control of smolt input) in the light of projected market demand. However, the lack of universal support for this program throws doubt on the success of this approach. The Norwegian industry appears to have invested more readily in new technology to improve production efficiency and also put more into the development of new markets.

France is the main export market for Scottish Salmon. The French market is divided into fresh gutted salmon and fresh whole round salmon. The latter segment shows less capacity for future sales expansion as the current rate of increase in demand has slowed, whereas most other products still have potential for increases in sales. Sales could be boosted further by increased

penetration of salmon into the ready meal sector. The Norwegians in order to face the tight limits existing now within EU try to develop markets mainly in Russia and China (*ibid.: 51 - 54*).

Regulation can act as an important driving force of technology development. In Norway, for example, the combination of the existing limit of the cage volume[47], the limitations on the number of farms[48], and the existence of further measures that target the curtailing of production[49], have clearly encouraged technical developments that improve cage utilisation and feeding capacity.

In the UK, there have been concerns regarding the role of the Crown Estate in granting sea bed leases for marine fish farms, as landlord and regulator. As a result the government has reviewed their role and concluded that this function would be best performed by local authorities, which could introduce further transparency and local accountability into the process. To address concerns about the divergence of approaches adopted by individual authorities the government has produced national guidelines advising on the processes implemented when considering applications. This approach provides an opportunity for greater monitoring and control of the industry on the part of the planning authorities, local stakeholders, environmental organisations, and the multiple retailers. The industry recognises the need for a more proactive approach to environmental management and through SSGA/SSFA is working with SEPA, the Crown Estate and others to develop appropriate guidelines and standards which could eventually be incorporated into the Scottish Quality Assurance Scheme. These pressures will continue to drive technical progress (*ibid.: 44 - 45*).

2.3.4 Other Issues

2.3.4.1 Price setting

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[47] Cage volume is limited to 12,000 m^3 with a maximum continuous biomass of 300 tonnes (equal to a stocking density of 25kgr/m^3) (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 44*).

[48] The number of farms is limited through a licence scheme. The number of licences has remained constant since 1988, although companies can transfer ownership and the government can reallocate licences to new sites (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 44*).

[49] In 1995 fish bans on fish over 4kg and later on fish over 2kg, were established. Also, since 1996 feed quotas have been in place to limit production (initially 550 tonnes per 12,000m^3, were subsequently increased by 15% in 1997 and rose further to 715 tonnes in 1999) (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 44*).

The salmon farming industry is still relatively young and it is the production sector that has driven the growth over the past years. This growth has been fuelled mainly by developments in production technology and increasing willingness of large companies to invest in the sector. At the same time falling salmon prices[50], rising real incomes and increased availability have driven the market for salmon and salmon products to expansion in order to absorb the extra production.

The foreign competitors and more specifically the Norwegian producers are those who set the prices given their dominant position in the European market. However at this point it is important to distinguish between price changes arising from exchange rate changes that are potentially reversible in the short run, and longer run pressures on prices arising from intensifying competition. Although Scottish producers are price takers, there have been occasions when they set the price by selling lower than the Norwegian prices. This happens when producers need to reduce their stocks at times of relatively low demand. Larger companies have their own trading operations, while smaller companies tend to use agents[51].

Maintaining and enhancing the competitive position of Scottish farmed salmon is crucially important. Although prices rank highly in maintaining a competitive position the quality of salmon produced emerges as the most highly rated competitive factor.

Pricing by processors is more complex than for the producers and varies with product and position in the processing/marketing chain. For products destined for UK multiple retailers, the multiples are active in the price settings (usually based on production costs plus 10%). For smoked products where there is more European competition prices are set to some extent by Danish processors. However, there is more space for product differentiation in the processing sector and the better quality smoked Scottish salmon can achieve a premium. In general the processors do not favour discounting as a primary tool for competition, preferring instead to concentrate on quality and reputation (*ibid.: 32 – 37*).

2.3.4.2 Exports and imports of salmon

Exports

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[50]Salmon prices have declined by approximately 35% in the period 1990 – 1997 (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 32*).

[51] These may be independent or attached to a primary processing operation. The relationship between producers and agents is often quite stable and based on trust. Long-term contracts are rather the exception than the rule even though they provide a degree of security. Contractual agreements are more likely to exist between processors and large retailers (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 33*).

The continued growth of export markets is of crucial importance for the industry and provides an important indicator of the industry's competitiveness[52]. A small amount of salmon may be imported, processed and then re-exported. In absolute terms the export performance of the industry has been very encouraging particularly in the period 1993 – 1996 when export volume increased by 53%. Moreover the share of the output exported had been broadly maintained, fluctuating from 40% to 50% of Scottish salmon production between 1989 and 1996. In 1997 47% of production was exported.

The largest export market is France (48% of the exports in 1996). The next largest market varies from year to year, but never takes more than 10% of the exports. In 1996, Germany was the second largest export destination. Other major export markets include: the USA, Belgium/Luxemburg, the Netherlands, Italy, Spain and Japan.

Fresh chilled salmon makes the most important contribution to the value of total salmon exports[53]. Smoked and prepared salmon products accounted for £39.3 million of exports in 1997 (30% of the UK salmon exports value). There has been relatively little growth of frozen Atlantic salmon but this is a small part of value of exports (2% in 1997). The different pattern of behaviour of fresh chilled and smoked/prepared export markets segments suggests that the latter export markets are proving more difficult to develop. Overall, the UK is the second largest exporter of smoked salmon in EU after Denmark, whose production is double that of the UK.

Imports

There is a steady rise in imports of fresh chilled salmon in the UK, with their value in 1997 being £31.3 million (26% approximately of the value of all salmon imports). The main supplier of fresh chilled salmon is Norway, followed by the Faeroe Islands, Sweden, Iceland, Denmark, USA, and Ireland[54]. Imports of smoked salmon had a value of £81.6 million (67.7% of the value of all salmon imports) in 1997. Smoked salmon imports are supplied by 13 countries including France, Germany, Ireland and Switzerland (*ibid.: 80 – 84*).

2.4 Producers' views on issues in salmon farming

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[52] Exact figures on Scotland's exports are hard to obtain, as export statistics do not record original source and data are generally for the UK (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 80*).

[53] In 1997 such exports amounted to £87.8 million (approximately 67% of the UK salmon exports value) (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 83*).

[54] Some of the imports are re-exports of Norwegian fish as not all of the nations are salmon producers (*Highlands & Islands Enterprise and The Scottish Office, 1998, p 84*).

This section explores the producers' views about the salmon farming sector, as gathered from the fourth and largest part of the questionnaire[55], with regards to market, support, regulation and health, future prospects of the industry, and organic salmon. An evaluation of these views enables a simple picture of the salmon farming arena to be constructed. A summary of all the assessed statements can be seen in table 2.15 in the appendix.

2.4.1 Market issues

The salmon farming sector is important for the financial well-being of rural areas. However, its profitability for the actual operators is particularly low. Fish farmers believe, they receive an insufficient share of the retail value of their products, and the income earned from such activities is not enough to guarantee business survival. As a result, the trend in the sector is towards increased consolidation and large scale industrial fish farms. In contrast to this bleak picture however, the supply chain is not perceived as a long one and the sector is seen as sufficiently dynamic to attract persons with the necessary management skills. As a result of the latter, farm labour availability and staff turnover are not seen as critical issues. The opinions of the respondents were divided on whether most production is on contract for a predetermined supply chain or not.

International recognition of the Scottish brand name on salmon products is perceived as a significant strength for the industry and for that reason certifying mechanisms were perhaps considered earlier as an important aspect of the arena. Quality management is not seen as solely restricted to compliance in the monitoring of these certification mechanisms. However, it is somewhat unclear whether these schemes have been the reason for a wide range of niche market development over the years.

2.4.2 Support issues

The respondents' views regarding the support provided to the industry were not particularly positive. Government policy and regulation are not perceived as effectively dealing with issues relating to the competitiveness of the sector. The industry is not significantly subsidised or as it was later underlined by SSGA, not subsidised at all. In addition the government does not ensure that the importance of salmon farming receives sufficient public debate even though published scientific research (at that point in time) does not detract from the sector's image. On the other hand, programmes aimed at further development of the skills of the management and the workforce are inadequately funded even though the sector believes that continuous training at all levels should be seen as a business priority.

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[55] See questionnaire layout in the appendix.

Generally, government policy is not seen as a hindrance for the industry. This contrasts with results from interviews, conducted latterly in the research, where the government and regulation are seen as an obstruction to the development of salmon farming industry. Financial support, past and present, from the Highlands & Islands Enterprise network for business expansion and business start ups was deemed beneficial.

Organic salmon farmers perceived government policy as neutral, whereby it is viewed neither as actively promoting transition to that production regime as a solution to the industry's problems, nor as an obstacle against such a regime.

2.4.3 Regulation – environmental concerns

Producers do not view positively the environmental regulation associated with their operations. Strong and enforced legislation (regulation), exceeding international standards, is seen by the respondents to be the norm, with the expectation that it will become even more stringent. Regulation is perceived to prevent the efficient management of the firms because government regulation does not effectively respond to consumer concerns regarding animal welfare and environmental issues on the one hand. On the other, the producers believe they are responding adequately to such concerns without the need for further and stricter regulation. Fish farmers' responses indicate a belief that their operations are environmentally friendly. It is claimed that alternatives to antibiotics are routinely used in most of their operations while performance enhancers, such as growth promoters, are not. Finally, genetic technology is not viewed as possibly beneficial for the aims of the sector.

2.4.4 Future prospects

The future of the sector is generally seen as problematic, mainly due to unsatisfactory financial performance of the salmon producing companies. The cost base of the Scottish salmon industry is regarded as uncompetitive and there is not confidence in future commercial success. Producers believe that there is insufficient profitability in salmon farming to maintain the sector. In addition, there is insufficient investment in updating capital assets and the viability of the industry is adversely affected by foreign salmon production.

On the other hand, certain traces of optimism are maintained and the industry believes that it might be able to recover from current financial difficulties. Total domestic demand is increasing and respondents believe that it has been unaffected by the controversy over the risks of consuming farmed salmon. Multiple retailers are believed to be the driving force of the

domestic consumer market. EU enlargement is seen as representing an opportunity for the sector and the domestic UK market is sufficiently developed to act as a platform for exports. This is boosted by the fact that supply significantly exceeds domestic demand and so it can force export development. Benchmarking of unit costs, service levels and best practice are the norm in the industry and there is significant investment by international companies in the sector.

2.4.5 Organic salmon

Mainstream fish farmers have a somewhat negative attitude towards organic salmon. Organic salmon, like the mainstream salmon, is perceived to be a healthy product. Total domestic demand is increasing for organic salmon but a strategy towards moving to organic production would not solve many of the sector's, primarily financial, problems. Furthermore barriers to organic farming concern the definition and understanding of "organic" in fish husbandry, the high risk associated with switching, the price premium for organically farmed salmon is currently too low to justify such a turn, and the actual organic product is not seen as effectively marketed.

Organically farmed salmon is a niche market, with a low expansion potential firstly because of the underlying regulation, and secondly because, it can only refer to small segments of the mainstream market. There would not be any buyers if the conventional output of the sector were to change into organic. Therefore, organic salmon farming, on a large-scale, is unlikely to become standardised in the next ten years. In agreement to that the majority of the respondents did not see themselves switching to organic production in the next five years.

2.5 Summary – conclusions

In this chapter an effort was made to present a picture of the arena in which the salmon farming industry operates as perceived by the producers. Such a picture was constructed using data gathered from a questionnaire postal survey conducted as part of this research. The results of this survey complemented those of a similar one conducted in 1997 on behalf of the Highlands & Islands Enterprise and The Scottish Office. This picture will be elaborated in chapter 6 following the analysis of interviews and documents conducted after this postal survey.

In summary the majority of the participants in this part of the research program are small[56], of independent ownership status companies with operations between 11 and 15 years, focused

[56] See section 5.3.2 for further explanations on the classification of the companies participated in the (secondary) survey into small, medium, or large. A detailed listing of these companies is given in the appendix.

mainly in the production of mature salmon with annual production of less than 2,000 tonnes. Sales are mainly limited to the domestic UK market and France to fish processing companies, wholesalers, supermarkets, and associates and packing stations. Management aspects of their production cycle and associated financial issues are primarily identified as important issues affecting operations. Certifiers are deemed important actors, alongside regulatory authorities, in the salmon farming risk arena with an ability to perhaps boost the sales of salmon products. In addition, regulatory and political institutions, foreign competitors, customers or other purchasers of their products, and multinationals are deemed important actors in the arena having impacts on the financial viability and efficiency of their businesses.

From the analysis of the survey results the importance of environmental issues, and the concerns of associated groups or other stakeholders, seem to have been underplayed. In contrast, the industry generally regards itself as environmentally friendly, whose future development and viability is possibly being hampered by a lot of unnecessary regulation coming from many different sources. The position held towards organic salmon was somewhat negative and the view of that production regime was not seen favourably as a solution to the industry's financial problems.

With regards to the social resources described by the arena framework[57], the producers mentioned money or rather the lack of it, lack of power on their behalf and compliance with the unnecessary demands of a number of regulatory and political institutions, certifying mechanisms, and customers. They spoke about the certifying mechanisms and their code of practice as perhaps ways to create social influence, value commitment and better understanding of their industry from the general public in an effort to improve their financial positions. Finally, published scientific evidence was mentioned as not supporting the environmental concerns of the various stakeholder groups.

This initial picture was enriched by an intra-sectoral presentation of the industry through an adaptation of the arena metaphor framework. This is an internationally highly competitive sector with intense profitability and overproduction problems. As expected, the main concern of the producers in that environment is their financial survival which they try to tackle through certification schemes that can potentially differentiate their products in the eyes of the general public. All the associated with the industry's operations groups have similar profitability problems and they also try to maintain their position in that environment.

The above picture will be developed further in chapter 6 using the presentation of the interview data, the analysis of which will consider perspectives of those in the industry alongside those of

[57] Discussed in section 3.3.2.

regulatory bodies and other stakeholding organisations. Hopefully this will result in a structuring and evaluation of the risk debate taking place in the salmon farming arena, as well as an investigation into the changes that environmental accounting and reporting potentially bring. In conjunction with an examination of risk perceptions the evaluation will be achieved via an investigation of the communication routes used by and messages communicated by interested parties.

The risk arena representation of the salmon farming industry in Scotland is enriched in chapter 5 and in the appendix through a short presentation of the organisations participated in this study. At the same time the study's rationale will be concluded in chapter 5 through a discussion on the data collection methods and analytical techniques used.

The following chapter (chapter 3) introduces the reader into the rationale underlying this work. This takes place through a discussion of the ontological, epistemological and methodological positions held by the researcher and it is furthered by the review of the associated literature in the field of risk research in chapter 4.

Chapter 3: Methodology

3.1 Introduction

The struggle between positivism and constructivism cannot possibly be demonstrated more clearly than in the field of risk research. Over the centuries the word 'risk' has changed its meaning and its use has become far more common and applied to a plethora of situations. In its early days it designated the possibility of an uncontrollable danger[1]. It excluded the idea of human fault and responsibility. Risk was perceived to be a natural event and humans could do very little except attempting rough estimations of the likelihood of such events happening and taking steps to reduce their impact.

Perhaps the most significant changes in the meanings and use of risk are associated with the emergence of modernity (see for example *Beck 1992a, b, 1994a, b, 1995, 1996, Giddens 1990, 1991, 1994a, b, 2002*). Modernist is built upon the notion that emerged in the eighteenth-century Enlightenment, that the key to human progress and social order was thought to be objective knowledge of the world through scientific exploration and rational thinking. It assumes that the social and natural worlds follow laws that may be measured, calculated and, therefore, predicted. The science of probability and statistics developed as a means of calculating norms and identifying deviations, thus embodying the belief that rationalised counting and ordering would bring disorder under control (*Hacking, 1990, p vii, Bernstein 1998, p 1 - 6, Douglas 1990, p 2*). These fields were to become important to the modernist technical notion of risk.

During the eighteenth century, the concept of risk had begun to be scientised drawing upon new ideas in mathematics relating to probability. By the nineteenth century, the notion had been extended. Risk was no longer exclusively present in nature but it was also affected by human beings, in their conduct, in their liberty, in the relations between them, in the fact of their association in society. The modernist concept of risk assumed that unanticipated outcomes may be the consequence of human action replacing earlier concepts of fate. Moderns had eliminated genuine indeterminacy (or uncertainty) by inventing "risk" and by doing so they had learnt to transform a radically indeterminate cosmos into a manageable one through the myth of calculability (*Reddy, 1996, p 237*).

Risk, in modernity, came to rely upon conditions in which the probability estimates of an event were able to be known or knowable. Uncertainty was used as an alternative term when these probabilities

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[1] See section 4.2.1.

were inestimable or unknown. This distinction presupposed that there was a form of indeterminacy that was not subject to rational calculation of the likelihood of various alternative possibilities (*Reddy, 1996, p 227*). Risk could also be distinguished in good or bad through the notions developed in insurance science associated with notions of chance or probability on the one hand, and loss and damage on the other.

At the end of the twentieth century, these fine distinctions between risk and uncertainty, and good and bad risk tend to be somewhat lost. Risk has become a key word in everyday life. In lay people's language, risk tends to be used to refer almost exclusively to a threat, hazard, danger or harm. Issues of calculable probability are not important to the colloquial use of the term. Risk and uncertainty tend to be treated as conceptually the same thing. Scientists, because of developments in probability statistics and computer technologies that allow the statistical manipulation of large data sets and the establishment of institutions and regulatory agencies to deal with phenomena conceptualised as highly risky, have moved scientific thinking from paradigms of mono-causal determinism. Changes in the nature of risks themselves have made them more globalised, less identifiable and more serious in their effects and therefore less easily manageable and anxiety-provoking (*Beck, 1992a*).

Post-modernity prompted by a growing sense of the failed promises of early or simple modernity and a tendency to challenge the key assumptions of that period, especially those viewing science and medicine as the vanguards of progress, questions the established thought, expression and practice.

All these changes are seen as contributing to a particular way of understanding the self and the world that differs dramatically from earlier eras. These changes are associated with an intensifying sense of uncertainty, complexity, ambivalence and disorder, a growing distrust of social institutions and traditional authorities and an increasing awareness of the threats inherent in everyday life. Decisions today of individuals or organisations can be identified as the root cause of disasters. Therefore, arguably one could oppose such individuals and organisations to obviate danger. The concept of risk has gained importance in recent times because of the perceived dependence of society's future on current decision-making (*Lupton, 1999, p 5 – 12*).

In the previous chapters an attempt was made to link together the different notions attached to this study, alongside a skeletal picture of the salmon farming arena. This chapter functions as an introduction to the rationale underlying the research which is further developed in the two subsequent chapters. In this context this chapter is structured as follows: the next section briefly outlines the view of critical realism as this is seen through the writings of Tsang at al (*1999*). This perspective will be enhanced by a summary of the ontological, epistemological, and methodological positions held by the

different disciplines involved in the field of risk research[2] and an exploration of the respective positions adopted by sociological research. Then a general overview of the framework used to conduct this research into the Salmon Farming risk arena in Scotland is presented. The chapter's final section outlines the researcher's ontological, epistemological and methodological standpoint.

3.2 Methodological issues

Contemporary western societies have been described as post-traditional (see, for example, *Beck et al, 1994*), whereby old traditions have been called into question, and in many cases stripped away, leaving greater uncertainty and insecurities behind. Given the contemporary nature of risk the realist[3] tradition characterising the early modern era is not deemed an appropriate paradigm to consider the phenomenon of risk. Critical realism is preferred because of its three basic contentions; firstly, the reality to which scientific theories primarily refer to concerns the structures and mechanisms of the world, rather than empirical events. Structures, in this context, are defined as sets of internally-related objects and mechanisms as ways of acting. Objects are internally linked in a structure in the sense that their identity depends on their relationship with other components of the structure. Secondly, the underlying structures and mechanisms are only contingently related to observable empirical events. Thirdly, although scientific knowledge of reality, especially social reality, is never infallible, it is still possible to acquire such knowledge through creative construction and critical testing of theories.

The combined effect of structures and mechanisms may generate observable events. However, the absence of an observable event does not necessarily mean that the underlying mechanisms do not exist[4]: perhaps they counterbalance one another. Thus, Bhaskar (*1978, p 56 – 62*) distinguishes the domain of observable events from the real domain in which generative mechanisms capable of producing patterns of events reside. Since the domains are distinct, the move from the real to the empirical depends on the ambient contingent conditions. This can be better understood with reference to critical realism's distinctive view of causality.

The critical realist argues that a constant conjunction of events is neither a sufficient nor a necessary condition for a causal law. Causality concerns not a relationship between discrete events but the causal powers of objects or their relations, or more generally their mechanisms. To ascribe a power to an

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[2] The sociological perspectives deemed as important for this study are further discussed in chapter 4.

[3] Realism or objectivism is the philosophical thesis arguing that a mind-independent reality, which has its own inherent order, exists (*Fay, 1996, p 200*)

[4] This could not be truer than in the realm of risk where a lot of the underlying mechanisms might be manifested many years after the initial source-event (see for example *Beck 1992a*).

object is to say something about what it will or can do, in the appropriate conditions, in virtue of its intrinsic nature. Often causal powers inhere not simply in individual objects but in the structures they form. Whether a causal power is activated depends on two types of contingent conditions, namely intrinsic and extrinsic conditions. The former are satisfied when there is no change in the nature of an object for consistent operation of mechanisms. Extrinsic conditions are those external to the object and yet affect the functioning of mechanisms. When activated, mechanisms produce events in conjunctures.

The above distinction between the domains of the real and the empirical is crucial. Since the empirical domain is not the deepest level of reality, the impossibility of invariable empirical laws does not imply the denial of objective reality.

A closed system is one in which a constant conjunction of events obtains (i.e. in which an event of type A is invariably accompanied by an event of type B) (*Bhaskar, 1978, p 70*). When both intrinsic and extrinsic conditions are met a closed system is achieved and regularities of events are generated. Scientists need to conduct experiments precisely because of the open character of the world in which events are subject to diverse causal variations. Conditions of closure are rarely possible in social sciences because of: the configuration of social systems which is modified by human actions, thereby violating the extrinsic conditions; and the human capacity for learning and self-change which violates the intrinsic conditions.

Therefore social structures are less enduring than structures found in nature. It follows that, for the positivist, knowledge of causal laws governing the social reality is almost unattainable. In contrast although realists agree that experiments, where closed systems are created, provide ideal conditions for the study of mechanisms, they do not think that the quest for reality is altogether precluded in open systems. Even if patterns of events do not amount to invariable laws, they are still the manifestation of the real structures under less than ideal conditions.

The impossibility of constructing closed systems in the social sciences implies that the disciplines are primarily explanatory or interpretive, rather than predictive. The critical realist agrees that the search for quantitative social laws that can accurately predict social events is not feasible. The exclusive emphasis on prediction will even obscure the important role of explanation in natural science, and in the latter as well as in everyday life. Explanations often exist without being able to predict (*Kaplan, 1964, p 347)*. However, it remains true that if predictions can be made successfully on the basis of a certain explanation, then there is a good reason and perhaps the best sort of reason for accepting the

Table 3.1: *A systematic Classification of risk perspectives*

	← Integrated aproaches (e.g. social amplification of risk) →						
	Actuarial aproach	**Toxicology Epidemiology**	**Probabilistic risk analysis**	**Economics of risk**	**Psychology of risk**	**Social theories of risk**	**Cultural theory of risk**
Base unit	Expected Value (EV)	Modeled Value	Synthesised Expected Value	Expected Utility (EU)	Subjectively Expected Utility	Perceived Fairness & Competence	Shared Value
Pre-dominant method	Extrapolation	Experiments/ Health surveys	Event & Fault tree analysis	Risk-Benefit Analysis	Psychometrics	Surveys/ Structured Analysis	Grid-Group Analysis
Scope of risk concept	Universal	Health & Environment	Safety	Universal	Individual Perceptions	Social Interests	Cultural Clusters
	One Dimensional	One Dimensional	One Dimensional	One Dimensional	Multi Dimensional	Multi Dimensional	Multi Dimensional
Basic problem areas	Averaging over space, time, context			Preference aggregation		Social relativism	
	Predictive Power	Transfer to humans/ Intervening variables	Common mode failure	Common denominator	Social Relevance	Complexity	Empirical Validity
Major aplication	Insurance	Health / Environmental protection	Safety engineering	Decision making	Policy making and regulations Conflict resolution (mediation) Risk communication		
Instrumental Function	Risk Sharing	Early warning Standard Setting	Improving Systems	Resource Allocation	Individual Assessment	Equity Fairness Political Acceptance	Cultural Identity
Social Function	Assessment	Risk Reduction & Policy Selection					Political legitimisation

Source: Renn (*1992a, p 57*)

explanation (*ibid.:350*). Similarly, although verification and falsification are never conclusive, critical testing of theories is very important (*Tsang at al, 1999, p 3 – 4*).

There are many classifications of the different disciplines and frameworks used to approach the field of risk research. There can be no theory or scientific investigation without classification. The latter provides the conceptual tools necessary to select and order the phenomena a researcher attempts to study (*Renn, 1992a, p 55*).

The literature provides an array of classifications. Some are based on hazard types, whilst others relate to definitions of risks, to risk conflicts and some to semantic images revealed through risk perception studies (*ibid.: 55*). Krimsky (*1992, p 7 -21*) for example identifies a number of such categorisations in the field such as: quantitative laws (*Starr 1969, Starr et al 1976* as quoted by *Krimsky 1992 p 8*); static taxonomic frameworks; system models; causal models (*Kasperson 1992, Kasperson et al 1988, Kates and Kasperson, 1983*); process models; functionalist explanations (*Douglas 1992, Douglas and Wildavsky 1982, Thompson 1980, Thompson and Wildavsky 1982, Thomspon et al 1990*); cognitive explanations (*Slovic 1992, Slovic et al 1980*); analogical models and interpretive representations (*Hesse 1966, Kasperson 1992, Kasperson et al 1988, Kates and Kasperson, 1983, Renn 1992b, Nowotny 1979 as quoted by Palmlund 1992 p 201, Palmlund 1992*); and individualist and contextualist modes of explanations (*Wildavsky and Dake 1990, Douglas 1992, Douglas and Wildavsky 1982, Renn 1992b, Kasperson 1992, Palmlund 1992*) .

All of these classifications have specific merits but provide little insight into the philosophies and mind-sets that underpin different concepts of risk. Few attempts have been made to develop trans-disciplinary taxonomies of risk perspectives. Although the growing risks of societal development have been the central focus of modern society, there is no approach in sight that could integrate the variety of definitions and concepts to offer a common conceptual denominator. A classification may not offer one common conceptual denominator, but it may provide a framework for comparison and analysis of the different risk concepts and thus help to define common elements and distinctions between different concepts (*Renn, 1992a, p 55 - 56*).

Table 3.1 presents a classification of the different approaches in risk research[5]. The reader can see the different ontological and epistemological positions taken by these different disciplines in approaching

[5] A different classification of the sociological perspectives than the one described in table 3.1 with reference to the rational actor concept, social mobilisation theory, organisational theory, systems' theory, neo Marxist and critical theory, and social constructionists' concepts) can be found in Renn (*1992a, p 58 – 72*).

issues of risk (note than on the left side are the disciplines with a purely realistic ontological position whereas on the right side are the ones with a purely relativistic position).

All these risk concepts have one element in common: the distinction between reality and possibility. If the future is either predetermined or independent of present human activities, the term risk makes no sense. If one's fate is predetermined, there is no need for anticipating future outcomes other than to please one's curiosity, because negative consequences cannot be avoided. If the distinction between reality and possibility is accepted the term risk denotes the possibility that an undesirable state of reality (adverse effects) may occur as a result of natural events or human activities. This definition implies that humans can and will make causal connections between actions (or events) and their effects, and that undesirable effects can be avoided or mitigated if the causal events or actions are avoided or modified.

Risk is therefore both a descriptive and a normative concept. It includes the analysis of cause-effects relationships, which may be scientific, anecdotal, religious, or magical but it also carries the implicit message to reduce undesirable effects through appropriate modification of the causes or mitigation of the consequences. The definition of risk contains three elements: undesirable outcomes, possibility of occurrence, and state of reality. All risk perspectives provide different conceptualisations of these three elements, which can be paraphrased in the following three questions: how can we specify or measure uncertainties; what are undesirable outcomes; and what is the underlying concept of reality. These three questions can serve as guidelines for distinguishing these different perspectives (*Renn, 1992a, p 55 –58*).

3.2.1 Risk and the social sciences

The important question when studying issues of risk it is not whether the ontology of the latter is real or mere construction, but concerns the need to understand, in the broadest sense, risk construction as a practice of manufacturing particular uncertainties that may have harmful consequences to life. The essence of risk is not what it is happening, but what might be happening. Risks are manufactured not only through the application of technologies but also in the making of sense and by the technological sensibility of a potential harm, danger or threat. One therefore cannot observe a risk as an entity out there; risks are necessarily constructed. However, they are not constructed on the basis of voluntary imagination. Instead they are being revealed in their construction. The construction of risk must obey the logic (discourse or reason) of its revelation. In order to make sense it has to incorporate the technological sensibility (know-how) of that which granted its existence. The consequences of this revealing are irreversible but not fixed.

The theory and analysis of risk, therefore, takes us out of both the empirically accessible world of social facts as well as the sphere of pure social construction. This is so because, on the one hand, the materiality of technologically – constituted hazards always includes the virtual domain of latency, invisibility and contingency and on the other, socially constructed risks are also lived as potential harm. This im/materiality constitutes a difficulty because it forces theorists to transcend not only the choice between realism and constructivism, but also the reliance on the empirically accessible world of social facts. For social theory this means a radical destabilisation of two often unquestioned problematics and critical tools that lie at the very heart of the social sciences: epistemology; and methodology. For social scientists, perceptions of risk are intimately tied to understandings of what constitutes dangers, threats, hazards, and for whom. A number of technologically-induced hazards are characterised by inaccessibility to the senses. Without visual presence, the hazards associated with these technologies are difficult to represent as risks, let alone sustain their existence beyond their momentary emergence (*Adam et al, 2000, p 2 -3*).

The im/materiality and in/visibility of the threats that suffuse the risk society (*Beck, 1992a*) mean that all knowledge about it, is mediated and it is, as such, dependent on interpretation; inherently a matter of perspective and, hence, political. The above nature of technologically induced hazards puts natural scientists, social theorists, news workers, business managers and members of the public in similar structural positions concerning truth, objectivity and certainty of knowledge.

Risks are transformed into embodied dangers which cause widespread expression of public concern (mobilising pressure groups, expert advisers, scientists, politicians, the media and other stakeholders), intense academic debate and are put firmly in the political agenda.

Thus, the ontology of risk does not grant privilege to any specific form of knowledge. In practice of course, some people have substantially better access to information and research facilities than others. In addition there are differences in discursive competencies, in acquiring accreditations of legitimacy, in resources to divert and displace risks to other groups and last but not least, in shielding oneself from potential harm.

Therefore, in a risk society the politics and sub-politics of risk definition become extremely important. They highlight the contested nature of who is defining what as risk and how. Risks have become a considerable force of political mobilisation, often replacing inequalities associated with class, race and gender (*Adam et al, 2000, p 3 – 4*), i.e. the underlying basis of: the accountability or managerial stakeholder theory; the organisational legitimacy; and the political economy theories.

The basic premise of the stakeholder concept of the firm argues that a business organisation has relationships with many constituent groups ("stakeholder groups") that affect and are affected by its decisions (*Freeman 1984, p 24 – 27, Gray et al, 1996, p 45*). The management of businesses is responsible not just to their shareholders and investors but also have duties of stewardship which extent to a wide range of stakeholders, including employees, creditors, consumers, the government and wider community. The companies will be wise to ensure that appropriate information is provided to all those groups, which are in a position to take action, in the light of their perception of a company's environmental performance that may directly or indirectly affect the company's present or future position (*Macve et al, 1992, p 1*).

The organisational legitimacy theory posits that the continued existence of a business organisation within society depends on there being a perception amongst the wider society that the values adopted by that organisation are commensurate with society's own values (*Gray et al, 1996, p 46*). Thus by implication, to the extent that a business organisation's perceived social values are out of step with those of the society in which it operates, the legitimacy of the organisation is said to be under threat. In response to this "legitimacy gap", organisations are argued to employ various strategies of legitimisation, the aim of which is to close that "gap" (*Lindblom, 1994, as quoted by Gray et al, 1996, p 46 - 47*).

In the context of corporations' environmental responsibilities legitimacy reflects a minimalist environmental strategy. If the organisation adopts a legitimacy strategy, the objective is to maintain its position in the industry and the referent community, situating it such that environmental related actions will not negatively effect the firm's operations. The primary focus is preserving its legal and social licence to practice by meeting regulatory requirements and providing no compelling environmentally related reasons to deny the firm operating rights. The organisation seeks parity and social licence through its environmental practices, not advantage and preference. The ultimate decision criterion is to enhance the input-output ratio by balancing the organisational costs and benefits of externalising transformational costs.

A competitive advantage environmental strategy attempts to improve its market and economic position as a result of environmentally-related actions. Environmentally desirable behaviour represents a tool for improving profitability. For example, the firm may achieve higher efficiencies or higher quality as a result of environmentally related actions by improving its processes. Also, the firm may establish new markets, gain additional market share, and/or increase market size through environmentally related product development, product improvements, and increased customer loyalty.

The primary focus is enhanced economic results. Environmental resources are seen as inputs to a transformation process that is to be carried out in the most economically efficient manner. Maximisation of owner/shareholder wealth represents the ultimate decision criteria. Enacting environmental policies and actions are viewed as a means to an economic end (*Dillard et al, 2005, p 14 – 15*).

Political economy is the social, political, and economic framework within which human life takes place. According to the emphasis placed on the level of resolution of analysis and thus the importance placed on structural conflict within society it can be viewed as either "classical" (most usually associated with Marx) or "bourgeois" (most usually associated with John Stuart Mill and subsequent economists). A classical political economy places structural conflict, inequality and the role of the State at the heart of the analysis, whereas bourgeois political economy tends to take these things as given and excludes them from the analysis. As a result the latter tends to be concerned with interactions between groups in an essentially pluralistic world. While this produces useful analysis it does according to classical political economists, entirely miss the more important point of how those relative differences in power, wealth, etc. were generated and maintained by the system in the first place (*Gray et al, 1996, p 47 – 48*).

It is the particular reliance on both interpretation and expert systems that have made risks the object of one of the most effective discursive strategies for changing the political horizon of modern industrialised society (sub-politicisation). It is no longer interests that dominate the political horizon but claims about the legitimacy of particular forms of expertise and knowledge (*Adam et al 2000, p 4*). The inescapability of interpretation makes risks infinitely malleable and open to social definition and construction (*Beck, 1992a, p 23*), which in turn puts those in a position to define and legitimate risks (the mass media, scientists, politicians and the legal profession) in key social positions.

The pervasiveness of mediation, the high level of indeterminacy and the inevitability of political involvement mean that there is no one truth, that there are no facts outside the relativising influence of interpretations based on context, position, perspective, interest and the power to define and colour interpretation (*Adam et al 2000, p 4*).

In the above social context characterised by the openness provided by the human social structures and mediation of hazards at individual, institutional and social levels, it is made clear that research on risk debates/positions needs a strong working framework focusing primarily on those characteristics of the social systems and the risk issues involved rather than their ontological position. Such a framework can be an integrated approach, such as the one described by the social amplification/attenuation of risk

Table 3.2: *The continuum of epistemological approaches to risk in the social sciences.*

Epistemological Position	Associated perspectives and theories	Key Questions
Realist: Risk is an objective hazard, threat or danger that exists and can be measured independently of social and cultural processes, but may be distorted or biased through social and cultural frameworks of interpretation.	Technico-scientific perspectives, most cognitive science theories	What risks exist? How should we manage them? How do people respond cognitively to risks?
Weak Constructionist: Risk is an objective hazard, threat, or danger that is inevitably mediated through social and cultural processes and can never be known in isolation from these processes	'Risk society' perspectives, critical structuralism, some psychological approaches	What is the relationship of risk to the structures and processes of late modernity? How is risk understood in different sociocultural contexts?
	'Cultural/symbolic' perspectives, functional structuralism, psychoanalysis, phenomenology	Why are some dangers selected as risks and others not? How does risk operate as a symbolic boundary measure? What are the psychodymamics of our risk responses? What is the situated context of risk?
Strong Constructionist: Nothing is a risk in itself. What we understand to be risk (or a hazard, threat, or danger) is a product of historically, socially and politically contingent "ways of seeing"	'Governmentality' perspectives/post-structuralism	How do the discourses and practices around risk operate in the construction of subjectivity and social life?

Source: Lupton (*1999, p 35*)

for example[6] (*Kasperson, 1992, p 158*). For the purposes of this research the arena metaphor framework (*Renn, 1992b, p 179*) was used to tackle the multi-dimensional issues concerning risk construction, and risk communication[7] between the parties involved in the salmon farming industry in Scotland, and to address the issues concerning policy making; regulations; and conflict resolution (mediation).

The arena metaphor incorporates the necessary flexibility for research into the open structures of the human social systems and the associated physical and mediated structures and interrelations of the parties involved in the specific debate-arena. It takes into account the views of the respective stakeholders without attempting to measure their risk profiles, whilst highlighting their risk perception and subsequent actions taken, bringing thus into focus possible interpretive theories. Before this framework is presented however, the methodological positions taken on risk by social theorists will be explored as these ideas could be used to explain the results provided by the application of the arena metaphor framework.

3.2.2 Theorising risk

There are a number of ways in which the phenomenon of risk is addressed in the social scientific literature on risk perception; the main schools of thought of which are summarised in table 3.2.

The previously described schema is reductive in the sense that some approaches to risk, for example, may combine aspects of more than one perspective rather than being able to be neatly slotted in a specific category. Nonetheless the model is useful as a device to demonstrate the links between the epistemological positions of various perspectives and theories as well as outlining the key questions about risk that are asked from the various approaches (*Lupton, 1999, p 34*).

The most common is the realist perspective, which has developed and is expressed principally in technical and scientific approaches. Techno-scientific approaches to risk, emerging from such fields as engineering, statistics, actuarialism, psychology, epidimiology, and economics, bring together the notion of danger or hazard with calculations of probability. They define risk as the product of the probability and consequences of an adverse event (*Bradbury 1989, p 382*). Risks are pre-existing in nature and in principle are able to be identified through scientific measurement and calculation and

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[6] Discussed in section 4.5.2.

[7] As this is underlined within the context of stakeholder accountability responses (see for example: *ASSC, 1975; Gray et al, 1996; Bebbington et al, 2004*), and legitimacy actions (see for example: *Weber, 1966; Habermas 1976; Anshen, 1980; Held, 1996*).

controlled using this knowledge (*Lupton, 1999, p 18*). Cognitive science based on psychology is one approach that has adopted such a realist perspective. On the other side of the spectrum is social constructionism advocated by those who are predominantly interested in the social and cultural aspects of risk.

3.2.2.1 The techno-scientific perspective

Debates over risk in the techno-scientific fields tend to revolve around issues of how well risk has been identified and calculated; the level of seriousness of a risk in terms of its possible effects; the accuracy of the science used to measure and calculate risk; and how inclusive are the causal or predictive models that have been constructed to understand why risks occur and why people respond to them in certain ways. One question that is not asked however, is how risks are constructed as social facts, as the nature of risk is taken for granted. While subjectiveness is acknowledged as an inevitable element of human judgment which, by implication, makes risk calculation non value-free, the calculations produced tend to be treated as if they were objective facts.

Much of the techno-scientific literature addresses the perceived conflict between scientific, industrial and government organisations and the public relating to the health and environmental risks associated with science, technology and industry. The literature on risk addressing this problem attempts, somewhat erratically, to identify the social and psychological factors influencing greater public cynicism and distrust of institutions and lay people's assessment of risk. The objective is to facilitate the understanding between the public and the institutions to provide a route out of the ever-growing bitterness of clashes between affected publics and the managing institutions (*Brown, 1989, p 2*). Lay people are often portrayed as responding unscientifically to risk using inferior and unsophisticated sources of knowledge such as intuition.

This school of thought is carried and applied in the social sciences in various psychological models of human behaviour[8], in which researchers try to identify the ways in which people respond cognitively and behaviourally to risk. The objective facts of risk as they are calculated by experts are contrasted

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[8] See for example: the psychometric perspective (*Slovic et al, 1980*, as quoted by the *Royal Society, 1992, p 103, Slovic 1992, Fischoff et al 1978*) whose exponents seek to measure the relative influence of different cognitive factors in shaping lay responses; and the health belief model, which sees a linear relationship between knowledge of a risk, developing the attitude that one is at risk and adopting a practice to prevent the latter happening to oneself (*Lupton, 1999, p 19*). The psychometric approach is well grounded empirically, but it offers a relatively undeveloped theoretical framework and in this respect it has probably not progressed much from the position found in Royal Society's 1983 report (*Royal Society, 1992, p 124*).

with the subjective understandings of lay people, which are seen as being less accurate compared with these facts. Experts' understandings of risk are being represented as neutral and unbiased, arrived at by the use of expert knowledge and action. The cognitive research approach is founded on a theory of rational behaviour[9] constructing individuals as calculating and emotion-free actors (*Lupton, 1999, p 17 – 22*).

However, an epistemological uncertainty is evident relating to the techno-scientific perspective concept of risk as it is carried and applied in psychometric and psychological research. In examining the individual's response to risk a subjectivist interpretation is provided within a realist paradigm (see for example: *Slovic 1992; Slovic et al 1980*). Some researchers argue that actual risks exist but they can only be interpreted as perceptions whilst others continue to argue that some definitions of risk are real and correct (see for example: *the Royal Society 1992, Renn 1992a*). Finally some confusingly include both concepts of risk in their work interchangeably (*Bradbury, 1989, p 384*).

Cognitive science does not generally take into account the symbolic meanings (created through social interaction) that humans give to things and events. Perception is limited to how humans see and understand the world through their senses and brain functioning without acknowledging the ways in which cultural conceptual categories mediate judgment. People are positioned outside the cultural and political frameworks, relationships and institutions within which they construct their beliefs and engage in behaviours. Individuals are represented as atomised and self-interested, ideally behaving in response to their carefully considered calculations of risk. Risks and associated behaviours are singled out for attention in this literature separated from other risks and behaviours. This is convenient for statistical testing and modelling but reduces and over-simplifies such phenomena.

However, some recent research in psychometric approaches tries to address the above issues referring to social and cultural group membership in people's responses to risk. Since late 1980s some socio-cultural perspectives on risk have been taken up by some researchers in cognitive science and other techno-scientific fields interested in risk perception and management. This usage however has been selective and at times distorted the conceptual lenses applied (*Lupton, 1999, p 22 – 24*).

3.2.2.2 Socio-cultural perspectives

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[9] A position often attacked by many social researchers. See for example Kahneman et al (*1979*). It has also been argued that cognitive science presents too narrow a view of rational action so that anything outside this becomes viewed as irrational (*Douglas, 1985, p 3*).

Socio-cultural perspectives[10] on risk emphasise the very aspects that cognitive science and other techno-scientific approaches have been criticised for neglecting: the social and cultural contexts in which risk is understood and negotiated. These perspectives can roughly be categorised in three major groups based on the perspective adopted: the cultural/symbolic perspective (see for example *Douglas et al, 1982*); the risk society thesis (see, for example, *Beck, 1992 and Beck et al, 1994*); and governmentality theories (see, for example, *Foucault, 1991*).

While there are some major differences between these perspectives, their exponents tend to see risk as having become a central cultural and political concept by which individuals, social groups and institutions are organised, monitored, and regulated. Accordingly risk has become an increasingly pervasive concept of human existence in western societies; it is a central aspect of human subjectivity; it is seen as something that can be managed through human intervention; and it is associated with notions of choice, responsibility and blame.

These perspectives can also be loosely categorised according to the epistemological and methodological positions taken within socio-cultural investigations into risk. In that way they can be distinguished between structuralists, post-structuralists, phenomenologists, and psychoanalytic theorists.

Structuralists, approach their analyses of risk primarily by seeking to identify the ways in which underlying cultural structures, hierarchies and categories serve to define knowledge and practices. They may adopt a functionalist structuralist approach, interested in how social and cultural structures and systems serve to maintain social order and the status quo and deal with divergence from accepted norms and social rules concerning behaviour. Douglas and some of her followers can be included in this category[11].

Alternatively critical structuralists focus more on social conflict, inequities and dissent and the need for social change in relation to risk. Critical structuralists tend to be interested in criticising the ways in which institutions wield power over individuals, reducing their capacity for agency and autonomy. The work of Beck and Giddens largely adopts a critical structuralist approach[12].

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[10] They have emerged from disciplines such as cultural anthropology, philosophy, sociology, social history, cultural geography and science and technology studies (*Lupton, 1999, p 24*).

[11] See for example: Douglas (*1966/1969, 1970, 1978, 1985, 1990, 1992*); Douglas and Wildavsky (*1982*); Thompson (*1980*); Thompson and Wildavsky (*1982*); Thompson et al (*1990*); Wildavsky and Dake (*1990*).

[12] See for example: Beck (*1992a, b, 1994a, b, 1995, 1996*); Beck et al (*1994*); Giddens (*1990, 1991, 1994a, b*).

The post-structuralist perspective as it has been adopted to explore issues of risk, builds largely upon Foucauldian theory[13]. The importance of identifying the discourses that participate in the construction of notions of realities, meaning and understandings is emphasised in this perspective. Post-structuralists tend to focus less on what they see to be the overly rigid definitions of structures identified in structuralism. They are more interested in change and flux in social structures and meanings. There is also a different view on power relations than that propounded in structuralist accounts. Power relations are seen as being always implicated with knowledge and individuals are seen not to be fixed in social or cultural identities but constantly shifting, the products of various combinations of power-knowledge formations. Power is seen as not simply coercive or oppressive as critical structuralism tends to have it, but also as productive and inevitably present in any social relation.

Phenomenological or hermeneutic accounts of risk are interested in the situated meanings that are given to risk[14]. Exponents of this perspective are less interested in the macro-structures organising and constraining the meanings of risk than the structuralists. They turn their attention towards how individuals experience their world as an interpretive reality with the use of shared commonsense meanings and knowledge. Phenomenologists argue that the meanings of risk differ from locale to locale; thus they try to understand how actors within a certain socio-cultural setting construct their risk understandings as part of their interactions with others, albeit within the broader frame of social structures. Meaning is not simply drawn from the social environment but also from the manner in which social actors also influence the latter.

The psychoanalytic theoretical perspective tries to explore the unconscious psycho-dynamic processes which mediate people's responses to other people, to objects and to events, through the notions of the body, of otherness, and of the symbolic notions of riskiness arising from the challenging of one's subjectivity and individuality[15] (*Lupton, 1999, p 24 – 28*).

3.2.2.3 Social constructionist positions

Within the social constructionist approach, a range of positions can be taken, which can be located on the realist-relativist spectrum. Sometimes risk is discussed as if it were based on objective facts about dangers and hazards, amenable to rationalistic calculation, which are then mediated, perceived and

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[13] See for example: Foucault (*1984, 1988, 1991*); Ewald (*1991*); Gordon (*1991*); Kendall and Wickham (*1992*); Castel (*1991*).

[14] See for example: Lash (*1993, 1994a, b, 2000*), Lash & Wynne (*1992*), Wynne (*1989, 1992, 1996*).

[15] See for example: Bauman (*1991*); Kristeva (*1982*); Lupton (*1999*); Cohen and Taylor (*1976/1992*).

responded to in particular ways via social, cultural and political processes[16]. This may be described as the weak social constructionist thesis (see table 3.2), which overlaps to some extent with those psychometric and psychological studies which go beyond a focus on individuals to directing attention at social group membership and power relations.

Exponents of the more relativist perspective (the strong constructionists described in table 3.2) argue that there is no risk in reality and it depends on how one analyses the danger and considers the event (*Ewald, 1991, p 199*). The risk society thesis tends to exist within a realist and a weak constructionist paradigm, while the cultural/symbolic approach is somewhat more towards the strong end of constructionism[17]. Exponents of the governmentality approach[18] generally adopt an even stronger relativist position.

However, regardless of the strength of their ontological position, all social constuctionists tend to argue that a risk is never fully objective or knowable outside of belief systems and moral position. They argue that humans and their social world exist in a dialectical relationship, in which each creates the other. Although the material and social world are experienced by most individuals as objective, pre-existing realities, they involve the reproduction of meaning and knowledge through social interaction and socialisation and rely upon shared definitions. Because of the continually constructed nature of reality, its meanings are precarious and subject to change.

All knowledge about risk is bound to the socio-cultural contexts in which this it is generated, whether it is expert or lay knowledge. Knowledge is never value free but rather always the product of a way of seeing. A risk therefore is not a static, objective phenomenon, but rather is constantly constructed and negotiated as part of the network of social interaction and the formation of meaning. Expert judgments rather than being the unbiased assessments portrayed by the techno-scientific literature are regarded by social constructionists as equally being constructed through implicit social and cultural processes as those made by people in the daily lives. It is not therefore a matter of doing more research to obtain a clearer view of exactly to which risks people are exposed but instead on examining how concepts of risk are part of world-views. There is a cultural pattern in the ways in which certain phenomena are identified and dealt with as risks, and this pattern is subject to change over time and space. This approach highlights the importance of understanding the embeddedness of risk perceptions and

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[16] See the work of Giddens, Beck, and Douglas discussed in sections 1.2, 1.2.1, 1.2.2, 4.3.1.2, 4.3.1.3, and 4.4.4.

[17] The weak social constructionist position sees risks as cultural mediations of real dangers and hazards, whereas the strong end of that "continuum" a hazard or danger itself is also seen as socially constructed but coming into social existence when human actors recognise it and label it as such (*Fox 1999, p 19*).

[18] See section 4.3.1.1.

emphasises that these differ among actors who are located in different contexts and that bring competing logics to bear upon risk.

Debates about risk always involve questions about cultural representation, meaning and political positions. Judgments about risk therefore are not simply cultural interpretations of objective dangers or hazards. What is deemed as a risk in one context (cultural or historical) may not be identified so in another. This has implications on the development of knowledge and understanding of the notion (*Lupton, 1999, p 28 – 31*).

The extent to which objects may be linked with each other and with harm in a causal attribution model is potentially infinite. According to Hilgartner (*1992*, as quoted by *Lupton, 1999, p 30*) the process of an object becoming a "risk object" presupposes first objects becoming constructed as "objects" and then as "risky", or identified as the cause of harm and danger. Therefore the process of defining a harm or danger is a third construction in this linkage.

What is of importance for a socio-cultural analysis of risk is the ways in which certain linkages are/can be defined. The task of constructing a risk object is essentially a rhetorical process, performed in specialised texts or in public arenas and usually involves building networks of heterogeneous risk objects. It often involves intense struggles over meaning, particularly in relation to those actors who are deemed to be responsible for the risk object. These struggles are complemented by struggles with a variety of human and non-human actors to identify and control risk objects (such as in the salmon farming arena).

It is rarely lay people who play a major role in the construction of risk objects at the level of public debate. Rather, expert knowledge embedded within organisational contexts and often mediated through the mass media are central to construction and publicising of risk. Debates among scientists and other experts arise around uncertainties as what is considered adequate proof that a phenomenon is hazardous, how acceptable the level of hazard is, and what the consequences of attempting to control the hazard might be. While disputes over the validity of technical data may contribute to such debates, it is the different systems of values and ways of seeing that shape experts' judgments of these data. Experts in seeking validity do not tend to acknowledge the situated and localised nature of their risk calculations and prognoses and the cultural shaping of particular assumptions about the cultural, the natural and what means to the human.

If a risk is understood as a product of perception and cultural understanding, then to draw a distinction between real risks (as measured and identified by experts) and false risks (as perceived by lay people)

is irrelevant. Both perspectives are describing forms of risk, and both lead to certain actions. It is the ways in which these understandings are constructed and acted upon that is considered important not the extent to which one perspective may be considered to be more accurate or less biased than the other. The questions that might be asked about the risk from the constructionist perspective therefore are very different from those asked from the techno-scientific premises (*Lupton, 1999, p 28 - 33*). These can include the following: what statements are used to construct certain kinds of knowledge about risk at a particular historical moment and socio-cultural setting?; what rules prescribe certain ways of talking about risk and exclude other ways?; what types of subject are constructed through risk discourses?; how does knowledge about risk acquire authority, a sense of embodying the truth about it?; what practices are used in institutions and by individuals for dealing with the subjects or risk discourses?; how do new discourses on risk emerge, supplanting other discourses, and what are the effects of this for risk knowledge and subjects of risk? (*Hall, 1997, p 45 – 46*).

3.3 The social arena concept – an introduction

It seems that one approach alone cannot provide a thorough and valid understanding of the social experience of risk. Integrating the various perspectives is a necessary and difficult task but it would be futile to mix them together without specifying each concept and creating a common network of linkages between them.

The concept of arena policies is not an integrative framework that combines scientific, individual, social and institutional responses to risks. It is a theoretical framework within the boundaries of risk communication[19], based on the political concept of arena policies and the basic structure of the resource mobilisation theory. Its strength (and weakness) is its focus on political debates about risk issues and the behaviour of each actor in such debates.

The basic claim of the theory is that social groups in a political arena try to maximise their opportunity to influence the outcome of the collective decision process by mobilising social resources. The outcome however, is determined not only by individual or group actions but also by the structural arena rules and the interaction effects among the competing groups. This theory is based on the assumption that individuals and organisations can influence the policy process only if they have sufficient resources available to pursue their goals. The political organisation of an arena and the external effects of each group's actions on another group's actions constitute structural constraints that make the outcome of an arena struggle often incompatible with the evidence and/or values of any participating group.

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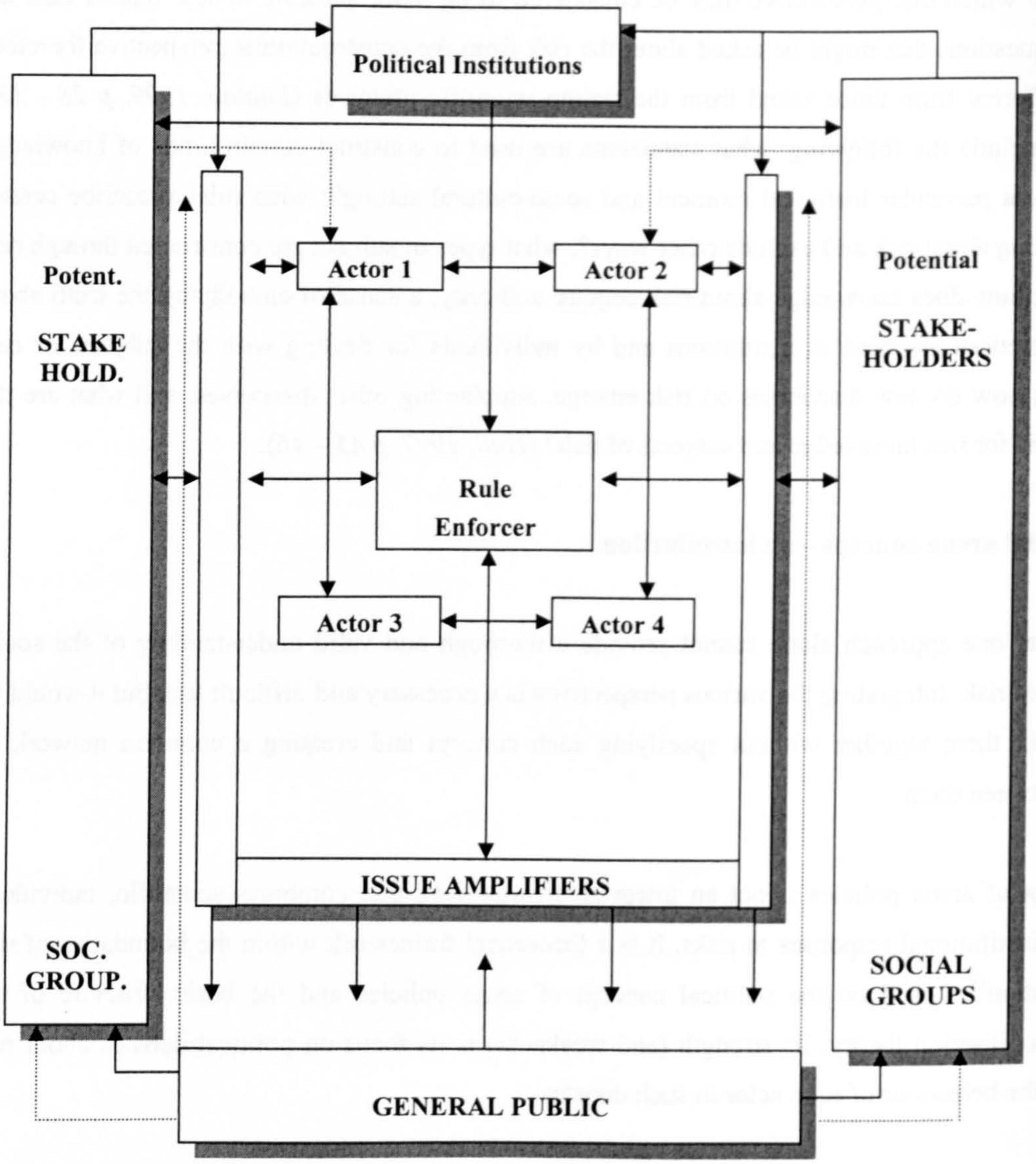
[19] See sections 4.5 and 4.5.1.

Figure 3.1: *Graphical representation of the arena metaphor*



Note: Solid arrows show communication flow; dotted arrows the direction of social mobilisation.
Source: Renn (*1992b, p 183*)

A social arena is a metaphor to describe the symbolic location of political actions that influence collective decisions or policies. Symbolic location means that arenas are neither geographic entities nor organisational systems. They describe the political actions of all social actors involved in a specific issue. The arena concept attempts to explain the process of policy formulation and enforcement in a specific policy field. Its focus is on the meso-level of society rather than on the individual (micro-level) or on societal behaviour as a whole (macro-level). It reflects the segmentation of society into different policy systems that interact with each other but still preserve their autonomy.

The arena model incorporates only those actions of individual or social groups that are intended to influence collective decisions or policies. Intentional behaviour of individuals are conceptualised as inputs into the arena rather than as elements of the model. Within a policy field several arenas[20] may exist in which actors have to be present in order to influence the policy process. These arenas may be closely related and share actors. For this reason they are referred as stages within a single arena.

That social groups in an arena intend to influence policies is the only assumption the model makes relating to inferences about intentions, motivations, goals, purposes, or hidden or overt motives of social actors. Under this assumption success and failure of group activities can be measured by the amount of influence that the specific group has been able to exert on the resulting decision(s) or policies. The reasons explaining why people feel motivated to become active or to invest time and effort to become players in the arena are not the focus of the concept. The study of reasons and motivations may be better served by the traditional resource mobilisation theory or phenomenological approaches (*Renn, 1992b, p 179 – 182*).

3.3.1 The framework

The central stage of the arena (figure 3.1) is occupied by the principal actors: those groups in society that seek to influence policy (*Renn, 1992b, p 182*). Some groups focus on several issues at once and are hence involved in different arenas, other focus only on one issue in a single arena. Each arena is characterised by a set of rules: formal rules that are coded and monitored by a rule enforcement agency; and informal rules that are learned and developed in the process of interactions among the actors. In most cases the rules are external constraints for each single actor and several actors may join

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[20] Such as the legislative, administrative, judicial, scientific and mass media arenas. Stages are manifestations of the same arena within different institutional contexts. The number of actors and types of institutions involved may differ from one stage to another but all these stages have the same functional goal of providing social input to the policy process (*Renn, 1992b, p 181 – 182*).

forces to change the rules even if they disagree on the substance of the issue. Formal rules require institutional actions to change, whereas informal changes occur as a result of trial and error and may change according to whether or not rule-bending is penalised (*Renn, 1992b, p 182*).

The rule enforcement agency ensures that the actors abide by the formal rules and often coordinates the process of interaction and negotiation. In many arenas the rule enforcement agency is also the ultimate decision maker. In this case all actors try to make their claims known to the decision makers and to convince them by arguments or through public pressure to adopt their viewpoint.

Issue amplifiers are the professional "theatre critics" who observe the actions on stage, communicate with the principal actors, interpret their findings, and report them to the audience. Through this communication process they influence the allocation of resources and the effectiveness of each resource to mobilise public support within the arena. The audience consists of other social groups who may be enticed to enter the arena and individuals who process the information and may feel motivated to show their support or displeasure with one or several actors or the arena as a whole. Part of the political process is to mobilise social support by other social actors and to influence public opinion.

The arena concept does not picture the actions on stage as a play of script of actors performing role assignments (as the theatre stage metaphor does – see *Palmlund 1992*). Arenas are more like medieval courtyards in which knights have fought for honour and royal recognition according to specified arena rules that determine the conditions for the fight, but leave it to the actors to choose their own strategies. Accordingly, modern arenas provide actors with the opportunity to direct their claims to the decision makers and to ultimately influence the policy process. Actors may use innovative approaches to policy-making or use traditional channels of lobbying. Arenas are regulated by norms and rules, which limit the range of potential options. Actors may decide to ignore some of the rules if they feel that public support will not suffer and if the rule enforcement agency is not powerful enough to impose penalties on actors who violate the rules.

The outcome of the arena process is undetermined. Various actors may play out different strategies that interact with each other and produce synergistic effects. Strategic manoeuvring may even result in an undesired outcome that does not reflect the stated goal of any actor and may be sub-optimal for all participants. On the other hand, interactions in the arena may change the arena rules. Novel forms of political actions may evolve as actors experience the boundaries of tolerance for limited rule violations. Those arena characteristics limit its use for predictions but do not compromise its value for explanation and policy analysis (*ibid.: 182 – 184*).

3.3.2 Social resources

To be successful in a social arena, it is necessary to mobilise social resources. These can be used to gain the attention and support of the general public, to influence the arena rules, and to score in competition with the other actors. Resources help actors to be more influential. Resources may be the ultimate goals of an actor, but are more likely the means by which actors can accomplish their specific intentions. Such resources that social groups need in order to be influential in society can be: money, power, social influence, value commitment, and evidence.

Money provides incentives (or compensation) in exchange for support or at least tolerance. Money is most frequently used in the economic sector but like all other resources it is also instrumental in other sectors such as the social system. Its medium of expression is the transfer of capital, which in turn provides incentives for other actors to show loyalty to the donor. Money usually buys compliance rather than convictions.

Power is the legally attributed right to impose a decision on others; conformity is established by the threat of punishment. It operates through coercion and requires compliance with rules and commands independent of the subjugated group's convictions or personal values. Authority and force are the two media through which power is expressed and are the basis on which power relationships are established. The motivation to comply stems from the threat of punishment, which may include physical force, although the threat alone is sufficient to produce conformity without formal sanctions being imposed.

Social influence produces a social commitment to find support through trust and prestige. It is a resource that operates through the media of reputation and social reward. Reputation generates trust in the specific actor even if the meanings of the action are not understood by others. People believe these actors because they are convinced of their sincerity, accept them as role models, or identify them as experts on this issue. The second medium, social rewards, constitutes symbolic reinforcements of behaviour and generates social prestige. By analogy with money, social rewards can increase conformity and evoke support. Social influence is not based on shared values or meaning with respect to the issue in question, but on socially accepted incentives for assigning credibility to others and receiving social status through others.

Value commitment induces support through persuasion, solidarity, and cultural meaning. It is a cultural phenomenon of finding meaning and sense in the behaviour of social actors and society as a whole. The two dominant media of expression are persuasion and meaning. If social actors can

persuade others that their behaviour is in accordance with their commonly shared values, interests and worldviews, they can count on the solidarity based on this commonality. Shared meaning conveys a sense of purpose in life and creates a cultural unity that also extends into solidarity and a feeling of community. Value commitment has become one of the most powerful organising principles in political debates as societal pluralism provides opportunities for individuals to be selective in choosing worldviews and to change alliance if this is deemed appropriate.

Evidence can be used to convince persons about the likely consequences of social actions. It is the claim of truth that social groups or subsystems of society make based on methodological rules and accepted theoretical knowledge. In the arena concept it serves as a powerful social resource to convince people that the expected factual impacts of one group's claims are in their best interest, whereas the potential impacts of the competing group's claims are not. Policy options are potentially empirically testable. Supporting evidence can be based on past experience, logical reasoning, empirical tests, theoretical plausibility, or a combination thereof. The claim to provide the truth is supported by adhering to methodological rules of inquiry or rhetorical rules of argumentation.

In modern democratic societies actors need more than one resource to be successful in an arena. All actors, including the rule enforcement agency need a minimal reservoir of each resource. The need to collect all the five types of resources creates an exchange market for resources. Resources are partially convertible and it depends on the context and availability of other resources whether one resource can be exchanged for another. The resources can be generated without subtracting resources from other groups. The generation of resources may result, however, in inflationary or deflationary developments. Too many resources of one kind, for example, diminish the social value of the resource.

Another limitation of resource exchange is the problem of legitimising the use of resources outside their dominant application. For example, the use of money for compensation may lead to a decline in social influence and value commitment because the transaction might be perceived as bribery. Gaining resources in an arena is a balancing acts where the need to exchange resources has to be weighed against the probability of losing both the resources one is willing to sacrifice and the resources one hopes to gain.

Another strategy to gain additional resources is to use one's influence in other established arenas to generate resources and to transfer them to a novel arena. At the same time, groups may enter an arena only for the sake of receiving resources that they can use for another political issue. This strategic behaviour of groups is one of the reasons that arena theory makes no assumptions about the

substantive goals of the actors but limits itself to the resources that actors try to mobilise as a means to influence the policy outcomes.

Social actors will enter a risk arena if they expect that doing so will provide them with the opportunity to gain enough resources to influence the policy process. Actors can generate more resources beyond their reservoir of current resources by exchanging one resource for another and by communicating to other actors and issue amplifiers. The objective of communication is to receive public support and to mobilise other groups for one's causes. The more resources a group can mobilise in an arena, the more likely to succeed in pushing its interests or goals through the conflict resolution process[21] and getting its point of view incorporated in the final decision.

In the process of the conflict, actors communicate with each other, the rule enforcement agency, other potential actors and the issue amplifiers. This communication serves the purpose of defining each actor's stakes in the arena and the gaining or exchanging of resources. Two feedback mechanisms are crucial for the resource mobilisation purpose. Communication may entice other groups to join or at least support the claim of one of the actors; and public opinion is revealed through opinion polls and other relevant public behaviour. Both the mobilisation of organised support and the assurance of public sympathy help the actors increase their reservoir of social resources.

If all groups have a sufficient reservoir of resources, they may also opt to initiate a constructive discourse in which all participating groups can bring in their own interests and values and orient their efforts to facilitate common understanding and to explore the range of shared interests. This idea of rational and fair discourse depends on many conditions one of which is the procurement of sufficient resources for each participating group (*ibid.: 184 – 190*).

3.4 Summary – conclusions

In summary the above discussions illustrate the plethora of epistemological positions taken in the field of risk research from the premises of the social sciences. The author's position can be traced standing together with those described by the exponents of the social theories of risk on the continuum

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[21] At the beginning of a conflict, social resources are not equally distributed among the current and potential actors. Conflicts are resolved through resource mobilisation, and take place if either one of the actors is powerful enough to dominate the policy outcome or if all relevant actors feel that their cause is better served by pursuing a compromise solution. A conflict remains unresolved if none of the actors is able to dominate the process and at the same time one or more actors are convinced that they can generate or sustain more social resources by avoiding a compromise solution (*Renn, 1992b, p 189*).

presented in table 3.1. Such a position is in accordance with the view of Adam et al (*2000, p 2*) that what matters is the need to understand the construction of risk as a practice of manufacturing particular certainties that may have harmful consequences to life and not whether the ontology of risk is real or mere construction. That position in conjunction with the critical realism's perspective which underlines the open character of social systems (*Tsang et al, 1999*) brings forth the need for a flexible tool (i.e. the risk arena framework) for the conduct of research into the Scottish salmon farming risk arena, that can take into account that openness of social life and at the same time it can allow the identification and integration of potential explanatory theories[22]. In addition to that the latter framework, by allowing the integration of different methods of data collection and analysis makes a significant methodological contribution towards a more "complete" investigation of risk issues in the field through risk communication.

It was argued in the introductory chapter of this thesis and it is further discussed in the literature review (chapter 4) that ideas about accounting form patterns of visibilities and invisibilities that assist in the social construction of reality. Often fundamental issues are ignored by traditional accounting in that reality construction (see for example *Cooper and Thomson 2000*). The social arena framework for risk debates as a form of risk communication allows the consideration of the different existing perspectives/notions of reality (or risk) construction and can complement traditional accounting and accountability methods and techniques.

At the same time the examination of the existing accountability mechanisms in a defined risk arena is allowed with valuable insights into the legitimatising risk processes of any (sub)political institution, and their modes of governance. Understanding accountability processes in that way allows the evaluation of the extent to which any system is reflexive. Who accounts to whom; what they account for; how they account for it; how their accounts are received by others; and how they perceive others' accounts of the same phenomena, are important variables in an empirical study of accountability and risk governance.

Based on the methodological issues discussed in this chapter an investigation in the field of risk research through the use of the risk arena framework would require information on: the different risk perceptions; the risk communication (risk messages) between the different in a risk arena bodies; the actual participants in an arena (i.e. main actors, rule enforcers, political institution, other stakeholders, the media, the general public); and documentary analysis (since this is one of the main mechanisms of communication). With reference to the salmon farming risk arena this work was undertaken it is presented in chapter 5 where the methods and techniques of data collection and analysis are discussed.

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[22] See section 4.6.

In relation to these, it was deemed necessary to gather information from the fish farmers, regulatory and political institutions and other stakeholding groups, in the form of wholesale price-data, a questionnaire survey, interviews and documentary analysis.

The importance of some of the aspects of the information requirements will be justified and expanded in the next chapter. The risk arena metaphor presented here is going to be enriched there with the positions held by the exponents of the risk society thesis termed as "weak constructionists". Chapter 4 starts with an overview of the story of risk with references to the notions of sustainability and accounting. However, the chapter is primarily concerned with giving a critical and detailed presentation of the sociological perspectives to enrich the working framework of the arena metaphor, which will in turn be used as an "operationalised working tool" for the purposes of this thesis.

Chapter 4: Literature review

Does God play with the Dice? Even if He does, human beings, in spite of all our efforts, do not enjoy complete knowledge of the laws that define the order of the objectively existing world. We must contend with the behaviour of something beyond the patterns of nature: ourselves. Indeed as civilisation has pushed forward, nature's vagaries have mattered less and people's decisions have mattered more (Bernstein, 1998, p 330).

4.1 Introduction

Risk...what is risk or even better, what is uncertainty? How do people understand these words? How do these affect our lives? Everyone is a true risk expert in the original sense of the word. All have been trained, by practice and experience, in the management of risk.

According to Adams (*1995, p 1 – 5*) the development of our expertise in coping with uncertainty begins in infancy. The trial and error processes in all our learning acts involve decision-making in the face of uncertainty. The existing sense of danger suggests that a balancing act is performed. Sometimes it is a physical balancing act like, for example, learning how to ride a bicycle that cannot be done without accidents. However, in mastering such skills a zero-risk life is not sought. There is a balance between the expected rewards of certain actions and the perceived costs of failure.

Most decisions about risk involving infants and young children are taken by adults. Between infancy and adulthood there is a progressive handing over of responsibility. Adults are considered as responsible for their actions but they are not always considered trustworthy or sufficiently well informed. A similar tier of responsibility for the management of risk consists of various authorities, whose wisdom about the nature and handling of risk is considered superior.

Nothing in the world is considered certain. How do we cope with it? Grown up risk-taking is also a balancing act. Billions of decisions are made daily. The consequences in most cases appear to be highly localised, but perhaps they are not. Extreme sensitivity to subtle differences in initial conditions makes the behaviour of complex natural systems unpredictable (see, for example, chaos theory). Predictions become even more difficult when people are introduced in these sensitive systems. People respond to predictions altering the predicted outcome. Rarely are risk-decisions made with information that can be reduced to quantifiable probabilities. There is a gap between what is scientific and capable of being measured, and the way in which public opinion perceives risk and makes decisions.

Within the above context two basic sectors in risk management can be identified: a) the formal sector of the authorities; and b) the informal sector. The formal sector is the realm of the expert. It involves government, commerce and industry. The work of this sector is highly visible. It holds inquests and commissions research. It passes laws and formulates regulations. It runs safety training programmes and posts warning signs. It puts up fences and locks gates. It employs inspectors and enforcers and its objective is to reduce risk. The informal sector consists of billions of freelance risk managers, each with his/her personal agenda. Both sectors share a common objective to balance risks and rewards (*ibid.: 4*).

The two sectors co-exist uncomfortably. The activities of the formal form a part of the context within which, the informal makes its decisions. Sometimes the efforts of the formal are appreciated. Sometimes they are thought to be inadequate and other times are resented, but in most cases the behaviour of the latter sector is modified by the activities of the former.

The formal sector responds to the activities of the informal sector in various ways. Often it is patronising. Sometimes it is abusive. But most commonly is mystified and frustrated from its inadequacy to frame risk. A significant part of this it appears to lie in its division of labour. Risk management at an individual level involves no division of labour. The balancing calculations are all done in the head of the individual. But when institutions assume responsibility for risk management, then it is difficult to identify where the balancing act is done.

The previous chapter examined the field of risk research by looking at the different ontological, epistemological, and methodological positions held by the different disciplines in the social sciences. At the same time the framework of the risk arena metaphor that has been conceptualised as appropriate for this study was presented. This chapter will enrich that introductory picture by discussing the positions held by various theorists in the field, in an effort to develop helpful insights for the interpretation of the results of the interviews. This presentation will take place through a thematic categorisation of the associated literature. The views discussed are then integrated into the risk arena metaphor in an attempt to demonstrate the interpretive value of this framework.

Chapter 4 is thus structured as follows: the next section discusses issues of definition whilst providing a short overview of the development of the field in conjunction with the development of mathematics and statistics to its contemporary social understandings. Section 4.3 then makes a link between risk, institutions, governance structures and accounting mechanisms while at the same time the notions of sustainability and accounting are briefly discussed. Section 4.4 presents a discussion on the positions adopted by the exponents of: "risk and subjectivity"; "otherness"; "risk and pleasure"; and cultural theory. The next section attempts to complete the

picture in the field from the premises of the social sciences, by introducing risk communication theory[1] with a specific focus on the social amplification/attenuation of risk framework[2]. The last and concluding section (section 4.6) summarises the above positions; criticises conventional accounting practice as based on similar faults as the techno-scientific paradigm; and brings into focus the social arena metaphor[3] as a framework capable of integrating influential socio-cultural perspectives in an attempt to interpret the results of this study, which are presented in the following chapter.

4.2 Definitions

4.2.1 An overview of the story of risk

Bernstein (*1998*) describes the measurement of risk and its evolution in conjunction with the development of mathematics and statistics. He views the mastery of this notion as the revolutionary idea that defines the boundary between modern times and the past: a notion that sees the future being more than a whim of the gods and that, men and women are not passive before nature. Until human beings discovered a way across that boundary, the future was a mirror of the past or the domain of oracles and soothsayers who held a monopoly over knowledge of anticipated events.

Traditional cultures did not have a concept of risk because they did not need one. Risk refers to hazards that are actively assessed in relation to future possibilities and it comes into wide usage only in a society that is future oriented: a society that sees the future as a territory to be conquered or colonised: a society that tries to break away from its past, which is the prime characteristic of modern industrial civilisation. All previous cultures, including the early great civilisations of the world had lived primarily in the past using the ideas of fate, luck or the will of the gods or even denied the idea of chance altogether (*Giddens, 2002, p 22 – 23*).

The modern conception of risk is rooted in the Hindu-Arabic numbering system that reached the West seven to eight hundred years ago. But the serious study of risk began during the

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[1] A part of the field of risk perception has undergone a process of self-redefinition with the emergence of risk communication as a topic of concern. The study of risk communication relates theory and findings from basic risk perception studies to the formulation of policy, to the currently evolving legislative frameworks for dealing with hazards, and to the key question of public involvement in decision-making about hazards (*The Royal Society, 1992, p 89 – 90).*

[2] More examples of risk communications frameworks can be found in Palmund (*1992*), and Renn (*1992b*).

[3] Presented in section 3.3. See also section 4.6.

Renaissance, when people broke loose from the constraints of the past and started challenging long-held beliefs (*Bernstein, 1998, p 1 – 2*).

It is generally acceptable that in the Middle Ages there was no concept of risk. The idea appears to have taken hold in the sixteenth and seventeenth centuries, and was first coined by western explorers as they set off on their voyages across the world. The word seems to have come into English through Spanish, or Portuguese where it was used to refer to sailing into uncharted waters[4]. Originally it had an orientation to space, later it became transferred to time as used in banking and investment, to mean calculation of the probable consequences of investment decisions for borrowers and lenders[5]. It has subsequently come to refer to a wide range of other situations of uncertainty (*Giddens, 2002, p 21 – 22*).

The story of the modern notion of risk starts in 1654 when the Chevalier de Méré, a French nobleman with a taste for gambling[6] and mathematics challenged the famed French mathematician Blaise Pascal to solve a puzzle[7]. This puzzle had confounded mathematicians since the monk Luca Paccioli posed it some two hundred year earlier. Pascal turned for help to Pierre de Fermat and together they created the mathematical heart of the concept of risk. Their solution to Paccioli's puzzle meant that for the first time people could make decisions and forecast the future with the help of numbers. Up till then people made decisions without any real understanding of risk or the nature of decision-making.

As the years passed, mathematicians transformed probability theory from a gambler's toy, into a powerful instrument for organising, interpreting and applying information. As one idea piled on

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[4] There is no real consensus over the linguistic routes of the word. Risk derives from the early Italian (or Portuguese according to *Giddens, 2002, p 35*) *risicare*, which means "*to dare*". In this sense, risk is a choice rather than a fate. The actions humans dare to take depend on how free mankind is to make choices and that possibly defines what it means to be a human being (*Bernstein, 1998, p 8*). Ewald (*1991, p 198*) on the other hand argues that the term has no precise meaning and is a neologism of insurance central to its own definition, said to derive from the Italian word *risco*, which meant "that which cuts" hence reef and consequently risk to cargo on the high seas. In everyday language the term is understood as a synonym for danger or peril (*ibid.: 199*).

[5] The notion of risk is inseparable from the ideas of probability and uncertainty. A person can't be said to be running a risk where an outcome is 100% certain (*Giddens, 2002, p 22*).

[6] The concept of risk originally emerged in the seventeenth century in the context of gambling. For this purpose a specialised mathematical analysis of chances was developed. Risk then meant the probability of an event occurring, combined with the magnitude of the losses or gains that would be entailed (*Douglas, 1990, p 2*).

[7] The question was how to divide the stakes of an unfinished game of chance between two players when one of them is ahead (*Bernstein, 1998, p 3*).

top of another, quantitative techniques of risk management emerged that helped trigger the tempo of modern times.

In 1703, Gottfried von Leibniz commented to the Swiss scientist and mathematician Jacob Bernoulli that "*Nature has established patterns originating in the return of events, but only for the most part*" prompting Bernoulli to invent the Law of Large Numbers[8] and methods of statistical sampling. Leibniz's admonition "*but only for the most part*" provided the key to why there is such a thing as risk in the first place, without that, everything would be predictable. In such a world where every event is identical to a previous one, no change would ever occur (*Bernstein, 1998, p 4 -5*).

By 1725, mathematicians were competing with one another in devising tables of life expectancies and the English government was financing itself through the sale of life annuities. By the middle of the century marine insurance[9] had emerged as a flourishing, sophisticated business in London (*Douglas, 1990, p 2*).

In 1730, Abraham de Moivre suggested the structure of the normal distribution (bell curve) and discovered the concept of standard deviation[10]. Eight years later, Daniel Bernoulli first defined a systematic process by which people make choices and reach decisions. He propounded the idea that the satisfaction resulting from any small increase in wealth will be inversely proportionate to the quantity of goods previously possessed. With that assertion he explained why King Midas was an unhappy man, why people tend to be risk-averse, and why prices must fall if customers are to be persuaded to buy more. The above statement stood as the dominant paradigm of rational behaviour for the next 250 years and laid the groundwork for modern principles of investment management.

Almost exactly one hundred years after the collaboration between Pascal and Fermat, the English minister Thomas Bayes made a striking advance in statistics by demonstrating how to

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[8] The difference between the observed value of a sample and its true value will diminish as the number of observations in the sample increases (*Bernstein, 1998, p 5).*

[9] Insurance is the baseline against which people are prepared to take risks. It is the basis where fate has been ousted by an active engagement with the future. Like the idea of risk, modern forms of insurance began with seafaring with the earliest marine insurances written in the sixteenth century (*Giddens, 2002, p 25*).

[10] These two concepts make up the Law of Averages and are essential ingredients in modern techniques for quantifying risk (*Bernstein, 1998, p 5).*

make better-informed decisions by mathematically blending new information into old information[11] (*Bernstein, 1998, p 1 - 6).*

After World War I the "modern" belief than mankind would be able to control risk (and therefore future) and that certainty will replace uncertainty vanished. The explosion of knowledge over all these years served only to make life more uncertain and the world more difficult to understand. The Nobel Prize winner Kenneth Arrow, instead of focusing on how probability works or how observations regress to the mean, concentrated on how people make decisions under conditions of uncertainty[12] and how they live with the decisions they have made. He can be seen as the father of the concept of risk management as an explicit form of practical art (*ibid.: 206).*

In 1921 Frank Knight in his book *Risk, Uncertainty and Profit* adopts a different stance from that being cited in predominant theory of that time; whereby decisions are made under conditions of perfect certainty or the established laws of probability; an emphasis that lingers on in certain areas of economic theory today. Knight spoke of the failure of the probability calculus to reflect the tentative, creative nature of the human mind in the face of the unknown[13] (*ibid.: 220).*

In 1936 John Maynard Keynes[14] in *The General Theory of Employment, Interest and Money,* rejected the faith in the universal applicability of measurement. Faced with the tensions of the post-war years, none could pretend that all problems could be solved through the rational application of differential calculus and the laws of probability with well-ordered preferences. Mathematicians and philosophers had to admit that reality encompassed sets of circumstances that people have never contemplated before. The distribution of odds violated the symmetry of the bell curve and was regressing to means that were far more unstable than what it was specified (*ibid.: 217*). Keynes managed to carry the distinction between risk and uncertainty much further than Frank Knight did (*ibid.: 223*).

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[11] Bayes's theorem focuses on the frequent occasions when sound intuitive judgments about the probability of some event exist and understanding is needed on how to alter those judgments as actual events unfold (*Bernstein, 1998, p 5).*

[12] Bernstein (*1998, p 197 - 214*).

[13] A man may act upon an estimate of the chance that his estimate of the chance of an event is a correct estimate. To be sure after the decision is made he will be likely to sum all up in a certain degree of confidence that a certain outcome will be realised and in practice may go further and assume that the outcome itself is certainty (*Knight, 1964, p 227*).

[14] More information on the works of Knight and Keynes can be found in Bernstein (*1998 p 215 - 230*).

In 1953 an important advance in the understanding of risk and uncertainty appeared in the guise of the theory of "the games of strategy" (*ibid.: 235*). The theory[15] focuses on decision-making, but bears little resemblance to the many other theories that originated from games of chance. Game Theory brought a new meaning to uncertainty. Earlier theories accepted uncertainty as a fact of life and did little to identify its source. Game Theory says that the true source of uncertainty lies in the intentions of the other. Almost every decision is made as a result of a series of negotiations in which effort is paid in trying to reduce uncertainty by trading off what other people want in return for what we want for ourselves. Choosing the alternative that is judged to bring the agents the highest payoffs is often the riskiest decision because it may provoke the strongest defence from players who stand to lose if things go that way. Settling for compromise alternatives, which may require making the best of a bad bargain, usually takes place (*ibid.: 231 – 232*). This outcome is known as Nash Equilibrium. The outcome although stable, is less than optimal. Both sides would prefer almost anything to this outcome. Yet they cannot reach a better bargain unless they drop their adversarial positions and work together on a common policy that would give each other a supportive or at least a neutral role that would keep them from getting into each other's way (*ibid.: 242*).

The critically important work on rational behaviour, mostly dating from the early 1970s, provoked a dramatic break in the optimistic views of rationality that had characterised the innovations of the 1950s and 1960s. Today the journals are full of attacks on concepts of rational behaviour and risk aversion. Kahneman and Tversky *(1979, p 263)* presented a critique on the expected utility theory as a descriptive model of decision-making under risk and developed an alternative model termed as prospect theory in response to the pervasive effects that are inconsistent with the basic tenets of utility theory. In relation to the latter, people under-weigh outcomes that are merely probable in comparison with outcomes that are obtained with certainty. This tendency, called the certainty effect, contributes to risk aversion in choices involving sure gains and to risk seeking in choices involving sure losses. In addition, people generally discard components that are shared by all prospects under consideration. This tendency called the isolation effect leads to inconsistent preferences when the same choice is presented in different forms.

The word *irrational* may be too strong to apply to such behaviour, because irrationality conveys craziness and most people are not crazy. An alternative theory says that perhaps people are not irrational but the traditional model of rationality may specify a pattern of behaviour that captures only in part the way the rational human beings make their decisions. Logic can follow a variety of paths in addition to the paths specified in the traditional model. A growing volume of research reveals that people yield to inconsistencies, myopia, and other forms of distortion

[15] Bernstein (*1998, p 231 – 246*).

throughout the process of decision-making. Those flaws may be extremely important in areas with serious consequences (*ibid.: 264 – 266*). As a response a new age of risk management was evolving. In the field of the financial markets, for example, the notion of the derivatives, portfolio insurance and other risk management products (*Bernstein, 1998, p 304 – 328*).

Legislation in the early 1970s[16] with the formation of agencies such as the Environmental Protection Agency (EPA) elevated the role of formal risk assessment in the regulatory process and led to the professionalisation of risk analysis, with a burgeoning array of consulting firms to serve the public and the private sectors. The increasing use of risk analysis in industry and the regulatory process lent legitimacy to this field as an academic activity (*Golding, 1992, p 25).*

Bernstein (*1998*) finishes his overview of the mathematical story of the field by pointing out the controversies lying in that path of development. In all its history, risk has been marked by a persistent tension between those who assert that the best decisions are based on quantification and numbers determined by the patterns of the past, and those who base their decisions on more subjective degrees of belief about the uncertain future. The question though is to what extent does past determine the future? The future cannot be quantified because it is an unknown, but numbers can be used to scrutinise what happened in the past. But to what degree are patterns of the past reliable in telling the future? What matters more when facing a risk; the facts as they are seen or the subjective beliefs in what lies hidden in the void of time?

It is one thing to set up a mathematical model that appears to explain everything. But when people face the struggle of daily life, of constant trial and error, the ambiguity of the facts, the power of the human beings, can obliterate the model in short order. Over time, the controversy between quantification based on observations of the past and subjective degrees of belief has taken a deeper significance. The mathematically driven apparatus of modern risk management contains the seeds of a dehumanising and self-destructive technology in which vast ills have followed a belief in certainty (*ibid.: 6 - 8).* In the modernisation process, more and more destructive forces are being unleashed, forces before which the human imagination stands in awe. Both sources (of wealth and destruction) feed a growing critique of modernisation, which loudly and contentiously determines public discussions (*Beck, 1992a, p 20*).

The past seldom reveals when unpredictability will break out. Wars, depressions, stock market booms and crashes and ethnic massacres come and go but they always seem to arrive as

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[16] Golding (*1992*) gives a broad picture of the modern history of risk research for the social sciences in the United States by looking at the growth of a series of indicators of risk research, including patterns of funding, the development of the Society for Risk Analysis, and the establishment of academic research centres.

surprises. After the fact, though, when the history of what happened is studied, the source appears so obvious that it seems difficult to understand how people were oblivious to what lay in wait for them.

Nowadays, many of the most critical decisions are made by computers, which feed on numbers and provide the "desired" outcomes. However, numbers are only tools; they are tools with no soul *(Bernstein, 1998, p 8)*. In addition, data about the future cannot be input because such data is inaccessible. So data from the past is used to fuel the decision-making mechanisms created by the existent models. But past data from real life constitutes a sequence of events rather than a set of independent observations, which is what the law of probability demands. The dice and the roulette wheel along with the stock and the bond market are natural laboratories for the study of risk because they lend themselves so readily to quantification, but they are only a small proportion of the "risks" that people seem to manage.

The statistical "science" of risk management creates new risks even as it brings old risks under control. The faith in risk management encourages agents to take risks they wouldn't otherwise do. This may be beneficial but it cannot be formally quantified, therefore attention has to be paid to the total risk in the system (*ibid.: 334 – 335*).

4.2.2 Definitional issues

In 1983 Britain's Royal Society published a report called *Risk Assessment*. Its tone, in keeping with the Royal Society's standing as the UK's pre-eminent scientific institution, was authoritative, confident and purposeful. The report drew upon and exemplified the prevailing international orthodoxy on the subject of risk and became a major work of reference.

This report distinguished between objective and perceived risk. The former is the sort of thing experts know about and the latter the person's often very different perception of future events. The report approached the subject scientifically and defined: a) *risk* as the probability that a particular adverse effect occurs during a stated period of time, or results from a particular challenge. As a probability, in the sense of statistical theory, risk obeys all the formal laws of combining probabilities; and b) *detriment* as the numerical measure of the expected harm or loss associated with an adverse event. It is generally the integrated product of risk and harm and is often expressed in terms such as costs in monetary terms; loss in expected years of life or loss of productivity and is needed for numerical exercises such as cost-benefit or risk-benefit analyses.

The above definition of detriment is the definition of risk most commonly encountered in the risk and safety literature[17]. It is also the definition of common parlance; people do talk of the risk (probability) of some particular event being high or low, but in considering two possible events with equal probabilities but different magnitudes of outcomes, the one with the greatest magnitude will be described as the greater risk.

That first report of the Royal Society highlighted the objective reality of risk and because of that objectiveness it was believed that the progress in the field lies in doing more of what the natural sciences are good at. Namely, refining the methods of measurement and collecting more data on both the probabilities of adverse effects and their magnitudes. One of the main conclusions of the 1983 report was that there was a need for better estimates of actual risk based on direct observation of what happens in society (*Adams, 1995, p 7 – 9*).

Over the next decade social scientists attacked that position forcing the Royal Society to acknowledge the many developments occurred during that period, especially in the areas of risk perception and communication. This led to the review of the positions taken in 1983 by a group comprising of several of the contributors of the original report and social scientists. The aims of that review were: a) to update and advance the study on risk assessment; b) to consider and help to bridge the gap between what is stated to be scientific and capable of being measured and the way in which public opinion gauges risks and make decisions; and c) to compare the decisions taken on investment by society in the reduction of risks and the allocation of resources implied on risk-benefit criteria (*The Royal Society, 1992, p 1).*

However, the social scientists, with the exception of the economists, could not agree with the physical scientists of the Royal Society on the nature and meaning of risk (*Adams, 1995, p 7- 9*). The definitions adopted in the 1992 report were the same with those of the previous one. Specifically, *risk* continued to be seen as the probability that a particular adverse event occurs during a stated period of time, or results from a particular challenge. It must always relate to a specific event or set of events and where appropriate it must refer to an exposure to hazard specified in terms of its amount or intensity, time of starting or duration. An *adverse event*[18] is

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[17] See for example National Research Council, (*1989, p 32*), Rayner (*1992, p 93*), The Royal Society (*1992, p 3*), Douglas (*1990, p 2*) and others.

[18] Adverse event and risk aversion go in hand with each other. The latter says that the utility of increases in wealth will be inversely related to the amount of wealth already possessed. (B*ernstein, 1998, p 239*). However, Kahneman and Tversky (*1979, p 263*) found that the valuation of a risky opportunity appear to depend far more on the reference point from which the possible gain or loss will occur than on the final value of the assets that would result. It is not how rich you are that motivates your decision, but whether that decision will make you richer or poorer.

an occurrence that produces harm; *hazard* is the situation that in particular circumstances could lead to harm, where *harm* is the loss to a human being/population consequent on damage; and *damage* is the loss of inherent quality suffered by an entity (physical/biological). *Benefit* is the gain to human population and the term "expected benefit" incorporates an estimate of the probability of specified damage or harm in a given period. *Detriment* is a numerical measure of the expected harm or loss associated with an adverse event, usually on a scale chosen to facilitate meaningful addition over different events. It is generally the integrated product of risk and harm and it is often expressed as costs in monetary terms, loss in expected years of life or loss in productivity. It is needed for numerical exercises such as cost-benefit or risk-benefit analyses. Although it may represent the only numerical way of comparing different events associated with the same hazard or the combined effects of events from different hazards, such comparison in itself is an arbitrarily weighted total of incommensurables; *risk assessment* is the general term used to describe the study of decisions subject to uncertain consequences and it is subdivided in *risk estimation* and *risk evaluation*. *Risk management* is the decision-making concerning risks and their subsequent implementation, and flows from risk estimation and risk evaluation (*The Royal Society, 1992, p 2 – 3*).

Risk estimation includes: a) the identification of the outcomes; b) the estimation of the magnitude of the associated consequences of these outcomes; and c) the estimation of the probabilities of these outcomes. *Risk evaluation* is the process of determining the significance or value of the identified hazards and estimated risks to those concerned with or affected by the decision. It includes the study of risk perception and the trade-off between perceived risks and perceived benefits (*ibid.: 3*). *Risk management* describes processes surrounding choices about risky alternatives. In common usage, assessments of the risks and benefits of various options are seen as technical activities that yield information for decision-makers, whose decisions are called risk management decisions (*National Research Council, 1989, p 37*). The essence of risk management lies in maximising the areas where there is some control over the outcome while minimising the areas where control over the outcome does not exist and where the linkage between effect and cause is hidden (*Bernstein, 1998, p 197*).

Social theorists argued that: there are serious difficulties in attempting to view risk as a one-dimensional objective concept. Risk perception cannot be reduced to a single subjective correlate of a particular mathematical aspect of risk. Risk perception is multi-dimensional and personalistic where each risk/hazard means different things to different people and different things in different contexts; public attitudes favouring stricter regulation often go hand-in-hand with the desire to see a technology more widely developed. Calls for stricter regulation of a new technology cannot be lightly brushed aside as representing an anti-technology bias; the currently available advice on risk communication lacks empirical validation in terms of its effectiveness

to meet set goals or in the capacity to avoid unintended consequences; all human activities involve some element of risk. The field of risk management is wide-ranging and diverse and it has become too segmented; the notion, favoured by scientists and technologists that risk assessment and risk management are overlapping but separate tasks, is too simplistic and misleading. Risk management cannot ordinarily be conceived as a single-seated goal-setting process; there is a need to bring together natural sciences expertise and social science knowledge about human behaviour and the operation of human institutions. As the human handling of risks is affected by a variety of institutions, it is important that attention be focused on the elements of institutional design for the public management of risk[19] (*The Royal Society, 1992, p 7 – 8*).

The effort by the Royal Society to bridge the gap between the physical and social sciences in the perception of risk was unsuccessful (*ibid.: 12*). The 1992 report based its view on techno-scientific rationale and used the same definitions of terms set in 1983 even though they had limitations *they served the purposes of the group of scientists and engineers concerned with putting numbers on risk* (*ibid.: 2*). The distinction between objective and perceived risk was carried on the first four chapters of the 1992 publication and was later contradicted in chapters 5 and 6 by the claim that this could no longer be the mainstream position and risk is culturally constructed (*Adams, 1995, p 9*). Nevertheless, the report acknowledges that the separation between objective and subjective or perceived risk can no longer be a mainstream position. Human judgment enters not only individual assessments but also models of mathematical risk assessments (*The Royal Society, 1992, p 89 – 90*).

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[19] Specific criticisms on the "out-dated" approach (*Adams, 1995, p 10*) of the techno-scientific rationale to risk, concern gaps and uncertainties in knowledge in relation to: hazard identification; exposure estimation; estimation of the probability of harm; identification of synergistic effects; scientific rationale and errors in scientific judgement (inappropriate reliance on limited data, tendencies to impose order to random events, to fit ambiguous evidence into predispositions, to systematically omit components of risk, and overconfidence in the reliability of the analyses); and the influence of human values on knowledge about risk (choices of numerical measures of risk, values connected to the attributes of the hazards (*National Research Council, 1989, p 30 – 2, Beck, 1992a, p 58, 66 – 68, Kahneman and Tversky, 1971, p 105, Kahneman and Tversky, 1972, p 434 - 435, Kahneman and Tversky, 1973, p 207, Campbell and Ott, 1979, Fischhoff et al., 1981, McCormick, 1981* as quoted by the *National Research Council, 1989, p 42, Slovic, 1992*). The conditional nature of all risk assessment is acknowledged in Royal Society (*1992, p 92 – 98*, see also *Funtowicz & Ravetz, 1990, and Smithson 1989*, as both quoted by the *Royal Society 1992, p 96, Blockley, 1980*) where the debate between the existence of objective – subjective risk and value judgements and the meanings/developments they have for notions such acceptability and tolerability of risks (seen as political processes) are discussed (see also *Health and Safety Executive, 1988 and 1991*). More information and critics of the techno-scientific (actuarial approach, toxicology and epidemiology, and probabilistic risk analysis) and economic rationales can be found in Renn (*1992a, p 58 – 72*).

Following this brief presentation on the history of risk and the associated definitional issues as seen through the premises of the technical sciences, the next section will introduce responses on the field as these have been developed from social theorists.

4.3 Governance, institutions and risk

From the perspective of the social sciences, risk perception involves people's beliefs, judgments and feelings as well as wider social or cultural values and dispositions that people adopt towards hazards[20] and their benefits. The perception of risk is multidimensional with a particular hazard meaning different things to different people and in different contexts. Important aspects of risk perception and acceptability involve judgments not just of the physical characteristics and consequences of an activity but also social and organisational factors such as the credibility and trustworthiness of risk management and regulatory institutions. Risk is essentially a human and social phenomenon (*ibid.: 89 – 90).*

Sociological perspectives reflect the need to base risk policies among others on the experience of inequities, unfairness and perceived social incompetence. As a consequence, sociological studies can help to address the issues of fairness and competence and provide conclusions that legitimise risk policies. However, these conclusions will vary considerably depending on which of the perspectives is being employed.

The sociological perspectives include undesirable effects that are socially defined and constructed. Real consequences are always mediated through social interpretation and linked with group values and interests. Possibilities of future events are not confined to the calculation of probabilities but encompass group-specific knowledge and vision. Furthermore possibilities are shaped by human interventions. Social organisations and technological developments ignoring the connections between them and technological performance may seriously underestimate the likelihood of failures. Reality is seen as a system of both physical occurrences (independent of human observations) and constructed meanings (fairness, vulnerability, justice).

The broad scope of sociological perspectives and the inclusion of social experience of risk partially close the gap that is left open by the techno-scientific perspectives. The necessity to reduce the complexity of the social world and to model the major influential factors introduces

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[20] Hazards are defined as threats to people and things they value *(Kates & Kasperson, 1983* as quoted by *The Royal Society, 1992, p 89*). The view of risk is intentionally broad and takes into account the fact that it is characteristics of hazards rather than some single abstract concept that people appear to evaluate (*The Royal Society, 1992, p 89).*

subjective selection and ideological reasoning into attempts to manage risk. The outcome of a sociological analysis is at least partially predetermined by the theoretical concept on which the analysis is based. Furthermore in today's complex reality sociological perspectives can offer proof of any risk position. As a result actors in society often select the perspective that best serves their interests and ignore those perspectives that are antagonistic to their interests (*Renn, 1992a, p 67 – 72).*

4.3.1 Institutional responses to risk

4.3.1.1 Governmentality responses

The notion of risk as a product of late modernity, with an institutional focus on its management, can be examined through the writings of Michel Foucault[21]. From these perspectives and in accordance to the reflexive modernisation thesis[22], the intensification of discussions on risk issues and practices is seen as an outcome of the social changes incurring in the wake of modernisation.

The advocates of the governmentality thesis adopt a strong version of social constructionism and a poststructuralist approach to power relations. They offer important insights into the ways discourses, strategies, practices and institutions around a notion, such as "risk", serve to bring it into being and to construct it as a phenomenon. They argue that it is only through these discourses, strategies, practices and institutions that people come to know risk. These produce truths on risk that form the basis for action. The nature of risk therefore is not the important question for analysis. Risk is seen as a calculative rationality rather than as a thing in itself (*Lupton, 1999, p 85*).

Michel Foucault has not specifically dwelled upon the topic of risk but much of what he has said on governmentality and modernity has been considered by scholars as relevant ideas for the analysis of risk as a socio-cultural phenomenon (*Lupton, 1999, p 85*).

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[21] See for example Foucault (*1984, 1988, 1991*).

[22] Two major exponents of the reflexive modernisation thesis are examined in this chapter. Antony Giddens (Giddens, *1990, 1991, 1994a, b*) and Ulrich Beck (*Beck, 1992a, 1994a, b*), in sections 4.3.1.2 and 4.3.1.3 respectively. Their writings have much in common despite initially developing their diagnoses of risk and late modernity largely separately of each other (*Lupton, 1999, p 58*). For presentation reasons Giddens is discussed before Beck. A comparison is made between the work of the two theorists initially in section 4.3.1.2 and then in 4.3.1.3. In section 4.3.3 Foucault, Giddens and Beck are briefly reviewed from the premises of other sociologists (e.g. Lash and Wynne) whose work is subsequently discussed in section 4.4.1.

Governmentality is the approach to social regulation and control that began to emerge in the sixteenth century in Europe (*Foucault, 1991, p 87*). Governmentality was associated with social changes in Europe such as the breakdown of the feudal system and the development of administrative states in its place, based on the principle of the legitimate rule. By the eighteenth century, the early modern European states began to think of their citizens in terms of populations as a social body requiring intervention, management and protection so as to maximise wealth, welfare, and productivity. Population features such as demographic estimates, the calculation of the pyramid of ages, different life expectations and levels of mortality, studies of the reciprocal relations of growth of wealth and growth of population, various measures of incitement to marriage and procreation, the development of forms of education and professional training became central to the project of technology of population (*Foucault, 1984, p 278 – 279*).

According to Foucault governmentality as a strategy and rationale has dominated political power in western countries since the eighteenth century and in its contemporary form it is characterised by an approach to political rule, neo-liberalism, which champions individual freedom and rights against the excessive intervention of the state (*Lupton, 1999, p 86*).

Foucault, like Giddens and Beck[23], emphasises the role of expert knowledge in the constitution of late modern subjectivity. Expert knowledge is argued to be integral to the reflexive techniques and practices of subjectification. However, for Foucault, expert knowledge is not a means to engage reflexively but is seen as pivotal to governmentality. Expert knowledge provides the guidelines and advice, by which populations are surveyed, compared against norms, trained to conform to these norms and rendered productive. Through normalisation, the late modern individual is fabricated within a network of instruments and techniques of power. The technologies of mass surveillance, monitoring, observation and measurement are central to this disciplinary power, helping to construct understandings of bodies in space and in time and to use these understandings to regulate them (*ibid.: 86 - 87*).

From this perspective, risk may be understood as a governmental strategy of regulatory power by which populations and individuals are monitored and managed through the goals of neo-liberalism. Risk is governed through a heterogeneous network of interactive actors, institutions, knowledge and practices. Information about diverse risks is collected and analysed by experts, such as medical researchers, statisticians, sociologists, demographers, environmental scientists, legal practitioners, bankers, accountants. Through these never-ceasing efforts risk is rendered calculable and governable. So through these procedures particular social groups or populations

[23]See sections 4.3.1.2 and 4.3.1.3 respectively.

are identified as at "risk" or "high risk" requiring particular forms of knowledge and intervention (*ibid.: 87*). Risk from the Foucauldian perspective is a moral technology. To calculate a risk is to master time and to discipline the future (*Ewald, 1991, p 207*).

The strategies of governmentality include both direct, coercive strategies to regulate populations, but also less direct ones that rely on individuals' voluntary compliance with the interests and needs of the state. Other agencies and institutions such as the mass media are also capable of forming such strategies (*Lupton, 1999, p 87 – 88*). Citizens are positioned in governmental discourses as active rather than passive subjects of governance. Rather than mainly being externally policed by agents of the state, individuals police themselves in their pursuit of their own best interests and freedom, in their effort to seek self-improvement, happiness and healthiness (*Gordon, 1991, p 44*).

The concept of risk initially deflects attention away from individuals and their behaviour towards aggregates or populations. The information gathered about risk from population data is often employed in advice to individuals about how they should conduct their lives. Discourses on risk are directed at the regulation of the body. These discourses also contribute to the constitution of selfhood/subjectivity *(Lupton, 1999, p 88*). Through the "*Technologies of the Self*" (*Foucault, 1988*) the individual becomes the entrepreneur of himself/herself in terms of attempting to maximise his/her human capital (*Gordon, 1991, p 44*) in an attempt to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality (*Foucault, 1988, p 18*). In doing so, they seek out and adopt advice from institutional governmental agencies, from experts who have problematised areas of life as pervaded by risk; and because expert knowledge about risk has proliferated the various strategies that individuals are required to practice upon themselves to avoid risk have equally proliferated *(Lupton, 1999, p 88*).

In late modern societies not to engage in risk avoiding behaviour is considered a failure of the self to take care of itself; a form of irrationality or simply a lack of skilfulness. Risk-avoiding behaviour therefore becomes a form of self-government, involving the acceptance and internalisation of the objectives of institutional government. Because the project of selfhood is never complete but continues throughout the lifespan, so too the project of risk avoidance as a technology of the self is never ending, requiring eternal vigilance *(ibid.: 91*).

The notion of dangerousness is argued to have been replaced by that of risk in institutional dealings with marginalised social groups and individuals. The concept of dangerousness in the past (19th century) tended to be used in relation to the problems of health and crime. Dangerous classes/individuals were identified from expert judgements and against those classes were

juxtaposed those which were seen to be at risk from the depravations or contamination of members of the former (*Kendall and Wickham, 1992, p 11 – 12*). Contemporary preventive strategies of social administration have dissolved the notion of a subject or concrete individual and put in its place a combination of *factors*, the factors of risk. State intervention now resides in the establishing of flows of population based on the collation of a range of abstract factors deemed liable to produce risk in general. As a result, specialist professionals are cast in a more subordinate role, while managerial policy formations take over (*Castel, 1991, p 281*).

The expert notion of risk, despite acknowledging potentiality, is calculated through systematic statistical correlations and probabilities based on populations rather than close observation on individuals. Risk has become more selective and precise but at the same time it applies to a larger group of people than the notion of dangerousness. A risk does not arise from the presence of particular precise danger embodied in a concrete individual or group. It is the effect or combination of abstract factors, which render more or less the occurrence of undesirable modes of behaviour (*ibid.: 287*). To be designated at risk is to be located within a network of factors drawn from the observation of others. It is to be designated as part of a risk population.

Identifying and monitoring risks in populations constitutes a new mode of surveillance; namely that of systematic pre-detection. This is a form of surveillance in the sense that the intended objective is that of anticipating and preventing the emergence of some undesirable event. It does not necessarily require the actual presence of the risky individual and it can be based on the monitoring of records. It is enough that a person is identified as a member of a risk population based on a risk profile developed from calculations using demographic and other characteristics[24]. That shift from dangerousness to risk results in the production of a potentially infinite multiplication of the possibilities for intervention because there is not a single situation for which, one can be certain that it harbours no risk, no uncontrollable or unpredictable chance factor (*ibid.: 288 – 289*).

Within the context of the notion of governmentality there have been identified three types of risk rationality in neo-liberal societies: insurantial risk; epidemiological risk; and case

[24]People who have typically been categorised as a member of a specific risk group have their future behaviour gauged and the interventions that are judged to be required are based on the characteristics of this group. These calculations rest upon a notion of management that highlights the importance of rationalised and standardised assessment and prediction and a notion of the individual actor that represents him or her as behaving predictably in alliance with patterns identified in wider populations (*Lupton, 1999, p 94 – 95*)

management or clinical risk[25]. There are certain differences between these risk rationalities based on the types of risk calculations that are manifested and the specific risks to which they are directed (*Lupton, 1999, p 95*).

For all three types of risk rationality, individuals and groups are increasingly expected to engage in risk avoidance or risk minimisation strategies relating to the impact of risks to themselves. This is termed new prudentialism; a neo-conservative approach, which progressively removes the responsibility for risk protection from state agencies to the hands of individual or community-based groups. The acceptance of personal responsibility is presented as a practice of freedom, relief from state intervention and an opportunity for the entrepreneurial subject to make choices about the conduct of his/her life. In this context the role of government is to provide advice and assistance for the self-management of risks, encouraging the active, free citizen who voluntarily engages in risk avoidance, rather than providing large-scale financial support. This is taking place in a socio-cultural and historical context in which dominant notions of selfhood privilege the self who is able to exert strong control over her/his mind and body, constantly engaging in self-denial for the greater good and readily takes up the injunctions of experts in making lifestyle choices. Those individuals who are deemed to be at high risk either of being a victim of risk or perpetrating risk are expected to take control to prevent risk through their own actions rather than rely on social insurance apparatus as a safety net (*homo economicus*[26]) (*ibid.: 99 – 100*)

4.3.1.2 Risk and reflexive modernisation

This perspective offers an approach that considers the politics and macro-level of the current meanings and strategies of risk. Risk society exponents[27] focus on processes such as individualisation, reflexivity and globalisation as converging in the risk society of western nations (*ibid.: 58*).

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[25] The case management approach, in contrast to the other two types of risk rationalities, uses more individualistic sources of data derived from interaction with and observation of specific clients, such as interviews, case notes and files. The case management type of risk rationality has proliferated in neo-liberal societies moving from the spheres of social work and clinical medicine to address such problems such as unemployment and welfare dependency (*Lupton, 1999, p 98*).

[26] This is the representation of an individual who is invested with additional moral and political characteristics and conforms to the self-interested and responsible actor found in neo-conservative discourses (*Lupton, 1999, p 101*)

[27] Beck (*1992a, 1994a, b* – see also section 4.3.1.3) and Giddens (*1990, 1991, 1994a, b*).

Reflexivity means a response to conditions that arouse fear or anxiety that is active rather than passive. It is a defining characteristic of all human action, involving the continual monitoring of action and its contexts. It involves the weighing up and critical assessment of institutions, including those who speak with expert voices about risk. Reflexivity is argued to be an inherent aspect of the contemporary meaning of risk: they are two sides of the same coin. The heightened sensitivity to risk evident in the late modernity era is developed through a highly reflexive approach to the world (*ibid.: 15*).

Antony Giddens's work is close to Michel Foucault's writings[28]. He has written at length on risk and the uncertainty with which individuals approach life in contemporary western societies (*Giddens, 1990, 1991, 1994a, b*). He sees risk as a central concern in the contemporary era, emerging from the processes of modernisation. Risks are seen to have changed in their character in late modern society having greater ramifications in their impact across space and time (*Lupton, 1999, p 81).*

Risk was supposed to be a way of regulating the future, of normalising it and bringing it under mankind's dominion. However, things in modernity did not turn out that way. Our very attempts to control the future tend to rebound upon us forcing us to look for different ways of relating to uncertainty. Risk can be distinguished in two categories: external risk which is experienced as coming from the outside, from the fixities of tradition or nature (bad harvests, floods, plagues or famines); and manufactured risk which refers to risk situations which people have very little experience of confronting (environmental risks). In modernity people started worrying less about what nature can do to them and more about what people can do to nature. That is because much of what used to be natural isn't completely natural anymore and it affects all the aspects of everyday life. This marks the transition from the predominance of external risk to that of manufactured risk (*Giddens, 2002, p 26 - 27*).

Giddens is interested in the political aspects of risk (*Giddens, 2002, p 29 – 34*), singling out reflexivity as a primary response to uncertainty and insecurity in late modernity. In agreement with Beck[29] he sees late industrialism or late modernity as being characterised by transformations in traditional habits and customs, having a radical effect on the conduct and meaning of everyday life. Modern institutions are identified as central to the nature of modernity. These institutions affect everyday life and selfhood but in turn are shaped by individual's actions (*Lupton, 1999, p 72 – 73*).

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[28] See section 4.3.1.1.

[29] See section 4.3.13.

He also identifies a greater awareness on the part of the lay people that the claims of experts about risk are often uncertain or clash with each other, and a willingness on lay people's part to challenge experts, governments and industry in relation to risk concerns (*ibid.: 81*). He sees modern reflexivity for both individuals and institutions involving awareness of the contingent nature of expert knowledge and social activity and their susceptibility to revision and change (*Giddens, 1991, p 20*). Modernity is characterised by doubt about the validity of knowledge, paradoxically greater knowledge has led to greater uncertainty (*Giddens 1994b, p 185 - 186).* The reflexive organisation of the knowledge environments requires the constant prediction of the nature of outcomes in the future. This risk assessment by its very nature is always imprecise, for these calculations rely upon abstract knowledge systems, which are subject to contestation and change. As a result, people have become increasingly cynical about the claims to progress offered by traditional modernity *(Lupton, 1999, p 75*).

Like Beck, Giddens extends his discussion of reflexivity into the realm of the private life and intimate relationships, remarking upon the ways in which risk and its associated reflexivity have permeated this realm. He adopts a weak social constructionist approach to risk, which is founded on critical structuralism and focuses his attention on how risk is generated and dealt with at the macro-structural level of society, the political implications of this and the social conflicts that arise (*ibid.: 81*).

Giddens's writings differ from Beck's on some main points. One concerns the relationship that is implied between risk and reflexivity to risk. Beck implies that a heightened degree of risk reflexivity is the outcome of a greater number of risks being produced in the late modern era. Giddens sees the relationship as being the other way round. Risks are not greater in number in late modernity but they are *thought* to be greater because the nature of subjectivity in general has changed to an approach to life that is far more sensitive to the possibility of risk than in previous eras (*Giddens, 1991, p 32 – 34, Giddens, 2002, p 34*).

Further Beck and Giddens represent expert knowledge systems in different ways. For Giddens, reflexivity takes place through expert systems and is reliant upon lay people's trust on expertise. The reflexive project of self-identity requires consideration of risks as filtered through contact with expert knowledge (*Giddens, 1991, p 5*). The key features of modernity, for him, are institutional and individual reflexivity combined with the reorganisation of space and time and the expansion of disembedding mechanisms in systems of expert knowledge, where these systems deploy modes of technical knowledge which have validity independent of the practitioners and clients who make use of them. But exactly because of the disembedding mechanisms and globalisation, effects are far more wide reaching and that is why late modernity can be described as a "risk culture" (*Lupton, 1999, p 73*).

The conditions of modernity, the progressive separation of space, place and time; alongside the increasing role played by disembedding mechanisms all depend upon trust vested not on individuals but in abstract capacities (*Giddens, 1991, p 3, 18*). People now cannot simply rely on local knowledge, tradition, religious precepts, habit or observation of others' practices to conduct their everyday lives as they did in the pre-modern and modern times. Rather they have to look principally to experts, they do not personally know and are unlikely ever to meet, to supply them with guidelines (*Lupton, 1999, p 75*). So trust remains a necessary part of life[30], but if expert knowledge fails, the repercussions extend far beyond the local context. Reliance upon global expert systems therefore, is characterised by uncertainty. People are required to be more challenging of expert knowledge requiring from them that they win their trust. They are also turning back towards face-to-face relationships in their attempt to re-embed their trust in those whom they know personally. This means different sorts of trust relationships and different sorts of risks (*ibid.: 77 - 78*).

Trust for Giddens presupposes awareness of risk, offering reliability in the face of contingent outcomes and thereby serving to minimise concern about possible risk[31] (*ibid.: 78*). Trust may result from reflexive calculation or else simply from choosing to invest faith in an individual or organisation. It allows individuals to develop a cocoon of invulnerability, which enables them to get on with their lives and fend off the knowledge of the risks that await them at every turn (*Giddens, 1991, p 3*). If the cocoon is pierced by experiences that highlight the existence of risks then people might deliberately seek out these risks but it is often the case that the cocoon is re-established allowing the sense of relative invulnerability to return (*ibid.: 40*). Everyday routines are also vital to the establishment and maintenance of the previously described ontological security allowing people to habitually deal with dangers and associated fears (*ibid.: 44*). Notions of fate also tend to exist in the face of low probability but high consequence risk over which individuals have no personal control and who decide either to simply trust the abstract systems or to decide that fate will take its course regardless (pragmatic acceptance[32]) and ostensibly relieves the burden of anxiety by displacing fear (*Giddens, 1990, p 133 - 136*). Other (adaptive) reactions to risk are: sustained optimism, which is essentially the persistence of the attitudes of

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[30] The disembedded characteristics of abstract systems mean constant interaction with absent others – people one never sees or meets but whose actions directly affect features of one's own life (*Giddens, 1994a, p 89*)

[31] Risk and trust intertwine, trust normally serving to reduce or minimise the dangers to which particular types of activity are subject....What is seen as "acceptable risk" (the minimising of danger) varies in different contexts but is usually central in sustaining trust (*Giddens, 1990, p 35*)

[32] Pragmatic acceptance is compatible with either an underlying feeling/tone of pessimism or with the nourishment of hope which may coexist with it ambivalently (*Giddens, 1999, p 135*)

the Enlightenment, a continued faith in providential reason in spite of whatever dangers threaten at the current time; cynical pessimism, or dampening the emotional impact of anxieties by approaching with a humorous or world weary perspective; and radical engagement, an attitude of a practical contestation towards perceived sources of danger such as is found in the new social movements (i.e. green movement) (*ibid.: 136 – 137*).

For Beck, on the other hand, reflexivity is a critique of expertise, based not on trust but distrust of expert systems, particularly in relation to environmental hazards (*Lupton, 1999, p 82*). Giddens focuses more on self-reflexivity, reflexivity directed towards the body and the self, than does Beck, who places greater emphasis on individuals' reflexive critique of the social (*Lash, 1994a, p 116*) and thus is more challenging of current social arrangements than is Giddens (*Lupton, 1999, p 82*).

The next section critically reviews Beck's work through the writings of Lupton (*1999*). At the same time a presentation of critical aspects of Beck's *Risk Society* (*1992a*) (i.e. the expert Vs. lay debate) will be given (see *Bebbington and Thomson 2004*)[33] and their relation with accounting will be further developed in section 4.3.2.

4.3.1.3 Beck's views on contested risk perceptions or the expert vs. lay people debate

The German sociologist Ulrich Beck has become a prominent figure in the sociological literature on risk. He argues that individuals in contemporary societies are living in a transitional period in which industrial society is becoming a risk society. The production of wealth is accompanied by risks, which have proliferated as an outcome of modernisation. The central problem of western societies is not the production and distribution of goods such as wealth and employment in conditions of scarcity (as it was in the early modernity and remains the case in developing countries) but the prevention/minimisation of bads. Debates and conflicts over risks have begun to dominate public, political and private arenas. Individuals living in those societies have therefore moved towards a greater awareness of risk and are forced to deal with them on an everyday basis (*Lupton, 1999, p 60*).

Beck demonstrates a realist approach to risk, which he uses as another word for a hazard or danger. The risks of modernisation are irreversible threats to the life of plants, animals and human beings (*Beck, 1992a, p 13*). However, this realist approach is not consistently maintained

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[33] Beck (*1992a*), Lupton (*1999*), and Bebbington and Thomson (*2004*) were used as guides for this presentation. The other original sources (*i.e. Beck 1995, and 1996*) were double-checked and then quoted or referenced. The reader can find a more detailed discussion of Beck's "Risk Society thesis" in sections 1.2.1 and 1.2.2.

throughout his work. In some parts of his writings, the social and cultural processes by which understandings and perceptions of risk are mediated are highlighted and he thus demonstrates a weak version of social constructionism (*Lupton, 1999, p 60*). In 'Risk Society', for example, it is mentioned that there is a difference between a risk itself and the public perception of it. It is not clear whether it is the risks that have intensified or the public's view of them. Risks are risks in knowledge; perceptions of risks and risks are not different things but one and the same (*Beck, 1992a, p 55*). However, in a later article it is argued that the risks are social constructs, which are strategically defined, covered up or dramatised in the public sphere with the help of scientific material supplied for that purpose (*Beck, 1996, p 4*).

Beck contrasts what he sees as the two major approaches to interpreting risk (*Beck, 1995, p 162*); "natural-scientific objectivism about hazards" and "cultural relativism about hazards" and concludes that both have strengths and weaknesses.

Natural scientific objectivism is useful because it identifies risks using technical powers of observation, measurement and calculation. Hazards require natural-scientific categories and measuring instruments to be perceivable at all. On the other hand, however, the scientific approach in its quest for neutral objectivity fails to recognise the ways in which scientific facts like other views on risk are situated and interpreted in cultural and political contexts. Neither experiments nor mathematical models can prove what human beings can or should accept, nor can risk calculations be formulated solely in technological-bureaucratic terms for they presuppose the cultural acceptance they are supposed to manufacture (*ibid.: 162*).

The cultural relativism approach emphasises the contextual aspect of risk responses, pointing out that what concerns one social group in one historical era may not worry another. Risk calculations from this perspective are no longer thought as the arbitrators but as the protagonists in the confrontation, which is enacted in terms of percentages, experimental results and projections. However, this approach often becomes too relativist, regarding anything as potentially classifiable as dangerous and failing to recognise the special nature of "real" contemporary hazards (*ibid.: 162 - 163*).

Beck seeks to integrate both approaches in what he calls a sociological perspective. This perspective centres upon the institutional contradictions between the safety and control requirements imposed by the state on one hand and the normalisation of large-scale hazards on the other. It is precisely in the context of highly developed welfare and safety bureaucracies that the legalisation of decision-dependent dangers of annihilation points to the immanent social contradictions; and also to the political dynamic wherein the social subsystems (economy, science, law, politics) have become entangled in a civilisation of large scale hazards (*ibid.: 76*).

He maintains a natural–scientific objectivist approach by subscribing to the idea that "real" risks exist. Beck incorporates cultural relativism by arguing that the nature and causes of risks are conceptualised and dealt with differently in contemporary western societies compared with previous eras (*Lupton, 1999, p 61*).

Bebbington and Thomson (*2004)* present the expert versus lay people debate discussed in Beck's (*1992a*) work and make a connection with conventional accounting practices and social environmental accounting[34] (SEA).

Beck views the consequences of scientific and industrial development as a set of social and ecological risks and hazards that are no longer limited in time and space, whose measurement, valuation and calculation is highly problematic, that no-one can be held accountable for and impossible to compensate for. He identifies a number of critical aspects of risk such as the danger of seeking verifiable and neutral truth, the causal denial of harm, expert versus lay knowledge of risks, social construction of risk, radicalisation of rationality and in particular the paradox of science creating risks and yet the critical role of science in uncovering and managing these risks.

Risks, as seen by Beck, are created in social systems designed to manage and control risky situations. These social institutions are dominated by experts who ignore and exclude non-experts. Unfortunately it is the non-experts who are exposed to and the victims of these risks. Within society, the dominant risk discourses are constrained by culture, historical heritage and an unreflective scientific process. Risk is governed by groups of technical experts fighting for control of the risk agenda. Risk is a contested arena and offers access to resources and power to the dominant group in risk governance. Currently, the dominant risk discourse is cloaked in the language of an objective scientific process, which denies these political, social, economic, and ethical dimensions.

Beck argues that current scientific institutions are systematically misrepresenting "risks". He discusses how they transfer their knowledge, constructed from a scientific process, into social action. Scientists privilege a particular form of knowledge production and legitimisation that offers only a limited perspective into social and ecological phenomenon. This is largely because of the questionable physical assumptions, naive realism and inadequate models of social behaviour that underpin the ontological and epistemological paradigm of the natural sciences. Modernist science methods abstract the object of their enquiry from the field, denying the social and ecological context of the risks they investigate, yet they do not object to their "work" being used to engineer these contexts to make them "safer". By insisting on uncontroversial evidence

[34] See section 4.3.2.1.

of a causal link between action and harm, risks are not reduced but increased. Risks are legitimated by social institutions based on knowledge; they are epistemological constructs as much as they are physical.

If the recognition of a particular risk is denied due to an unclear set of data, necessary counter-actions are not deemed necessary and the danger grows. Turning up the standard of scientific accuracy, reduces the number of legitimate risks requiring corrective action. Insisting on the purity of scientific knowledge leads to the contamination in the physical world. Insisting on higher quality knowledge as a precursor to action would appear on one level to be a reasonable and legitimate approach to manage risks, but on another level can be seen to increase risks as a consequence of their successful de-recognition.

For example, the "polluter-pays" principle could be neutered by a requirement for inconvertible scientific proof between actual harm, the value of that harm and corporate action. Modernist scientific methods are unable to offer this level of certainty. By insisting on strict causality allows corporations and regulatory institutions to deny causal connections that exist nonetheless. The ability to deny causal links enables corporations to escape liability and accountability for their actions. It is possible that science could be captured by polluting corporations, with scientific knowledge *"legitimating patterns of global industrial pollution" (Beck, 1992a, p 62).*

Similar problems arise in determining scientifically acceptable levels of pollutants and human exploitation e.g. minimum wage levels, working terms and conditions. The science behind these limits, Beck argues, can be translated as *"I don't know either, or blank cheques to poison nature and mankind a bit" (ibid.: 65).* These consent levels and minimum standards are not about risk prevention but about legitimising permissible levels of poisoning and exploitation. They also allow corporations the opportunity to deny poisoning or exploitation if they can demonstrate performance in compliance with acceptable levels. Industrialisation can be seen as a permanent experiment with people as lab animals having to collect and report data on their own toxic symptoms. These expertimentees, lacking resources, expertise and institutional power, have to fight against the experts, who perversely impose higher burdens of proof than they themselves require. However, there have been a number of cases where the institutions have been forced to reverse their position due to the efforts of lay-people who used science to defeat science.

Over the last decade, Beck's observation that the scientific investigation of risks is following rather than leading the social critique has been demonstrated to be the case. This has also been observed in SEA where external stakeholder groups, using external social audit methods to gather information on corporate activity, try to provide alternative accounts to counter corporate

reports of the same events. Much of corporate social reporting activity can be attributed to powerful social critiques of their activities, rather than endogenous evolution of accounting practices.

Within Beck's work there is a tension between the observation that the sciences are incapable of managing the risks of industrialisation, as they are implicated in the creation and multiplication of these risks, and the necessity of science to identify these risks. A similar tension exists within social and environmental accounting[35]. Undoubtedly accounting is implicated in the social and environmental damage caused by profit-driven corporations and that corporate social reporting could be captured and be used to legitimate and promulgate risks. This tension is apparent in the on-going academic debate as to the potential impact of the corporate social reporting project.

Risks are risks in knowledge, the perception of risks and risks themselves are not different things, but are the same. Society has to cope with the symptoms and symbols of risk, rather than waiting for proof that is unlikely ever to come. The nature, level and symptoms of society's exposure to risks are constructed via pedagogic processes. Knowledge construction and dissemination is critical to the risk problem. Just as risks are constructed by science so they can be changed by science. The failure of modernist scientific rationality to deal with the risks of globalisation is accepted, but this is not the only form of scientific rationality. Beck calls for a reflexive reform of science, the radicalisation of rationalisation, in particular the need for an end of the artificial dichotomy between expert and lay-people. The weakness of science has to be addressed by a scientific critique of science. Members of the public need to develop a localised, specific knowledge of globalisation risks they face.

Individuals or collectives need to collect data and develop theories, drawing attention to defects in official science studies, replicating studies in their own locations, challenging scientific assumptions, questioning the origins, presentation and interpretation of statistics and previous official evidence, uncovering the tricks and scientific falsification techniques. The public need to use the power of science to critique science, demystify the scientific process and so reclaim their place in legitimate knowledge construction and dissemination.

Risk has to be repositioned away from the risk experts, who are arguing with each other over their latest pronouncements over what is and is not safe. Risk is currently a contested territory with different disciplines competing for control of the risk industry. However, this contest is between different groups whose techniques are located in the techno-scientific paradigm. This apparent pluralist contest has consistently failed to deliver a safer situation, mainly due to the limitations of modernist science's treatment of the human and their social interactions.

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[35] See section 4.3.2.

Modernist institutions, for example, are based on the premise of well informed, thinking individuals, who can shift through the jungle of competing and conflicting knowledge. Experts appear to consider their work to be done by simply dumping "their contradictions and conflicts at the feet of individuals" and inviting them to arrive at the best outcome through a process of critical reflection. However, no support is given to the populace in how to perform this evaluatory role, leaving most at the mercy of unfiltered and unstructured media scare stories (*Beck, 1992a p 137*).

Risks fall through the sieve of over-specialisation since they are what lie between specialisation. Coping with risks requires co-operation across the contested historic borders between theory and practice, different professional disciplines, competences and institutions, values and facts, experts and lay people, politicians and public. Risk needs to be the subject of a reflexive pluralist scientific discourse, legitimating and drawing upon a range of alternate ontological, epistemological and methodological paradigms, reversing the current privileging of modernist scientific rational.

Science is currently needed to recognise risks. Such risk recognition is a pre-requisite to its prevention, management or compensation. Victims can also use science to succeed with their claims. In the process these scientific studies can modify official legitimated knowledge and challenge the dominance of current scientific rationality. However, a general crisis in scientific authority could reduce the visibility of risks, leading to the inability of individuals to contest the activities of corporations.
(*Bebbington and Thomson, 2004, p 4 -7)*

Beck's interest in the societal responsibility that political institutions carry can be seen from the above discussion[36]. He talks about reflexive change directed to institutional risk governance structures. He addresses the meso-level of society outlining the importance risk perceptions of other stakeholders have/must have for politically reflexive institutions, without necessarily falling short in acknowledging the complexity of responses to expert knowledge, communal, aesthetic and shared symbolic aspects of risk as accused by other theorists (*Lash 1994a*)[37].

These latter aspects of risk perception in everyday life could be addressed at a more micro-level of investigation into risk perception research[38]. Doubtless enriching, these views would not

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[36] See also sections 1.2.1 and 1.2.2.

[37] See sections 4.3.3 and 4.4.1.

[38] See for example Lash's and Wynne's work in section 4.4.1.

necessarily add anything new to the importance Beck's and Giddens' insights carry for institutional reflexivity and change.

In the case of the salmon farming risk arena for example, Lash's and Wynne's work[39] could further shed light onto how risk is conceptualised in the everyday life of salmon farmers, stakeholders, rule enforcers both as regulators and stakeholders, media amplifiers and general public. Even though this view at the micro-level of risk perception would add additional information on the issues addressed, it would not perhaps add anything new to the evaluation of the "story" told at a meso-level.

In this thesis Beck's work is seen as sufficiently explaining the debate about the salmon farming industry's practices in Scotland on environmental grounds[40]. The researcher saw the issues raised by the interviewees as a close match to Beck's "thesis", and in many cases the "stories" told by these interviewees and the media were and are a rephrasing of "Risk Society" into the context of the respective risk arena.

4.3.2 Risk and CSR/SEA – an introduction

The above presentation of Beck's position highlights the potential linkages between the notions of risk and CSR/SEA. The latter as a response to the public's concerns for corporations' societal responsibilities[41] is of major significance when trying to address environmental issues.

Accounting is the effect of the need for accountability. A need that was initially developed around very shortsighted notions of risk; namely financial risks that directly impact on corporations' financial positions, their stakeholders, and the involved in their everyday running management. This came to be the norm. It was adapted by an *oligarchic* financial establishment concerned only for its financial wellbeing and was promoted as the "right way to do things"[42].

However, the range of risks acknowledged was very limited to properly cover the *democratic* accountability needs and demands of society (*Gray et al 1996*). Corporations have societal

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[39] Discussed in section 4.4.1.

[40] The evaluation of the empirical work presented in chapter 6 takes place in chapter 1.

[41] See Gray et al (*1996*) for a short review of the earlier literature on the development of CSR/SEA. Special reference is made to: social responsibility, customer-/community-care; labour union issues; and the environment.

[42] See sections 4.3.2.4 and 4.3.2.5.

responsibilities which they try to mitigate[43] and especially those relating to costs externalised on the environment.

This is clearly demonstrated within the context of Beck's (*1992a*) work who brings into perspective society's needs for accountability through what is seen as the struggle of the "sub-political" to have its own risk perceptions and needs acknowledged and taken on board by the "political" risk managing institutions (i.e. experts Vs. lay people) dominated by corporations' aims and policies. CSR/SEA from its very beginning has been developed as an alternative or more complete form of accounting that tries to bridge the existing accountability gap in the social risk arena (see *Gray et al 1996*).

In this light and continuing this section the linkages between risk, accounting and CSR/SEA will be further explored while at the same time the notion of sustainability will be brought into the discussion.

4.3.2.1. Examples of institutional risk governance?

From the previous discussion and by following Beck's critique of Risk Society (*1992a*), it can be argued that risk governance is potentially problematic when institutions legitimising risk make "closed" decisions on governance structures. Accounting mechanisms are part of these structures and when the latter simply feed in the institutional mechanisms ignoring risk perception of other stakeholders then the whole process can be problematic if there are differences of opinion on the legitimacy of the respective risks. In the past, corporations were able to deny the reality of the harm, by various legitimating claims backed by government institutions, conflating safe, risk-free practices with not breaking specific regulations or exceeding acceptable emission limits. Alternatively, corporations would use the absence of scientific evidence relating to the observed harm of their action as a justification or defence of the safety of their actions. Indeed, Beck argues that in contemporary society, if risks are not recognised scientifically they do not exist. If they don't officially exist they do not need to be prevented, managed or compensated for. However, scientific ignorance does not mean that people and eco-systems are not damaged (*Bebbington and Thomson, 2004, p 1*).

A more "reflexive" scenario would probably involve these accounting mechanisms informing and being informed by notions of risk existing at different societal levels rather than being confined within a closed self-preserving system.

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[43] CSR/SEA can also be used in a similar manner (see for example: *O'Dwyer 2002; 2005; O'Dwyer and Norris 2004; O'Dwyer and Unerman 2004*).

Conventional accounting arguably is an example of such closure. There are numerous examples of real transactions and events whose inclusion in accounting records has been contested, due to their valuation being unable to be determined objectively and verifiably. Despite these 'things' being considered as material by groups of powerful stakeholders, the absence of certainty in valuation is still sufficient for their exclusion. It is only when consensus is reached on legitimating methods of calculation that items are systematically included in financial reports. It is worth noting that these calculative techniques do not actually "value" with objective certainty, but that they are institutionally accepted as doing so (*Bebbington and Thomson, 2004, p 4 – 5*).

When corporations have to address their environmental responsibilities the situation can become even more complicated and problematic. Often corporations do not view their actions as causing the claimed harm and think that the risks attributed to their activities are wrong or non-existent. Corporations feel that they are unfairly treated; particularly when they are operating within legally defined parameters. Their perspective is that if only those protestors knew what the corporation knew (as in the case of the salmon farming industry) they would be put at ease. Protest, fears, criticisms or resistance in the public sphere are problems of ignorance. Assurance and calming down these ill-informed fears could be addressed by providing a rational, scientifically informed account provided by the corporation backed by assurance from credible and trusted institutions. Corporations believe that these risks are not real but the result of ignorance and deliberate scare mongering. Therefore corporations need to address the public's misconception and lack of knowledge about their actions. Corporations could be seen as adapting accounting procedures and self-reporting in order to repair and secure credibility, in a way that does not lead to the disruption of existing structures of power distribution and social control (*ibid.: 2*).

By developing corporate reports, in terms of their social and environmental performance, corporations are using accountability as a solution to social and environmental risks, building upon a long association of the accounting profession with risk management[44]. The extension of this 'financial-rational' approach to dealing with social and environmental risks however, is problematic and likely to fail[45] (*Bebbington and Thomson, 2004, p 2 – 3, Cooper and Thomson, 2000*).

Beck's work is highly relevant for assessing the efficacy of transferring financial accounting techniques into the domain of social and environmental risk management. Beck views the consequences of scientific and industrial development as a set of social and ecological risks and

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[44] See, for example, Owen et al (*2001*), Danastas and Gadenne (*2004*), O'Dwyer and Unerman (*2004*), Bebbington et al (*2004*), Mathews and Reynolds (*2004*).

[45] See section 4.3.2.2.

hazards that are no longer limited in time and space, whose measurement, valuation and calculation is highly problematic, that no-one can be held accountable for and impossible to compensate for. This definition of risk would question the ability of accountants to contribute to social and environmental risk reduction (*Bebbington and Thomson, 2004, p 3*), even though corporate social reporting also contains the potential to challenge corporations and play a part in wider social change process (*ibid: 5*).

However, before the discussion moves to social and environmental accounting, the related notion of sustainability and its relation with accounting practice has to be briefly presented first.

4.3.2.2 Sustainability and regulation

Duncan (*1997, p 1 – 16*) provides an overview of the development of the notion of sustainability and the contemporary issues attached to it. Sustainability[46] relates to the planet's and biosphere's ability to renew itself. The carrying capacity of the planet is the extent of a renewal process that copes with ecological interactions, which are often outside the control of society (*Lovelock, 1982*, as quoted by *Duncan, 1997, p 4*).

There has been an increasingly visible and growing concern about the state of the natural environment and related social issues (see for example: *O'Riardon, 1994, p 4 – 6; Bebbington et al, 1994a, p 2; Bebbington and Thomson, 1996, p 1; Marien, 1994, p 115; Gray, 1990, p 7 – 10*). This concern focuses on the viability and state of the continued existence of human societies[47]. Sustainable development has been almost universally accepted as the goal for becoming a less unsustainable society and it is seen to be both an environmental and a social concern (*Bebbington et al, 1994a, p 8 – 9*). These three inter-linked aspects of sustainability are commonly referred to as "eco-efficiency", "eco-justice", and "eco-effectiveness" (*Bebbington et al, 1994a, p 8; Bebbington and Thomson, 1996, p i*) and form the definitional foundation of sustainability. Eco-efficiency refers to the natural environment and society's use of it. Eco-justice refers to social equity; equity between members of the current generation (intra-generational) and between members of the current and future generations (inter-generational) (*Duncan, 1997, p 4*). The term "eco-efficiency", which captures the notion of reducing material and energy inputs per unit of output, needs to be distinguished from eco-effectiveness, which captures the idea of reducing our overall ecological footprints (see *Chambers et al, 2000*). For sustainability to be achieved eco-justice, -efficiency, and –effectiveness need to be met for both

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[46] The terms sustainability and sustainable development are used interchangeably in the literature without being clear if these two words have substantially different meanings (*Bebbington et al, 1994a, p 2*)

[47] Economic, political and ecological interdependences effectively mean that a single society cannot fully insulate itself from the actions of other societies (*Duncan, 1997, p 3*).

current and future generations (*Gray and Bebbington, 2001, p 296*). A change in peoples' beliefs, worldviews and behaviour is seen as fundamentally necessary in any move towards sustainability (*Corson, 1994, p 207 - 208; Milbrath, 1994*).

The basic nature of sustainability can broadly be conceived in five major and interrelated dimensions (*Clayton and Radcliffe, 1996*):

1. "Sustainability is an economic, social, psychological, and cultural issue."

Economic systems determine energy and resource flows, to and from the environment, by humans and influence economic wealth distribution. Cultural values are embedded in economic systems. Social and psychological models influence the way in which people make decisions in economic systems.

2. "Sustainability is a moral issue."

A decision made today may have numerous effects on the environment having different implications for societies in different parts of the world and for different generations. There are *moral judgements to be made* as to who, and to what extent, should there be assumed a general responsibility for decisions and actions that could affect people in both current and future societies. Taking equity as the objective, the rights of current and future societies should be catered for in an equivalent manner. This will be problematic given the lack of consensus, or need to blame different current societies for prevailing unsustainability.

3. "Sustainability is a political issue."

In practice, many of the decisions will be based on estimates and guesswork. It is unlikely that there will be "*clear-cut 'good' and 'bad' alternatives*", instead a choice between alternatives that have different benefits and costs for different people at different times. Sustainability questions such choice; should society err on the side of caution, or allow only development not proven to cause harm? Such decisions involve value judgements as to the priorities and actions of society.

It is likely that conceptions of sustainability will be driven more by political systems than by breakthroughs in knowledge about environmental systems. Herein lies a contradiction where current acceptance of sustainable development must mean concessions from those currently holding political and economic power. If there truly is commitment to sustainable development this must involve sacrifice from those in power, which many regard as optimistic at best and politically naïve (*Cooper and Thomson, 2000, p 3*).

Sustainable development is a political concept, utilised especially by the dominant Western bodies of power, those bodies that surely will have to concede power, resources and status in the move towards sustainable development.

4. "Sustainability is a global issue."

It would be possible for one nation to maintain an amiable local environment by exporting its toxic waste. However, this represents a short-term displacement of the problem rather than a solution. "Sustainability can only be fully assessed at global level", but such global concerns need also to be enacted at a local level.

5. "The solutions are sometimes simple, but our thinking has to be sophisticated."

It will often be difficult to determine what the most effective action would be, because the links between our social and economic systems and the environment are so extensive and complex. Sustainability is a complex issue that requires significant change, but given the dynamic nature of society and the eco-system, sustainability will probably never fully be defined or realised (*Duncan, 1997, p 5 - 6*).

The notion of sustainable development is taken to be the prevalent broad articulation of sustainability in the contemporary era. It is most frequently defined as development that: *"meets the needs of the present without compromising the ability of future generations to meet their own needs."* (*WCED, 1987, p 8*).

The term has been conceptualised as an intellectual innovation, a normative principle, societal transformation and more generally as a massive opportunity with the potential to guide human-environment interactions so that continued human presence on the Earth is viable (*Bebbington & Thomson, 1996*). However, the utilisation of the notion can be problematic if applied within the context of the dominant economic orthodoxy (the western orientation of sustainable development – see for example: *Duncan, 1997, p 9 – 11; Gray et al, 1993, p 306 – 307; O'Riardon, 1994, p 4; Bebbington et al, 1994a, p 4, 7*).

Alternative routes towards sustainability have been proposed that are outside the current hegemony of the neo-classical economic system. Such proposals require not simply a shift, but a radical reworking of current society. There are calls for a spiritual reawakening, and new institutions for a different, non-market, economy.

From a deep green perspective it is perceived that there is a need for a paradigm shift from quantity to quality; domination to partnership; and from expansion to conservation. In so far as

the excesses of the existing Western social and economic paradigm are unacceptable and unsustainable, a move away from such excesses is essential (*Duncan, 1997, p 11*).

Part of the reasons for unsustainability is connected to current dominant interpretative systems (*Cooper and Thomson 2000, p 18*). For that reason deep green approaches to sustainability reject the anthropocentric valuation and economisation of society and the environment. Economic and monetary valuation is criticised as increasingly inappropriate; once goals, such as sustainability, are measured in money *enough doesn't exis*t. When money, representing goals and aims, becomes a goal in itself opportunities that provide recognised net monetary benefit will be sought, often without examination of the underlying goal. Economic valuation and accounting, executed through notions such as the "polluter-pays" principle, are not seen as a means of encouraging businesses to become less unsustainable instead a means of pursuing hidden ideological aims of capitalism (*Cooper et al, 1992, p 18*).

Environmental systems have limits; in contrast economic systems operate as if these limits did not exist e.g. utilising non-renewable resources, causing extinction through changing environments. Economists argue that such anomalies can be eliminated through fuller economic valuation of the environment. Where market valuations are only partial, techniques for social and environmental valuation, such as contingent valuation, travel cost method, hedonic pricing, full costing arguably, can be used to allow the market system to operate in accordance with human wants regarding environmental systems (*Pearce 1989, 1993* as quoted by *Duncan, 1997, p 12*). However, such valuations are highly subjective where the guiding values and aims of valuers shape decisions. If such valuations occur within neo-classical economic motives of maximising personal welfare, this will not take us close to a sustainable society of equity and justice. Such valuations, if at all applicable, must account for and articulate both eco-efficiency and eco-justice concerns. Arguments for involving accounting and economic based valuation in moves away from unsustainability have been suggested as possible solutions (*Duncan, 1997, p 12*).

Clayton et al (*1999*) discuss the importance of regulation in creating the incentives for sustainable development in the context of environmentally unfriendly sectors. Regulation and other policy instruments could be used to promote innovations that are more efficient in resource use and thus more competitive as well as cleaner. Economic development and environmental protection can be reconciled in that way. However, it is of particular interest how the forms of the necessary regulation arose. Out of the combined demands for pollution-free, resource-efficient and sustainable modes of production, the concept of cleaner production came into being. The idea of waste minimisation at source and changes to industrial processes that would improve resource efficiency tended to be favoured because: a) the established procedures for dealing with waste were becoming increasingly difficult and costly; b) the number of

pressing environmental issues and problems was growing and in its turn started generating increasing pressure on firms and governments; and c) public awareness and concern was also growing, and the public debate was becoming increasingly sophisticated, which was making a number of previously acceptable and established solutions, untenable (*ibid.: 7 - 14*).

Regulatory systems thus are informed by a combination of factors that include not only scientific and technical considerations in but also questions of public concern and perception which influence the political context within which regulatory systems are ultimately determined (*ibid.: 51*).

Regulation is one of the main influences on the environmental and related behaviour of firms. This is because state intervention can redress the failure of the market to protect the environment when firms externalise their environmental costs. In principle societal pressures may operate upon firms without the use of formal legal mechanisms enacted by government agencies. In practice, however, firms react only a little if at all, to the public pressures. On the other hand, public perceptions of hazard may influence the behaviour of politicians and regulators in both developing and implementing regulation. So although growing environmental concern seems to be the underlying driver for change, this does not act directly upon firms but seems instead to operate through its effects on legislation and the implementation of regulation. Regulation and other kinds of public policy intervention and regulatory pressure including the expectation of changes in regulation appear to be the most immediate influences on the environmental behaviour of firms.

The traditional response to environmental pollution has been to use regulation as a catalyst prompting changes in firms' behaviour. The relationship between industry and regulatory authorities in most of the countries has tended to be adversarial. Industry tended to see environmental regulation as an imposition of unnecessary costs, while regulatory bodies tended to see industry as a source of environmental problems than of solutions.

An effective regulatory system provides incentives to solve environmental problems at source. Empirical work in Denmark and the Netherlands shows that models involving more collaboration between regulator and regulated firm around environmental goals may be far more effective than the adversarial ones and the traditional concept of the regulator operating at arms-length as an environmental policeman who monitors and enforces compliance with the existing standards. In these countries firms are encouraged to collaborate in research projects and share the benefits of the associated investments by participating in formal and informal agreements to share the costs and risks of developing new and more fundamental solutions to their common environmental problems (*ibid.: 26 - 28*)

A holistic regulatory regime, as opposed to strict enforcement, creates the basis and possible incentives for greater engagement between regulator and firm. The regulator becomes involved in broader strategic judgements about the environmental behaviour of a company. This in turn obliges the regulator to develop some understanding of that behaviour and take into account the technological and commercial context of the firm. In that way the two parties are engaged in a dialogue, which may open the way to more creative solutions (*ibid.: 47*). At the same time public participation and accountability when formulating regulations for large projects or industries is of great importance since the role of government is in principle to protect and represent the public interest and therefore it must at all times be possible for the public to verify whether this is indeed the case. For that reason a two-way communication with civil society and with stakeholder groups and media should be given high priority (*Flyvbjerg et al, 2003, p 107 - 124*).

There have been however, particular objections to the idea of using regulation as a driver of technological change. The uncertainties regarding the technical feasibility of compliance and their imputed costs could be especially high. In that way the industry faces difficulties regarding whether, how quickly and at what cost regulatory requirements could be met. At the same time regulators have to assess these claims. Such approaches tend to be characterised by conflict between regulators and industry.

Nevertheless regulation can itself become a key competitive factor, creating new markets and new opportunities to make profits. Regulation also shapes markets and favours players able to meet particular regulatory requirements. Regulation needs to promote improved environmental responses in a way, which encourages industrial innovation. The latter can improve resource efficiency or waste minimisation and can result in improved competitiveness. The challenge therefore is to design ways of applying regulatory and public policy pressures in a way, which encourages innovation geared towards improvements in the efficient use of resource and reduced environmental impact. In this context, key issues are thought to be: a) the attention that has to be paid to ongoing processes of innovation within a firm. Positive self-regulated tendencies have to be encouraged; b) the importance of dialogue between firms and government. In that way both problems will be solved and it can also be ensured that cleaner solutions may be more generally disseminated and adopted; c) the need for regulatory pressures that can provide a consistent incentive for improvement within firms. An important part of this would be policy and regulatory stability.

A shift in the mode of regulation is needed. It has to change from being seen as an external force compelling firms to adopt certain behaviours, to be promoting and reinforcing a shift in

the internal climate and perspectives of the firm (environmental goals are intrinsic and linked to competitive goals). From such a perspective, one important role of the regulator may be in promoting and organising exchange of information amongst firms and between firms and other sources of knowledge such as research and advisory bodies and regulators themselves (*Clayton et al, 1999, p 28 - 32*).

4.3.2.3 Sustainability and accounting

Bebbington et al. (*1994a, p 9 – 10*) suggest that relationships between accountancy and sustainability and the environment arise on three levels including:

1) A connection between the two areas via systems theory. The latter traces the links between accounting and the environment (*Bebbington, 1999, p 150, Gray et al, 1993, p 17 – 22, Gray, 1990, p 26 - 32*). The systems perspective is said to lead to greater or fuller costing of the environment; it is assumed to make accounting's connection with the environment more explicit, highlighting the partiality of conventional accounting practice. However, systems theory does not consider new non-economic based accounting even though such qualitative accountings could provide a new system of interpretation and meaning (*Duncan, 1997, p 12*).

2) Theories that examine the relationships between business organisations and society, and the role of accounting as a dialogue between these two groups. According to "political economy theories" business organisations should provide a greater range and level of information to a greater range of individuals. Accounting information is used to legitimise organisational activities; discharge responsibility for activities; and negotiate and express a social contract between the organisation and society. Such theories are focused on the role of accounting in external reporting. The basis of political economy theories may also be applied to internal management accounting systems.

3) Ideas about accounting forming patterns of visibilities and invisibilities, and assisting in the social construction of reality. Selective pictures of reality are created providing a link between accounting and (conceptions of) the environment[48] (*Gray et al. 1993, p 17; Cooper and Thomson, 2000, p 9 – 11*). Current accounting representations recognise only those things that can be measured by economic pricing (*Bebbington et al, 1994a, p 10*). As many aspects of sustainability are unrecognised by such measures, making decisions, identifying goals and concepts that affect sustainability will be incomplete.

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[48] Or other aspects of social life (see, for example, *Greer, 1994*).

From these ideas the authors propose that these links support the examination of sustainability within an accounting context and that a "*sustainability account*" needs to be developed[49].

Bebbington et al (*1994a*) suggest that if we know we are heading towards greater levels of unsustainability the first task to be addressed should be to start reducing this unsustainability. There is a large body of literature which posits that environmental and social accounting can *at least* improve societal eco-efficiency through wider recognition of the associated benefits (e.g. *Gray, 1990, Gray et al., 1993, p 10 – 13; Macve and Carey, 1992* as quoted by *Duncan, 1997, p 12*) and there have been suggestions for wider accounting for sustainability (e.g. *Bebbington et al, 1994a; Bebbington, 1999*).

However, this literature is often criticised because it is grounded within the current system of capitalism (e.g. *Cooper, 1992; Tinker et al., 1991, p 46 – 47*). It is also criticised because of the incompatibility it has with the "*logic of the capitalist system*" (*Wildavsky, 1994, p 478 – 480*). Deep green criticism of economic valuation is evident in the burgeoning field of social and environmental accounting and reporting literature. Such criticism can be focused on the nature of accountability that uses unitary, one-dimensional money measures of representation (*Duncan, 1997, p 13*). More "shallow" accounting reform, which merely expands the existing system is seen by deep greens as potentially more destructive in the long term. There is seen to be an increased possibility that social and environmental issues are captured or enclosed within the existing system, which by its nature is unsustainable (*Cooper et al., 1992, p 20*).

Assuming that in the short term a complete upheaval of current society is less rather than more likely, suggestions for sustainability will be shaped by beliefs derived from existing social and economic paradigms. From this position the arguments and suggestions of "shallow" accounting reformers are seen to be more pragmatic and capable of producing some level of change.

The problems of businesses in articulating and making meaningful the concerns of sustainability are said to be an indication that the concept remains radical and problematic (see *Bebbington et al., 1994a* for problems in articulation of the issues by accountants). On the basis of empirical responses Bebbington et al. (*1994a*) conclude that there is a role for accounting techniques, and accountants, in an organisation's pursuit of sustainability[50] provided the focus and role of

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[49] The notion of SEA (or CSR) briefly presented in section 1.4 addresses the environmental and social aspects of corporations' behaviour and falls within the boundaries of such a sustainability account (*Bebbington, 1999, p 150*)

[50] This conclusion is grounded in a societal approach to accounting where accounting is socially created and helps to create (reinforce) societal values. Accounting thus has the potential to be a socially useful discipline and must be developed to this end (*Duncan, 1997, p 13*).

accountants and accounting are extended. Proposals for such new accountings were still predominantly quantitatively based (e.g. *Gray et al., 1993; Bebbington et al, 1994a, p 12 -15; Macve & Carey, 1992*). However, it is also stated that an organisation serious about sustainability would make efforts to reduce the influence of conventional accounting in its operations (*Duncan, 1997, p 13*). In the latter case such organisations are said to be value-centred; organisations that are driven by wider values and not merely financial goals. It is through a change in values away from the current business orthodoxy that "*sustainability depends on*" (*Bebbington et al, 1994a*). Thus any moves that sustain and facilitate the current orthodoxy may be contradictory to moves towards sustainability (*Milbrath, 1994*).

Further research is required to examine the potential role that accounting plays within (un)sustainable activities of businesses. This includes examining the extent and nature of accounting influence and how changes in accounting have affected, or can affect (un)sustainability, and whether accounting is simply a tool, which will facilitate the capture and control of sustainability. The more understanding of the purposes and effects of accounting in practice, the better the position to analyse suggestions for change.

If accounting is important in shaping organisational behaviour, investments, and change then accounting may be utilised to the advantage of a sustainable society (see, for example, *Bebbington et al, 1994a, 1994b, Bebbington and Thomson, 1996* for suggestions of what accounting may look like).

4.3.2.4 Conventional accounting orthodoxy as a source for environmental risks

Bebbington (*1999, p 144 – 145*) provides an overview of the main criticisms conventional accounting must address in light of its environmental and social obligations. Such criticisms concern the way that accounting socially constructs organisations, whilst being a social construction itself.

At its broadest and simplest, accounting is the provision of accounts for objects of interest. This description of accounting generalises conventional accounting practice[51] so a number of refinements must made to enhance the reader's understanding of existing accounting practice. The American Accounting Association (AAA), provides a widely accepted (or at least widely quoted) definition of accounting as *"the process of identifying, measuring and communicating*

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[51] This description includes both financial accounting (which is concerned to represent an organisation to external parties) and management accounting (which constructs internal relationships). These two forms of accounting are interdependent (*Bebbington, 1999, p 146*).

economic information to permit informed judgements and decisions by the users of that information" (*Weetman, 2003, p 4*) with the purpose of enabling users to make "*economic decisions which ... will enhance social welfare*". In this way the practice of conventional accounting is narrower than all possible accounts and involves accounts that focus on a particular accounting entity and the economic activities of that entity, which can be described in financial terms and conveyed to a particular set of individuals who have the right to that information. The entity concept is of prime importance as it defines the item of interest for which an account is given. The relationship between the entity and its environment provides the basis for drawing the organisation's boundary and exchanges over that boundary, which conform to the above requirements, and form the basis for accounting transactions which are represented in the financial statements.

While the above serves as a basic description of accounting it does not explain how such an activity achieves the ends ascribed to it by the AAA (that is, to enhance social welfare). It is assumed within the dominant economic orthodoxy that accounting plays a role in assisting individuals to maximise their personal wealth and in doing so enables the maximisation of society's overall economic wealth, which is in turn assumed to enhance social welfare. However, Gray et al. (*1996*) note that "*this is not the case*" (*ibid.: 17 – 22*). Thus conventional accounting exists as a set of particular practices that create a particular account of the organisation resulting in partial accounts of an entity's interactions with society with potentially serious ramifications.

Accounting takes into account a limited number of inflows and outflows to and from an organisation. Environmental and social elements that underlie these flows are often ignored. Conventional accounting chooses only to recognise those things "*which can be measured, which can be measured in prices, and which are exchanged for prices*" (*Gray, 1990, p31*). The picture drawn of organisations' interactions with society is by necessity very partial. Furthermore even though conventional accounting does not often recognise the social and environmental impacts of its operations (increasing thus the existing risks), it does not mean that these do not exist[52].

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[52] Gray (*1990, p 31*) describes the belief that "*events not accounted for, do not exist*" as the "Macnamara Fallacy": "*The first step is to measure whatever can be easily measured. This is okay as far as it goes. The second step is to disregard that which can't be easily measured or to give it an arbitrary quantitative value. This is artificial and misleading. The third step is to presume that what can't be measured easily really isn't important. This is blindness. The fourth step is to say that what can't be easily measured really doesn't exist. This is suicide*". In addition to that Grey at al (*1993, p 10*) see current accounting practice and the present accounting and financial frameworks as both hindering environmental initiatives and positively encouraging environmental malign activities.

Conventional accounting thus helps define and measure the "success" of actions and, ultimately helps construct concepts of organisation and of the world itself. In that way accounting is implicated in the construction of a "social reality" but with regard to the environment it is obvious the accounting picture is one from which essential elements are missing and, if used as a basis for action and decision, must mislead. The present environmental crisis may well owe a lot to this narrow relationship between accounting constructs and major decision takers (*Gray, 1990, p 31 – 32*).

The above conceptualisation emphasises the role of accounting in reflecting relationships between an entity and its environment, in the general sense of that word. In addition, accounting may also be seen to be a behaviour-influencing mechanism. Thus, accounting creates particular "realities" and thereby influences the behaviour of those individuals who respond to that "reality". In particular, in creating certain patterns of visibility accounting creates the sense that some aspects of organisational life (that priced by economics and captured by accounting) are important. Conversely, invisible aspects (such as social and environmental aspects) as well as individuals' behaviour are ignored, further reinforcing this picture. Simply, accounting is a "reality" constructor just as risk can be a social construct.

4.3.2.5 Reflexivity, sustainability and social and environmental accounting

Several researchers see company motivation behind social and environmental accounting as at the least questionable. Owen et al (*2001, p. 264 - 276*, as quoted by *Danastas and Gadenne, 2004, p 3*) for example conclude that current stakeholder engagement process may be "*little more than corporate spin*" and at best is used as a means of corporate legitimisation and cite examples of "*corporate power riding roughshod over stakeholder interests*". The authors believe current stakeholder engagement processes do not produce credible social reports and suggest promoting corporate social responsibility ideals may be more effective in extending accountability.

O'Dwyer and Unerman (*2004, p 11*) also highlight stakeholders' (NGOs) perception, in Ireland, that corporations are being primarily motivated by a desire to stave off potential regulation and/or political pressure through presenting an image of a trustworthy organisation. In the same path Bebbington et al (*2004, p 21 - 23*), argue that SEA is part of a reputation risk management process undertaken by companies in their effort to legitimate their operations[53].

[53] See also Mathews and Reynolds (*2004*) for a more detailed exploration of the motivating theories behind additional disclosures of non-traditional (social and environmental) materials in corporate reports.

Bebbington and Thomson (*2005*) argue in favour of not just conventional forms of accountability but for these to be integrated with ideas from writers from a range of academic disciplines (such as education, accounting, sociology, risk, development, and sustainability) in an attempt to evaluate the contribution of accounting in the transformation process towards sustainability. These works, despite their diverse disciplinary backgrounds, share a number of common themes (i.e. social change dynamics, reflexivity and epistemology-knowledge states and learning processes) that are critical to the sustainability debate. These themes are viewed as interlinked in forming an interdisciplinary or transdisciplinary epistemological context to evaluate accounting and accountability practices. Underpinning their notion of accountability is the belief that the recent dominance and spread of advanced Western capitalism has created an unjust, oppressive and unsustainable world. Sustainability is viewed as a desirable alternative to the risk, dangers and abuses resulting from neo-liberalism and consumerism. The re-alignment of social, economic, cultural and ecological issues associated with sustainability will require substantive changes in the way people live their lives. To achieve sustainability, institutional structures must enable critical democratic engagement and action. An important precursor to this engagement process is the ability of individuals and social groups to critically appreciate the (un)sustainability of their/others' past, current and future actions. An ability dependent on pedagogic processes that recognise the conditioned and socially created nature of people's understandings, sets about making the hidden commitments of these understandings explicit and then requires an examination of whether these commitments are justified, then building new practices and understandings of the world, which are somehow "better" than what went before.

It is argued that currently the dominant institutional structures, administrative processes, cultural values and educative processes do not allow this type of pedagogy. Existing assemblages of values, powers, and knowledge appear to be concerned with restricting knowledge of sustainable ideas, approaches and techniques. It is the case that many collectives and individuals have began to perceive the unsustainability of current structures/actions/values/knowledge but at present they are not part of systems that visibly and invisibly shape people's thoughts, evaluations and actions. Currently, accounting is a powerful component of this pedagogic assemblage, educating all in the merits of advanced Western capitalism. Accountants, accounting knowledge and accountability processes play significant roles in administrative processes in all social organisations; help redesign and maintain institutional structures; are used to evaluate many different types of actions and decisions; form part of the values of different cultural groups (by adherence or opposition); and accounting knowledge is considered legitimate and powerful by many dominant groups in society (*ibid.: 1*).

Reflexivity, it is argued can offer valuable insights into the transformation towards sustainability (*Shenkin 2005*). Sociological observations on the nature of reflexive modernity allow developing prior evaluations of the potential role and change dynamics associated with

accounting praxis and reforms, in particular the contribution of social and environmental accounting in driving and/or shaping change processes towards sustainability. Reflexive modernity recognises the inter-dependence and complex co-evolution of institutional structures, administrative processes, social knowledge, cultural groupings and values. Its exponents stress the critical role of knowledge construction, dissemination and legitimisation in social reforms.

> Epistemological distortions, restrictions and oppression are identified as key mechanisms in restricting social change. According to them knowledge is never abstract, universal, ahistoric, acontextual or apolitical. Knowledge (or ignorance) is integral to all social actions, but knowledge is constructed from social processes. Knowledge is used in the design and reform of institutional structures, the design, operation and reform of administrative processes; it is used by individuals and groups to consider what is right / wrong; it legitimates the power and role of different groups, cultures within a society, and the formation of alternative social structures and influences the underlying value set of different social groupings. Knowledge is re(de)-constructed, re(de)-legitimated and hidden/disseminated by different institutional structures, administrative processes, cultural groupings, values (*Bebbington and Thomson, 2005, p 2*).

In the field of corporate accountability, where knowledge more often than not becomes interpreted as information, theories of reflexivity provide means to transcend the tendencies towards capture often applied to social-democratic models. For example, both Beck and Giddens[54] develop frameworks for social change in which processes of social reconstruction are evoked in cognitive systems of appreciation and action. In other words, capacities for reflexivity come to hinge at all times on players access to and ability to appropriate information. In procedural approaches to corporate accountability, where similar bases for cognition are applied in the field, it is the accumulation of information, which allows for alternative processes of accountability to arise in the decision-making schemes of players and their "Habitus". However, in proposing a critique of cognition in models of social reflexivity a more hermeneutic model of reflexive social dynamics can be appropriate (*Shenkin 2005*).

Hermeneutic approaches to accountability, in that they avoid these tendencies towards proceduralism in the field, tend less to be based on the formal communication of well-defined sets of information. Instead, as Lash (*1993, 1994a, b, 2000*) argues[55], hermeneutic forms of social analysis tend to reconstruct movements in the field around the dissemination of aesthetic, linguistic and cultural symbols. They carry weight in a social context in which the abilities of players to process social description are limited by the speed, ephemerality, and sheer volume of information. Under such conditions, the objects of reflexivity appear not as self-monitoring

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[54] See sections: 1.2.1; 1.2.2; 4.3.1.2; and 4.3.1.3.

[55] See section 4.4.1.

systems of communication and control, but as self-interpretive background discourses that sustain certain lifestyles and communities of social action (*Shenkin 2005*).

Accounting and accountability is seen as a precondition of any form of social cohesion. Without which, there would be no such thing as a society structured around social and cultural norms, only an anarchic space made up of fragmented individuals. Accountability relationships and praxis are a complex system of discourse enmeshing, empowering, and restricting social practices. Accountability is the end product of an embedded process of exchanging accounts as a way of explaining and justifying actions and their effects. At any particular point in time accountability is a process that legitimates certain types of social discourse and privileges different types of knowledge. The dominant accountability praxis shapes, enables and implements systems of social control, knowledge, power and discipline. This suggests that some form of accounting will be present in any social system; therefore it is important that these accounts are the most appropriate and supportive of sustainability.

Institutional/administrative/cultural changes are shaped by the development, dissemination and acceptance of alternative systems of accountability. Given prior observations that prevailing accountability orthodoxy is implicated in the maintenance of the prevailing social power relationship, sustainable accounting must challenge this orthodoxy and provide the basis for co-evolving new accountability processes and praxis commensurate with the principles and governance mechanisms of sustainability. Transforming society along a sustainability trajectory places different demands upon accounting and the ways of evaluation of accounting and accounting reforms.

Sustainability needs to consider how alternative forms of accounting praxis can assist in organising effective social collective intervention. Sustainability needs to consider how systems of organisational / institutional/ social / cultural accounting praxis will need to be reconstructed given the sustainability-reconstruction of systems of governance. Sustainable accounting should facilitate a critical exploration of the institutional structures and rules as well as adapting to different objects of analysis (*Bebbington and Thomson, 2005, p 5 -7*).

Sustainable accounting is not just about generating new sets of information, enhancing corporate or institutional transparency (*Gray et al, 1997*, as quoted by *Bebbington and Thomson, 2005, p 7*). Providing new legitimated "facts" does not always allow those outside the entity to effectively respond. Attempts to create transparency are likely to be ineffective unless they also create epistemological standpoints to allow "outsiders" to process and evaluate the meaning of these new disclosures. Sustainability requires accounting to operate as a medium of

reflection, allowing social actors to perceive and appreciate the relevance of the information made available to them.

Sustainable accounting needs to: consider the impact of institutions; use multiple scales (individual, community, regional, national, bio-regional, global); use different time scales (now, annual, generational, natural cycles, geological); see different entities (products, species, eco-systems, air, water systems, soil systems) and different social-ecological and cultural contexts. This form of accounting must incorporate concepts of holism and co-evolution; social justice and equity; empowerment and community building; sustainable production and reproduction; social experimentation and social learning. Sustainable accountability needs to apply at cognitive and hermeneutic levels, providing multiple ways of linking practice to conceptual models of social, economic, ecological and political change (*Bebbington and Thomson, 2005, p 7*).

Current accountability orthodoxy does not allow the appropriate level of critical reflection, incorporation of interdisciplinary expertise, different entities or topics. Accountability praxis has become dominated by accounting practices of corporate entities and their governance processes. Accountability has been largely captured by the provision of performance reports of the economically manageable aspects of corporations. The dominant orthodoxy of accountability is premised on demands for economic information by actors as part of the process of co-ordinating the efficiency of self-regulating financial markets. Corporate accounts have been further legitimated by their incorporation into regulatory systems, apparently to allow democratic control over profit-oriented entities. More recently attempts have been made to adapt this basic information set to attempt to manage public impressions of their social and environmental activities (*ibid.: 7*).

The dominant technologies of accounting help sustain the myth of economic theory, which is highly problematic in relation to sustainability. Corporate accounting technologies assume authoritative positions in defining the meaning and scope of accountability praxis. Accountants the main wielders of accounting technologies, could be seen as experts in providing and legitimating knowledge that maintains their embedded notion of social order (*Cooper and Thomson 2000*). What is noticeable about "accounting in the field" is the absence of reflection and systemic critique, and its reliance on ingrained, inbred expertise. There is a taken-for-granted social meaning of accountability, with limited internal critique or reflection (by practitioners) of the political ideals underpinning it, its privileged social status, problematic application of political utopias and the current notion of accounting as a master metaphor for economic theory (*Shenkin 2005*).

Corporate accounting technologies as a body of expertise restrict the development of knowledge about corporations. Accountants, by producing legitimate accounts and by defining pertinent categories of capture, exclude objects to be included in their accounts. Often these objects are those that would challenge the neo-liberal orthodoxy, and remain isolated outside an accountant's limit situation. This epistemological restriction in accounting praxis must be addressed if accounting is to become sustainably transformative (*Bebbington and Thomson, 2005, p 8*)

4.3.2.6 Environmentally enlightened accounting

Within the context of the changes SEA can bring into the practices of organisations in order for the latter to become more environmentally sustainable, Dillard et al (*2005, p 2*) develop an environmentally "enlightened" framework that apply to the empirical data reported by *Georgakopoulos and Thomson (2004)* in the context of the salmon farming industry in Scotland.

Environmentally enlightened management conceives of the organisation as primarily an ecologically sustainable, and sustaining, entity as opposed to solely an economic one. Environmental considerations, instead of being opposed to maximising economic value, constitute the primary long-term decision parameters. Strategic objectives are predicated on long-term sustainability objectives rather than profitability goals. Management believes that the firm must act in environmentally responsible ways to insure its long-term preservation. Enlightened management contemplates alternative courses of action in light of whether by carrying out the anticipated actions the organisation can achieve environmental sustainability by creating and producing products and services that are consistent with the long-term regenerative capacities of renewable resources and absorptive capabilities of the ecosystem (*Dillard et al, 2005, p 15*).

Building upon Bebbington's and Thomson's (*2005*) dialogic approach, Dillard et al (*2005*) take an intra-organisational management view and argue that environmental stewardship must become a primary concern if management is to adequately fulfil its societal responsibilities. In addition, they try to develop an enabling accounting that representationally connects the organisations and the decision-makers therein in a systematic way with the natural systems upon which they depend and act and as such to render the environmental implications visible and comprehensible (*ibid.: 5*).

According to them, management and accounting information systems must aggressively respond to the previous emerging requirements for environmental stewardship in order to support adequately the associated information needs as well as to design organisational systems

that motivate and facilitate the desired behaviour. In that way management's and therefore accounting's responsibility with respect to environmental resources will be addressed. Accounting is envisioned as a positive force with the potential to facilitate the development of viable and emancipatory ways for bringing about democratic social progress through a process of dialogue stimulation and action that will be directed towards change and the building of the mechanisms that engender responsibility and accountability.

Management's environmental strategy must be made visible and comprehensible, and the implications of management's decisions must be specified. Further, formal corporate information systems must incorporate environmentally relevant information forcing management to consider the environmental impact of their operations and actions inclusive of, but also moving beyond, the economic implications. Such an environmentally enlightened perspective should incorporate issues beyond, and sometimes in opposition with, maximising shareholder value. Organisational management must recognise its societal responsibility as the operators of the primary natural resource transforming vehicle within the current social order and, as such, fulfil its stewardship responsibility with respect to natural systems. Management must formulate and implement environmentally impregnated strategies and information systems that enable and sustain such strategies (*ibid.: 4*).

The purpose of developing environmentally enlightened accounting systems is to render these systems as a positive force in the pursuit of progress toward environmentally responsible action. Within such a system, environmental factors are primary and determining in that the environmental implications are viewed as an end, and not a means or an impediment, to economic ends. Enlightened management views the objective of the entity or enterprise as being environmentally sustainable and sustaining. This perspective is directly and actively concerned with the relationship between natural systems and social systems, of which the economic system is a subset. This is seen as the only viable, long-term strategic perspective involving a fundamental shift in how management is viewed (*ibid.: 18 – 19*). The economic domain is subordinated to the needs of both the natural and social systems. This so called paradigm shift requires much more inclusivity, moving beyond an individualist, utilitarianism focus towards a more holistic, communal perspective. The decision considerations migrate away from operational and economic indicators toward indicators signifying the impact of the organisational acts on natural systems. Information systems are redesigned and expanded to support needs, reflecting the organisation's impact on, and implications for, natural systems.

Dillard et al (*2005*) discuss the environmental activity space as relating to the scope of the decision processes that encompasses time, space, and inclusivity parameters associated with organisational actions. Concern is put on the environmental implications of organisational

actions and as such this dimension is specified as relating to the range of ecological impacts considered within the resulting action space. These parameters circumscribe the social and environmental implications considered by decision-makers in contemplating action from a given strategic perspective. For illustrative purposes three prototypical designations for environmental activity space were chosen (i.e. operational, customers/markets, and stakeholders/society) (*ibid.: 15 -16*)

Components of an environmentally enlightened management perspective, as seen by these theorists relate to all the above mentioned three dimensions of the proposed models of the alternative management strategies of legitimacy and competitive advantage logics of representation (*ibid.: 14 - 15*) as these have been identified by the authors with each considered from a perspective that privileges the environment over the economic aspects[56] (*ibid.: 19*).

4.3.3 Governance, institutions and risk – a summary

To conclude this section of the literature review, the notions of risk relating to institutional responses and governance structures with a particular emphasis on sustainability and accountability (CSR/SEA) issues were discussed. However, the advocates of these positions have been criticised of examining risk discourses and strategies in a superficial way without taking into account the ways people actually conceptualise risk events in their everyday lives.

Specifically, Foucault himself and those taking up his perspectives on the regulation of subjects via the discourses of governmentality may be criticised for devoting too much attention to these discourses and strategies, and not enough to how people respond to them as part of their daily lives. The question of how risk-related discourses and strategies operate; how they may be taken up, negotiated or resisted by those who are the subjects to them, remains under-examined. Further the Foucauldian view of the self tends to be represented as universal, without recognising differences between the ways in which people of different gender, age, ethnicity and so on may be treated by and respond to these discourses and strategies differently[57] (*Lupton, 1999, p 102 – 103*).

The reflexive critique of science and other expert knowledge systems, and social movements, on the other hand, have also been criticised of not being features of the "late modernity" only but also present in the "earlier era" (*Lash, 1993, p 9, Wynne, 1996, p 50*). The advocates of those positions argue, like in Foucault's work, that Beck's and Giddens's representations of

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[56] See Dillard et al (*2005, p 19 - 22*).

[57] Issues addressed by Lash (*1993, 1994a, b, 2000*), Lash & Wynne (*1992*), Wynne (*1989, 1992, 1996*) and others in section 4.1.4.

modernity are simplistic, not acknowledging the complexity of responses to expert knowledge. The two theorists are also considered (*Lash, 1994a*), as being too speculative without grounding their claims specifically enough in the actual processes and experiences of institutional and everyday life. It may be further argued that Beck and Giddens do not sufficiently acknowledge the communal, aesthetic and shared symbolic aspects of risk in their focus on individualisation.

Despite those criticisms however, Beck and Giddens have been enormously influential in Anglophone sociology. Their insights into the structural and political features of risk, the changes in the meanings of risk over the eras of modernity, early and late, and the implications of their ideas about risk for subjectivity and social relations are valuable and suggestive (*Lupton, 1999, p 82 – 83*). The next section will discuss the literature associated with risk perception, which attempts to address such criticisms to a certain extent. Emphasis will be on the notions of: risk and subjectivity; otherness; risk and pleasure; and cultural theory.

4.4 Risk perception

4.4.1 Risk and subjectivity

The theoretical perspectives that have been reviewed thus far provide various approaches to understanding how concepts of risk influence subjectivity. However, these theoretical approaches have tended not to explore in detail the diverse and dynamic ways in which lay people respond to risk.

The psychometric literature (see, for example, *Slovic 1992*) attempted to document why lay people often hold perspectives on risk that differ from those put forward by experts. Cultural theorists[58] further contended that this is not simply a matter of their ignorance or inability to understand probabilities. The existence of varying perspectives on risk among both experts and lay people suggests that the phenomenon of risk is a product of competing knowledges about the world (*Lupton, 1999, p 104 - 106*).

Risk discourses position social actors in certain specific ways. These discourses tend either to identify subjects as responsive to risks that are identified as threatening them, actively making choices in relation to risk prevention, or as risk makers, the causes of risk and thus requiring observation, regulation and discipline. As Beck and Giddens have pointed out, as a consequence of modernisation and individualisation, increasingly more aspects of life are considered to be subject to human agency. The contemporary self, therefore, is positioned to make choices about a myriad of aspects of life; however the complexity of living in the late modern world, where

[58] See section 4.4.4.

change is rapid and intense and the number of choices has proliferated, renders decision-making/choice-making very difficult and fraught with uncertainty. People are expected to take personal responsibility for these choices and many people appear to have accepted the notion that one should make oneself aware of risks and act in accordance with expert risk advice so as to prevent or diminish the impact of risk.

The notion of reflexivity itself suggests a rational, calculating actor and it implies that individuals develop and exercise reflexivity in response to expert knowledge rather than generating their own risk knowledge via personal experiences of the world. Beck and Giddens, whilst acknowledging that reflexivity is practiced in the sphere of the intimate and the everyday, tend to suggest that this reflexivity is primarily a response to expert knowledge systems[59]. They give little recognition to the ways in which lay actors draw upon their situated knowledge of the world to construct an understanding of risk and to respond to experts' pronouncement of risk (see, for example, *Wynne, 1992*).

While risks may be debated at the level of expertise and public accountability, they are dealt with by most individuals at the level of the local, the private, the everyday and the intimate. Lay knowledge tends to be far more contextual, localised and individualised, reflexively aware of diversity and change, than the universalising tendencies of expert knowledge (*Wynne, 1996, p 68 - 73*). Lash and Wynne (*1992*, see also *Wynne, 1992, and Wynne, 1996*) highlight what they see as the multi-layered response to risk on the part of lay people as a form of private reflexivity which they argue must be the basis for the more public forms of reflexivity.

Some sociologists have sought to demonstrate that lay perceptions of risk are founded on sources of knowledge that should be acknowledged as being equally as important and rational as scientific expert assessments, which themselves are often based on optimistic fantasies about behaviour in the normal world (*Wynne, 1989, p 38 - 39, Wynne, 1992, p 292 - 293*). Their argument tends to revolve around debates concerning the supposed irrationality of lay people's responses to risk, contending that what may seem irrational is in fact based on rational judgement. When scientists judge the risks coming from the use of a herbicide, for example, make assumptions based on an ideal world and they fail to recognise that most workers do not or cannot follow the prescribed instructions for preparation and use.

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[59] According to Lash (*1993, p 9*) Beck's and Gidden's pre-eminently cognitive notions of reflexivity stand in relation to sociological positivism, whereas aesthetic reflexivity stands in relation to hermeneutics. Public relationships with expertise and its institutions has always been reflexive, though in a more thoroughly hermeneutical sense than the rational-calculative model of Giddens (*Wynne, 1996, p 50*)

Lay people also incorporate in their assessment of risk their pre-established knowledge of how the relevant industries and regulatory bodies have tended to deal with risks in the past. People make judgements about the trustworthiness and persuasiveness of experts involving recognition of the socio-cultural frames and interests, which shape experts' risk knowledge. It is not simply a matter therefore, of individuals weighing up the relative magnitude of physical risks as different experts assess them. Rather they go through a process of evaluating risk experts and institutions themselves. Such responses are not rationalist-calculative assessments of science, but are cultural, reflecting on different ways of understanding and representing such phenomena as agency, predictability, control and values (*Wynne, 1992, p 296*). As members of social groups and networks, people's responses to risk are embedded within these relationships and are therefore collective as well as developed through individual biographies (*Wynne 1989, 1992, 1996*).

Lay actors also often resist or directly challenge experts' judgements on risk. In constructing private reflexivity, people struggle with the reconciliation of different and often conflicting interests and identities (*Wynne, 1996, p 50*). Even where there seems to be no evidence of public dissent over risk, at the everyday, personal level such dissent takes place. This suggests that the relationship that people have with expert knowledge systems is highly complex and ambivalent. It is not simply a question of lay people deciding which of two or more bodies of dissenting expert knowledge to trust when they are making judgements about risk but they rather construct their own expert knowledge with or without the use of risk professionals' knowledge (*Wynne, 1996*).

Lay people are aware of their dependency over expert knowledge when it comes to disputes about risk. In addition, they are aware of their lack of agency and opportunity as non-experts when it comes to challenging expert knowledge even if the latter are uncertain or conflicting but in the context of everyday life, these aspects of expert knowledge may be considered as irrelevant or distracting (*Wynne, 1996*). So, what it might be considered as ignorance by the experts might be deliberate ignoring or avoiding of expert knowledge because it is regarded as peripheral to the key issues at stake, or at worst, inaccurate and misleading[60] (*Michael, 1996, p 119 – 120*). These alternative rationalities, usually portrayed by experts as inaccurate or irrational, often make sense in the context of an individual's life situation, including the cultural frameworks and meanings that shape subjectivity and social relations and the institutions and structures within which individuals are placed. The reflexivity of lay people in relation to risk may develop from their observations of the ways in which everyday life operates and from

[60]Expressed determination to curtail scientific knowledge can be viewed as linked with an effort to establish independence from science and possibly to challenge the authority of actors using science (*Michael, 1996, p 120*).

conversations and interactions with other lay actors. Conforming to expert advice about how to avoid risk therefore, is seen not necessarily to guarantee protection from harm.

People's perceptions and understandings of risk are established over a lifetime of personal experiences as well as their location within social milieux and networks of communication. These networks include mass media and conversations with others as well as expert knowledge. Risk positions not only emerge from people's locations within social milieux but also serve to position them within such milieux as a means of developing and supporting social cohesion or group membership; the feeling of belonging to a community or a cause-group (*Macgill, 1989, p 57*). Risk positions may also be important therefore to people's sense of self-identity as part of a social group or sub-culture. Concerns about risks often generate temporary political alliances between people, united by their anxieties and their desire to fight against the agencies they see as imposing risk upon them. It is important to note that rather than remaining static, risk positions are constantly changing, responding to changes in personal experience, local knowledge networks and expert knowledge.

The approach to risk behaviour, which assumes rational calculation, the weighing up of costs and benefits, also tends to ignore power relationships. Individuals are seen as agents operating in fields of social relations in which they are able to move between different logics of risk at will. Some critics have responded to Beck's and Giddens's writings on risk by asking whether reflexivity is an important aspect of everyday subjectivity for most people in late modern societies. They have argued that even though social factors such as class, gender, ethnicity, position in the life course and so on may have weakened somewhat in their influence in the contemporary era, particularly in the move towards individualisation, they are still important in shaping subjectivity and individuals' chances in life. The designation of the label "at risk" often serves to reinforce the marginalised or powerless status of individuals and for that reason special attention is directed to them by positioning those social groups in a network of surveillance, monitoring and intervention.

The self-reflexive individual, as presented by Beck and Giddens, is a socially and economically privileged person who has the cultural and material resources to engage in self-inspection. Many people, however, simply lack the resources and techniques with which to engage in self-reflexivity. Lash (*1994a*) sees Beck's reflexive modernisation thesis as having at its core the assumption that agency is progressively freeing from structure, that people are increasingly able to define their own lives. However, while old structures (family, the welfare state, trade unions, government bureaucracy and social class) are disappearing, entire new ones (information and communication structures) are generated in late modernity. "*The risk society is thus not so much about the distribution of bads or dangers as about a mode of conduct centred on risk*" (*Lash,*

1994a, p 141). As a result, some agents are equipped through access to social resources such as education to engage in self-reflexivity (reflexivity winners) and others are unemployed or socially under-privileged (reflexivity losers). Access to and place in the new modes of information and communication structures is now more important than is their access to productive capital[61].

Studies that have been undertaken on occupational risk (for example *Nelkin et al, 1984, p 113 – 124*) and on contexts in which risk is understood and acted upon in relation to the activities of marginalised groups such as sex workers and gay men (*Bloor, 1995, p 91 - 94, Hart and Boulton, 1995, Whittaker and Hart, 1996*) have revealed that people's social location and their access to material resources are integral to the ways in which they conceptualise and deal with risk. Rather than responding as autonomous agents to the risks they perceive, people act as members of social groups and social networks. Their membership of these groups and networks may well be more dynamic than what was the case in earlier eras, but it is still influential in mediating the capacities of individuals to act as reflexive subjects in relation to risk.

In a further critique of Beck's and Giddens's model of reflexivity in modernity, it has been argued (*Lash, 2000*) that their approach leaves aside the cultural and aesthetic aspects of judgement. It has been contended that reflexivity should be understood not simply as a process of rationalist self-monitoring through cognitive or normative categories. Reflexivity may also incorporate interpretation of the self and of social processes conducted through aesthetic and hermeneutic understandings; those that seek to understand the deep meaning and significance of actions, words, deeds and institutions.

Aesthetic or hermeneutic reflexivity is embodied in such aspects of life such as taste and style, sense of time and space, leisure and popular culture and membership of sub-cultural groups. It is rooted in background assumptions and unarticulated practices, in intuition, feeling, emotion, and the spiritual. It involves the processing of signs and symbols rather than simply information. Knowledge about the world is developed through and not just in relation to the body. Aesthetic reflexivity relies upon an individual's membership of a community, the moral and culturally learned and shared assumptions. It is not rooted in self-monitoring, but rather in self-interpretation, involving intuition and the imagination above moral and cognitive judgement. It pre-exists the development of moral and cognitive judgements and it is based in bodily predispositions that are acculturated from individuals' entry into society (*Lash, 1993, p 8 – 10*). An example of the hermeneutic dimension of risk responses is the way in which people define

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[61] For that reason Lash (*2000*) calls for a need in contemporary societies to move further than the institutional reflexivity described in Beck's and Giddens's writings towards a more fundamental and deeper change in social life when taking into account issues of risk.

"others" as risky, based not necessarily or only on expert definitions, on what might be a transmissible disease for example, but on their culturally-acquired understandings of purity and danger (social class, ethnicity, sexual preference, period of knowing each other, manner and physical appearance). The assumptions on which these judgements of riskiness are based are found in binary oppositions, stereotypes, and other systems of meaning that individuals begin to learn from childhood as part of their acculturation into society.

People often feel that knowledge about risk, including their own, are so precarious that they simply do not know what course of action to take. As a result they may move between different risk positions at different times, sometimes attempting to control risk and at other times preferring a fatalistic approach that simply accepts the possibility of risk without attempting to avoid it. In addition to that, risk responses need not necessarily take place on a conscious or rational level as the model of the rational actor indicates (*Bloor, 1995*). A distinction may be made between reflexive actions versus conventional or habitual conduct, which does not require conscious problematisation. Risk-related actions therefore might include activities that need high level of reasoning but also practices that have been experienced as a second nature to us.

Bourdieu (*1984*) introduced the notion of "Habitus" as a set of dispositions and bodily techniques; modes of behaving and deporting oneself that is passed from generation to generation and is linked to membership of sub-cultural groups. These sets of dispositions and techniques are organising principles by which socio-cultural practices are maintained and reproduced. Most of the dispositions and behaviours that comprise an individual's "Habitus" operate as habits at the subconscious level and the very difficulty in changing one's habits is founded on their almost automatic nature (*Lupton, 1999, p 121*).

Some aspects of risk avoidance are a part of everyday life that is often habitual, barely thought upon because they have been adopted as part of people's everyday routines. So, what might be labelled as "risk-taking" activities in some discourses may instead be viewed by those who engage in them as part of their everyday life and not as risks (*Lupton, 1999, p 104 – 122*).

4.4.2 Risk and otherness

Beck claims that in risk society, the globalised and therefore democratic nature of risks is such that the propensity to identify the other as the source of danger recedes (the end of the other). A close examination of the ways in which risk discourses operate as strategies of normalisation, of exclusion and inclusion however, demonstrates that this is not the case. Notions of otherness remain central to ways of thinking and acting about risk (*ibid.: 123*).

Ideas and strategies around risk often operate at the symbolic, conceptual level, organised around notions of self and "other". Otherness is dangerous because it confounds order and control. It represents the unknown and the threat of loss of one's own identity through contact with this unknown, the dissipation of boundaries and the realisation of our own limits (*ibid.: 129*).

Risk beliefs and practices as they are employed in the deportment and experience of the body, go beyond the need to exert control against the threat of particular hazards (pollution, toxins, viruses, crime, etc.). At the more symbolic level the body is conceptualised as being "at risk" when its autonomy and integrity appears to be threatened. Because the dominant ideal notion of the body is that of it as a controlled entity with boundaries policed, regulated and kept separate from other bodies and the outside world, anything which appears to flout these boundaries, to break them down and allow intermingling of properly separate entities is considered threatening or risky. Those bodies of others who are considered to lack the capacity for proper regulation of their bodily boundaries are routinely positioned as risky to oneself. Those individuals in the Western societies are typically members of stigmatised or marginalised groups (women, the working class, the poor and unemployed, non-whites, injecting drug users, homosexuals, etc.) who are constructed as grotesque bodies and therefore as risky or at risk. It has also been argued that constructions of Otherness also evoke feelings of: fascination; excitement; desire; and pleasure; as well as anxiety in responses to the risky "other" (*ibid.: 147*).

An issue central to the notion of otherness also involves hybridity because it is difficult to classify and therefore creates feelings of unease and repulsion. To classify is to give the world a structure: to manipulate its probabilities; to make some events more likely than some others; to behave as if events were not random or to limit or eliminate randomness of events. In classifying, acts of inclusion and exclusion are performed. Ordering is the central task of modernity, an attempt to fend off chaos. The imperative of modernity has led to intolerance of things that cannot readily be ordered and categorised. The other is the uncertainty, that source and archetype of all fear (*Bauman, 1991, p 7*). Hybrid identities are constantly in flux, remaking boundaries instead of bolstering them. Hybridity has long been the cause of great concern and anxiety among privileged groups who are threatened by the idea of their gene-stock being adulterated or contaminated by mixing with other races (*Lupton, 1999, p 131 – 132*).

The liminal is that which represents a transitional middle stage between two distinctly different entities, identities or sites. It cannot be categorised in to either; it is "in between". In contemporary Western societies, bodies that are seen to transgress or blur culturally important boundaries are the source of confusion, fear, anxiety and even hatred, revulsion and disgust (*ibid.: 133*). All the things that cannot be easily categorised, that fail to stay in their categories,

or that simply are too different from the self, tend to arouse anxieties and fears. They are culturally designated as potentially polluting and contaminating to self and as a result are typically dealt with using exclusionary tactics that seek to locate them as far as possible, both symbolically and physically form the self (*ibid.: 136*)

A further perspective on otherness is articulated in psychoanalytic theory, which focuses on the projection of unconscious emotions and fantasies upon the "other" as part of individuals' continuing attempts to maintain a coherent and untroubled subjectivity and to construct and maintain conceptual borders. According to the object-relations theory the ontological state of selfhood is a process that is constantly in tension with an individual's relationship with another. Some objects become the repositories of very negative feelings. Others become objects of our love and desire. Some are both simultaneously. For Kristeva (*1982*), this other is the abject, the source of endless fascination as well as horror, which disturbs identity, boundaries and order, from which one always tries to escape but yet is drawn to and inextricably linked to.

Abjection is argued to be a powerful feeling; both symbolic and also experienced as a bodily sensation, a revolt of the person against an external menace from which one wants to keep oneself at a distance. The abject is viewed as dirty, filthy, contaminating waste, which confounds boundaries. The abject is not fully other because its boundaries continually threaten to merge with our own and this is what renders it so threatening (*Lupton, 1999, p 137 - 139*). The notion of the abject as a psychodynamic phenomenon that is constructed through social and cultural processes but experienced as a series of emotions arising from within provides some explanations for the irrational virulent feelings to which some individuals and social groups are exposed[62] (*ibid.: 139*).

Strategies of spatial exclusion are typically employed by members of dominant social groups to exert control over marginalised groups for which they hold hostility, contempt, or fear of contamination. Such groups may be constructed as posing a risk to the dominant group through behaviour that is deemed to be too different or potentially polluting and therefore confronting. The spaces these groups occupy are commonly singled out as dangerous or contaminating to the dominant groups. Marginalised groups on the other hand may be constructed as being vulnerable and at risk from the greater power of the dominant group. For marginalised groups, constructed by dominant groups as the "other" (requiring regulation, exclusion or both) this domination of space leads in turn to feelings of enhanced fear and anxiety; of being at risk of intimidation, violence or coercion (*ibid.: 146*).

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[62] AIDS/HIV, for example, represents the ultimate horror. It implies that there is no way of distinguishing the contaminated "other" from who one requires protection (*Lupton, 1999, p 139*)

4.4.3 Risk and pleasure

Contemporary experts and popular cultures tend to represent risk as negative, something to be avoided. So much of the academic literature on risk represents individuals in late modernity to be constantly dogged by feelings of anxiety, vulnerability and uncertainty in relation to the risks of which they are constantly made aware. As it was argued in the previous section, the emphasis in contemporary western societies on the avoidance of risk is strongly associated with the ideal of the "civilised body". To take unnecessary risks is commonly seen as foolhardy, careless, irresponsible, and even deviant, evidence of an individual's ignorance of lack or ability to regulate the self. Against these dominant discourses on risk, however there is a counter discourse in which risk-taking is represented more positively. "*Acceptance of risk is also the condition of excitement and adventure and the very source of that energy, which creates wealth in a modern economy*" (*Giddens, 2002, p 23*). Risks valorise escape from the bonds of control and regulation. This discourse rejects the idea of the disembodied rational actor for an ideal of the self that emphasises sensual embodiment and the visceral and emotional flights produced by encounters with danger of walking on the "wild side" (*Lupton, 1999, p 148 – 149*).

Risk-taking may be regarded as the flipside of modernity, a response to the ever-intensifying focus on control and predictability of modernity. On the other hand the willingness to take risks converges with some of the most basic orientations of modernity. The current insistent presence of risk may be associated with new modes of conducts and self-formation, the invention of new experiences of life and pleasures in response to the social changes emerging in late modernity. The contemporary subject may be understood to require both routine and risk. An excess of one state leads to a fervent desire for the other[63]. Heightened awareness of risk may itself lead to a desire to take risk. Indeed, predictability itself may be viewed as a risk (*ibid.:157*).

Another issue involves risk taking and the associated gender of the person who ventures in that. The dynamic and variegated natures of femininities and masculinities have implications for the gendered meanings of risk-taking. While risk-taking has been most closely linked to the performance of dominant masculinities and risk avoidance is associated with dominant femininities, there is evidence of some shifts in these meanings. Dominant notions linking certain risk-taking activities with masculinities have begun to be challenged by some women, who have sought to perform alternative femininities through engaging in such activities (*ibid.: 163*).

Transgression is also a potent source of pleasure as well as fear and anxiety. It is a risky activity because it calls into question accepted conceptual boundaries, threatening self-integrity by

[63] See for example Cohen and Taylor (*1976/1992*)

allowing the "other" into the self. Yet this very act is also the source of the ambivalent pleasure that may be experienced in allowing these boundaries, at least for a time, to be disrupted, blurred or crossed. The power of the culturally forbidden and the so called "contaminated" provides the opportunity for frissons of exhilaration and heightened sensibility that go beyond the excitement afforded by merely engaging in dangerous activities (*ibid.: 171*).

In a world in which self-containment and self-regulation are highly valued and encouraged, participation in activities that are culturally coded as risky allows the contemporary body/self to revel at least for a time, in the pleasures of the grotesque or uncivilised body. In some social contexts, risk-taking is actively encouraged as a means of escaping from the bounds of every day life, achieving self-actualisation, demonstrating the ability to go beyond expectations or performing gender. Risky activities such as drug-taking, and sexual intercourse, provide routes by which the culturally forbidden may be indulged in at least for a time. The popular media also afford the opportunity to engage vicariously in transgression, to enjoy the sights and sounds of grotesque bodies and thereby experience heightened emotions. Engagement with the marginalised other is also a potent source of fascination and desire, often at the unconscious level. The courting of symbolic risk implicated by the crossing or blurring of boundaries is a central aspect of the pleasure and excitement associated with transgression and contact with otherness (*ibid.: 171 – 172*).

The following section will further expand this review on risk perception by taking into consideration the insights provided by Cultural Theory.

4.4.4 Cultural theory - an introduction

There is evidence that there may be significant individual and group differences in risk perception. In the human sciences individual differences are generally held to be the result of relatively long-term psychological predispositions and are assumed not to be stable for any particular individual, but to vary across members of a given population. Group differences, on the other hand, are believed to reflect attitudes, beliefs and behaviours that result from an individual's identification with and membership of a particular social category, group or culture. Identification forms the basis for conformity with the norms, beliefs and behaviours of that group or culture and an individual may identify with more than one group at any one time as well as change affiliations over time. Cultural identification however is thought by some to be relatively resistant to change (*Royal Society, 1992, p 108*).

The perceiver of risk is rarely an isolated individual but a social being, who necessarily lives and works, plays and rests within networks of formal and informal relationships with others.

Such relationships manifest in a wide range of both small- and large-scale social and institutional arrangements within and across societies. These arrangements set constraints and obligations upon people's behaviour and provide broad frameworks for the shaping of their attitudes and beliefs. They are also closely tied to questions both of morality and of what is to be valued and what is not. There is no reason to suppose that beliefs and values relating to hazards are any different from other more general beliefs and values and it follows from this that they will also be in part at least, related to broader social factors and processes. Individual based analysis can account for only a part of risk perception and risk behaviour and it is not very applicable to policy-making procedures (*ibid.: 111 –112*).

The cultural anthropologist Mary Douglas has been a pivotal figure in socio-cultural analyses of risk and she is the influence in cultural/symbolic perspectives on risk. Douglas's approach to risk is best understood as part of a trajectory of theorising on the body selfhood and the regulation of contamination and danger that she began three decades ago in which the symbolic aspects of judgments about danger, pollution and otherness[64] were identified. Much of her writing on risk seeks to explain why it is that some dangers are identified as risks and others are not. Her main explanations revolving around the importance for social groups, organisations or societies to maintain boundaries between self and "other", deal with social deviance and achievement of social order. In her extensive writings she is trenchant in her critique of cognitive scientific and other techno-scientific approaches to understanding risk. She is particularly critical of the individualistic approach taken by the psychological researchers dominating risk perception research in their focus on processes of cognition and choice. She emphasises the cultural relativity of judgments about risks, including the differences between groups within the same culture in terms of what is considered a risk and how acceptable it is thought to be (*Lupton, 1999, p 36 – 38*).

An important feature of Douglas' approach is her attempt to distinguish between certain defined modes of organisation and their related responses to risk. This is best demonstrated in the grid/group typology featured in Gross et al (*1985, p7*).

Grid/group analysis is a method for comparing organisations, communities and other social units, according to the strength of two factors in the social environment, called grid and group. The typology suggests that there are as few as four prototypical patterns of culture with each consisting of a characteristic behavioural pattern and an accompanying justificatory cosmology[65] (*Gross et al, 1985, p ix – xii*). The culture describes the ways in which people

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[64] See section 4.4.2.

[65] The four prototype patterns of culture were first identified by Mary Douglas in *Natural Symbols* (*1970,* as quoted by *Gross et al, 1985, p xii*) where she also formulated the concept of Grid and Group. She

make sense of their world and it potentially can explain why people do what they do as well as why they do it in one way and not in another. The cultural interpretation of the acceptability of risks revolves around different perceptions of what risks are, rather than on the dichotomy of right or wrong perceptions of costs and benefits (*Gross at al, 1985, p 2 – 4*). The *group* dimension represents the extent to which people are restricted in thought and action by their commitment to a social unit larger than the individual. High group strengths results when people devote a lot of their available time to interacting with other members of their unit, whereas low strength occurs when people negotiate their life on their own behalf as individuals. The low group experience is a competitive, entrepreneurial way of life where the individual is not strongly constrained by duty to other persons. The *grid* dimension denotes the extent to which people's behaviour is constrained by role differentiation, whether within or without membership of a group. Grid is high strength whenever roles are distributed on the basis of explicit public social classifications and low when classificatory distinctions only weakly limit the range of choices or activities open to people. Social environments where roles are primarily ascribed, grid constraints are high; where roles are primarily achieved grid constraints are low (*Gross et al, 1985, p 4 – 6*).

4.4.4.1 Patterns in uncertainty

In conjunction with the grid/group typology cultural theorists use the area of Ecosystem Management as a good example in order to describe their so-called "myths of nature". Ecosystem managers must make decisions in the face of great uncertainty. Ecologists who have studied managed ecosystems have found that different managing institutions faced with apparently similar situations have adopted very different management strategies. Patterned consistencies were noted in these differences that appeared to be explicable in terms of the managers' beliefs about nature. It was noted that when confronted by the need to make decisions with insufficient information, the managers *assumed* that nature behaves in certain ways. The various sets of assumptions have been reduced to the *four myths of nature* (see *Adams 1995, p 34*): nature benign; nature ephemeral; nature perverse/tolerant; and nature capricious. The essence of each of the four myths is illustrated by the behaviour of a ball in a landscape and each can be associated with a distinctive management style.

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further developed the theory in Cultural Bias (*1978*, quoted by *Gross et al, 1985, p xii*) and it has been since a sustainable collaborative effort among several individuals and institutions (see for example: *Douglas and Wildavsky, 1982*, as quoted by *Lupton, 1999, p 50; Rayner, 1992; Thompson, 1980; Rayner, 1982*). In accordance to the four prototype patterns of culture quadrants A, B, C, and D in Gross et al (*1985 p7*) represent the typologies of the individualists, fatalists, hierarchists, and egalitarians respectively.

Nature benign: nature according to this myth is predictable, bountiful, robust, stable and forgiving of any insults mankind might inflict upon it. However violently it might be shaken the ball comes safely to rest in the bottom of the basin. Nature is the benign context of human activity, not something that needs to be managed. The management style associated with this myth is therefore relaxed, non-interventionist (laissez-faire) (*Adams, 1995, p 34*). Nature benign encourages and justifies trial and error. As long as all we do is our exuberant individualistic things, a "hidden hand" will lead us towards the best possible outcome (*Thompson et al, 1990, p 27*).

Nature ephemeral: here nature is fragile, precarious and unforgiving. It is in danger of being provoked by human carelessness into catastrophic collapse. The objective of environmental management is the protection of nature from human. People, the myth insists, must tread lightly on earth. The guiding management is the precautionary principle (*Adams, 1995, p 34*). Nature ephemeral requires us to set effective sanctions to prevent the destructive irresponsibility dictated by nature benign (*Thompson et al, 1990, p 27*).

Nature capricious: nature is unpredictable. The appropriate management strategy is again laissez-faire in the sense that there is no point to management. Where adherents to the myth of nature benign trust nature to be kind and dangerous the believer in nature capricious is agnostic; the future may turn out well or badly, but in any event is beyond his control (*Adams, 1995, p 34*). In the flatland of nature capricious there is no knowledge. It is luck that from time to time brings resources our way (*Thompson et al, 1990, p 28*).

Nature perverse/tolerant: this is a combination of modified versions of the first two myths. Within limits nature can be relied upon to behave predictably. It is forgiving of modest shocks to the system, but care must be taken not to knock the ball over the rim. Regulation is required to prevent major excesses, while leaving the system to look after itself in minor matters. This is the ecologist's equivalent of a mixed-economy model. The manager's style is interventionist (*Adams, 1995, p 34*). Nature perverse/tolerant requires us to ensure that exuberant behaviour never goes too far. Everything hinges upon mapping and managing the boundary line between the equilibrium/disequilibrium states. Certainty and predictability, generated by experts become the dominant moral concerns (*Thompson et al, 1990, p 27*).

The four myths of nature[66] are all anthropocentric; they represent beliefs not just about nature but about mankind's place in nature. The four myths of nature by focusing attention on the

[66]According to *Thompson et al (1990, p 29 – 33)* a fifth rationality exists. "The hermit" is based upon the myth of nature's transformation (nature resilient). However, this is regarded marginal in the contexts of this study.

managers' beliefs help to understand why managers do what they do. They carry out their responsibilities as if nature could be relied upon to behave in a particular way.

The central theme of risk and culture is that risk is *culturally constructed.* Work that has been done by Schwarz & Thompson (*1990*) in *Divided we stand* and by Thompson at al (*1992*) in *Cultural theory* inquires into the origins of the beliefs about nature that guide risk-taking decisions and identifies "cultural" patterns. The essence of these patterns has also been distilled into a fourfold typology (see "the four rationalities typology" in *Adams 1995, p 37*). The typology of human nature could be mapped onto the typology of physical nature. As a result:

Individualists are enterprising self-made people, relatively free from control by others and who strive to exert control over their environment and the people in it. Wealth and the number of followers they can command often measure their success. They tend to view nature as stable, robust and benign, capable of shrugging off the insults of man and rarely retaliating. They are believers in market forces and individual responsibility and are hostile to the regulators of the "nanny-state". They tend to an optimistic interpretation of history and are fond of citing evidence of progress in the form of statistics of rising GDP and lengthening life expectancy (*Adams, 1995, p 36*). For the individualists, human nature is both self-seeking and unmalleable. As Adam Smith claimed, pitting interest against interest would create a political system that generated a beneficial collective outcome, which was no part of the intention of any of the participants (*Thompson et al, 1990, p 34*).

Hierarchists inhabit a world with strong group boundaries and binding prescriptions. Social relationships in this world are hierarchical with everyone knowing his/her place. They believe that nature will be good to them if properly managed. They are members of big business/government/bureaucracy. They are respecters of authority, both scientific and administrative; those at the top demand respect and obedience, those at the bottom give it, and those in between do some of each. They believe in research to establish "the facts" about both human and physical nature and in regulation for the collective good. Hierarchists take a balanced view of history; it contains warnings but also holds out the promise of rewards for correct behaviour (*Adams, 1995, p 34*). Hierarchists believe that human beings are born sinful but can be redeemed by good institutions. For them it is the task of the "higher powers" of conscience and reason to regulate, discipline and restrain the lower, baser passions and impulses, which if left to themselves would escape control and wreak havoc (*Thompson et al, 1990, p 35*).

Egalitarians have strong group loyalties but little respect for externally imposed rules, other than those imposed by nature. Group decisions are arrived at democratically and leaders rule by force or personality and persuasion. They cling to the view of nature as fragile and precarious.

They would have everyone tread lightly on the earth and in the cases of scientific doubt invoke the precautionary principle. They join the individualists in opposition of the compulsory enforcement of regulations but they do that for different reasons. They claim that the measures, for example, which are supposed to protect people in vehicles, encourage heedless driving that puts pedestrians and cyclists at greater risk. They incline to an anxious interpretation of history; they read it as a series of dire warnings and precautionary tales of wars, plagues and famines and species and civilisations that were extinguished through human greed or carelessness (*Adams, 1995, p 36*). Egalitarians believe that human beings are born good but are corrupted by evil institutions. A non-coercive and co-operative social environment is a viable way of organising life (*Thompson et al, 1990, p 34*).

Fatalists have minimal control over their own lives. They do not belong to groups responsible for the decisions that rule their lives. They are resigned to their fate and they see no point in attempting to change it. They believe nature to be capricious and unpredictable. They hope for the best and fear for the worst; life is a lottery over whose outcome they have no control. They tend to be found at the bottom of the socioeconomic heap and hence are exposed to more that their share in risk (pollution, traffic, health, etc.). They do not get involved in arguments about what should be done about it because they see no point; nothing they do will make any difference. They have high death rates both from natural causes and accidents. They do not study history (*Adams, 1995, p 36*). Fatalists never know what to expect from others and because of that they react by distrusting their fellow human beings. This suspicious view of human nature justifies their fatalistic acceptance of their exclusion from the other three ways of life (*Thompson et al, 1990, p 35*).

The *Hermit* in subsuming all the rival myths of human nature inevitably withdraws himself from the ravening desires that variously fuel the engaged ways of life. By then projecting this direction of withdrawal beyond the point he has reached he is able to descry his unique goal: the state of enlightenment in which all desire is transcended. At that moment he escapes from the wheel of suffering and from the social map. Nirvana is someplace else (*ibid.:36 - 37*).

The paradigms of science and the myths of cultural theory are power filters through which the world is perceived and they are reinforced by the company one keeps[67] (*Adams, 1995, p 33 – 41*). The representatives of the above categories of cultural theory are caricatures, but they have many real life approximations in debates about risk. Long-running controversies about large-scale risks are long-running because they are scientifically unresolved and unresolvable within

[67] Cultural pluralism is essential. The three active rationalities (hierarchical, individualistic, and egalitarian) structure the world in different and (in the right circumstances) complementary ways and try to advance their causes by mobilising the fatalists (*Schwarz et al, 1990, p 12*).

the time scale imposed by necessary decisions. This information gap is filled by people rushing in from the four corners of the cultural theory's typology, asserting their contradictory viewpoints. The debate is characterised not by irrationality but by plural rationalities (*Adams, 1995, p 50*).

4.4.4.2 Error cultures and types of error

In the "error cultures" featured in Adams (1995, p 56) is represented the risk-taking process under the viewpoint of each of the "four rationalities" presented earlier. By accentuating the risks of technological development and economic growth, *egalitarians* are able to shore up their way of life and discomfort rival ways. Any system that would impose hidden, involuntary and irreversible dangers on people is not to be trusted. Egalitarians' predictions of imminent catastrophe not only enable them to discredit the existing authority for ignoring the welfare of its citizens but also help to convince them anew that is safer inside than outside the egalitarian group, thereby dampening its schismatic tendencies (*Thompson et al, 1990, p 63*). Because of the enormous potential consequences of an error[68], egalitarians strive unrelentingly to reduce the variance (to move in the direction of the dotted line) and hence the risk of things going wrong; it is sometimes acknowledged that zero risk is an unattainable idea but nevertheless one towards which we should all continually strive. Those who believe it is actually attainable are clearly deluded *(Adams, 1995, p 56 –58).*

Fatalists do not knowingly take risks. All they could do, in their own estimation, is get hurt while having no chance of gain. But others, because of the fatalists' passivity, may try to impose unwanted dangers on them. "What you don't know can't harm you tends to be their accommodation to those risks that cascade down on them. They don't worry over things they believe they cannot do anything about (*Thompson et al, 1990, p 63*). Nature is simply unpredictable. One variant of fatalism holds that all is predestined, another that God throws dice. But ignorance precludes adherents to either perspective knowing what the future holds. As fatalists they are entitled to no intentions with respect to risk, only hopes. They can but hope for the best and duck if they see something about to hit them *(Adams, 1995, p 56 –58).*

Hierarchies are not at all squeamish about setting acceptable risk at high levels, as long as the decision is made by experts; experts are expected to do the right thing. To suggest that authorities acted out of ignorance or self-interest would be to de-legitimise not only a single decision but also the whole system that authorised it (*Thompson et al, 1990, p 63*). Hierarchists are convinced that those under their authority persistently have more accidents than they should.

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[68] The level of risk intended is zero. There is only one direction in which one can fall if one loses one's balance – in the direction of greater than desired risk (A*dams, 1995, p 57*).

They seek to reduce risk. They usually acknowledge the impossibility of reducing it to zero but seek to manage it more efficiently. Implicit in their attempts to manage risk better are two beliefs: first that through ignorance or incompetence people take higher risks than they intend, with the result that the number of adverse effects is greater than the acceptable risk level; secondly, many people under their authority are irresponsible and accept higher level of risk than they should. The hierarchist adopts a paternalistic approach to risk regulation. Not only must people be prevented from behaving in a way that puts other people at risk but they must also be protected from themselves. Hierarchists strive through engineering, measures, persuasion, regulation, training and exclusion to shift the frequency distribution of risk-taking behaviour towards lesser levels of risk and reduce its variance (*Adams, 1995, p 56 –58*).

For *individualists*, risk is an opportunity. Where there is no uncertainty or danger of loss, there would be no prospect of personal reward and hence no scope for entrepreneurs. The long-run will take care of itself since it is believed that by that time new combinations and new technologies will arise to mitigate unforeseen events (*Thompson et al, 1990, p 63*). Individualists also seek to reduce their variance and are assiduous collectors of information about risk whether it involves racetrack or the stock market. But they are more conscious to the rewards of risk-taking. They are self-conscious risk-takers and they are convinced that a benign nature will ultimately reward those who trust her. They trust individuals to make their own decisions about risk and scorn the regulators of the "nanny" state (*Adams, 1995, p 56 –58*).

The risk that cascades down upon the fatalists alert us to the existence of a whole web of risk exchanges that lace the engaged ways of life into an elaborate and counterintuitive system of interdependency. Individualists are good at spotting the opportunities others have missed. They are also good at shunting off those risks that they judge are unlikely to bring them any reward. Hierarchists strive hard to internalise their externalities – to manage the entire risk system (which explains their readiness to set acceptable levels of risk). But even so, they will always be missing something. Egalitarians spot risks that the others have missed then bring them forcibly to the attention of the people they see as having generated them (*Thompson et al, 1990, p 64*).

The *Hermit* adopts a risk-handling style that is characterised by the eager acceptance of myopically perceived risk. At the same time his strategy of avoiding all socially coercive involvement results in the risks he takes remaining closely attached to him. Unlike the individualist for example, he cannot pass some of the risks onto someone else. On the positive side, his autonomous strategy insulates him from the unwelcome attentions of those risks that, having been exuded by some other way of life are looking for a social sponge to absorb them. The hermit's way of life experiences neither an inflow nor an outflow of such risks. In this it differs from all the other ways of life. All the hermit needs are the right conditions, a coercive transactional system from which to withdraw and a congenial niche to withdraw into.

Sometimes the niche is geographically defined (as in the Himalayas); sometimes it consists of nothing more than a fortuitous absence of opportunities for economies of scale (as in the inner city lives of self-employed taxi drivers and the caretakers of small office buildings). Either way, hermits are alive and well and perfectly capable of reproducing their distinctive way of life (*ibid.: 64 - 65*).

The difference styles of risk-taking can be related to the type 1 and type 2 statistical errors[69]. The level of confidence is a measure of the risk of error. The 95% confidence interval most commonly employed in social science research means that the researcher accepts the probability of getting it wrong one time in twenty. The four myths of nature are contextual hypotheses constantly being subjected to partial tests. Egalitarians, for example, whose working hypothesis states that catastrophic consequences will flow from a failure to respect the fragility of nature will insist on a very high standard of proof before rejecting this hypothesis. In the statistician's language they will be prepared to run a high risk of a type 1 error and a low risk of a type 2. Individualists who are convinced of the robustness of nature will require a very high standard of proof before accepting the egalitarians' null hypothesis. Hierarchists who believe in stability within limits will return the hypothesis to the sender requesting greater specificity with respect to critical limits. Disputes of this kind usually turn out to be arguments not about facts but about where the burden of proof should lie.

The egalitarians are usually more risk-averse than the hierarchists. The latter are usually responsible for putting safety measures into effect. They commonly find themselves lobbied from two sides, with the egalitarians urging for more action to reduce risk and the individualists insisting on less. The fatalists see no point in arguing (*Adams, 1995, p 58*).

4.4.4.3 Contributions and problems of the contextualist paradigm

Mary Douglas's theoretical approach to risk has been influential because she has provided a trenchant and persuasive critique of the realist (techno-scientific) approaches that have dominated the field. Her cultural/symbolic approach emphasises that risk judgements are political, moral and aesthetic; they are constructed through cultural frameworks of understanding and implicated with notions of the body and the importance of establishing and maintaining conceptual boundaries. This provides a perspective on risk that sets up an important counterpoint to the individualist focus that predominates in the realist perspective (*Lupton, 1999, p 55 – 56*). In the wake of Douglas's approach cultural theorists have advanced the understanding of risk in three general areas those of: the ontological status of risk; a theory of

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[69] Strictly, a type 1 error is committed by wrongly rejecting the null hypothesis whereas, a type 2 when wrongly accepting it (*Adams, 1995, p 58).*

risk selection; and testable models that connect sociological variables with individual attitudes toward risk.

The ontology of risk refers to its metaphysical status as a property or quality in the physical world. Cultural theorists have criticised the psychometric paradigms for advancing a realist's ontology[70] of risk. According to Thompson and Wildavsky (*1982*, as quoted by *Krimsky, 1992, p 19*) risk although it has some roots in nature it is inevitably subject to social processes.

A second contribution of cultural theorists to the ontological dimensions of risk is their critique of methodological individualism or the explanation of social behaviour by the aggregate of individual behaviours. Group and social context, not individual cognition, plays the primary role in the selection and response to risk. According to this view the proper scale of analysis is sociological and not psychological. The order of explanation proceeds from the social context to the individual. The choices people make about risks is settled by the choices they make in the kinds of social institutions with which they associate.

Cultural theorists offer a general theory of risk selection that is based on a functionalist approach to cultural survival[71]. Functionalism pre-empts the role of a transcendent rationality. An interpretation about risk is not right or wrong in some absolute sense. It survives or disappears because of its usefulness in the social system. An activity that is perceived to be risky by some may not be for some others.

The third contribution is testable models or hypotheses from which causal or structural connections can be drawn between social groupings and risk selectivity. Grid/group analysis has been the most prominent explanatory schema for connecting social context and organisational affiliation to individual risk selection (*Krimsky, 1992, p 19 – 20*).

Despite such contributions cultural theorists are also criticised. It has been argued that Douglas's approach tends to be somewhat static in the sense that there is little explanation provided for how things might change in accounts of risk, purity and danger (*Lupton, 1999, p 56*). The respective prototypes do not characterise individuals but social aggregates. Anecdotal evidence tells that individuals may simultaneously belong to different organisations and groups having different cultural profiles. Role differentiation and segmentation of individuals are

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[70] However, Slovic a leading figure in psychometric School denies that his theory embraces a realist's ontology of risk (*Krimsky, 1992, p 19*).

[71] An important contribution of Rayner and other cultural theorists has been to clarify the selection of some risks and the avoidance of others according to social attributes of the cultural group (*Kasperson, 1992, p 164*).

mirrored in the functional differentiation of social aggregates. But often this differentiation is very difficult at best, if not impossible.

The relationship between the cultural prototypes and organisational interests is unclear and problematic. What determines the cultural prototype to which groups or organisations belong? Are people born as entrepreneurs or egalitarians? Are social institutions formed because cultural prototypes desire to express themselves? If cultural affiliations are social acquisitions learned through interaction with others then they must be linked with personal or institutional tasks or interests.

The selection of the four or five prototypes as the only relevant cultural patterns in modern society needs more evidence than the reference to tribal organisations. Many social groups seem to have agendas and worldviews that cannot be captured by these prototypes. For example, many religious groups are very hierarchical in structure but egalitarian in doctrine. The reductionist view of partitioning culture in four or five segments appears to be too simplistic.

The cultural perspective has not provided sufficient empirical evidence of its validity. This is partly due to the problem of measurement. Organisational philosophies are often hidden and cannot be revealed by interviewing representatives of these organisations. Furthermore, if prototypes are mixed in organisations then the perspective is not falsifiable[72] (*Renn, 1992a, p 75).*

A further problem arises due to the way Douglas' theorising on risk has been used by others. A number of psychometric and other psychological researchers have begun to incorporate some of Douglas' insights into their models of risk perception, often referring to her work as the "cultural theory" approach to risk[73]. In this literature, however, Douglas' writings are frequently interpreted as implying that lay perceptions of risk involve inaccuracies and errors of judgement because of the "contaminating" influence of cultural and social processes. In such writings, as in much of the other psychometric and psychological literature, the risk judgement of experts continue to be privileged as objective and factual over those of lay people, against which perceptions are compared and found wanting.

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[72] See Popper (*1994*) for example.

[73] Kemshall (*1997, p 247 - 248*, as quoted by *Lupton, 1999, p 56*) for example argues that risk perception can be prone to bias and error leading to exaggeration and overestimation of risks. Risk perception is a subjective process, with what is identified and responded to as risk being often a matter of value judgement rather than fact.

Other commentators who take a laissez-faire political approach have used Douglas' work to claim that the state should not attempt to impose its views on risk on the public in risk reduction efforts, given the subjective nature of risk assessment, the uncertainty of knowledge about risk and the political dimensions of risk debate (*Adams, 1995*). Douglas's own position on risk sometimes seems to support a politically conservative approach, particularly in her writings on the environmentalist movement. Douglas and her collaborator Wildavsky have been criticised for siding with business and industry (see for example *Lash, 2000*) inappropriately positioning them as the victims of the environmental movement. Environmentalists tend to be portrayed as behaving politically and ideologically, in constructing certain beliefs about industrial pollution and risk. In contrast, the risk positions of the industry and big business tend to be represented as politically neutral, whereby industry and big business are scapegoats and inappropriately blamed for risk. Douglas may be criticised for failing to recognise the cultural underpinnings of these institutions' risk positions. This seems to clash with her overall position on risk which, while taking a weak rather than a strong social constructionist approach, is adamant about the inherently cultural nature of any group or community's perceptions and judgements about risk (*Lupton, 1999, p 56 – 57*).

Despite the shortcomings of the contextualist paradigm represented by the cultural theory of risk, it offers an interpretation of the social experience of risk without falling prey to the arbitrariness that characterises many of the sociological analyses inspired by the same philosophy. It can offer additional evidence for the importance of cultural factors in risk perception and risk policies. In addition, it provides better explanations for social actions that seem to be in conflict with either the technical risk analyses or the obvious interests of the initiating group (*Renn, 1992a, p 76*).

As mentioned in section 1.2 the researcher was intrigued by the interpretive power and possibilities offered by this paradigm. At least three different cultures seemed to exist in the salmon farming risk arena (i.e. egalitarians, hierarchists, and individualists) and ways were sought in trying to operationalise the framework towards building a cultural theory case. However, the story told by the different actors in the salmon farming arena mainly concerns arguments about reflexive techno-scientific data on environmental grounds and it could be well explained by the concepts held by other sociological positions (i.e. reflexive modernisation; governmentality; risk and subjectivity; otherness; and risk and pleasure).

The contested nature of salmon farming exhibits many of the characteristics described by Beck's Risk Society thesis[74] (*Beck 1992a, b, 1995, 1996 see also Giddens 1991, 1994a, b, Lash 1993, 1994a, b, 2000, Lash & Wynne 1992, Wynne 1989, 1992, 1996*). In addition it could be

[74] See chapter 6.

further argued that Beck is in agreement with the cultural theorists that culture and society are important in moulding perceptions of risk theorising the field though through an egalitarian's perspectives (*Adams, 1995, p 182*). However, the insights provided by the risk society thesis do explain in detail the findings whereas Cultural Theory could effectively be seen as another form of an arbitrary categorisation. Furthermore Cultural Theory as a framework for research can be perceived as somewhat, less flexible than the respective ones provided by risk communication[75].

The discussion now moves to consider risk communication with particular attention being paid to the social amplification/attenuation of risk in an attempt to provide a more complete picture on the field of risk research from the premises of the social sciences.

4.5. Risk Communication – an introduction

The study and practice of risk communication is a relatively new development with most relevant literature appearing after the publication of the original Royal Society report in 1983. However, it is clear that several substantive issues relating basic risk-perception research to public policy and decision-making as well as to the process of risk management, are raised through a consideration of risk communication. Accounting and in particular CSR/SEA can be seen as part of the risk communication process since it is one of many methods of communicating environmental risks about an organisational entity to external and internal parties.

Several interrelated factors have led to the emergence of interest in risk communication research. Firstly, in practical terms there is an increasing requirement, both legally and morally, that government and private industry inform populations about hazards to which they might be exposed. The goal of such communication may be to encourage a particular behaviour to guard against an immediate individual risk. In the case of large-scale risks communication may be a statutory part of the emergency planning process[76]. Legislation as a result of major accidents has set specific requirements upon public bodies for information provision and preparedness. However, these requirements may change depending on the context[77].

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[75] See section 4.5.

[76] Emergency planning necessitates consideration first of what communication should be made in advance of a potential incident to inform and prepare those that might be affected, and secondly, plans for providing effective warnings in the event of an emergency (*Royal Society, 1992, p 119*).

[77] The context within which risk communication operates may be highly specific to one culture or nation and the findings should only be generalised to other contexts with considerable caution (*Royal Society, 1992, p 119*).

A second reason for the emergence of risk-communication research derives from the public policy dilemmas that have arisen as a result for particular social conflicts over risks (i.e. the siting or expansion of hazardous facilities). Risk-perception research illustrates the varied perceptions and frames of reference that different parties might be expected to bring to such disputes. The forms of communication between the parties involved in such disputes might contribute to better mutual understanding and hence to resolution of the potential conflict. In this case the question of who communicates what to whom (and in whose interests) raises potentially controversial ethical issues (*Royal Society, 1992, p 118 – 119*).

4.5.1. Conceptual approaches to risk communication

Effective risk communication to diverse audiences, who hold different values and frames of reference with respect to a specific problem, where multiple feedback channels and competing messages are available, and where interpretation is dependent upon cultural factors, is a very challenging task. A particularly significant dilemma arises from conflicting goals in risk communication such as the reassurance-arousal paradox[78].

There is no easy way to define risk communication and at least four partially overlapping approaches can be identified. The simplest defines risk communication in terms of a top-down or one-way transmission of some message about a hazard or risk from a particular "expert" communicator to a target "non-expert" audience. Such an approach focuses upon characteristics of the source, channel, message and receiver that might enhance (or hinder) communication of any particular content. This model has been the target of much criticism. It has been accused of having a very narrow focus and by assuming an altruistic communicator it implicitly devalues the perspectives and knowledge of the risk bearers as well as glossing over the political aspects to many of the risk conflicts in society.

A second approach stresses the process of communication within a two-way exchange or dialogue. In this context, risk communication is an interactive process of exchange of information and opinion among individuals, groups, and institutions. It involves multiple messages about the nature of risks and the expressed concerns, opinions, or reactions to those messages or to legal and institutional arrangements for risk management. This approach highlights the critical role that feedback and interaction play in any complex communication. It implies that risk communication necessarily involves a fluid and dynamic interchange of information between the parties to a risk issue or conflict in the search for mutual understanding. Opportunities for learning exist on all sides of a risk debate or conflict. The

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[78] A message or messages about the same activity may need to both reassure and to warn (*Otway & Wynne, 1989*, as quoted by the *Royal Society 1992, p 119*).

National Research Council (*1989, p 16 - 19*), identifies four principal reasons for conducting risk communication: desire by governments to inform; desire by governments or industries to overcome opposition to decisions; desire to share power between government and public; and desire to develop effective alternatives to direct regulatory control.

A third approach stresses the exchange of information between actors and takes account of the wider institutional and cultural contexts within which risk messages are formulated, transmuted and embedded. From this perspective, risk communication consists of a complex tangled web of messages, signs and symbols. Intentional messages often compete with many other unintended signs and symbols relevant to a hazard. This implies that predicting the outcome of any intended communication may often be far more uncertain than what the simple one-way model suggests. In addition, the cultural approach clearly recognises that all hazards have a history, which will influence the interpretations of particular messages at any particular point in time. The communicator therefore has to fully appreciate the context within which communication will occur.

A final approach views risk communication as part of the wider political processes that operate within a democratic society. In this respect communication is seen as an essential prerequisite to the enabling and empowerment of the risk-bearing groups in society in ways that allow them to participate more effectively in decision-making about risks. This highlights the important question of whether public groups should be granted a right to know about the risks they face, and the precise role of the public in risk-management decision-making. This right to know about risk management is clearly associated with the accountability debate discussed earlier. People may tolerate some risks insofar as they believe that major risk are reduced, and shown to be reduced to levels as low as practical, where the benefits are clearly in the public interest and that appropriate measures are in hand to cope with post-disaster effects (*Royal Society, 1992, p 119 – 121*)

In the continuation of this section the social amplification/attenuation of risk will be presented as a framework for risk communication. The social arena[79] (*Renn 1992b*) and social drama concepts[80] are two other frameworks falling within the same thematic category.

4.5.2 The social amplification/attenuation of risk; an introduction

[79] Presented in section 3.3 but also discussed in section 4.6.

[80] See Palmlund (*1992*).

The social amplification of risk[81] arose in response to a continuing series of disjunctures in the intellectual history of hazards and risks. These disjunctures have thwarted the development of an integrated and powerful analysis of environmental hazards. Instead a mosaic of concepts and approaches emerged, each of which illuminated some "faces" of risk causation and experience while concealing others. Meanwhile, disciplinary and theoretical squabbles over the correctness of particular viewpoints have diverted energies from seeking out the meeting point of theory, from appreciating the particular contributions of alternative interpretations and from fashioning more holistic analyses of hazard experiences and their social meanings. These disjunctures have limited significant gains in improving the understanding of risk, its social causes and meaning and its embedment in the fabric of society and new more holistic approaches are needed.

The most striking disjuncture has been between the "technical" and the "social or perceptual" analysis of hazards. However, while discrediting the narrow technical conception of risk and the limitations of mandated science, the social science critics have not offered a coherent framework or approach for integrating the technical and social aspects of risk. At the same time the unsuccessful effort by the Royal Society to bridge the gap drove home what many already knew; "defining risk is essentially a political act".

The second disjuncture has been within the social sciences themselves. Psychologists exploring the bases of human judgements in a world constructed from social concepts have been centrally involved in the empirical study of risk. Cultural theorists, as seen in section 4.4.4, have criticised both the technical and the psychological conceptualisation of risk, suggesting the individuals select what and how much to fear largely as a product of a particular cultural bias or to support a particular way of life. Those risks selected for concern and worry are functional in that they strengthen one way of life while weakening others. Thus these critics have often claimed that cultural theory should be favoured over other competing explanations. Sociologists and policy analysts have seen risk as an element in social movements or dynamics of social controversy and disasters as a phenomenon for studying critical problems of social structures and processes. Economists tend to see hazards as market externalities requiring social intervention. Ironically social scientists were the ones who failed to incorporate concepts from alternative approaches to enrich the analysis of risk.

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[81] The social amplification of risk and the cultural theory framework have been subject to far less direct empirical testing than the psychological approaches but do, however, potentially offer more valuable, and wide-ranging theoretical insights into the factors underlying risk-perception. Bridging the gap between these two approaches may be of enormous value for risk-perception research (*Royal Society, 1992, p 124*).

The third disjuncture lies in the largely separate confluences that have marked the intellectual history and sociology of what should be the integrated subject matter of risk. Recent years have seen more convergence between the two oldest research areas, disaster sociology and natural hazards research; however, both fields remain quite isolated from risk analysis, which has been largely focused on technological impacts. The paradox here lies in the fact that so far there is not a clear dividing line between natural and technological hazards or disaster sociology and the capacity for these different schools of scholars to learn from one another is high.

The last disjuncture lies in the nature of knowing and science. Most of the truly difficult risk issues are trans-scientific. They can be raised but cannot be answered by science. Scientific knowledge confronts enormous unpredictable uncertainty, which lies at the boundaries of current knowledge. Scientific knowledge moves along pathways that strip away essential interconnections and unavoidably distorts the character of the phenomenon under study. Human experience of risk cannot proceed by science alone but requires infusion from indigenous or "folk" knowledge and analogical reasoning, a requirement often overlooked in contemporary risk analysis. A new kind of science is needed to understand problems that lie in the domain of high uncertainty and high value resonance. This new science should not be merely a new field of expertise but a new conception of the objects, methods, and social functions of knowledge about the material world and its interaction with structures of power and authority (*Kasperson, 1992, p 154 – 157*).

4.5.2.1 The framework

The social amplification framework attempts to unify psychological, social and cultural approaches to risk perception. It was developed by the Clark University group (*Kasperson et al 1988*, as quoted by *the Royal Society 1992, p 114, Kasperson, 1992*) and adopts a metaphor loosely based upon communication theory to explain why certain hazards are a particular focus of concern in society, while others receive comparatively little attention. It was suggested that hazards and their objective characteristics interact with a wide range of psychological, social or cultural processes in ways that intensify or attenuate perceptions of risk. People come to know about the world through various communications that are received from signs, signals or images. As was mentioned in the psychometric paradigm, hazardous events hold a signal value, which may differ for different people or social groups. Accordingly, an individual or group can be conceptualised as receivers of such signals about hazards. Such signals may be subject to predictable transformations as they are filtered through a variety of social amplification stations. Examples of such stations are scientists, the mass media, government agencies, politicians, and activist groups within a community (*Royal Society, 1992, p 114*).

The individuals or groups who collect information about risk communicate with each other and through behavioural responses act as amplification stations. It is obvious that social groups or institutions can amplify or attenuate signals only by working in social aggregates and participating in social processes. But individuals in groups and institutions do not act or react merely in their roles as private persons but rather according to the role specification associated with their positions. Amplification, therefore, can differ among individuals in their role as private citizens and in their role as employees or members of social groups and organisations (*Kasperson, 1992, p 159*). Each station will intensify or attenuate certain aspects of risk in ways predictable from the social structure and circumstances. Social amplification accounts in a very general sense for the differential interpretations that individuals and groups place upon hazardous events.

Social amplification accounts for the observation that certain events in their terms, lead to spreading ripples of secondary sequences, which may go far beyond the initial impact of the event and may even impinge upon initially unrelated hazards. Such secondary impacts upon the original risk-managing organisation include a loss of sales, regulatory constraints, litigation, community opposition, and investor flight (*Royal Society, 1992, p 114 – 115*).

Kasperson (*1992, p 158*) presents a simplified model of the risk amplification framework. Some terms used in this concept need further explanation. *Risk from this view is in part an objective harm to people and in part a product of culture and social experience.* Hence hazardous events are real. They involve transformations of the physical environment or human health as a result of continuous or sudden releases of energy, matter, or information or involve perturbations in social and value structures. These events remain limited in the social context unless they are observed by human beings and *communicated* to others. The consequences of this communication and other social interactions may lead to other physical transformations, such as changes in technologies, changes in methods of land cultivation, changes in the composition of water, soil and air. The experience of risk is therefore both an experience of physical harm and the result of culture and social processes by which individuals or groups acquire or create interpretations of hazards. These interpretations provide rules of how to select, order, and explain signals from the physical world (*Kasperson, 1999, p 158 – 159*). "*Additionally, each cultural or social group selects certain risks and adds them to its strand of worry-beads to rub and burnish even as it ignores other risks as not meriting immediate concern*" (*ibid.: 159*).

The amplification process starts with either a physical event or a report on environmental or technological events, releases, exposures or consequences. Some groups and individuals also, actively monitor the experimental world, searching for hazard-events related to their agenda of concern. In both cases, individuals or groups select specific characteristics of these events or

aspects of the associated depictions and interpret them according to their perceptions and mental schemes. They communicate these interpretations to other individuals and groups and perceive interpretations in return. Social groups and individuals process the information, locate it in their agenda of concerns and may feel compelled to respond. Some may change their previously held beliefs, gain additional knowledge and insights, and may be motivated to take action; others may use the opportunity to compose new interpretations that they send to the original sources or other interested parties; and still others find the added information as confirming long-held views of the world and its order.

Role-related considerations and membership in social groups shape the selection of information that the individual regards as significant. Interpretations or signals that are inconsistent with previous beliefs or that contradict the person's values are often ignored or attenuated. They are intensified if the opposite is true. The process of receiving and processing risk-related information by individuals is well researched in the risk perception literature. But this is not sufficient: individuals act also as members of cultural groups and larger social units, which code-determine the dynamics and social processing of risk. In this framework, these larger social units are termed as social stations of amplification. Individuals in their roles as members or employees of social groups or institutions do not only follow their personal values and interpretative patterns; they also perceive risk information and construct the risk problem according to cultural biases and the rules of their organisation or group (*ibid.: 159 – 160).*

4.5.2.2 Clarifications and criticisms

Several areas are in need of clarification. The social amplification of risk refers to the cultural, social, and individual structures and processes that shape the societal experience of risk. This shaping can amplify or attenuate the risk burden to society. Although the various social structures and processes that interact with risks can be disaggregated for purposes of such analysis, such disaggregation severs key interactions and interdependencies. The amplification framework seeks a more holistic analysis of risk.

In this framework risk is considered being the threat of both direct harm that happens to people and their environments regardless of their social constructs and of the associated social conceptions and structures that shape the nature of other harms. The consequences associated with a particular risk or risk event are: the direct effects that are normally treated in technical risk analysis, such as health effects, property damage, medical costs, and emergency response costs; and the effects associated with the interaction of such harms with the social processing of the risk events, such as social stigmatisation, group conflict, loss of sense of community, and social disruption. Although it is often argued that the former tend to be quantitative and the

latter qualitative both in fact require some combination of quantitative and qualitative assessment. What is considered as "*harm*" is socially mediated and culturally determined. The nature of the risks and characteristics of the social amplification process will determine which category of consequences will pose the largest burden to society.

The term risk events, refers to manifestations of risk; the flow of discrete events that actualise the risk. Such events may relate to any stage of the causal model of hazard used by the Clark group. What are amplified or attenuated are primarily the consequences of the risk or risk event and usually the secondary or tertiary consequences. Where heightened consequences occur the effects may enlarge or totally change.

Under special circumstances, social amplification processes may increase the probabilities of all stages of risk (initiating events through consequences) by changing the culture or social setting in which the risk is embedded. Attenuation of the risk may paradoxically enlarge risk probabilities by eroding risk management resolve or diverting efforts to other risk domains, with heightened human and environmental harm as a result.

Information flow and behavioural responses will involve complex responses between actors. The nature of discourse about risk that characterises the social processing of the risk will be important due to the political competition for the control of language, symbols, imagery, used to define the risk and the definition of the risk problem itself.

Behavioural response in the framework refers to the complex actions undertaken by formal organisations, social institutions, cultural and social groups and individuals in reference to the risk. The sociological and individual interactions are seen as inherently inseparable.

Culture in this framework occupies the position of a critical variable that shapes characteristics of all stages, components and processes in the framework and even the risk or risk event itself. But culture is not enough to explain the social processes that emerge. The various social sciences need to address individual differences and to analyse such elements as economic factors, social status, political position, ethnicity, and education (*ibid.: 161 – 163*).

A drawback of the amplification idea is that it may be too general to be subject to direct empirical testing[82] and analysis (*Royal Society, 1992, p 115*) at least in the positivist sense. Thus the social amplification concept must prove its usefulness by demonstrating its analytical

[82] This limitation is shared with other broad social constructs. The concept must prove its usefulness by demonstrating its analytical strength and insights in interpreting social responses to risk difficult to explain by competing and often narrower approaches (*Kasperson, 1992, p 165*).

strength and insights in interpreting social responses to risk that are difficult to explain using competing, and often narrower approaches.

Similarly, the framework's ability to generate predictive hypotheses has also been questioned. However, its makers' view is that an integrative conceptualisation such as the social amplification of risk has three potential contributions. Namely to bring competing theories and hypotheses out of their terrain and into direct conjunction (or confrontation) with each other; to provide an overall framework in which a large array of fragmented empirical findings can be located; and to generate new hypotheses particularly geared to the interconnections and interdependencies among particular concepts or components (*Kasperson, 1992, p 165 – 166*).

The source-receiver framework illustrated in Kasperson (*1992, p 158*) also relies too heavily upon a simple conceptualisation of communication as a one-way process: that is from risk events, through transmitters, and then on to receivers. The development of social risk perceptions is always likely to be the product of more interactive processes between source and receiver of a message. The feedback between receiver and source has an important role in such communication processes. The framework has also been extended to include not only actual risk events but also simulated ones, such as a scenario within a risk-assessment model (*Royal Society, 1992, p 115*).

Several other criticisms of the paradigm have been raised. One concern has been that the framework suggests a "true" or "objective" and a "subjective" or "distorted" risk. However the creators of the framework argue that many, perhaps even most, of the direct or primary effects are heavily dependent on social structures and processes. Traditional risk analysis may not be able to provide realistic assessments (products of probability and gravity of consequences) in more than a very limited number of cases. On the other hand, not all risks are products of social constructs. People can be hurt whether or not they recognise or are concerned about the consequences. As with all models the linear structure of the social amplification of risk model carries the price of oversimplification. More complex ways are sought over time to represent the dynamics of the interconnections and feedbacks that occur.

A second issue concerns the metaphor of amplification itself. There is no example within the framework of the social costs of attenuation of risk. The authors did recognise the fact that both the attenuation and amplification consequences are possible. There is no certainty however, whether the processes involved in amplification and attenuation will be mirror images or be quite different. Social processes may transform, reconfigure or "reinvent" the risk event without substantially altering the magnitude of the overall consequences. The lack of even-handedness carries the danger that some may misunderstand, or choose to misinterpret the social

amplification concept as a tool to handle "exaggerated" or "irrational" fears of the public. For this reason the Clark University group has gone to great lengths to emphasise equally risk amplification and attenuation.

A third issue concerns the electronic analogy used in the paradigm. This analogy is too passive to cope with the complexity of human behaviour. The addition of tuners, filters, and other devices is needed to capture the richness of human behaviour. The ways the receiver is tuned to receive signals on one frequency and not another, and how it selects a particular signal subset from the total number of signals coming is also essential. The authors' intent was not to reduce social complexity to a particular communication theory or to a gross electronic metaphor. The integrative nature of the framework and the positive contributions that communication theory has to offer are the elements that must be emphasised.

Another criticism concerns the degree of balance between individual and social processes in the treatment of amplification processes. It was argued that future developments of the framework might benefit from a more articulated system and social psychological approach that would place findings more firmly in the societal context. Although the concept features the term social, (*Rip 1988, p 195*, as quoted by *Kasperson 1992, p 165*) its focus is on the individual. The authors accepted that position and for this reason they have sought to emphasise social processes, whilst adding and highlighting culture as a pervasive determinant of the entire social processing of risk. There is a need to continue to seek an appropriate balance among the various components of the framework (*Kasperson, 1992, p 163 - 165*).

Despite the above shortcomings, the social amplification of risk framework has to be recognised as a serious attempt to widen the conceptual debate on risk perception research. It emphasises the important point that the subject must be viewed from a multidisciplinary perspective rather than accepting the hegemony of any particular approach (*Royal Society, 1992, p 116*).

4.6. Summary – Conclusions

The aim of this chapter was to complement and further enrich the picture in the field of risk research introduced in chapter 3. This took place by bringing together in more detail the positions held by various theorists in the field from the premises of the socio-cultural perspectives, in an effort to distinguish between the appropriateness of different interpretations for the purposes and conduct of this study.

This review started with a short overview of the story of risk, whilst presenting definitions and associated issues deemed as important for the understanding of the scientific struggle to frame

the field. Links with the notions of sustainability and accounting were made, and insights and criticisms of cultural theory and other socio-cultural positions (i.e. reflexive modernisation; governmentality; risk and subjectivity; otherness; and risk and pleasure) were examined. This discussion was followed by a presentation of risk communication, specifically focusing on the social amplification/attenuation of risk framework, which was deemed to supplement the risk arena metaphor, presented in section 3.3, and could aid research into risk.

Risk perception research includes several well-defined paradigms (see the psychometric paradigm, the social drama concept and others), whose different positions display areas of agreement and disagreement[83]. The technical perspective for example, defines risk in a very limited way, which may be one of the major causes why it is not as effective as it could be. Alternatively, the potential problematic created by the plurality of the different sociological schools of thought can be a desirable situation in the sense that the diversity of views provides the basis by which decisions about risks can be informed from a wide range of perspectives, even though it remains the administrative dilemma of how in the face of such plurality, societal decisions about risks may be made that are both equitable and in some way in the interests of all (*Royal Society, 1992, p 124*).

It can be argued that conventional accounting demonstrates many of the weaknesses of the techno-scientific rationale. The dominant paradigm of conventional accounting practice as a constructor of realities is mainly based on the technical dimensions of the field (associated with measurement concepts, systems of evaluation, and quantification metrics). It is seen as a mechanism that may have originally been designed as a rational information system (trying to filter objective measurable reality in accounting categories (*Cooper and Thomson, 2000, p 11*) but it is clear that accounting does not operate as such. Like the techno-scientific paradigm any claims to the rational integrity of its internal processes are irrelevant as it is not used in a rational world and by rational human beings. It measures and reports on a limited set of monetary flows in a narrowly defined entity for a clearly defined period of time[84]. Thus,

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[83]Most approaches now take the view that risk perceptions must be investigated and perhaps more importantly be seen as valid in their own right. A second clear consensus is that a wide range of social, cultural, and sociological factors shape individual risk perceptions. A third is that the public should not be viewed as an undifferentiated entity. There are many groups within any society and some may hold different risk perceptions (*The Royal Society, 1992, p 124*).

[84] Gray et al (*1996, p 19 - 22*), for example, criticise conventional accounting's role in the model of a pristine liberal economic democracy and they argue that in such a model no allowance is made for environmental matters except in so far as these are represented in price. Nature is assumed to have no worth independent of its provision of economic facilities and environmental, ecological, or nature-centred

Table 4.1: *National accounting and sustainability inconsistencies and exclusions*

- Ignores unpaid domestic labour
- Excludes non-money transactions outside the household.
- Ignores distributional issues.
- Ignores differences in needs and circumstances of different nations.
- Uses unstable exchange rates in international comparisons.
- Ignores the value of peoples' possession and their associated depreciation.
- Ignores environmental wealth and its depreciation.
- Ignores human beings and their depreciation.
- Deals inadequately with positional goods.
- Privileges work-time over leisure time.
- Ignores the quality of work.
- Improperly accounts for reducing public provision for services.
- Improperly accounts for ineffective private sector provision of services.
- Value of output reflects the existing distribution of income.
- Ignores biodiversity.
- Ignores future generations.
- Ignores future costs associated with current activities.
- Ignores national externalities
- Diminishing marginal utility of money

Source: Cooper and Thomson (*2000, p 8*)

accounting can be incorrectly used by people who do not understand the meaning of the words and numbers they invoke to prove their case or maintain their ideological perspective (*Cooper and Thomson, 2000, p 12*). Table 4.1 presents some of the sustainability inconsistencies and exclusions of the conventional paradigm[85] and the complex implications of such a narrow view.

This thesis views an approach that could integrate perspectives from different sociological schools of thought being more preferable to the limited techno-scientific rationale and seeks insights into risk perception with particular reference to the salmon farming industry in Scotland. Applicable frameworks were found in the risk communication thematic category; specifically the social amplification/attenuation of risk concept, and the social drama and risk arena metaphors. The psychometric paradigm and cultural theory are perhaps the most developed frameworks on the empirical and theoretical side of things respectively. However, both approach the field from pre-constructed premises that do not allow plasticity for a better understanding of the rationalities behind the different actors, thus preventing a possible integration of the insights provided by sociological theorists.

On the other hand, the social amplification/attenuation of risk and the social drama metaphor are frameworks that can provide perhaps the necessary openness for integration of other theoretical positions in the interpretation of the findings (see figure 4.1 for example) without putting the researcher into pre-constructed realities; and these metaphors were considered adaptable enough to be operationalised to seek insights into risk perceptions. However, both were seen as perhaps not as easily to operationalise as the risk arena concept and perhaps too general in their meanings and applications. The arena framework was seen as a perhaps more flexible tool for research into the realm of politics and sub-politics.

With reference to this latter point the sub-political movement has had and continues to play a critical role in societal governance, but it has certain characteristics that are worthy of note. The rise of the number and power of these protest and/or influence groups is not matched by their democratic accountability. Sub-political institutions tend to be structured on the private corporate model with their restricted duties of accountability. Sub-political groups are extremely heterogeneous, motivated by diverse aims and value sets. Sub-political does not mean political subversion against those in power. Sub-politics is the expression of basic human rights of the citizen for freedom of thought, expression and speech. Sub-politics does not imply a coherent or shared ideology. It is wrong to think of sub-political movements as automatically opposed to

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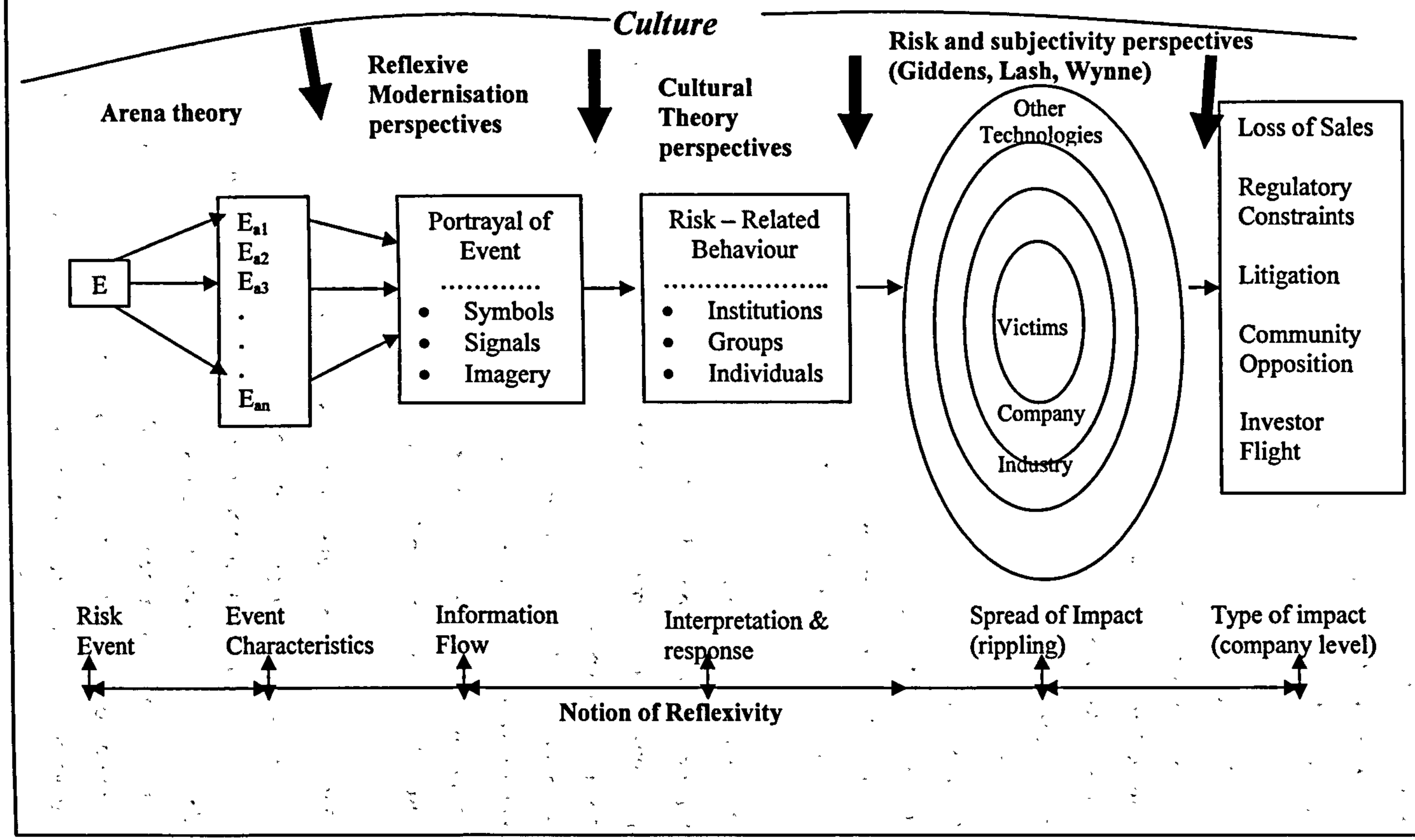
values can find no space within this conception. As a result ecological desecration is an inevitable consequence of an accounting practice based on such a model (*ibid.: 20*).

[85] As an extension of Cooper and Thomson's (*2000*) critique on national accounting. See also Gray et al (*1993, p 11*).

Figure 4.1: *Adaptation of the social amplification/attenuation of risk framework for research into the field of risk perception*



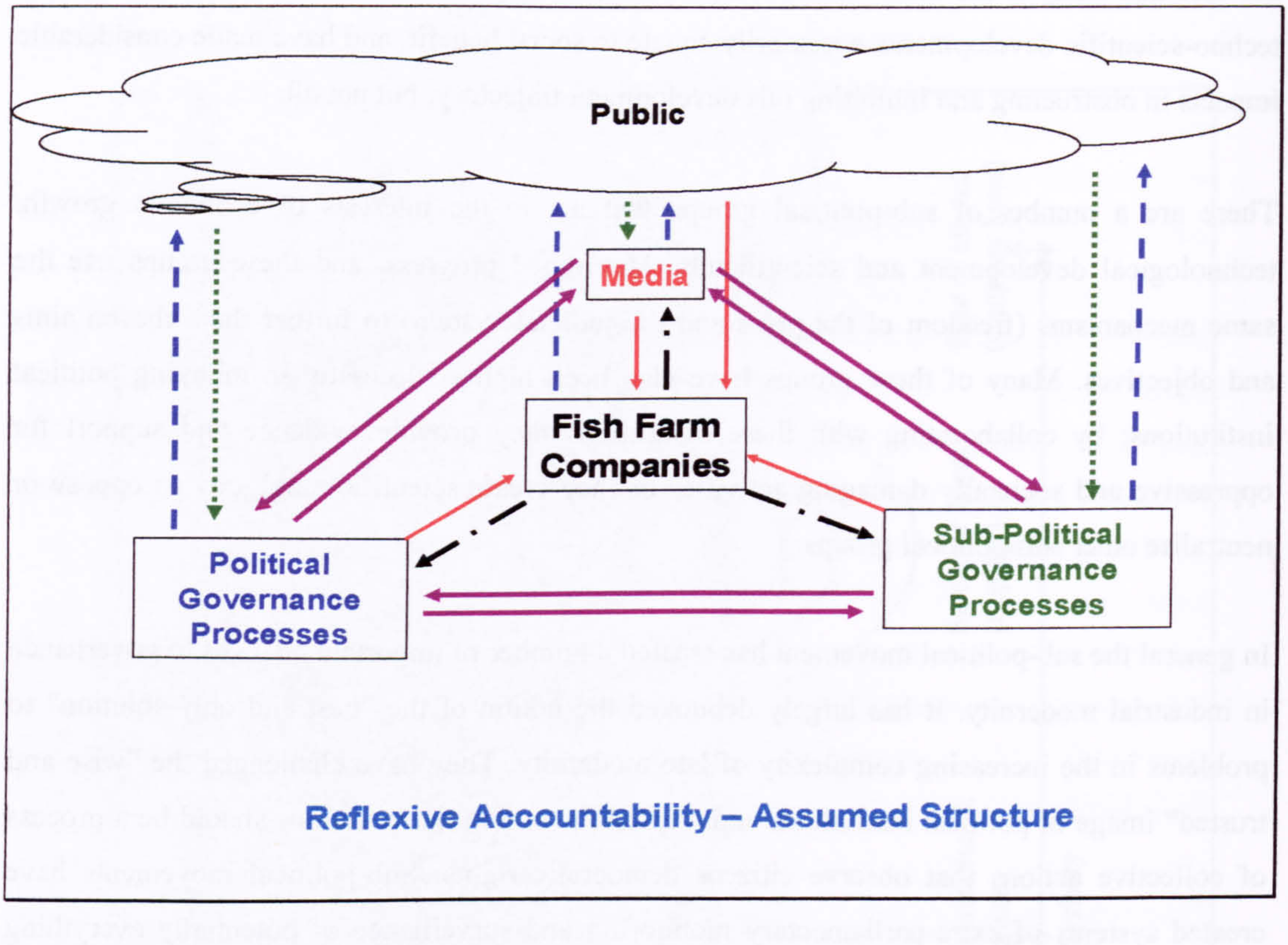
economic-technological developments, the exploitation of natural and/or human resources. It is the case that many of the most visible sub-political groups have been opposed to the notion that techno-scientific developments necessarily equate to social benefit, and have made considerable impacts in obstructing and inhibiting this development trajectory, but not all.

There are a number of sub-political groups that act in the interests of economic growth, technological development and scientifically determined progress, and these groups use the same mechanisms (freedom of the press and the judicial system) to further their chosen aims and objectives. Many of these groups have also been highly successful in lobbying political institutions; by collaborating with these institutions they provide evidence and support for oppressive and societally damaging activities or they create scientific ambiguity to oppose or neutralise other sub-political groups.

In general the sub-political movement has created a number of important changes to governance in industrial modernity. It has largely debunked the notion of the "best and only solution" to problems in the increasing complexity of late modernity. They have challenged the "wise and trusted" image of political institutions and created the notion that solutions should be a process of collective actions that observe citizens democratic rights. Sub-political movements have created systems of extra-parliamentary monitoring and surveillance of potentially everything and everyone. Sub-politics create sub-accountability processes to challenge the dominance of the political and corporate accounts. These sub-accounting processes create the possibility of a reflexive governance structure by enabling a creative and productive dialogic engagement between the political and sub-political movements. Reflexivity is the process that should bring about a rebalancing of power along the basic principles of modernity.

Risks can therefore be seen as locally and temporally emergent from these dialogic engagements (see figure 1.4). At any point in time there will be differences in what are "real" risks, methods of dealing with these risks and methods of adequately accounting for and communicating these risks to others. Risks at any point in time will be shaped by reflexively related factors such as political risk legitimisation processes, political governance institution and processes, political accountability mechanisms, sub-political risk legitimisation processes, sub-political governance institutions and processes, and sub-political accountability mechanisms. According the reflexive modernists the effective governance of risks depends on the inter-relationships between these different elements and the ability to transcend these fragmented legitimate risks and to synthesise new trans-disciplinary legitimate risks. These trans-disciplinary risks will then form the basis for constructing appropriate governance structures and accountability mechanisms. Accountability mechanisms are crucial in maintaining and evolving these reflexively determined risks as they are key to the re/de/construction of risk

Figure 4.2: ***Reflexive accountability communication links***



perceptions and critical to the pedagogic process Beck (*1992a p 181*) stresses as essential for reflexive modernity.

Examining accountability mechanisms offers a valuable insight into the legitimate risks of any (sub)political institution, and their modes of governance. Understanding accountability processes will allow the evaluation of the extent to which any system is reflexive. Who accounts to whom, what they account, how the account for it, how their accounts are received by others and how they perceive others accounts of the same phenomena, are important variables in an empirical study of accountability and risk governance.

Figure 4.2 illustrates the nature of accountability links that would be evidence of a reflexive process. The absence of any of these links would be detrimental and indicate a potentially ineffective risk governance assemblage. Ineffective, or unreflexive, risk governance could legitimate the perpetuation of ecological or social harm and create conditions for social conflict and disharmony. It should be noted that figure 4.2 is over simplistic as it presents political institutions, sub-political institutions, corporations, the media and the general public as coherent, homogeneous groups. Similar communication links within the nodes of the political institutions, sub-political institutions, corporations, the media and the general public would also be required.

The risk society inspired literature combined with the arena framework could predict a number of observable empirical occurrences. These could include, for example, variations in the perceptions of risks within and between political, sub-political and business organisations, the denial of certain risk perspectives, fragmented, single issue approaches to risk governance in both the political and sub-political domains, the absence of accountability processes or partial fragmented accounts of specific activities and the dominant assemblage to be a coalition of sub-political, political institutions legitimating the economic-technological development of business. It could also allow the observation of limited consensus and the emergence of proto-reflexivity of certain less controversial risks.

The arena concept for risk debates is not a new theory. It has been proposed by several scholars and has been endorsed by others for providing a particularly rewarding framework to analyse risk and environmental policies. So far its theoretical foundations have been scattered over the literature and its application to risk and environment has been no more than cursory. It is a framework capable of explaining social group responses to risk issues and of interpreting institutional and political actions directed toward risk reduction and risk management. Its advantages and problems in comparison with other competing positions are summarised below.

It explains that risk conflicts may not be about risks at all but about symbolic issues associated with risk debates. The arena metaphor focuses on both the structural rules of the arena and the perceptions of the actors.

Arena theory tries to encompass all those social factors that researchers have identified as influential for the social experience of risk. The theory suggests a clear focus and structure. Its emphasis is on social resources and their impacts on policies. This focus makes the theory valuable for designing research projects[86] and for selecting relevant phenomena for analysis.

It makes no inference about the actors' intentions or motivations (but it certainly allows their investigation and the risk communication between all the different actors). It focuses on their ability to mobilise resources. Conflicts in an arena are certainly grounded in differences in goals, values and interests. Whether these can be measured objectively or not is not the answer that this framework seeks to give; instead its focus is only on the means by which actors can influence the decision-making process.

By avoiding the question of motivation, arena theory does not imply a rational actor approach, nor does it assume that groups want to maximise their interests, nor does it pre-structure a group's profile as does the cultural theory of risk. Whatever the actors' goals are they can only be accomplished through the mobilisation of their resources. Availability of resources provides the bargaining power to influence the outcome of the policy process. If the last axiom is correct, social arena theory provides an elegant and powerful instrument for the analysis of social issues, in general, and risks in particular.

A limitation of the social arena concept is that it leaves the impression of politics as a game in which players want to win and spectators want to be entertained. The emphasis on social resources may obscure the fact that not all political actions are strategic and that people often mean what they say. The division between actors and spectators also gives the impression of a

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[86] An idealised format for research could be organised as follows: selection of an arena (or a stage of an arena); identification of major actors and their stated objectives (through interviews, value trees, etc.); identification of the formal and informal arena rules (through document study, interviews, etc.); search for clues about the availability of resources to each actor (financial situation, legal authority, social status, cultural affiliations, and access to scientists or science institutions); analysis of the role, position and strength of the rule enforcing agencies (legal power, image, trust, etc.); analysis of the communication patterns between the actors, issue multipliers, spectators and general public; design of a model capable for explaining actors' behaviour and conflict outcomes as a function of resource availability and mobilisation potential; transfer of model to other risk arenas or political arenas in general (*Renn, 1992b, p 193*).

democracy in which elites fight for power and influence and the masses are used as instruments for these elites to gain relative advantages.

Another problem concerns the empirical operationalisation of the framework. Almost any social behaviour can be interpreted as a resource mobilisation effort and any policy outcome as a product of the prior mobilisation efforts. If this is true the theory may still be good as an explanatory framework or a guide for data selection, but it cannot be tested empirically[87]. Thus we do not speak about the theory as true or testable, but rather as functional.

Social arena theory may produce only weak predictions of arena outcomes because the structural rules of arenas change and synergistic effects of interactions are difficult to anticipate. The theory may advance the knowledge, however, of present arenas and the actors within each arena. This knowledge can also help to restructure arenas or to assist the actors within each arena to reach a viable compromise.

Finally, arena theory is limited to the social processing of risk issues in political debates. It does not include individual perceptions or the motivations of individuals or groups to join a specific arena. Furthermore, it is based on a pluralistic and democratic policy style that is prevalent in the US and many European countries, but it is certainly not a universal style throughout the world. Arena theory does not pretend to be an integrative approach to include all relevant risk experience. It is rather a specialised framework for studying group responses to risk and to explain the dynamics of social conflicts within a special political system (*Renn, 1992b, p 194 – 196*).

Chapter 5 completes the study's rationale introduced in chapter 3 and further developed here with a discussion on the data collection methods and analytical techniques used in this work. At the same time the risk arena representation of the salmon farming industry in Scotland commenced in chapter 2 is enriched further through a short presentation of the participating in this study organisations.

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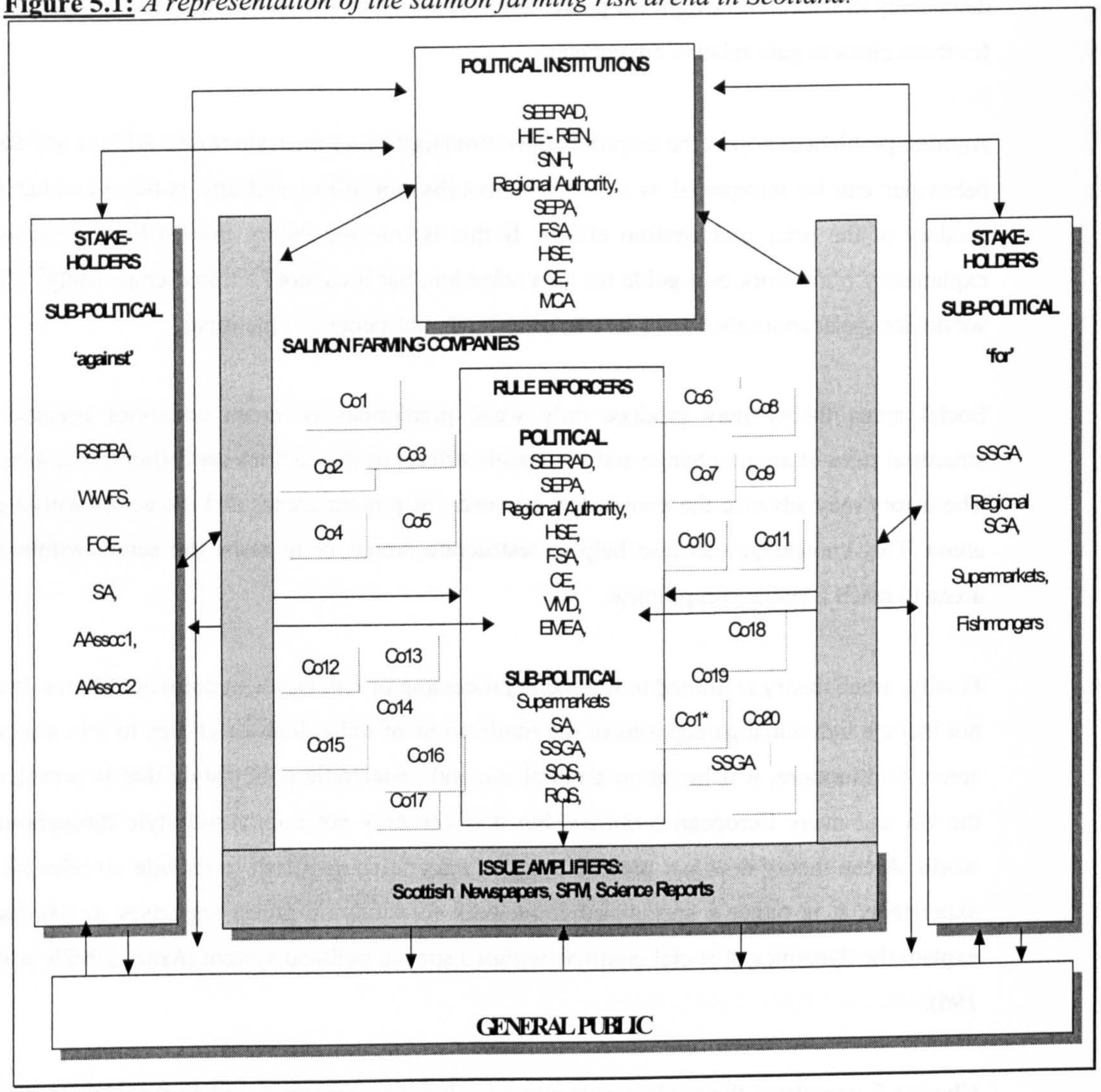
[87] If the five resources can be operationalised so that they do not include all behaviours that groups demonstrate the theory can be tested and potentially falsified (*Renn, 1992b, p 196*).

Figure 5.1: *A representation of the salmon farming risk arena in Scotland.*



Chapter 5: Research methods

5.1 Introduction

The attempt started in the previous two chapters to introduce and expand the rationale underlying this research is completed here. Chapter 5 discusses the research methods used to gather and analyse the associated data. In addition to that, the introductory picture of the salmon farming risk arena outlined in Chapter 2 it is enriched by giving a short description of the actors, regulators, political institutions and other stake-holding organisations that participated in this work. In figure 5.1 the reader can see a representation of the salmon farming risk arena within the context of this study.

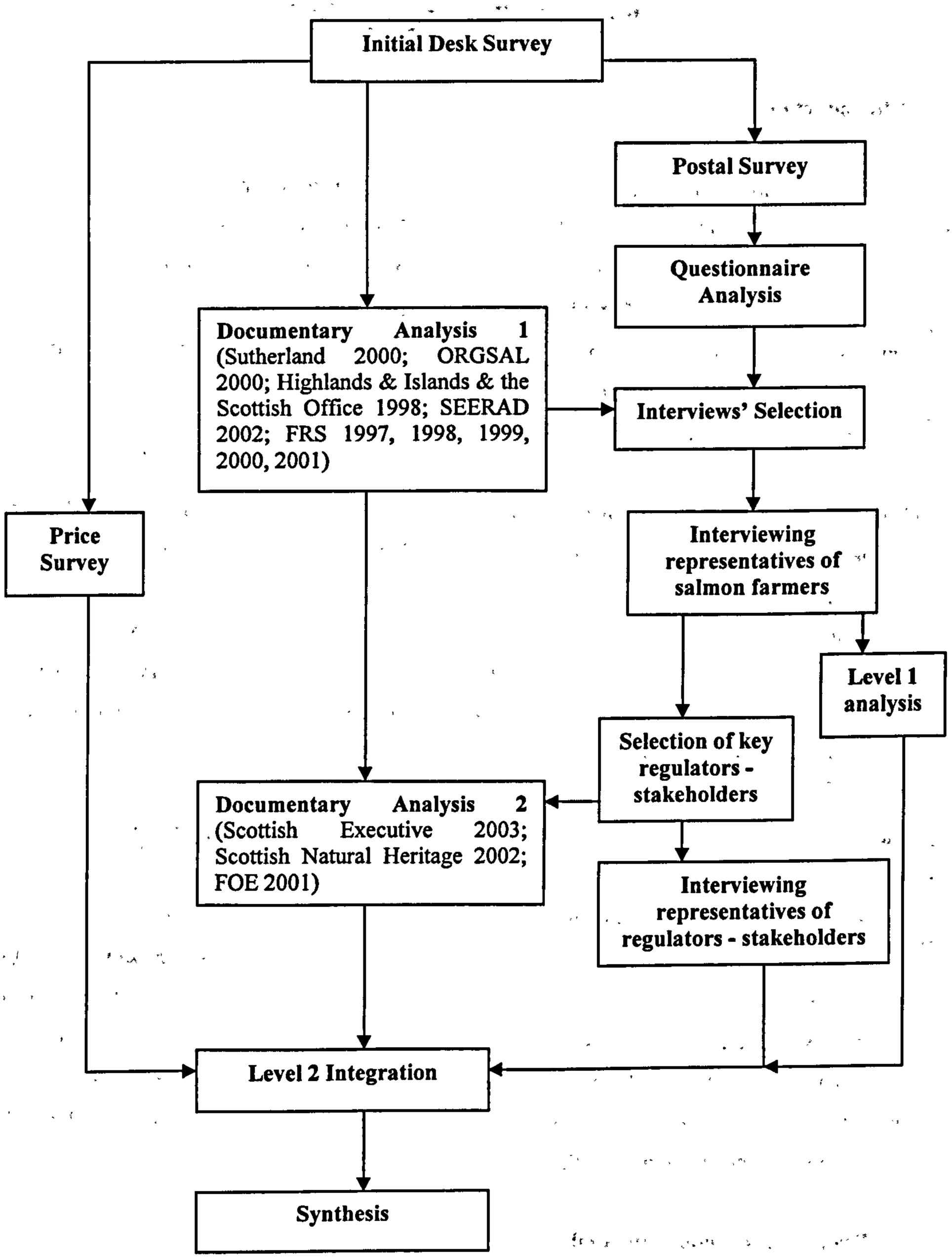
Chapter 5 is structured as follows: firstly the rationale behind the collection and analysis of salmon price data is explained. Then the conduct of the postal survey that was undertaken is presented, alongside a short presentation of the actors that participated in this part of the programme. Sections 5.4 and 5.5 give an overview of the main work carried out for the purposes of this thesis. The associated methods of interview data collection and documentary analysis are presented and are followed by section 5.6 where the organisations participated in this latter part of the study are presented.

The overall research process involved in this work is presented in figure 5.2. Initially a desk survey was made and it was followed by the postal (secondary) survey. At the same time the documentary analysis/review and the price survey commenced. The former in combination with the results of the postal survey fed into the selection process of the interviews. Fish farmers were interviewed and from the associated analysis, key regulators and stakeholders were selected. At the same time the researcher was signposted towards the collection and analysis of important documentation. Regulators and other stakeholders were interviewed and the respective analysis undertaken provided a framework for the second documentary analysis. All these were then integrated and synthesised together.

5.2 Price data collection and analysis

To form a better picture of the UK's retailing market prices of fresh salmon products (i.e. whole fish, fillets, steaks in the mainstream, organic, and wild-salmon market), price data were gathered weekly for a period of 80 weeks from four major retailing outlets (Sainsburys, Waitrose, Tesco, and Asda), three wholesalers (Vallance Co, Campbell & Neill, and McDicken

Figure 5.2: *The overall research process.*



Andrew Ltd) and two fishmongers (MacCallum's of Troon, and McClurg)[1]. The supermarkets prices were available on the formers' on-line retailing sites, whereas the wholesale and the fishmonger retailing prices were gathered on the phone. If for any reason a price could not be collected on the preset date, the average calculated from the previous and following price readings was used instead. The same denominator (i.e. £/kg) was used for all prices giving thus the same point of reference and averages were calculated at the end of the collecting period for all the respective salmon products for each of the outlets. Averages were also calculated in the cases where two different prices were applying for the same product because of different weight sizes. All averages were further grouped per category (i.e. whole fish, fillets, and steaks) for conventional, organic, or wild fish for each of the retailers/wholesalers.

Due to the confidential nature of the arrangements between supermarkets, it has not been possible to gather data on the price paid to farmers. However, prices have been gathered on the wholesale price of salmon, which does illustrate the extent of the mark-up on salmon and the discontinuity between retail prices and commodity prices in the salmon sector.

5.3 Questionnaire survey

A first attempt to gather primary data on this sector was made by using a postal survey. 120 questionnaires were sent out in an effort to capture information about as much of the industry as possible in order to reveal which producers might be willing to be interviewed by the researcher[2].

Assembling the survey mailing list was problematic as no comprehensive list of salmon farms existed. An initial list was formed after checking the website of Scottish Quality Salmon and following the provided links. A thorough online search had also to be conducted and more information was brought together about the existing salmon producing companies in Scotland. At the same time, directions were sought from SEERAD on where and who to look for. Links were suggested through the only existing governmental report at the time (*Highlands & Islands Enterprise and The Scottish Office 1998*).

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[1] All wholesalers and fishmongers were located in Glasgow with Vallance Co and McDicken Andrew Ltd, representing Glasgow's fish market. A fourth wholesaler had also initially been contacted but after a period of 11 weeks he decided that he no longer wanted to participate. For this reason the respective price data was not used in the estimations of the wholesaling price/price premiums presented in section 1.5.3.

[2] The rest of the political, regulatory and other stakeholder representatives had, rightly, been assumed as easier to identify and contact. For that reason the initial aim of the work undertaken targeted in the form of the postal survey the salmon farming industry.

Following this stage of identifying salmon farmers the questionnaires were posted to all the companies identified. The response rate however, was low (13.3%). From the hundred and twenty questionnaires posted, only sixteen returned after several follow-ups and from them only four companies were willing to participate later in the programme.

Although these initial results were disappointing with regard to the insights given for the specific companies and the industry, a first analysis of this data was deemed necessary prior to the design and conduct of the actual fieldwork (e.g. the interviews with actors in the salmon farming arena).

5.3.1 Methods of analysis

There is a plethora of books tackling the issue of design and conduct of survey research (see, for example, *Parasuraman, 1986, Ajzen, 1980, Bagozzi, 1984, Bagozzi et al, 1982*). Parasuraman (*1986, p 120 - 122*), distinguishes between two types of such research; exploratory, and conclusive. Exploratory research intends to develop initial hunches or insights and to provide direction for any further research needed. Conclusive is the research having clearly defined objectives and data requirements; it is capable of suggesting specific courses of action.

The survey conducted for the purposes of this thesis could be classified as exploratory research. Information gathered prior to this, indicated that the salmon farming industry is a secluded sector constantly under attack for its environmental practices, whose willingness to participate in this study could potentially be difficult and problematic. In this light there was a specific objective to identify potential interviewees for the main fieldwork involved.

A questionnaire is simply a set of questions designed to generate the data necessary for accomplishing a research project's objectives. Primary data collection in exploratory-research projects can be accomplished in an informal, flexible fashion like for example a checklist of items needed to investigate (*Parasuraman, 1986, p 341*). The questionnaire used in this survey consists effectively of 129 questions/statements, designed to: gather factual data about the companies involved; and to attempt an initial exploration of the main issues involving the industry's activities as these are seen by the producers[3].

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[3] Peterson (*1982, p 84 – 85*) identifies such data as non-causal data. Non-causal data are descriptive in that they typically only permit inferences about relationships among variables and only in unusual circumstances do they permit cause and effect inferences, and even then these inferences are relatively weak.

The questionnaire[4] was divided into four parts, the first three focused on gathering factual information about the respective companies' decision-makers; their fish-farming activities; and their markets/customers[5]. The fourth and largest part consisted of qualitative statements seeking to explore the respondents' views on issues relating to the market; the support provided to the industry; regulation and health of the farmed stocks; future prospects of the sector; and organic salmon. In addition, the respondents were asked to answer by indicating in a five-assessment scale their strong-agreement/ agreement/ disagreement/ strong-disagreement; or non–relevance (NR) of the respective statements.

Interval scales are arguably the most frequently used measures in marketing research, numbers are/can be assigned to indicate differences in the degree of a property along a continuum (*Bagozzi, 1994, p 12*). They permit measurement of the equality of objects and allow ordering objects according to some characteristics as well as permitting inferences concerning the extent to which differences or distances exist between the stimulus objects with regard to the characteristic being investigated. Consequently, symbols used in interval scaling must be (or can be) assigned numbers. The difference between any two adjacent scale numbers on an interval scale is the same as the difference between any other two adjacent scale numbers on that same scale. Because of this property, it is possible to manipulate the intervals in certain prescribed ways, even though the scale numbers themselves cannot be interpreted in any absolute sense. In other words there is no absolute zero or natural starting point for interval scales. Stimulus object characteristics are measured only with regard to an arbitrary zero point specified by the researcher (*Peterson, 1982, p 266 – 267*). There are many formats used to create scales that are approximately interval in character. One of the most popular and effective is called the semantic differential, which in its typical application consists of seven-point bipolar scales anchored with adjectives such as pleasant-unpleasant, good-bad, or useful-useless.

The Likert or summated rating scale, which is approximately interval in character, was used in this questionnaire design. This is a series of statements regarding an attitudinal object for which a respondent is asked to agree or disagree (the zero point in this questionnaire was arbitrarily represented by the NR option or by a no-answer). The attitude of the respondent towards a specific category (profitability of the salmon farming industry for example) would be computed as the sum of responses to all items designed to tap this activity. A typical Likert scale will have an approximately equal number of favourably and unfavourably worded items for a total typically of 6 to 10 (*Bagozzi, 1994, p 14 – 15*).

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[4] See questionnaire layout in the appendix.

[5] The respondents were simply called in these parts to indicate from a list and/or to write down their activities.

The initial analysis of the data focused on whether behavioural patterns could be identified from the assessment of the respondents' statements, which could potentially be combined with the information provided for each company in order to form testable hypotheses. The analysis was based on a systematic description relying on single descriptive statistics (minimum, maximum and average values per thematic category).

The first step of analysis involved coding the completed questionnaires and putting data into a spreadsheet format. For the initial search of a pattern in the respondents' answers, because the questionnaire was including statements with both positive and negative meanings, and in order for consistency to be maintained in the analysis, the latter negative meanings were inverted into positive ones and the assessed scaling mark given by the respondents adjusted accordingly. The new resulted questionnaires (named as inverted) were again coded and inputted into spreadsheets. The next step involved categorising the statements from the fourth part of the questionnaire (Q62 to Q115) into nine thematic categories concerning the profitability of the sector; structural trends; staff/staff support issues; issues of competitiveness; commercial issues; opportunities/future prospects; demand and quality issues; practices; and support. For each of those thematic categories and for each of the 16 respondents, a percentage of the statements of agreement in relation to the totality of the statements answered (that formed each thematic category), as well as the associated minimum, maximum and average position for these readings and for each theme, were calculated (numbers 1 and 2 denoted agreement, whereas 3 and 4 denoted disagreement). The respective minimum, maximum, and average positions for all the nine thematic categories and for each company were plotted and used for different kinds of categorisations of the respondents.

However, the data did not reveal any possible testable hypotheses. In addition to that, this kind of data manipulation was deemed as too subjective, complicated and perhaps without actual meaning given the small sample of respondents. The collected data was used to provide a first description of the salmon arena through the producers' views, instead.

This first presentation of the Salmon Risk Arena in Scotland[6], its actors, their views, and the associated issues is given through the use of simple descriptive statistics and simple calculations of percentages of agreement/disagreement of the respondents with the statements given to them to assess.

Descriptive statistics essentially allow the organisation and summarisation of the data gathered. A first step in the data description is to gain an understanding of the data. This is done by summarising them both in terms of numerical indices or statistics as well as in terms of

[6] See chapter 2.

Table 5.1: *A summary of the companies participated in the postal survey.*

Company reference	Ownership	Size	Products	Organic	Market	Certification Scheme ##
Co1#	Independent	Large	Salmon, Smolts	No	UK, France, Europe, US, Japan	VERITAS
Co2	Subsidiary	Small	Fry	No	UK, France	TQM (SQS)
Co3	Independent	Small	Salmon	No	UK	SQSS
Co4	Independent	Medium	Salmon	No	UK, Europe, France, US, Japan	FFSCS
Co5	Independent	Medium	Salmon	No	UK, France, Europe, US, Japan	LRM, TQM (SQS)
Co6	Subsidiary	Small	Smolts	No	UK	SQA (SQS)
Co7#	Independent	Small	Smolts, Processor	No	UK, France	FCS
Co8	Subsidiary	Large	Ova, Fry, Smolt, Salmon	No	UK, Ireland, Chile	FCS
Co9	Independent	Small	Salmon	No	UK	SSQC
Co10#	Independent	Medium	Smolt	No	UK	FCS
Co11#	Subsidiary	Large	Smolts, Halibut, Cod, Salmon, Processing	Yes	UK, France	SA, Own Scheme
Co12	Independent	Small	Ova, Fry, smolt, Salmon	Yes	UK, France, Europe	SA
Co13	Subsidiary	Large	Salmon	No	UK, France, Europe, US, Japan	
Co14	Independent	Small	Salmon	No	UK, France, Europe	LRM, TQM (SQS)
Co15	Independent	Small	Mussels, Salmon	No	UK, France, Europe, US, Japan	SSQC
Co16	Independent	Medium	Salmon	No	UK, France	SSQC

Companies that participated in the interviewing part of this study. More information is given about them in section 5.6.1

More information on LRM, TQM, and SQSS is given in section 5.6.1 (SSGA). For FFSCS see also section 5.6.2 (SA)

graphical displays. Usually data description is accomplished on a uni-variable basis with some bi-variable and multi-variable investigations carried out. The purpose of the data description is not to conduct a complete data analysis but rather to understand their underlying structure. This kind of analysis can be considered as exploratory and as such it must be characterised by openness and intuition rather than by a rigid structured format if it is to be of maximum benefit (*Peterson, 1982, p 422*).

It has to be noted that the descriptive information resulted from the questionnaire analysis relates to the number of the producers who actually answered/evaluated the respective questionnaire sections. Caution is needed when interpreting the results, taking into account the small number of respondents, as well as potential problems relating to the survey design. For this reason this initial picture was complemented with official governmental reports and statistics. In addition to that, the reader should keep in mind the survey's exploratory character and main aim; to identify potential interviewees.

5.3.2 Company description

In this section a short overview (table 5.1) is given of the companies participating in the respective survey[7]. Additional information is provided for those few cases in which the respondents accepted to participate in the second stage of this programme (i.e. the interviews) in section 5.6.1. The number given for each company (Co1, Co2, etc.) corresponds to the one that was given to them during the coding of each of the questionnaires.

Classification of companies into large, medium or small can be made by following various criteria (i.e. turnover, number of people employed, assets value etc). The classification followed in this study takes into consideration the number of people employed by each of the companies. The government classifies companies in the UK as: small, when the number of people employed is less than 50; medium, when they employ between 50 and 499 people; and large, when their employees are above 500 (*Internal Intranet of the Scottish Executive*). Alternatively, the Centre of Rural Economy of the University of Newcastle distinguishes between small and micro businesses. The latter are usually found in the agricultural sector and they normally have less than 10 employees. It is the author's opinion that each classification has to relate with the subject under investigation. In this case the largest company examined was Co11 with 106 employees, and the smallest was Co15 with two employees. Within this context companies with 14 and less employees were classified as small; companies from 15 to 45 people as medium; companies with 46 and more employees as large. The number of employees contains both full-time and part-time personnel.

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[7] See the appendix for a more detailed presentation.

5.4 Non-responding strategy

Two weeks before the end of the deadline for the return of the questionnaires of the respective postal survey, follow-ups were made in an effort to increase the number of the respondents. Those follow-ups (in the form of letters, phone calls, emails and faxes) were continued for approximately one month after the end of the deadline that had been set before the project was allowed to pass into its interviewing stage, with very poor results.

It was initially hoped that the responding sample would consist of a few: organic (primarily companies, given the focus of the study); mainstream; large; small; independent; and multinational subsidiaries that would allow a wide array of choices to focus the study upon.

This was not the case however. The response rate was particularly low (13.3%). From the sixteen responding companies only two were engaged in organic salmon production and from them only Co11 was willing to be interviewed. From the whole sample only four companies initially agreed to participate later in the study (Co5, Co6, Co10, and Co11).

Follow-up inquiries were made with a particular focus on Co12, since it was the second and last organic producing company[8] having responded. The rest of the respondents were also contacted for possible interviews. The result of all this was only 2 more companies agreed to participate later in the programme (Co7 and Co12). However, access to Co5 and Co6 soon after the initial contacts was declined on confidentiality grounds.

Nevertheless, interviews were arranged with the companies/organisations that agreed to participate in the second stage of the study (Co7, Co10, Co11, Co12 and the industry's representative body – SSGA) in the summer of 2003. At the same time inquiries to the regional manager of Co11 made possible the access to the rest of the companies operating in the "A" Islands (i.e. Co1, Co17, Co18, and Co19). Several follow-ups were made to secure those interviews. Access to Co1 also led to an interview with their marketing company Co1*. Also, access to Co7 led to the introduction to the only organic producing company in the specific locality, whose owner also agreed to be interviewed (Co20).

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[8]The company is located in a remote island area and it was particularly difficult to contact the owner. After several and persistent phone calls, emails, and faxes the owner was finally contacted and he agreed to give an interview. An appointment date was set. However, other interviews had already taken place and due to financial constraints, this interview was cancelled.

Table 5.2: *Organisations interviewed*

Organisations Interviewed#	
Salmon Farming Sector	**Political Institutions – Rule enforcers**
Organic	"A" Islands Council (5/6/03 – 6/6/03)
Co17 (25/9/03)	AEH (5/6/03)
Co18 (26/9/03)	AED (6/6/03)
Co11 (5/6/03)	AL (5/6/03)
Co19 (6/6/03)	SEPAA (6/6/03)
Co20 (13/6/03)	SA, Edinburgh, Scottish Mainland (4/7/03)
Traditional	HIE, Inverness, Scottish Mainland (8/7/03)
	SEERADFG, Edinburgh, Scottish Mainland (10/9/03)
Co1 (4/6/03)	SEERADASD, Edinburgh, Scottish Mainland (10/9/03)
Co7 (12/6/03)	SEPAD Head Quarters, Dingwall, Scottish Mainland (12/9/03)
Co10 (9/6/03)	**Stake-holding Organisations**
Co1* (23/6/03)	WWF – SWT, Inverness, Scottish Mainland (8/7/2003)
Industry's Representative Body	RSPBA (24/9/03)
	AAssoc1 (25/9/03)
SSGA - SQS, Perth (7/7/03)	Aassoc2 (26/9/03)

More information is given about these organisations in section 5.6

In that way the initial low number of salmon farming representatives was increased to ten. Even though this is still low in terms of actual numbers, it included all the companies operating in a specific locality at that time (i.e. the "A" Islands) whose richness of knowledge of the industry and the local, national and international contexts of the conditions in which they operate provided the insights sought. In addition to this the contextual information provided by the companies operating in different localities indicated the generalisation of the issues raised.

As a result even though the sample of the industry's representatives was different from the initial expectations, it still represented a reasonable mix of: organic; mainstream; large; medium; small; independent; and multinational companies, specialising in one or more functions of salmon production, processing, marketing and distribution and sufficiently covered the information needs of this study.

From the interviewing process[9] other important stakeholder organisations were identified both at local (the "A" Islands) and national level[10]. These were contacted and additional interviews were arranged. These interviews were far easier to arrange than the salmon farmers'.

In table 5.2 a list of all the twenty-three organisations interviewed is presented. In addition to them the Scottish Natural Heritage (SNH – see section 5.6.2), the Friends of the Earth Scotland (FOE – see section 5.6.3) and the political initiatives for the Strategic Framework for the Scottish Aquaculture (SF – see SNH in section 5.6.2) were represented in this study by the reports of Scottish Natural Heritage (*2002*), Friends of the Earth Scotland (*2001*), and Scottish Executive (*2003*) respectively. After directions were given to the researcher by the associated agencies/organisations on the subject matter, the above documents were included in the transcript analysis. These reports brought the total number of the involved in this study parties to twenty-six[11].

The reader can see in table 5.3 a list of the issues discussed during these interviews. These discussion issues were informed by the prior documentary and questionnaire analysis (see figure 5.2).

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[9] See Fontana et al (*1994, p 365 -366*) for a discussion on the merits of unstructured interviews.

[10] The choice of those organisations was led mainly by the respective associated branches in the "A" Islands as well as from the related information provided by the interviewees.

[11] A description of the participants in this study can be found in section 5.6. Specifically see: section 5.6.1 for the salmon farming sector and the industry's representative body; section 5.6.2 for the political institutions and rule enforcers; and section 5.6.3 for the stake-holding organisations. Additional information on the underlying regulatory framework can be found in section 5.6.2.1.

Table 5.3: *Discussion issues during the interviews.*

Interviewed representatives	Discussion issues
Salmon Farming Industry	Information about the company/organisation (name; years and scope of operations; personnel numbers; premises; history of operations' evolution; marketing and distribution; important performance factors; business objectives; constraints and decision making process;). Information about the main issues in the industry (concerns about: consolidation; co-operation; economic, marketing, and future viability/development issues). Information about the organic salmon farming sector. Information on relationships within the industry and with regulators, certifiers, stakeholders, and others. Information on environmental concerns about the current practices of the sector.
Regulatory – Political Institutions	Information about the organisation and its involvement with the salmon farming industry. Information on current issues about the industry (risks faced/posed by the industry and how they are regulated). Information on communication issues between the regulators, the industry and other stakeholders (Strategic framework, policy messages and implementation problems, other problems, relationships Information on support to the industry (subsidies, MIP, insurance schemes) Information about the organic salmon farming sector (discussion on environmental problems, motivation, implementation issues, sustainability issues and economics, environmental regulation's limitations).
Other Stakeholders	Information about the organisation and its involvement with the salmon farming industry. Information on issues of concern disputes. Relationships and communication issues with the salmon farming industry, the regulators, other stakeholders and the public. Information about the organic salmon farming sector (discussion on environmental problems, motivation, implementation issues, sustainability issues and economics, environmental regulation's limitations).

All the interviews were conducted at the interviewees' workplace, and in the case of the industry, site visits also took place[12]. All the interviews, lasting between forty-five minutes and one and a half hours[13], were recorded. Additional material was also gathered in the form of pictures and hand-notes after the end of each interview. The interviewees were friendly and supportive, even in the cases at which the interviews were not pre-arranged, and the researcher had simply appeared, providing a brief summary of the research and asking for the best possible directions/persons to inquire.

5.5 Interview analysis – an introduction

Qualitative research is a field of inquiry in its own right. It crosscuts disciplines, fields and subject matter. A complex, interconnected family of terms, concepts and assumptions surround the term and include the traditions associated with positivism, post-structuralism and the many qualitative research perspectives, or methods connected to cultural and interpretive studies. There are separate and detailed literatures on the many methods and approaches that fall under

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[12] Some of the farms (Co7, Co10, Co17, Co18, and Co20) were located in isolated areas and the journey there was subject to the weather conditions, with a high risk of cancellation. In addition, public transportation or even taxis and private cars were not always available. In the case of Co17 once on the respective locality it was found that further arrangements should have been made for reaching the final destination. Public transport was not available and it was very difficult to get a taxi or a private car since it would have had to come from the other end of the island. As a result, a good mile walk was required until the pre-arranged meeting with the owner of the farm took place.

The interview with AAssoc2 was the very last one taken for the purposes of this thesis. Due to unfortunate conditions it had to take place in a pub. That resulted in a very noisy tape recording. The researcher when played the tape back, he was horrified that much was not audible, being covered by background noise. An immediate transcription of the respective interview took place (10 – 15 minutes after it was taken), which in conjunction with the audible parts it made possible the almost intact representation of this interview on paper and literally "saved the day".

[13] There were only two exceptions. In the department of law (AL) of the "A" Island Council, the interviewee refused to be recorded and hand-notes were taken. Many questions were avoided on grounds of confidentiality (later it was found that the salmon producers were not having very good relationships with the respective department and perhaps the interviewee was afraid of possible biased treatment of the information provided by him) and the whole interview lasted for about fifteen minutes. The second case involved SEERAD's Analytical Services Division. The interview there was not pre-arranged and it took place while waiting for the interview from the Fisheries Group. The interviewee is responsible for the Scottish Sea farming industry and he provided valuable information on the policies of SEERAD regarding aquaculture. The interview was not recorded and it was kept at the level of an informal friendly discussion. It lasted for about twenty minutes and hand-notes were taken at the end of it.

Figure 5.3: *Path of a post-interview data analysis*

Data Reduction 1
'General Overview'
- Listen to separate tape recordings
- Listen to tape-recorded reflections
- Read/relevant journal/diary notes
- Revisit interview notes
- Add to above notes as necessary

Data Reduction 2
'Recording Initial Themes'
- Initial transcript review (with tape running)
- Record emerging themes on transcripts
- Develop intuitive 'open' coding scheme
- Constantly review journal /diary notes and reflections on listening to tapes
- Prepare critical 'big picture' summaries
- Emphasise contextual information, rapport and contradictions

Reflection period

Data reduction 3
'The reflection Phase'
- Revisit and re-read transcripts and interview summaries
- Patterns emerging?
- Search for extra open codes
- All portions of transcript coded?
- Search for evidence challenging initial coding
- Alternative concepts?
- Prepare rough initial matrices based on open codes formulated

Data Display
- Preparation of mind maps
- Prepare detailed MS Word open code matrices
- Collapse 'open' codes into core codes
- Separately record uncollapsed 'open' codes
- Reformulate open code matrices according to 'core' codes
- Reformulate 'core' code matrices according to interview role, industry sector and size of company

Data Interpretation 1
'Detailed Analysis Tools Review'
- Conduct detailed examination of matrices
- Identify key patterns in evidence
- Revisit transcripts
- Prepare second critical interview summary and compare with first summary to ascertain any new insights
- Update and review journal/diary notes
- Review mind maps
- Question if evidence can be organised differently

Data Interpretation 2
'Big Picture Outline'
- Create 'big picture' story outline of interviews in mind map and thematic form
- Collate outlying perspectives
- Use to challenge the big picture story

Review: Matrices; journal; interview guide; mind maps; summaries; interview notes; tape recorded reflections; contextual information; transcript quotations

Data Interpretation 3
'Formulating a thick description'
Write initial thick description of findings using big picture story outline
- Embrace complexity
- Revisit transcripts and other evidence as necessary
- Select illustrative codes
- Adequate search for alternative explanations/conceptions

Data Interpretation 4
'Contextualising the thick description'
- Adequate consideration of contextual information?
- Richness in data fully exposed?
- Avoidance of detachment from data?

Data Interpretation 5
'Employing the Analytical Lens'
- Interpret descriptive evidence using the analytical theme
- Beware of selectivity and highlight preconceptions/contradictions
- Construct a short story/narrative using an iterative process
- Be open to creativity in writing

Source: O' Dwyer (*2003*)

the category of qualitative research such as interviewing, participant observation, visual methods, and others[14] (*Denzin et al, 1994, p 1*).

Any description of what constitutes qualitative research must work within the complex historical field that characterises its evolution[15]. Qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter. This means that it studies things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people brings to them. It involves the studied use and collection of a variety of empirical materials (case study, personal experience, introspective, life history, interview, observational, historical, interactional and visual texts) that describe routine and problematic moments and meanings in individuals' lives. Accordingly, qualitative researchers deploy a wide range of interconnected methods hoping always to get a better fix on the subject matter at hand (*ibid.: 2*).

Baxter et al (*1998*) and Leavy (*1994*) see qualitative research as having a strong craft-like element, which allows competent field researchers to acquire a significant amount of knowledge because of hands-on experience (*O'Dwyer, 2003, p 276).* The researcher of course is the primary research instrument, personally responsible for gaining access to sites and interviewees, maintaining good field relations, collecting/analysing data and writing in creative yet credible ways. Furthermore the burden of inference falls on the researcher as opposed to a statistical methodology, which crunches inputs into outputs thereby effectively absolving the researcher of errors in inference (*Ahrens et al, 1998*, as quoted by *O' Dwyer, 2003, p 276*).

Despite the plethora of books on qualitative research methods and analysis[16] the process of transforming qualitative data remains quite challenging. Brendan O' Dwyer (*2003*) in his paper "*Qualitative data analysis: illuminating a process for transforming a messy but attractive nuisance*", develops a practical, non-prescriptive process of analysis, which he uses to transform data sets emanating from interviews into a well-founded, coherent and illuminating narrative. This process was adjusted and used as a guide for the analysis of the data acquired from the interviews conducted for the purposes of this thesis. O' Dwyer's analysis process is outlined in figure 5.3, and it is in accordance to Huberman et al (*1994, p 429*) definition of data analysis embracing the three linked sub-processes of data reduction, data display, and conclusion drawing/verification (or data interpretation in O' Dwyer's terminology). These processes occur before data collection, during study design and planning; during data collection as interim and

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[14] See for example: Fontana et al (*1994*); Adler et al (*1994*); and Harper (*1994*).

[15] See Denzin et al (*1994, p 1 - 2*).

[16] See for example: Huberman et al (*1994*); Richards et al (*1994*); King (*1998, 1999*, as quoted by *O' Dwyer, 2003, p 276*); and any book referring to qualitative research and methods.

early analyses are carried out; and after data collection as final outputs are approached and completed.

With *data reduction* the potential universe of data is reduced in an anticipatory way as the researcher chooses a conceptual framework, research questions, cases and instruments. Once actual field notes, interviews, tapes, or other data are available, data summaries, coding finding themes, clustering and writing stories are all instances of further data selection and condensation. *Data display* is defined as an organised, compressed assembly of information that permits conclusion drawing and/or action taking. The researcher typically needs to see a reduced set of data as a basis for thinking about its meanings. More focused displays may include structured summaries, synopses, vignettes, network-like or other diagrams, and matrices with text (as in the case of this thesis) rather than numbers in the cells. Finally, *conclusion drawing and verification* involve the researcher in interpretation; the drawing of meaning from the displayed data. The range of tactics used appears to be large, ranging from the typical and wide use of comparison/contrast, noting of patterns and themes, clustering, and use of metaphors to confirmatory tactics such as triangulation, looking for negative cases, following up surprises, and checking results with respondents. Many accounts of this aspect of analysis demonstrate that there is a multiple, iterative set of tactics in play rather than one or two central ones and in this sense "data transformation" may be a more appropriate term as information is condensed, clustered, sorted and linked over time (*ibid.: 429*).

Prior to undertaking the interviews for the specific work, the researcher had little idea as to how he was going to analyse the resultant data. For this reason a decision was made to tape record and transcribe any interviews as there were specific methods for analysing data captured in this manner (qualitative research method books and articles seemed to offer a plethora of possibilities for analysis). An analysis process was then brought into the attention of the researcher and it was used according to advice received from researchers, who had been or already were in that process, and text.

5.5.1 The analysis process

The actual analysis process started almost immediately after the recording of each respective interview along with its transcription. It was initially decided for the produced documents to be as complete as possible, which meant full interview transcription as well as the addition of comments in these reports from the hand-notes taken at the end of each interview. That initial decision was made on the grounds of a possible use of a Qualitative Data Analysis (QDA) software package later on in the process, (word processors, text search packages, relational database management systems, or special purpose software for QDA such as: code and retrieve

software; rule-based theory-building systems; logic based systems; index based software – NUD*IST; conceptual network systems to name but a few[17]), for the reduction and analysis of the data.

As a result, the first two interviews taken from Co1, and Co11 were fully transcribed in MsWord files[18]. However, it became apparent from the very beginning that full transcription is a lengthy process and the possible benefits from the usage of QDA software in the subsequent stages of analysis might not have been able to discount the delays met at the initial stage. In addition some introductory information or comments made in the interviews were not relevant to the research questions and they did not need to be transcribed. Concern also caused the future management of a potential plethora of produced documentation. Huberman et al (*1994, p 429*) note that qualitative studies, especially those done by inexperienced or lone-wolf researchers, are vulnerable when it comes to data management. An advice to the question singled out as naive by Kvale (*1988*, as quoted by *Huberman et al, 1994, p 429*); "*how shall I find a method to analyse the 1,000 pages of interview transcripts I have collected*" is "*never to conduct interview research in such a way that you arrive at a situation where you have to ask such a question*". That problem had also been highlighted by fellow researchers who were already struggling with the management of data that was produced through a similar process. For these reasons an alternative was required and the solution was mind-mapping.

Cognitive mapping is a process composed of a series of psychological transformations by which an individual acquires, stores, recalls and decodes information about the relative locations and attributes of the phenomena of his everyday spatial environment. That type of research seeks to understand how agents come to understand spatial relations gained through both primary experience and secondary media (e.g. maps). The term has been used: as a descriptive title for the field of study that investigates how people learn, remember, process and use spatial information about an environment; as a descriptive phrase for the process of thinking about spatial relations; and as a descriptive name for a methodological approach to understand cognition in general, consisting of the construction of maps of cognitive processes (as in the

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[17] More information can be found in Richards et al (*1994, p 449 – 461*).

[18] The initial choice of the full transcription of the interviews taken from those two companies was based on the fact that they were the very first to be interviewed and also because the production manager of Co1 was not the person initially arranged to be interviewed by the researcher. The interview with the manager in charge of the company never took place because of his hectic timetable, and the researcher was directed to a second and then to a third in the hierarchy manager. The interview took place with the latter who because of his position in the organisation (site supervisor) and his non-clear speech (at least on the tape), was considered as not having provided the required information. For that reason a decision was made to follow-up with the interview with Co1*.

case of this study). In the latter context, the term "cognitive map" is used as a descriptive term for a conceptual drawing of an individual's cognitive processes (*Kitchin et al, 2000, p 1 – 2*)

All the tape-recorded interviews were transcribed in the form of cognitive maps on flip charts with simultaneous grouping and heading of the associated/discussed themes. In these mind-maps the information from the hand notes kept after the end of the respective interviews (when this applied) were also added. That mapping process made easier the studying of each interview. Rather than going through pages of documentation in order to simply read the interviews before analysis was attempted, the researcher had now a visual picture of each stakeholder's responses that highlighted the main themes of discussion. This further stimulated the reflection on the theory process that had already started during the pre-interview and transcription periods. As O' Dwyer (*2003, p 279*) puts it, "*transcribing the interviews yourself enables you to analyse in depth as you transcribe and provides a better feel for the data as you progresses. This is unavoidably time consuming but it can be invaluable in terms of obtaining insights. It also forces the researcher to think about the data*".

Before reading the interview transcripts in depth, the researcher listened to the separate tape recordings in a relaxed manner. Additional material such as pictures taken, hand-notes or documentation provided by the interviewees, was also reviewed. This gave a general feeling for the interview findings and it helped the researcher to review some preliminary key thoughts that seemed to be in accordance with the literature.

The next stage involved the detailed transcript analysis (including the two non-recorded interviews of AL and SEERADASD from the hand-notes taken). In relation to the research questions as these are outlined in section 3, each interview was examined from the premises of three different conceptual lenses: a) what is the risk construction of each of the interviewed parties. What is risk for the salmon farmers, what it means for the rest of the involved parties – stakeholders, what it means/meant for the organic producers; b) how decisions are made in the salmon farming industry and how risk communication affects/has affected that decision-making process of the specific fish farmers to move into organic salmon production; and c) what is the communication route/relationship between the industry and the rest of the stakeholders and what are the messages conveyed back and forth.

The examination of the transcripts through each of these lenses led to the identification of variables for each of these categories. The text analysis was made through a *code-and-retrieve process* (*Richards et al, 1994, p 446*), which mainly involves the labelling of passages of the data according to what they are about or other content of interest in them (coding or indexing), and then providing a way of collecting identically labelled passages (retrieving).

The code-and-retrieve method is the most widely recommended technique for management of rich and complex records and it strongly supports theory construction and testing (*Richards et al, 1994, p 447*). Firstly, the generation of categories, even the simplest descriptors, whether arrived at prior to data reading or by discovery of recurrent topics or in vivo categories in text is a contribution to theory. Decisions are being made about what is a category of significance to the study, what questions are being asked, what concepts developed, what ideas explored, and whether these categories should be altered, redefined, or deleted during analysis. Secondly, decisions about what the text segments are relevant to a category are never merely clerical decisions: they always involve some theoretical consideration. Thirdly, the viewing of segments from many documents on one topic or selected topics always offers a new way of seeing data. This is the major claim of the method to support analysis and researchers using it clearly engage in the building up of theories. Moreover, the method can support the pursuit of patterns by comparison of text segments on that topic from different sources.

Thus, in the first level of analysis variables were identified for each of the respective themes and the interview transcripts were initially coded on paper (three levels of coding were identified) according to their dominant meaning and they were then inputted in spreadsheets and were grouped according to the earlier identified coding levels. For the risk perception category, the first level code indicates the general risk category whereas the second and third level codes are used for further grouping and description of the respective theme. For the communication/relationship process, these codes indicate which are the parties involved and the type of communication/relationship they have. A similar method of grouping was used for the message-conveyed category. The variables used, highlight the communication route between the involved stakeholder groups and the perception/message they want to convey.

The process followed allowed the researcher to know exactly the statements of each of the stakeholders and to be able to retrieve them at any point in time.

The next step involved the collapsing of the previously identified and grouped variables for the categories of a) risk construction; and b) communication route/relationship process, and messages, in more general ones (second level of analysis). At the same time attention was paid in marking the stakeholders who kept the view of the more general statements. By completing that process, a framework had been created for the analysis of the reports representing FOE, SNH, and the Strategic Framework for Scottish Aquaculture. These documents were thoroughly reviewed through the premises of each of the pre-mentioned conceptual lenses and the variables, new or existing ones, identified for each of the categories were added and marked respectively. The new variables identified from the respective reports were added in the groupings and were

informed by the interview transcripts in order to identify which of the interviewees were in agreement with these new variables.

The third level of analysis involved the preparation of cognitive mind maps on paper, presenting the risk issues and communication patterns as these had been raised by the different stakeholding groups. These mind maps allowed the identification of similar issues and that led to further grouping and coding of the more general variables for presentation purposes. For the risk construction theme, some of the higher-level categories that had been identified through the previous analysis process were collapsed together. The latter are described by the same constituent variables that were describing the former. Specifically the categories of economic, management, market, competition and globalisation risks were collapsed under the "economic risk" theme since all the variables identified relate to an economic dimension. Similar groupings were undertaken for the: communication and perception; and social and public risk categories. For the relationship and message themes, communication routes were drawn between the involved stakeholders and the associated variables were coded. Variables with similar meanings were described by the same code and as a result were further collapsed to more general themes. The different levels of interview analysis, the initial statements made, and the stakeholders making these statements, are available on request.

For consistency to be maintained each variable identified is represented by a code. This describes in a unique way the associated relationship and message variable for each of the interviewed groups although the numeric element does not always keep the numeric order. The latter happened because at some point in the analysis numbers had to be changed because of double entries and for the numeric order to be maintained the whole coding system would have to be abandoned and recommenced. However, this was not necessary since each code already had a unique name with a combination of letters and numbers. The examination of those variables and the respective code creation started from the group of the industry's representatives and it was continued with the regulators and the other stakeholder groups. Therefore the codes under I, R, and S denote the specific kind of relationships as these were initially identified by the industry, the regulators, and the stakeholders respectively, whereas the codes M#I, M#R, and M#S describe the associated messages conveyed, as these again were initially identified by the industry's statements and progressively by the regulators' and the rest of the stakeholders' views.

5.5.2 Reflections on the analysis process

The analysis outlined above is a personal one and it emerged after seeking advice from literature and listening to other researchers' experiences. In the researcher's view there is no such thing as

rigorous qualitative analysis only a personal continuous struggle to group, categorise, code, and ultimately make sense of the data collected. To use O' Dwyer words (*2003, p 287 - 289*), "*it is essential to bear in mind that qualitative research is not value-free and it mainly represents a particular perspective rather than any form of absolute truth. There is never going to be one true story from a set of qualitative data*". The process that was followed merely served as an analysis technique. Therefore, the categories/variables emerging if a similar analysis was to be undertaken by another researcher might be slightly or much more different than those of this study. It is in the researcher's view, however, that the transparency and ability for replication[19] of the process as it was described earlier, as well as the explanatory power of the associated literature, provide the analysis with rigour and perhaps with similar results and conclusions, if one were to replicate the undertaken research.

Another issue might relate to the lack of use of any of the existing special-purpose software for qualitative data analysis (QDA). The code-and-retrieve method supports theory emergence. It also expresses theories that can be represented by codes and then tested by looking for codes in text and studying the relationships of codes. One therefore could argue that computer-based code and retrieve will do this better, because computers are good at working with structure and not content because in a code-and-retrieve system content is defined by coding the text. However, possible interpretive theories can find support in the content of the data and not in the structure of textual records. Management of records by use of code-and-retrieve in such cases offers help, but that help is limited to retrieving all passages coded with something relevant to the theory in question, so that the researcher can reflect on them altogether. However, in assessing what computers contribute one needs to distinguish textual-level from conceptual-level operations. Code-and-retrieve software is a textual level operation, whereas one's codings and retrievals are guided by theoretical interests that are used to shape and test theory. Therefore QDA could potentially put theoretical blinkers on one's text assessment. Textual-level operations are theoretically relevant, but they do not construct or operate on theories (*Richards et al, 1994, p 447 - 448*). Because of the above, as well as due to concerns for the necessary time

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[19] Tsang et al (*1999*), discuss the merits provided by replication in the social sciences and their associated limitations. Articles about replication usually focus on the issues of reliability, internal and external validity (or generalisation) and it is normally argued that the first replication is "the most dramatic" focusing on the generalisation function of a theory. The critical realist does not claim that replication can provide conclusive verification or falsification of theories and failure of replication to confirm previous findings does not mean conclusive falsification. In qualitative research, replication helps researchers to interpret the findings of a repeated study. By trying to understand events in their context light is thrown on the specific contingent conditions under which the postulated mechanisms operate and this in turn helps to compare the findings of a replication with those of an original study. Knowledge accumulation can be improved through replication.

needed to spend on learning how to use and programme a QDA package, a decision was made against such software usage. The first level of textual analysis was made manually and this allowed content and contextual factors to be attributed to the identified initial variables and groupings.

Large-scale research demands total immersion and commitment as well as a realisation that the researcher is a key part of the analysis. Whatever process of analysis one uses there is no substitute for knowing his data intimately. Qualitative research can challenge and/or further inform the literature underpinning a study. The researcher initially possessed a good knowledge of the associated risk literature and the story revealed by the interviews seemed to be explained by certain parts of this literature. However, the analytical process was laborious and at times tedious. The interview transcription and data categorisation seemed never-ending and there were significant concerns about whether the analysis and interpretation of results, will be acceptable by examiners and reviewers.

5.6 The interviewed organisations and document analysis entities

This section provides some background information on the organisations that agreed to participate in this study (see table 5.2 for a summary).

5.6.1 The actors

Co17: is a family-run business with four full-time employees. Current production capacity is 300 tonnes of organic salmon farmed in two sea-sites. They buy their organic smolts from a family run organic hatchery in Inverness. The company started operations in 1984 and in 1997 became one of the first producers of organic salmon production. Co17 owns 5% of Co11 and uses the processing, packing and marketing services of the latter's as well as Co11*. All their organic fish is packed by Co11 and distributed through its network (*Co17*).

Co18: is a family-run business with four full-time and two part-time employees. Current production capacity is 170 tonnes of organic salmon farmed in two sea-sites. They buy their organic smolts from an organic producer in the vicinity in which they operate. The company started operations in 1989 and subsequently moved into organic production in 1997. They are planning to expand their organic production in two more sea-sites. Co18 also owns 5% ofCo11 and it uses the latter's marketing teams as well as those of Co11* to sell their fish. All its organic fish is packed by Co11 and distributed through its network (*Co18*).

Co11: is a subsidiary of the Norwegian Co11**-Group with 106 employees and annual production of 8,000 tonnes of (mainstream and organic) salmon, salmon smolts (250,000 fish p.a.), halibut (500 tonnes p.a), and cod (broodstock and fry) in 18 sea-sites, five of which are fallowed. The company operates its own processing plant in the vicinity. Co11's processing and marketing activities are integrated with those of another Co11**-Group's subsidiary in Scotland called Co11*. Co11 initially started as a marketing co-operative in 1993 for all salmon producers in the "A" Islands. Due to gradual consolidation the largest firm member "E" took over a number of the smaller farms and inherited shares in Co11 and grew to be the biggest shareholder (90% of the shares). "E" was then bought by Co11* (a Scottish vertically integrated salmon firm), which in turn was bought up by "C" (a Norwegian feed company). "C" was sold twice within months. Initially it belonged to "D" but the whole "D"-Group was bought by "B" and because "C" did not fit into their portfolio (they already had a feed company) it was sold to Co11****. At the same time Co7*, which was the main customer of "C" was bought by the Co7**-Group (another feed company), and "C" lost its main customer. The latter presented the case to Co11**** board that their feed business could be secured by vertical integration in fish farming. Until then Co11**** did not have any farming operations so they bought farms in Chile, Canada and Scotland and became the Co11**-Group (operating in Scotland via its new subsidiary Co11***- Scotland). The Co11**-Group at the time of the writing of this thesis is 80% owned by the Norwegian Government and the funds to buy "C" and by implication Co11* (which it still operates under the old brand-name within the Co11**-Group, but now its main function is sales and marketing) came from the government swapping debt for equity. The Co11**-Group and the Co6**-Group (another Norwegian multinational) entered into an agreement (and formed together Co19) with which the Co6**-Group produces fish for the Co11**-Group to process, market, and sell for a better deal on fish-feed from "C". Co11 still unofficially acts as a co-operative and the two smaller organic producers (Co17 and Co18) still own 5% each of the initial shares of Co11 and they process and sell their fish through Co11* and Co11.

Co19: is a subsidiary of the Norwegian Co6**-Group, which has operations in Norway, UK, Spain and Chile. Their UK operations specialise in vertically integrated production of Atlantic salmon, from the egg right through to market-sized fish. They have an agreement with the Co11**-Group to grow organic and mainstream salmon for them. Co19 operates in five sea-sites (one of which is rented from Co11***-Scotland). At the time of the interviews acquisition negotiations were underway with the Co11**-Group. Co19 moved to the "A" Islands in 1999 from the Western Isles and initially bought two organic sea-sites, a processing factory and developed its own marketing and sales activities. Their main customer was Co11*. In 1999 their processing factory burned down and due to financial problems they decided not to rebuild but to contract processing with the Co11**-Group (*Co19*). The production manager of Co19 (who was

interviewed by the researcher) is also the Chairman of the "A" Islands' Fish Farmers Association and in his views he represented the five engaged in salmon production companies operating in this locality.

Co20: is a salmon-producing company with 70 to 80 Full Time Equivalent (FTE) employees, located in the Western Isles with seven sea-sites and an annual production of 1,000 tonnes of salmon. 50% of their production is currently organic and they have plans for all of their output to become organic. The company has been operating for 20 years. In 2000 they diversified into organic fish. The company also owns a sales division and a processing plant that includes a smoking operation. The sales division originated as a marketing co-operative, but as a result of consolidation in the industry it is now fully owned by Co20 (*Co20*).

Co1: is part of a larger family-run group of companies with 35 to 40 employees, operating in six sea-sites, with a production capacity of 5,000 tonnes per annum of non-organic "quality" salmon. The group owns two hatcheries, a broodstock site and a marketing company. The farming company moved to its current location following an oil spill at the site of their original farm (*Co1*).

Co7: Currently a salmon-smoking company with 12 employees. They started operations in 1982 as a salmon farming company with a maximum production of around 800 tonnes of mainstream salmon, 250,000 smolts and 7 tonnes of sea trout per annum. They ceased their production operations in 2002 because of poor profitability and disease problems and they are currently renting out their facilities (three sea-sites, two freshwater sites and one hatchery) to Co7*, which is a subsidiary of the Norwegian Co7**-Group. Their smokehouse operation is the only part of the company still surviving (*Co7*).

Co10: Smolt-producing company with five fresh-water sites and three hatcheries in the Scottish mainland. The company employs 25 local people and initially started as a sporting estate in 1984. It is a large (in production terms) independent smolt producing company with an annual output of 6.5 to 7 million fish. In the past they had conventional salmon-growing operations which they stopped due to poor market conditions. They specialise now in quality smolt production tailored for the Scottish marine environment (*Co10*).

Co1*: is the marketing company of Co1. The company has been in business since 1992 and in the past they used to trade other producers' fish but after they developed their own sites with Co1 they only trade their own production. They currently employ six people (*Co1**).

Scottish Salmon Growers Association (SSGA) – Scottish Quality Salmon (SQS): This is the official representative body of the salmon farming industry in Scotland, founded in 1982. It operated on a part-time basis until 1988 when it switched into full-time operations. SSGA's main objective is to develop salmon production in Scotland in line with the salmon's market growth. The association does not represent all salmon producers in Scotland and its members include local Farmers Associations. For example, the "A" Islands Fish Farmers Association is also a member of the SSGA. The Shetland producers are independent and represented through the Shetland Salmon Farmers Association (SSFA). SSFA works closely with SSGA, but SSFA runs its own certification scheme through Shetland Seafood Quality Control (SSQC). SSQC is an independent quality assurance organisation aiming to maintain and strengthen the Shetland Islands' reputation for high quality seafood products.

SSGA member companies plan their production volume on an individual basis but SSGA monitors production on a national basis. SSGA plans the production of the industry on a collective basis, by forecasting with the use of biomass models, what is coming out in a six-monthly period. This is intended to help producers avoid harvesting too much fish in the same period and avoid medium-term price collapses. SSGA representatives believe that the industry needs to control its output in order to avoid the type of price collapses that have occurred in the past. SSGA has funded projects on vaccine, marketing, and standard development (with regard to food safety; e.g. residues). The other main activity of SSGA is operating Scottish Quality Salmon (SQS) certification scheme (*SSGA*).

Scottish Quality Salmon is dedicated to improving the quality and commercial viability of salmon farming in Scotland. SQS now represents around 65% of the salmon produced by the Scottish salmon farming industry. SQS offers considerable advantages to salmon producers. It is recognised in France where in 1999 23% of Scottish salmon was exported and it has qualified for the prestigious Label Rouge award for Scottish farmed salmon by the French National Commission for Labels and Certification of Agricultural Food Products. SQS was the first and only non-French certification scheme that achieved this status.

SQS uses the Tartan Quality Mark, which assures retailers and consumers that the salmon is Scottish and that the production processes have been "*rigorously and independently*" inspected at every stage by Food Certification Scotland Ltd inspectors. These inspections include husbandry practices, temperature and hygiene controls, processing and handling. Every salmon

with the Tartan Quality Mark can be traced back to source. All members of Scottish Quality Salmon must participate in independently operated Product Certification Schemes operated by Food Certification Scotland Ltd. Food Certification Scotland Ltd is accredited to EN45011 by the United Kingdom Accreditation Service (UKAS), and is approved as an Organic Sector Body by United Kingdom Register of Organic Food Standards (UKROFS). Its governing board is independent and it is composed of representatives from the Scottish Trading Standards Departments, local authorities, consumer groups, academic institutions and the food production industry. The product certification schemes involve: a) Salmon Smolts; b) Scottish Quality Farmed Salmon; and c) Smoked Scottish Quality Salmon (*http://scottishsalmon.co.uk*, 3/4/2003).

SQS has also integrated the environmental management standards (ISO14000). Producers who are members of that scheme automatically qualify for Label Rouge and that has positioned the Scottish salmon industry in a quality market as opposed to the commodity product. Quality is seen as being able to keep the Scottish industry "*ahead of the game*". Label Rouge for example gives £400 to £500 per tonne more to Scottish producers. Price differential in the UK between quality and commodity fish is less (£70 to £80 per tonne) (*SSGA*).

5.6.2 The rule enforcers – political institutions

"A" Islands Council: It was originally established as a single, all-purpose authority, providing all local services, in 1974. It became the model for the reorganisation of local government in Scotland in 1996, when 32 all-purpose authorities were created. The Council is currently devoting much effort and resources to improving the delivery of its services. It produces a number of policy statements and strategies, including a corporate plan. It also co-operates closely, though the Community Planning process, with other public and private sector organisations. Co-operation with other public sector agencies like NHS "A" Islands and "A" Enterprise is particularly close given the responsibility all these organisations have for the same area (*organisation's website, 13/5/2004*). Within the Council the Planning Department[20] has inputs in new developments under the planning legislation and takes into account environmental impacts through the Environment Impact Assessments (EIAs) required from the proposed developers. The EIAs come into the department and are circulated to the rest of the bodies for their interpretation. SEPA is consulted for the respective developments, and the Planning Department will make a recommendation to the elected counsellors for approval or refusal of a planning permission (works' licence for the salmon industry) (*AEH*).

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[20] An interview from the respective department was attempted but the officer responsible for the planning permissions directed the researcher to the Departments of Economic Development and Law.

"A" Islands Council – Department of Environmental Health (AEH): The department is responsible for the public health, with an interest in the ways environmental impacts affect this. Consequently, they are concerned with the discharges every industry in the locality has/might have. Their interest in the local salmon farming industry is restricted only in their onshore activities and these are taken into account when they are considering any applications for commercial developments. Examples of their merit are: the amount of fish-feed left in the plastic bags onshore which if it is not managed properly, it may attract vermin and gulls which spread in the community; deliveries in inappropriate times from suppliers of the industry; vehicle movements and odour that may disturb the local residents; food safety aspects related to compliance with hygiene regulations of the processing plant of Co11 (*AEH*). Once the industry goes offshore then is very little input from the respective department and responsibility passes to the SEPA's branch (SEPAA) on the locality (*AEH*).

"A" Islands Council – Department of Economic Development (AED): The department is responsible for property developments, business advice, and financial support for the industries operating in the "A" Isles. Support is normally given in the form of business start-ups, expansion, grants, loans, or in the case of the salmon farming industry financial assistance for the construction of the fish processing plant[21]. This support also includes provision for infrastructure that businesses can develop themselves (Industrial Estates' related, transport infrastructure, etc.). All eligible businesses can apply for assistance for start-ups, modernisation, expansion, and aquaculture is an eligible sector. Support is currently provided to the shellfish industry. Diversification is examined as a solution for the fragile outer islands of the locality where there is a lack of employment opportunities/alternatives. The Council is assisting in the R&D costs in those areas and encourages cooperative groups to go and look at cultivation methods and marketing in those remote areas (*AED*). Related information is normally provided to businesses by directing them to the appropriate agencies/organisations. All development projects are funded from the Strategic Reserve Fund[22] .

In the past, the department was actively involved with the local salmon industry. Financial assistance of up to £3,000 was given to individuals to diversify from farming and fishing and start new businesses. This has now changed. The salmon industry has reached maturity and

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[21] The Co-op Co11. Even though the ownership of the company has changed and it now belongs to the Co11**-Group the processing plant is still owned by the "A" Island Council and is leased to Co11***-Scotland. They also assisted the industry indirectly by funding the establishment of a marketing company ("A" Quality Food & Drink Group Ltd) in the past in order to ensure that all products from the "A" Islands would receive a strong brand image (*AED*).

[22] Sourced from the tax the Oil Industry pays on its revenues (*AED*).

what the farmers know is by far greater than what the development services can offer. Subsequently the department has very little direct involvement with the industry (*AED*).

"A" Islands Council – Department of Law (AL): Department responsible among other things for the licensing of the shellfish and salmon farms. They are dealing with the actual legislative procedure. They check if everything is in order or if any kind of problems arise (complaints from the public, for example) for the respective licensing of applications. In their work they closely consult with the Scottish Natural Heritage (SNH), Scottish Water, Scottish Executive, SEPA, and the Crown Estate, and after they take into consideration all the associated issues they try to address them with the applicant. They are preparing the necessary documentation for the licensing application, which is then considered by the Planning Department (*AL*).

Scottish Environment Protection Agency (SEPAA) – "A" Islands branch: The department is responsible, amongst other things, to regulate the discharges of the salmon farming industry in the vicinity. They have specific guidelines and their role, apart from monitoring and forcing the existing farms to comply with their consent status, it is to also consider applications for further developments (with issuing of new discharge consents). For a given set of conditions in a sea-site there is a range of potential (fish) tonnages that could be permitted to keep. Those conditions involve the complex relationships between the current speed and the sea-bed of the site and effectively SEPA makes judgments on the assimilative capacity of the environment. SEPAA also acts a consultee for the "A" Island Council concerning the EIAs required for the works' licences (*SEPAA*).

Soil Association (SA): The Soil Association was founded in 1946 by a group of farmers, scientists and nutritionists who observed a direct connection between farming practice and plant, animal, human and environmental health to promote the case for an alternative, sustainable approach to agriculture that has since become known as organic farming. Since then the organisation has developed organic standards and now works with consumers, farmers, growers, processors, retailers and policy-makers. Its mission is to create an informed body of public opinion about the link between farming practice and plant, animal, human and environmental health and to promote organic agriculture as a sustainable alternative to intensive farming methods.

The Soil Association has set standards in the following areas: farming and growing covering arable, livestock, horticulture, plant raising, smallholders, and wild harvesting; processing and manufacturing including manufacturers, abattoirs, on-farm processors; retailing and catering including packers, delivery schemes, wholesalers, restaurants; importing; forestry, wood and paper products; fish farming; textiles; and health and beauty products.

The Soil Association is an organisation driven by a strong, clearly defined value set based on the fundamental link between healthy soil, healthy food, healthy people: "*We can do this because we are an independent charity and are not motivated by profit - **our goal is to promote the highest levels of organic integrity.** We want to ensure that Soil Association standards meet consumer expectations, reflect the best sustainable practice and become a benchmark for organic production globally. Certification and inspection, carried out by our wholly-owned subsidiary Soil Association Certification Ltd, ensures that these standards are adhered to.*" *(www.soilassociation.org, 14/2/2004)*

The Soil Association organic symbol is the UK's main certification mark, appearing on approximately 70% of organic food produced in the UK. Soil Association accreditation is generally accepted as a guarantee that the product meets, and in a number of important areas, exceeds minimum government "organic" requirements. The Soil Association is continually reviewing and upgrading their standards as part of their mission to raise the quality of organic food.

In the late 1990s the Soil Association decided to look at the development of organic standards for fish farming for two main reasons: a) other countries has already started developing their own organic standards and they wanted to import organic fish to the UK; and b) some farmers had already decided to produce fish organically. As regards the first, unless the UK developed its own standards, it could not implement the standards of a third country. Therefore it was very important that at least one certifier in the UK had some input for implements on organic standards in aquaculture. Fish farmers from the "A" Islands approached the Soil Association requesting the establishment of organic standards for salmon production. After a period of discussion an initial set of standards was agreed and the organic certification process was implemented around 1998.

The Soil Association was not convinced about some of the environmental issues associated with salmon and trout farming such as: a) the linearity of the system trying to manage. The marine system is not a closed one in the sense that there is not a closed loop in the marine environment as far as energy resources are concerned. A lot of fish-feed for example that goes into the system goes straight down into the water. Soil Association's principles are based on closed systems where resources can be recycled and that is not the case with fish farming; b) the raw materials for the fish-feed come from industrial fisheries that even though they are supposed to be "sustainably" managed, catching live fish in order to feed livestock is not considered a sustainable practice; c) sea lice carried on farmed stocks is passed on to wild stocks of trout and

salmon; and d) salmon have a migratory instinct, which is potentially denied when they are contained in cages against organic principles (*SA*).

However, SA decided that organic production aims to work more with the environment and to improve the environmental impact of the industry. For that reason interim organic standards were put in place. SA is currently working with the organic producers, SEPA, SNH, and Local Authorities to: a) finalise these organic standards; b) develop organic standards for other species (such as cod, halibut, turbot, and shellfish); and c) harmonise the UK organic standards with other certifiers in the EU in order for exports/imports to become easier.

Apart from the Soil Association, Food Certification Scotland (FCS) and the Organic Food Federation (OFF) had drafted organic standards for aquaculture but never implemented them. The Soil Association is currently the only organic certifier in the UK that has actually implemented its aquaculture standards[23] (*SA*).

Highlands & Islands Enterprise (HIE): The HIE network is responsible for economic and community development across a diverse geographical area which covers more than half of Scotland. The network reports to the Enterprise & Lifelong Learning Department of the Scottish Executive and its services (direct investment into businesses, workforce training, etc.) are mainly delivered through ten local enterprise companies (LECs), each one based in the area it serves and run by a board of local business people and community leaders. Every LEC offers its customers access to a range of specialist information, professional advice, help with training, infrastructure and financial assistance (*HIE, 2002*).

HIE has been involved financially by investing in the sector almost from the very beginning of the salmon industry in Scotland. The industry had been seen as something almost uniquely related to the rural areas and grant assistance was provided at the level of individual businesses[24] as well as to the industry's trade unions (SQS, Scottish Shellfish Marketing Groups and others). HIE is still putting some funds into aquaculture for new species development (cod hatcheries, halibut development, shellfish farming) but their involvement with the salmon industry in terms of funds and advice has been steadily decreasing (*HIE*).

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[23] The Royal Society for the Protection of Cruelty on Animals (RSPCA) has also developed a freedom food label for less intensive on growing of fish. Co4 (see appendix) is certified by them but their product is not called "organic" (*SA*).

[24] HIE was able to invest grants, provide loans or even take shares in businesses. The latter were expected to make their own business plans and the available funds were provided on a discretionary basis on the grounds of those plans (*HIE*).

Scottish Executive Environment & Rural Affairs Department (SEERAD): SEERAD is responsible for advising Ministers on policy relating to agriculture, rural development, food, the environment and fisheries, and for ensuring the implementation of those policies in Scotland. The Department also supports and promotes the agricultural and biological science base in Scotland. Its main aims are: a) to help improve the economic performance of Scotland's agriculture, aquaculture, fishing and food industries within the wider context of sustainable exploitation of the national natural resources and rural development, while safeguarding the interests of consumers, protecting and enhancing the environment, and ensuring a fair deal for the taxpayers; b) to support Ministers in helping the people of Scotland secure a high quality of life through sensitive stewardship and sustainable development of the natural resources of Scotland; in particular by securing a clean, healthy and safe environment, ensuring a safe and effective water industry, and improving people's enjoyment of the environment.

SEERAD aims to promote rural development and to ensure that the needs and interests of rural Scotland are reflected in all of the Executive's policies and priorities. The department is responsible for ensuring that rural circumstances and the views of rural communities are taken into account in policy development across the Executive and externally. It has the responsibility within the Executive for the promotion of sustainable development and embedding it across the range of the Executive's policies.

SEERAD aims to improve the agricultural, food and fisheries industries' economic performance by effective implementation of the EC Common Agricultural Policy and Common Fisheries Policy obligations, and by promotion of further policy reforms at UK and EU level. The Department is responsible for assisting the development and structural adjustment of the agriculture, aquaculture and fishing industries, for regulating the sustainable exploitation of fish stocks and promoting fisheries conservation measures, for taking action against plant, pest, animal, and fish diseases within the overarching controls of EU Single Market requirements. SEERAD also encourages high animal welfare standards on farms and in transport. It also promotes nature's conservation and the public's enjoyment of the natural heritage through ensuring compliance with EU and international nature conservation requirements and the positive management of designated areas. In order to achieve its aims, the department works closely with the Forestry Commission Scotland, the Scottish Environment Protection Agency (SEPA), the Scottish Water Authority, the Water Industry Commissioner, Scottish Natural Heritage (SNH) and it is assisted by three Executive Agencies (the Scottish Agricultural Science Agency, Fishery research Services, and the Scottish Fisheries Protection Agency).

SEERAD is also responsible for developing and implementing policy on flood prevention, coast protection and reservoir safety and for the determination of environmental appeals on behalf of

Scottish Ministers. The Department is also responsible for a range of scientific research establishments in Scotland, and sponsors several non-departmental public bodies (NDPBs) including the Royal Botanic Garden in Edinburgh, the Crofters Commission and the Deer Commission for Scotland (*www.scotland.gov.uk, 13/5/2004*).

In aquaculture SEERAD is responsible for statutory measures under the Diseases of Fish Acts (1937 and 1983) and the related EU fish health legislation to prevent the introduction and spread of serious pests and diseases of fish and shellfish which may affect farmed and wild stocks. All marine fish farms must be registered with the Department for disease control purposes. Certain diseases must be notified to the Department and formal procedures exist for the treatment and disposal of infected stock. SEERAD's Fisheries Research Services (FRS) carries out a wide range of basic marine fish farm research and offers advice on aspects of production and disease control. The Department also has wider responsibilities concerning the protection of fish, fisheries and the marine environment. It advises the Crown Estate on the implications for disease control, existing fishing interests and the inshore marine environment of applications for marine fish farm leases, and it is consulted by SEPA on discharge consent applications (*SEERAD, 2003, p 44*).

SEERAD – Fisheries Group (SEERADFG): The Department is actively engaged with the salmon industry and after wide consultations it put together the Strategic Framework for the Scottish Aquaculture[25]. Their work mostly relates to foreign competition and associated dumping issues of the Norwegian and Chilean industries. At the time of the interviews, they were collaborating with the Irish government in their effort to put together an application for consideration from the European Commission, for market surveillance of salmon products entering the EU, in the hope that this could act as a mechanism that would bring discipline to the salmon market (*SEERADFG*).

SEERAD – Analytical Services Division (SEERADASD): The department's main remit is to provide economic and statistical advice, interpretation, analyses and briefing on agricultural, fisheries, agri-environment, food and rural issues. The crosscutting nature of these issues means that contributions are offered to policy makers and Ministers from across the Executive. Since the agricultural part of SEERAD administers policies itself (via scheme managers and agricultural staff) and distributes EU rather than UK Treasury funds, the division is often

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[25]The Strategic Framework for Scottish Aquaculture was published in March 2003 and set out the Executive's vision for the future of aquaculture. The Framework identified 33 Action Points together with a timetable and indicators of progress as well as the bodies critical to delivering a successful outcome. In order to progress some of these Action Points, Working Groups have been established to deal with some of the priority action areas (*www.scotland.gov.uk, 13/5/2004*).

involved directly in highly technical work with an immediate and obvious linkage to policy design and implementation. The Division produces a number of annual publications, including the: "Economic Report on Scottish Agriculture", "Farm Incomes in Scotland", "Scottish Agriculture Output, Input and Income Statistics" and "Agricultural Census Summary Sheets". In addition, the Division provides information via the Department of Environment, Food and Rural Affairs (DEFRA) for inclusion in UK publications such as "Agriculture in the United Kingdom" and "Farm Incomes in the UK" (*SEERADASD*).

Scottish Environment Protection Agency (SEPAD) – Dingwall Headquarters: SEPA is the regulatory and enforcement authority for environmental protection and pollution control in Scotland, covering discharges to air, land and water. It seeks to ensure that EU and international obligations and domestic legislation relating to the environment and drinking water are implemented properly and Ministerial commitments fulfilled on time (*www.scotland.gov.uk, 13/5/2004*).

The agency has a duty to promote the cleanliness of Scotland's tidal waters and to conserve, so far as practicable, its water resources, balancing socio-economic elements. It is also required to promote the conservation of flora and fauna dependent on the aquatic environment. This includes safeguarding water quality and the condition of the seabed in the vicinity of fish farms. Under the Control Pollution Act 1974, SEPA's consent is required for the discharge of effluent from marine fish farms to coastal waters. SEPA is responsible for ensuring that appropriate monitoring of the aquatic environment is undertaken and this is achieved by applying the specific consent conditions and by its own audit monitoring (*SEERAD, 2003, p 45*). SEPA has links with the SE and has been actively involved in the consultations for the drafting of the "Strategic Framework for Scottish Aquaculture" (*Scottish Executive 2003*). SEPA liaises closely with the Salmon industry both at national and local level (with its local branches). They try, in a partnership approach, to identify each party's concerns and respond to the proposed for expansion plans by issuing the discharge consents. Their policy is not to permit expansion beyond the environmental threshold. SEERAD is also responsible for co-ordinating the policies of its different branches in order to maintain consistency between the local and national policies (*SEPAD*).

Scottish Natural Heritage (SNH): SEERAD in its support of its aims it sponsors and works with Scottish Natural Heritage, which is the Executive's statutory adviser on natural heritage (wildlife, habitats, and landscapes) and nature conservation matters (promotion of nature's sustainable use, and for fostering its understanding and enjoyment by the public) (*www.scotland.gov.uk, 18/5/2004, SEERAD, 2003, p 45*). SNH when consulted on aquaculture applications, takes into account the proposed developments' proximity to, and potential impacts

on, wildlife, habitats, and landscape[26] (*SEERAD, 2003, p 4*). SNH had a significant consulting input[27] in the Ministerial Working Group Process, which led to the Strategic Framework for the Scottish Aquaculture.

The Ministerial Working Group was set up following a series of preliminary bilateral meetings with stakeholder interests chaired by the respective deputy Minister for the Environment and Rural Development at the Scottish Executive or one of his senior officials, throughout the first half of 2002. It comprised a wide range of stakeholders on the aquaculture industry in Scotland. It accomplished its task in part through subgroup working but it also met six times in plenary session between June and November 2002 and then once more on 17 February 2003, following wider consultation on the draft proposals in the period from December 2002 to February 2003. The Central and Local Government, other public/regulatory bodies, private sector, wild fisheries and NGO representatives on the Group had a direct interest in the Framework´s objectives and contributed to their formulation (*Scottish Executive, 2003, p 2*).

5.6.2.1 The regulatory framework

In addition to the statutory regulatory agencies described earlier (SEERAD, Local Authorities, SEPA, SNH, HIE), important bodies directly involved with aquaculture also include:

The Crown Estate (CE): responsible for the management of the territorial seabed and most of the foreshore between high and low water mark. Anyone wishing to establish a marine fish farm must apply to it for a lease of the seabed, and foreshore where appropriate, within which the marine farm will operate.

Following a review of these arrangements, and public consultation, it was concluded that the Crown Estate's role in authorising marine developments should be reassigned to Local Authorities and planning controls are being extended into marine waters by the Water Environment and Water Services Act 2003. Meanwhile, Local Authorities have the lead role in advising the Crown Estate on marine fish farm proposals under interim administrative arrangements.

Different planning arrangements apply in Shetland and the Orkney Islands. In Shetland, under the Shetland County Council Act 1974, the Council has a statutory power as planning authority to licence "works" in coastal waters. Under this power, the Council has developed policies for the development and regulation of salmon and shellfish farming. Under the Orkney Islands

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[26] More information can be found at www.snh.org.uk.

[27] See Scottish Natural Heritage (*2002*).

County Council Act 1974, the Council exercises "works' licensing" powers within certain designated harbour areas. In the event that a "works' licence" is granted, the applicant must also apply to the Crown Estate for a "seabed lease" in the usual manner (*SEERAD, 2003, p 44*).

The **Veterinary Medicines Directorate (VMD)** is an Executive Agency of the Department for Environment, Food and Rural Affairs protecting public health, animal health and the environment, and promoting animal welfare by assuring the safety quality and efficacy of Veterinary medicines in the UK (*ibid.: 45*).

The **European Agency for the Evaluation of Medicinal Products (EMEA)** co-ordinates the existing scientific resources for the Member States in order to evaluate and supervise medicinal products for both human and veterinary use throughout the whole of the EU. The EMEA network of partners includes the general public and the users of medicines, the pharmaceutical industry, healthcare professionals and international partners (*ibid.: 45*).

The **Maritime and Coastguard Agency (MCA)** aims to develop, promote and enforce high standards of maritime safety and pollution prevention, to minimise loss of life amongst seafarers and coastal users, and to minimise pollution from ships to sea and the coastline (*ibid.: 45*).

The UK **Health and Safety Commission (HSC)** and the **Health and Safety Executive (HSE)** are responsible for the regulation of almost all the risks to health and safety arising from work activity in Britain (*ibid.: 45*).

The **Food Standard Agency** (FSA) is an independent food safety watchdog set up by an Act of Parliament in 2000 to protect the public's health and consumer interests in relation to food (*ibid.: 45*).

5.6.3 The stakeholders

World Wide Fund Scotland (WWFS): Environmental non-governmental network operating in more than 90 countries. WWFS members see themselves as part of a challenging, constructive, science-based organisation that addresses issues from the survival of species and habitats, to climate change, sustainable business and environmental education (*www.wwf.org.uk, 18/5/2004*). WWFS is collaborating in a joint programme with Scottish Wildlife Trust on a focus for sustainable fish farming development. They are concerned that the economic and commercial interests of the industry are taking precedence over its environmental responsibilities, which undermine its long-term viability at the end of the day. WWFS representatives believe that despite the recent initiative of the Strategic Framework for Scottish

Aquaculture there are still various areas, which are very important and have not been pointed out or addressed yet. They would like, therefore to identify those areas and to take steps to minimise environmental damage. Sustainable management for them means that both environmental and commercial interests co-exist and that the former are not undermined by the latter (*WWFS*).

The Royal Society for the Protection of Birds – "A" Islands' branch (RSPBA): Since its founding in 1889, it has grown into a wildlife conservation charity with more than a million members. It has offices across the UK and, since its successful first campaign to end the plumage trade it has widened its sphere of influence to include a huge range of issues that affect wildlife and habitats. RSPB: works with decision-makers on behalf of birds and the environment; researches wildlife problems and promotes practical solutions; protects, restores and manages important areas for wildlife across the UK; works internationally through a global conservation partnership called "BirdLife International"; shares expertise and knowledge to help young and old enjoy the natural world; tackles wildlife crime and habitat loss; works with landowners and farmers to help countryside birds. An elected Council and committees for Northern Ireland, Scotland and Wales oversee that work. The Chief Executive reports to that Council. Divisional directors of Conservation, Finance, Human Resources, Public Affairs, Marketing, Scotland, International, Northern Ireland, Wales and the English regions form their Management Board (*www.rspb.org.uk, 18/5/2004*).

RSPBA has been operating in the "A" Islands since 1940 and it has been involved in the protection of individual/nesting birds and conservation matters, commenting on planning applications of all sorts. Its members are trying to ensure that the salmon industry does not impact on biodiversity in general and on birds in particular and they act as a non–statutory consultee by commenting on the respective planning agencies when they consider applications for fish farming developments (*RSPBA*).

"A" Islands Association 1 (AAssoc1): The Association was set up in 1971 and it represents politically the "A" Fishermen's interests (around 70 fishing boats, the majority of the fishermen in the locality). AAssoc1 makes comments on the new national or European regulations and conveys the fishermen's views on how wild fisheries can be improved. The AAssoc1 runs a lobster hatchery through which fishermen try to enhance the wild stocks. They also run a Producers' Organisation (PO), which has been operating for the last three years and which has close links with the homonymous training association. The latter provides statutory compulsory training to all fishermen in the locality. AAssoc1 has a competitive relationship characterised by frictions with the "A" Islands' Salmon Farming Industry. Fishermen are normally involved in direct dialogue with some of the fish producers (*AAssoc1*).

"A" Islands Association 2 (AAssoc2): Voluntary NGO with 500 members (non-locals are included) with interests associated with wild trout fishing/angling. Its constitution is committed to maintain public access to fishing/angling. AAssoc2 tries to promote a healthy environment and at the same time to maintain environmental resources. The association offers mooring areas in some lochs for members with boats and it has a small-scale restocking programme for brown trout and local fish for many of the "A" Islands' less productive waters *(organisation's website, 18/5/2004*). The Aassoc2 representatives see their organisation as a very active local entity with a defined structure (chairman, secretary, vice-chairs, and subcommittees with their own chairs)[28] and wide member participation with a range of views and levels of concerns regarding the local salmon industry. Aassoc2 representatives do not consider themselves members of an environmental NGO. Their only issue of concern is the wild sea-trout populations but because of associated interests, they believe that they are dragged in other environmental issues as well. The association broadly overviews the environmental impacts the salmon industry has and it has been participating in the consultations of both the ministerial and tri-partite working groups.

In the latter's context meetings take place at local level between the salmon industry, governmental agencies and conservation or other stake-holding organisations for the management of the local coastal areas. In these meetings, Area Management Agreements (AMAs) are decided between the aquaculture industry and the various stakeholders. Whole areas are treated as homogenous management area-groups with a special focus on sea lice treatment and impacts on wild populations (*AAssoc2*).

Friends of the Earth Scotland (FOE): Non Governmental Network of environmental groups with representation in 68 countries and one of the leading environmental pressure groups in the UK. The network consists of campaigning local groups, working in more than 200 communities in England, Wales and Northern Ireland. Its supporters largely fund it and over 90% of its income comes from individual donations, the rest from special fundraising events, grants and trading. The Network commissions detailed research, provides extensive information and educational materials and boasts to have won many battles over the years with government and industry, achieving bans on ozone-destroying CFCs, reduced trade in rainforest timber, increased support for cleaner energy technologies, and much more (*www.foe.co.uk, 18/5/2004*).

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[28] The association does not have physical headquarters and its members hire rooms for their meetings. There are 19 people involved in the management structure and in the annual general meeting the members elect the association's management and various subcommittees. Around 50 members, mostly locals, vote in these annual general meetings. In addition there is a regular cycle of meetings between the various subcommittees during the year.

FOE has actively campaigned against the Scottish Aquaculture industry and its views can be seen in the associated environmental reports of: "The salmon myth"; and "The one that got away"[29].

5.7 Summary

In this chapter a description of the research methods of data collection and analysis was given. Price data had been collected for a period of 80 weeks in order to provide insights in the UK's retailing market prices of fresh salmon products. In addition, data was gathered from a postal survey; interviews held with the industry, regulatory and political, as well as other stakeholder representatives; and desk research took place in order to construct a picture of the industry and the issues behind the salmon farming risk arena.

The next chapter presents the results of the interview and documentary data analysis focusing on the perspectives of the main actors (i.e. the salmon farmers whose views were introduced in chapter 2), of the rule enforcers and political institutions and of other stake-holding organisations.

The interviews reveal the existence of an active accountability network and a set of discourses ripe for Social and Environmental Accounting. However, Social and Environmental Accounting techniques did not feature in the engagement processes. On the contrary it was observed the existence of fragmented accountability networks, and evidence of a struggle for domination of a techno-scientific accountability process[30].

In this light chapter 7 discusses the changes that environmental account reporting could potentially bring. This evaluation[31] is achieved through an examination of the risk perceptions the different stakeholder parties bear, or perceive themselves to bear, and through an investigation of the communication routes and messages between them in chapter 6.

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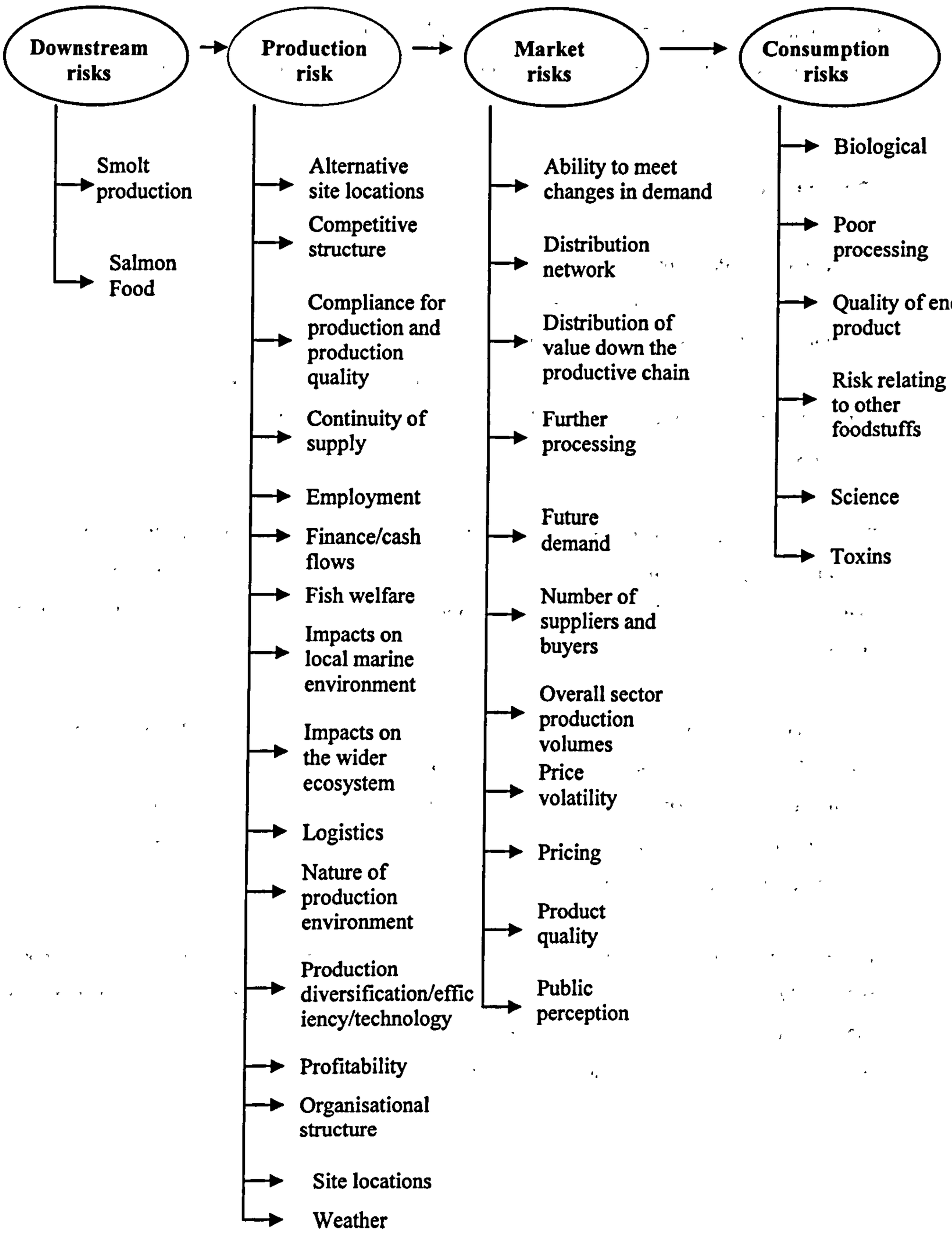
[29] Friends of the Earth Scotland (*1988, 2001*).

[30] See Beck (*1992a*).

[31] Taken place in chapter 1.

Figure 6.1: *Impacts of salmon farming*



Chapter 6: Empirical evidence

6.1 Introduction

This chapter presents the main empirical findings of this thesis to provide the reader with a more complete picture of the risk debate taking place in the Scottish salmon farming arena. This presentation takes place from the positions of each of the participating in this arena stake-holding groups and helps to provide valuable insights into the key research questions discussed in section 3 of the introduction.

Chapter 6 is structured as follows: initially, an overview of the risk construction of all those interviewed or represented in another form (reports of FOE, SNH, and the Strategic Framework for Aquaculture), is given. This overview is broken down in its constituent risk categories and the specific risk perception of each of the stakeholders for each of those categories is outlined. The next section presents the communication routes between the various stakeholders and the messages carried back and forth outlining the positions taken within this debate. The concluding section brings the issues raised together and prepares the reader for chapter 7 where the main conclusions of this study and their implications for CSR/SEA are discussed.

6.2 Risk construction – an introduction

Figure 6.1 presents an initial categorisation of the impacts salmon farming has involving downstream, production, market and consumption related risks. Within those categories numerous issues were identified relating to certification; communication and perception; disease and disasters; economic; environment; farming or other production related; regulatory; and social and health risks. A more detailed presentation of the constituent variables of each of the above categories can be seen in table 6.1.

A fact that was made apparent from the very beginning of the analysis involved the heterogeneity of the statements of each of the three groups of the arena participants. The industry representatives (main actors) appeared to be the most homogenous with the fewest differences in their risk perception. The same applies to a certain extent to the stakeholders[1]. The most differences in risk perception seem to exist among the regulators' representatives[2]. This perhaps indicates the differences in the statutory remit of each of the latter associated agencies, which allows them to perceive risks from their point of "expertise" in regulating them.

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[1] In the context of this arena, the term refers to those who are generally opposed to salmon farming (see figure 5.1: sub-political – against).

[2] The term refers to a combination of the rule enforcers and political institutions presented in figure 5.1.

Table 6.1: *Risk break-down*

Production Risks			Market Risks		Consumer Risks
Alternative site locations Competitive structure ➢ Aggressive ➢ Co-operative ➢ Joint Ventures Compliance for production and production quality ➢ Regulation ➢ Voluntary certification schemes ➢ Positions of owners/staff ➢ Community views ➢ NGO's opinions Continuity of suply ➢ Forecasts for future demand ➢ Preselling of fish Employment ➢ Quality of staff ➢ Availability of staff ➢ Staff motivation ➢ Staff knowledge of issues Finance/cash flows ➢ Availability of finance/grants/subsidies ➢ Insurance, exchange rates, credit facilities, regulatory costs	Fish welfare ➢ Inappropriate life cycle for fish ➢ Disease, parasites - sea lice ➢ Space for fish ➢ Fish movements ➢ Treatment regimes ➢ Inappropriate size restrictions Impacts on local marine environment ➢ Wild salmon • Competition • interbreeding • disease transmission • escapees ➢ Toxic substances released into sea ➢ Biological waste Impacts on wider ecosystem Logistics ➢ Distance from markets ➢ Transport infrastructure ➢ Links with supply chain Nature of production environment Production diversification	Production efficiency ➢ Economies of scale ➢ Fish growth ➢ Food yield issues ➢ Cage densities ➢ Food source Production technology ➢ Low investment ➢ Out of date technology ➢ Hygiene ➢ Waste treatment facilities ➢ Operation of facilities ➢ Quality/size of nets/cages ➢ Treadmill Profitability ➢ Investment Organisational structure ➢ Small independent ➢ Network ➢ Multinationals (vertical/horizontal) ➢ Ownership culture Site locations ➢ Scale of operations ➢ Type of production ➢ Interaction with other production facilities Weather	Ability to meet changes in demand ➢ Limited because of the production cycle Distribution network ➢ Direct sales via markets and restaurants ➢ Marketing Co-ops ➢ Single buyers ➢ Open market Distribution of value down the productive chain Further processing ➢ Smoking ➢ Cuts ➢ Ready meals ➢ Whole fish sales Future demand ➢ Market growth Number of suppliers and buyers ➢ Power with suppliers ➢ Balance better suppliers and buyers ➢ Power with buyers Overall sector production volumes	Price volatility ➢ Short ➢ Medium ➢ Long term ➢ Cob-Webb ➢ Dynamics Pricing ➢ Commodity fish ➢ Quality premiums ➢ Organic premiums ➢ Pre-selling whole production ➢ Open market Product quality ➢ Quality certification- different schemes ➢ Organic Public perception ➢ Trust ➢ Scare stories ➢ Science ➢ Media coverage ➢ Pressure groups	Biological ➢ Poor hygiene process ➢ Parasites in fish ➢ Disease organisms Poor processing Quality of end product ➢ Not taste nice ➢ Texture ➢ Colour Risk relating to other foodstuffs ➢ Fat ➢ Protein Science ➢ Cancer ➢ Food poisoning Toxins ➢ Fish food ➢ Production environment ➢ Colourants ➢ Chemical treatment ➢ Packaging

In addition to the composition of that group with the inclusion of organisations such as the Soil Association (SA) for example, with perhaps a "greener agenda" contributes to that heterogeneity in their answers[3].

Another issue involves the categorisation of risk for which there was agreement/disagreement between the different arena participants over the risks posed or faced by the salmon farming industry. The "debate" in this risk arena seems to focus firstly on the environmental element of responsibilities of the industry, and then on the social and health, disease, and regulatory risk elements.

In the continuation of this section the differences between the risk perceptions of various groups will be identified in the previously mentioned categories (i.e. environmental risk; regulatory risk; social and health; and disease risk) in an effort to demonstrate the dominant environmentally-focused debate over the threats posed by the industry. Following this the risk communication between those stakeholders and the ways this has been affecting the salmon farming industry's practices and business decisions will be examined.

The specific categories of environmental, regulatory, social and health and disease risks were chosen to be presented because the risk debate between the different stakeholders focuses on those associated issues.

There is no real difference in the opinions of the various groups over the existing regulatory risk posed for the industry. However, this category is presented in order to demonstrate the industry's view that on the one hand it does not pose any environmental threats because exactly of that "strict" regulatory regime, but on the other hand that this regulation is somewhat "unrealistic".

Generally, there is agreement concerning the remaining risk categories, which are acknowledged but are not seen as dangerous for the rest of the stakeholders. For example WWFS's view is that "*the economic risks faced by the industry, are seen only from the premises of the impacts these are having for the environment in an effort to work together with the industry towards a more sustainable path*". There might be some minor differences within these risk categories as for example in the farming-production related one, where the biological circle of organic fish is perceived as problematic by those producers who have not ventured in it (Co1, Co7, Co10) and as not problematic by those who actually produce it (Co11, Co19, Co20).

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[3] See also footnote 14 in section 4 for a discussion on the reasoning why SA is examined together with the rule enforcers and not with the rest of the stakeholders.

However these differences were perceived by the researcher as contributing very little to the subsequently described "risk debate".

6.2.1 Environmental-related risk

6.2.1.1 The actors

The salmon industry representatives do not see themselves as posing serious environmental threats. They believe other sectors have larger impacts. For example, they see conventional agriculture, sea fishing, and diversification in cod farming as more dangerous sectors because of more lax regulation (*Co18*); of larger impacts on the wild stocks due to over fishing; and of cod only feeding on live fish (*SSGA*), respectively.

The industry does not believe it creates sustainability pressure on wild stocks because of the latter's usage of fish-feed. The raw materials for that fish-feed come from by-products caught for human consumption from industrial fisheries and the only problem for the sustainability of the respective wild populations might arise from a poor conversion of that fish-feed (*Co1*). The latter's conversion rate for the industry is close to 1:1[4] and it is much better than the respective feed conversion ratios in agriculture (*SSGA*).

The industry does not really believe it has environmental impacts. "*Salmon are like canaries. They can only grow in perfect environmental conditions and it is self-defeating for a producer to pollute the fresh/sea-water because salmon won't grow well, it won't be sold and the company will eventually go out of business*" (*Co7*).

Discharge impacts[5] still have to be proved because discharges from fish farms are professionally managed in a positive manner (*Co11*). Possible impacts depend on the site location. The representatives of the salmon industry in the "A" Islands spoke about pollution only in areas without strong tidal flows (in the West Coast of Scotland for example, *Co1*), something that does not happen in the oceanic conditions of the "A" Islands (*Co1, Co1*, Co11*).

The impact on wild stocks from escaped farmed fish was not seen as significant. Escapees are very few and there is no-proof that sea-lice are passing from farmed to wild fish (*Co7, Co10, Co18*). In addition, Co20 wonders "*why no-one speaks about the potential environmental*

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[4] However, this is challenged by AAssoc2 which claims that this ratio should take into account that the fish-feed refers to dried feed and it is thus closer to 3:1.

[5] "*It will be proven with time whether the existence of threats/risks posed by the chemicals used for sea-lice treatment exists*" (*Co18*).

impacts that the release of fish in salmon rivers by Fishery Boards (conservation boards) for restocking purposes is having, and everyone keeps attacking the industry for fish escaping".

Co18 and the *SSGA* spoke about natural wild stock decline. Interbreeding between escaped farmed salmon and wild stocks is not seen as a risk and in some cases it might be a positive impact on the depleted wild stocks. It is also believed that the industry can cope easily with these kinds of "accusations". Typical statements from the industry include:

"Environmental changes pose risk for the wild salmon stocks (predation, acid rain, the level of rainfall, etc.)" (SSGA).
"Wild salmon stocks had sea-lice problems even before the industry's initial setup, so the sector cannot be held responsible for those" (Co18).
"The wild stocks have been declining for the last 50 years, long before the industry, and their only hope is restocking the rivers with the use of hatchery techniques" (SSGA).
"The industry is not a risk for wild salmon stocks and even if it solves all the problems environmentalists throw at it, wild stocks will still not be in a healthy state" (SSGA).
"If escaped farmed fish have some negative in traits in them, they will not survive in the wild" (SSGA).
"The potential risk of farmed and wild stock interbreeding because of escapes will be minimised with the use of better quality nets/cages" (Co18).
"In theory escapees are a possible environmental risk (dilution of the wild gene pool). But a lot of escapees are snatched by seals and also there are not any salmon rivers in the "A" Islands" (Co10, Co20).
"Escapees' impacts are minimum, if not positive. The farmed stocks are only ten generations away from the wild and there is very few genetic improvement that can be done from one generation to another (4% improvement)" (Co7).
"There is no proof regarding interbreeding risks between the wild and farmed salmon stocks" (Co7, Co11, Co18, Co20).
"The dilution of the wild gene pool is a scare story" (Co20).
"Risk for the purity of the wild stocks is nonsense. All these (meaning wild salmon stocks) *were mixed somewhere in the North Atlantic during the ice age (rivers did not exist back then) under the cover of ice and as the latter retreated those stocks became exploited.... It has been found from the tracking systems on the released fish that Norwegian and Irish salmons swim in the Scottish rivers (only 10% of the fish stray in rivers).... The Rhine on the other hand was restocked with Swedish stocks" (SSGA).*
"It is very unlikely that the salmon gene pool developed over million years will be diluted by farmed fish which has been around for the last 50 years" (Co7, Co20).
"No risks for the wild stocks because it's not clear what wild river stocks are anymore" (Co20).

"Escapees spawning in rivers have a positive impact on the wild salmon population which has decreased due to environmental changes in the oceans" (Co7).
"Research that has taken place in Australian and Tasmanian farmed salmon stocks that were introduced from Canadian river stocks has shown identical genetic material between the farmed and the wild stocks after 10 years. There is no risk therefore from potential interbreeding with wild stocks" (SSGA).

The industry representatives spoke about a lack of environmental risks being posed by them because of compliance with strict environmental regulations (*Co1*, Co7, Co18, Co20*). SEPA is seen as a strict and effective regulator, making sure that the salmon farming industry does not have any adverse environmental effects (*Co1, Co1*, Co7, Co10, Co19*). The industry is supposed to be the most monitored and heavily regulated (at least in the "A" Islands), facing risks for termination of operations if compliance with SEPA's regulation is not met. The producers believe that they might have had adverse environmental impacts in the past but this has changed now because of better science, technology and appreciation for the environment (*Co19, SSGA*).

Finally, some producers see possible environmental impacts resulting from a large-scale, intensive industry (*Co1, Co7, Co11, Co18, Co19*). Large companies are only interested in their production volumes for profit reasons and they do not care about the consequences of their practices (*Co18*). Environmentalists mainly see these companies as an environmental threat and not the small producers (*Co7, Co18*). Environmental groups are anti-multinational mainly and they think of the latter as fair game (*Co7*). For this reason the small, non-intensive organic production regime is conceived as environmentally benign and according to Co17 it will stay so if it remains small-scale and it keeps to the organic rules of low fish density; no-chemical usage (anti-fouling substances); and uses suitable site locations (free of sea-lice).

6.2.1.2 The stakeholders

The stakeholders, on the other hand, perceive the salmon industry and the associated regulatory regime as holding significant threats for the environment[6]. They argue that both the industry and the regulators give precedence to economic issues over environmental benefits and the latter are more interested in helping the industry out of its current financial crisis.

[6] It is indicative AAssoc2's view that "*the best sustainable solution for salmon farming would be for farms to go away (disappear)*"

Stakeholder representatives believe that further development of the industry (especially in inappropriate areas) and diversification into other species production, hold significant environmental threats that can be exacerbated by a large scale-intensive industry (*AAssoc1, AAssoc2, WWFS, RSPBA, FOE*). However, the industry only sees economic growth as a solution to its financial problems. Because of the resulting increase in the production volume, in order for fixed costs to be cut down (*AAssoc2*), the Scottish environment slowly deteriorates. The industry claims this environment is so pristine that high quality products are produced (*RSPBA*). Other typical statements include:

"(Diversification means that) *more environmental issues might come up. Sea-lice had not been predicted and perhaps something else may appear in other species production. Environmental problems are very hard to predict" (AAssoc2).*

"Risks if lessons from salmon farming are not taught when producing other species such as cod for example which is encouraged" (WWFS).

"Environmental risks because the industry is so cost driven. It searches for the cheapest production, which means the cheapest environmental protection and this is not sustainable" (AAssoc2).

"Risk for the so-called organic production the financial motive of the farmers. The real issue should have been the environment" (AAssoc2).

"Risks from the development effort in terms of money that goes into the industry which can be very fragile in economic, social and environmental terms" (AAssoc2).

"The commercial risk does not take the environmental risk into consideration" (WWFS).

"Commercial interests should not take precedence over good containment of salmon and thus environmental impacts" (WWFS).

"Risk for the environment the politicians´ mentalities to put economy and jobs before the conservation of the natural environment" (RSPBA).

"The industry is very much market-led and environmentally only to the extent that this environment affects their market" (RSPBA).

"The industry does not make decisions on environmental grounds (not does it claim so itself)" (RSPBA).

"Risk for the environment (from further development of the industry) due to the salmon farmers' claims that they are a major employer in the rural areas. At least in the "A" Islands the number of people employed has been more or less stable for almost a decade now. It is quite hard to know how many people are employed by the industry because a lot of them are in other sectors such as processing for example. In the "A" Isles there is a surplus of well paid jobs with demand for people" (AAssoc2).

"Risk for the environment coming from unsustainable development which affects adversely biodiversity. A sustainable industry has to be able to exist and produce its product without negative impacts on the environment, otherwise it is unsustainable" (RSPBA).
"There are certain parts in the "A" Islands that cannot sustain further development and area 'X" is one of them, however this is a feeling that cannot be based on some good data"(RSPBA).
"By allowing a bit more of development every here and there, control could be lost" (RSPBA).
"The salmon farms are here so they have to go away from sensitive areas. Relocation is needed" (AAssoc2).
"The farms should be land-locked looking at non- genetically manipulated fish" (AAssoc2).

The stakeholder representatives give detailed identification of the specific environmental risks posed by the industry. They see the industry as being responsible for the depletion of the wild stocks (*FOE*) and they believe it poses significant threats for them because of diseases being passed on to wild populations (*AAssoc2, WWFS, RSPBA, FOE*); of interbreeding with wild salmonids, which results in the dilution of their gene pool (*AAssoc2, WWFS, RSPBA, FOE*); of toxic impacts on marine biodiversity because of chemical usage (*AAssoc1, AAssoc2, WWFS, RSPBA, FOE*) and insufficient discharge treatment; impacts on other species such as wild birds (entanglement in anti-predatory nets, shooting, chemical impacts, etc.) and seals (shooting) (*RSPBA*[7]); of the potential impact of escapees from possible future use of GMOs (*FOE*); and general risks for the sustainable existence of the wild stocks because of the way they have been treated by the industry for the feeding needs of the farmed stocks (*AAssoc1, AAssoc2, WWFS, FOE*).

The existing regulatory process is identified as being the main cause of these threats. The process is seen as inflexible, unrelated, or not robust enough (*AAssoc2, WWFS, RSPBA, FOE*) and it could exacerbate environmental impacts if the industry succeeds in the diversification of the production of other species (*WWFS*). Other risk parameters that were identified within this more general category include: lack of holistic impact assessments of the current regime of EIAs (*WWFS, FOE*); fragmented regulatory structure (*FOE*); inconsistent/ ineffective environmental strategy (*AAssoc2, WWFS, RSPBA, FOE*); lack of sea-lice/escaped fish regulations (*AAssoc2, FOE*); legitimisation of producers' practices (*FOE*); simplistic regulatory

[7] Especially for wild birds, RSPBA considers the "A" Islands' salmon industry as having serious impacts. According to them, area "X" is of immense national and international importance for birds especially in the winter. There are 21 species that are in internationally important concentrations and 11 more of national importance. The actual water-area of area "X" could not have been more important for birds and there is all this fish farming activity in its heart with no-one knowing the impacts the chemicals or entanglement in anti predatory nets might have on them.

modelling/bad science (*AAssoc2, WWFS, RSPBA, FOE*); and the Soil Association's political agenda (*AAssoc2*).

Because of the Soil Association's political agenda, AAssoc2 views organic (salmon) farming in contrast to the rest of the stakeholders (*AAssoc1, WWFS, RSPBA, FOE*), as a major environmental threat. They argue that because chemical treatment for sea-lice is not allowed for organic fish, organic farming in a perverse way could be more dangerous for wild populations than regular salmon farming. The application of organics in fish farming was borrowed from land-farming. A farm on land starts from a position "A" (not a pristine environment) and by getting Soil Association's accreditation, it stops using chemicals and it moves to a point "B" where there is a net benefit for the environment and that is what underpins that accreditation. However, if aquaculture puts organic fish in the marine environment in an unmodified bay for example, he might not use chemicals and he might have lower stocking densities but he will still have impacts on the environment because the farm will start from a point "B" of a pristine environment. *"If there is nearby a crossing of wild sea trout, the so-called organic fish will affect in some way the pristine environment and it will have some kind of interaction with the wild fish. In that way organic salmon farming could be something similar to cutting down rainforests to grow organic coffee trees" (AAssoc2).*

Other potential environmental risks might come about due to inefficient communication with stake-holding parties (*WWFS, RSPBA*); a possible lack of environmental groups (*WWFS, FOE*); a lack of polyculture practices (*WWFS*); inefficient small producers (*WWFS*); scenic pollution (*FOE*); and supermarket policies/mentality (*WWFS, RSPBA, FOE*). Typical statements on these issues include:

"Risk for the environment the mentality of the regulators for projects to go ahead without really considering other stakeholders´ views" (RSPBA).
"The developers in general do not really see the concerns of RSPB because the data does not exist for these concerns to be quantified and that makes these risks less real for the developers" (RSPBA).
"It is very difficult to prove things because it is impossible to obtain good data" (RSPBA).
"Risk for environmental impacts from the fact that organisations such as RSPB and AAssoc2 are not statutory consultees and do not receive direct information for the industry's developments" (RSPBA).
"Risk from the supermarket policies not to differentiate between the products of good and bad performers of the salmon farming industry (not appropriate labelling) so it is very difficult for the consumers to know what they buy" (WWFS).

"Risk for the environment from the supermarkets' mentality. If the customers have to pay more for organic/sustainable fish then the supermarkets will sell less and for that reason they will only promote what is good for their turnover. Organic means less income for the supermarkets and this is unfortunate for the environment. Supermarkets do not really care for a sustainable salmon farming industry" (RSPBA).

6.2.1.3 The rule enforcers and political institutions

The regulators' view, as was expected, lies somewhere between the previous positions. They also identify a number of risks for which the industry could potentially be held responsible. In addition to those mentioned by the stakeholder group, they see bad weather (*AEH*); lack of new technology in fishfeed mechanisation (*SF*[8]); lack of polyculture (native stocks)/lack of diversification in shellfish (*SNH, SF*); poor code of practice – certification (*SNH, SF*); and environmentally uneducated staff (*SF*), as potential causes for environmental impacts.

Like the stakeholders, they also see possible environmental risks from inflexible, unrelated, and non-robust regulation (EIA - lack of holistic approaches; inconsistent/ineffective environmental strategy; lack of sea-lice/escape regulation); unclear regulatory remit - weak planning process/fragmented structure (*SNH, SF*); lack of good science/regulation/expertise - precautionary principle (*SEERADFG, SEPAD, HIE, SNH, SF*). However, there is an elemental difference in their views; they believe that the current regulatory regime is good enough to base upon Scotland's environmental policy. This is something that perhaps does not happen in other competitive nations, where inefficient regulation may conceal real environmental risks (*SEPAD*). There might had been threats in the past because of lack of environmental regulation (*HIE*), but there is much less risk now because of better existing science (*HIE, SF*). For example HIE said that "i*mprovement in the quality of fishery scientists engaged with the wild fisheries has been an improvement in understanding the environmental impacts of the industry because they bring a degree of scientific objectivity which was lacking in the past in certain areas*". Further to the acclaimed efficient environmental regulation, no real environmental risk is seen to be posed by the fish farming industry because renewable resources are robust anyway and salmon in order to grow need good environmental conditions (*HIE, SF*). Typical statements of the above include:

"SEPA makes judgments on the assimilative capacity of the environment which are not far from the truth and the environment can cope with the discharges in the specific areas concerned" (SEPAA).

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[8] Representing the Strategic Framework for Scottish Aquaculture.

"SEPA believes that in terms of monitoring from what it does and what the fish farmers do there is a reasonable handling of the environment and that there is quite a good idea of what is happening in most sites" (SEPAA).

"SEPA is doing a pretty good job in making sure that the industry does not go beyond the environmental threshold. There are probably sites where SEPA's approach was not correct but the appropriate adjustments were made in the standards. On a national scale the impact of the discharges is well within what the environment can take and the industry's discharges are well within the assimilative capacity of the environment" (SEPAA).

"SEPA has been regulating the industry for 30 years now and it thinks that from experience the standards are not far off the mark" (SEPAA).

"SEPA has it about right with the regulation and the industry will not manage to get rid off many standards set by SEPA which are not far off the mark" (SEPAA).

"The (regulatory/scientific) *tools SEPA has are the only ones existing and we are confident enough to rely upon them" (SEPAD).*

"SEPA's modelling approach takes into account the local as well as the wider environmental impacts in terms of SEPA's standards being made or reached" (SEPAD).

"SEPA has a job to do and imposes a regulatory regime deemed as necessary to protect wider interests. SEPA believes that regulations have to be imposed and they do exactly that. They have prosecuted many farmers and it is clear to them that they have to comply with SEPA's regulations" (SEPAD).

"SEPA thinks that a risk can be posed for the environment from inefficient regulation (Norway for example where no-one is prosecuted). Others make their living in the same environment and there are issues about environmental protection and biodiversity" (SEPAD).

The views about organic farming are somewhat divided. The SA, SEPAA, SEPAD, HIE, and SNH perceive the organic sub-sector in general as less risky and less unsustainable than the conventional salmon industry. However, SEPAD believes that if organic producers cannot treat sea lice effectively they might actually contribute to the demise of wild sea trout and salmon. They argue that the Soil Association must address this issue. If no solution is found then organic farms will have to be located in areas where wild fish are not prevalent and there are not many places available, apart from some sites in the "A" Islands. On the other hand, AED sees organic salmon farming as any other type of farming in competition with the environment for resources. This competition might be at a lesser scale but the organic production regime still needs protection and assistance from the natural environment; this does not make it necessarily, a better or a more sustainable regime.

Finally, other possible environmental risks identified involve: lack of effective communication with other stakeholders (*SF*); lack of definition from the regulators on what sustainable means

in terms of fish farming (*AL*); lack of market incentives for sustainable, more expensive premiums in aquaculture (*HIE*); and impacts on wild marine stocks from possible introduction of non-native species (mainly for the shellfish industry) (*SNH, SF*).

6.2.2 Regulation-related risks

An identified risk category associated with the environmental impacts of the industry is that of the existing regulation.

6.2.2.1 The stakeholders

The only threat stakeholders see for the industry, relating to regulation, involves termination of fish farmers' operations if they do not comply with environmental regulatory standards (*FOE*).

6.2.2.2 The actors

The industry, perceives regulation as an immediate threat to its future development and existence. They believe that there is risk coming from the portfolios of the regulators who are only interested in regulating a disease problem (if there is one) without caring about the consequences it will have on the industry as a whole. "*They do not really care for the industry, something that is in total contrast with other competing nations (i.e. Norway)*" *(Co7).*

The regulatory process has also been characterised as a hindrance for the industry (*Co20*). There are many regulatory bodies involved[9] (*Co7, Co18, Co20*) that do not have a clear regulatory remit over the industry (especially the relationship between SEPA and the Local Authorities - *Co10, Co19*). This results to unwanted duplication and higher costs that have to be met in order for the proper licences to be issued (*Co19*).

SEPA is seen as the main rule-enforcing agency. However, the respective environmental regulation is believed to be somewhat unrealistic because salmon can only grow in good environmental conditions anyway, which makes industry's practices therefore environmental friendly on their own (*Co7*). For that reason SEPA is perceived as a possible risk if it assumes a sub-political role (against its statutory setup) to influence Scottish production indirectly through environmental regulation (*Co7*). For example, SSGA has identified on the European Commission's web-site 369 pieces of legislation affecting aquaculture. To set up a new sea-site in the UK, requires an Environmental Impact Assessment, consultation with 40 bodies (six of which are statutory), before applying for licences from the Crown Estate, the respective Local

[9] See arena model in figure 5.1.

Authority, and the Scottish Environment Protection Agency (SEPA). Objections from any of the 40 bodies could block the granting of a production licence with an immediate financial loss of about £30,000 (preparation cost of an EIA).

The ministerial working group process has also been identified as a possible risk. The industry believes that too few industry representatives participated in the Strategic Framework for Scottish Aquaculture. Only three from about 45 participants represented the industry. The producers had limited input because the number of the outside bodies was far too big and as a result the Framework was slanted in favour of the statutory organisations (*Co20*). Co7 spoke about the framework reflecting more the environmentalists' points of view and not the industry's. They perceive an anti-industry bias to have been adopted and they believe that the industry is regulated to death.

Other identified risks relate to: wrong regulatory decisions; delayed licensing for treatment; drop in investment levels; and no compliance with the regulation. Typical statements include:

"The current situation in Scotland is a result of decisions taken not to demand in the past companies' licences to be maintained in Scotland, operations to be in Scotland, and investing companies to be located in Scotland (As Norway did)" (Co20).

"There is very insecure future for the industry because fundamental decisions on operations, marketing control and production (supply and demand matching) were left too late to take" (Co20).

"Risk from not easy access to new medicines for lice treatment because of licensing issues. The Norwegians always had general exemption, under their veterinary rules, from such issues, but now since they have harmonised their rules with the EU they will have to play the same game with the UK" (SSGA).

"Investment in research by the Crown Estate has dropped from 10% to 40% in the last 3 years but its income has gone up by 50%" (Co10).

"Risk for companies to go out of business if they refuse to comply with SEPA's regulations" (Co7).

6.2.2.3 The rule enforcers and political institutions

The regulators' representatives also see regulation as a potential threat for the industry's future development. Identified risk pools include: global policy interests; lack of development/planning strategy; lack of regulatory expertise; local infrastructure issues (roads, etc.); regulatory clash; regulatory process; scientific uncertainty; and unclear regulatory remit.

Specifically, SEERADFG sees risk resulting from decisions made at EU level on the grounds of flawed evidence with regards to dumping; as well as risk for the national policy to protect the industry from "unhealthy" foreign competition through market surveillance. An application was made to the European Commission for the monitoring of every salmon import in the EU in terms of output volume and price. However, this application needs the support of the 75% foreign owned "Scottish" Salmon Farming Industry, whose intentions were unclear.

The struggle for power between regulatory agencies was identified as a potential threat to the salmon industry by the interviewees. Such a struggle is heightened by the changes promoted by SERRAD in the regulatory remit of the enforcing agencies. Typical statements include:

"Risk from lack of coordination between the local authorities and SEPA's counselling on environmental grounds for the industry's assessment at the local level" (SEPAD, HIE).
"Risk for clash between a local and a national policy on development/sustainability grounds. Co-ordination is needed with SEERAD" (AED, SEPAD, HIE).
"The Crown Estate has a fairly consistent approach throughout the country whereas different local authorities might have different angles resulting in inconsistencies in planning. For that reason, local authorities have to work together in order to develop a common approach when considering applications. That may result into different decisions on site specific basis but if they do the same short of things, SEPA hopes for a consistent approach to be maintained which will help SEPA" (SEPAD, HIE).
"Risk from the possible different point of view/interest from different local authorities. Edinburgh council for example has no interest in aquaculture and has a very different view from the Shetland Island council" (HIE).
"SEPA is a national authority trying to bring consistency in the industry and it does not want to see different things happening in different areas" (SEPAD).
"Local authorities have wider interests in addition to the planning legislation and that causes overlaps or bumping against SEPA's responsibilities" (HIE).
"It will be difficult to bring SEPA and local authorities together and there is work that needs to be done" (HIE).
"Regulatory risk for the companies as a result of the complicated process for licensing for new site developments" (AED, SEERADFG, HIE).
"Risk from the no clear planning remit between the Crown Estate and the local authorities" (SEPAD, HIE).
"Regulatory risk for the industry the difficulty to change the statutory remit of the involved agencies in order to create one, solely responsible for the industry" (HIE).

A number of risks relate to organic salmon production and its feasibility. Those risks specifically identified are the potential banning of any kind of sea-lice treatment (even that of Hydrogen Peroxide[10]) from the SA which might make organic production impossible all together (*SEPAD*); the lack of regulation defining what organic is (*SA*); and lack of robustness of the organic standards (*SA*).

Finally SEPAD spoke about regulatory risk for the sustainability of the fishmeal fisheries coming from the inability of the latter to meet the strict standards set by international accreditation bodies (like the Marine Stewardship Committee[11] – MSC, which is the only one on the table at the moment). These standards are so stringent that most of the industrial fisheries can not comply and as a result they are not subject to any kind of environmental regulation.

6.2.3 Social and health-related risks

6.2.3.1 The actors

The only risk the industry's representatives see for the public health involves some supermarkets' policies of putting both certified and uncertified salmon products on the same shelf. SSGA spoke about this having economic impacts on the producers whose products thus become non-differentiated and cannot command a premium price. Such practices also hide health risks for the public because products from third countries with lax environmental regulation as well as from "bad" producers are sold without proper labels and the consumers cannot identify them.

On the other hand a number of social risks are identified relating to the global character of the industry. Specifically the producers talked about risks from the lack of national identity for the industry which relates to limited economic benefits for the local communities and unemployment if the industry moves away/disappears for any reason. Typical statements include:

"Ethical risks about the Scottish identity and mark of the industry because of the increased consolidation" (Co20).

"Because of the consolidation, the capital of the respective Scottish sites is owned elsewhere and the amount of money fed back in the economies of the rural areas is limited" (Co7, Co20).

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[10] This is an alternative treatment to sea-lice regarded as environmentally friendly and its application is allowed for organic production, but it is generally recognised to cause the fish physical pain and stress.

[11] See MSC (*2003*).

"Because of the exchange rate issues, strict regulation and environmental control, investment in the form of multinationals might move away from Norway, Ireland, and Scotland to Chile" (SSGA).

"Cheaper labour in other countries will put even more pressure in the employment of the local communities since processing jobs will also be lost" (SSGA).

In addition Co7 identified a risk linked to the ways the industry is perceived by the general public in the lack of support the industry can get in the local communities in which it operates.

6.2.3.2 The stakeholders

On the other hand, the stakeholders identify a number of possible health threats coming from the industry relating to: substances entering the human food chain both from the conventional and the organic salmon sectors (*WWFS, FOE*); supermarket policies not to label correctly with enough information for informed choices[12] (*WWFS, FOE*); legitimisation of producers' practices by the current regulatory regime, which is characterised as inflexible, unrelated, or not robust enough (*FOE*); toxic risk for the employees in some fish farms (*FOE*); and unclear/outdated code of practice of the supermarkets/industry for the consumers (*WWFS, FOE*). In addition to them, the stakeholders see potential future risk for the covering of the human needs in fish protein coming from the feed companies' mentality to drive the over-harvesting of the wild populations for fish-feeding purposes (*AAssoc1, AAssoc2, WWFS, FOE*).

AAssoc1 identifies unemployment risks existing for the rural communities because of the global character of the industry. *"The industry is concentrated in the hands of bigger and bigger companies which at some point due to global competition (overproduction and poor prices) might decide that they do not make enough money in Scotland and move away. It is scary what might happen to Scotland in economic and social terms and the problem will be exacerbated in small communities such as area "Y" for example, where the industry employs 20 people in a population of 200"*. However, most of the stakeholders see unemployment risks lurking for those communities because of the limited economic benefits that accrue to them exactly because of that foreign ownership of the industry (*FOE*); the development promoted by the policy makers on fragile structures, subject to international forces (*AAssoc2, RSPBA, FOE*); and the environmental or scenic impacts fish farming has on other industries (*AAssoc1, FOE*).

[12] WWFS talked about supermarkets purposely disorientating and confusing consumers by not labelling correctly salmon products and leading the public in believing that these come from wild marine stocks.

6.2.3.3 The rule enforcers and political institutions

The regulators' position lies again somewhere in between. The views on health risks range from "no real threats" identified by SEPAD *"...The final product is as good and healthy as everything else one can find in supermarkets. There are risks from contaminants people eat but this is something everyone takes on board when one makes his own risk assessment. The product is no more risky than anything else, so there is no real risk for the consumers as far as they follow normal health advise"*, to "serious risks from substances entering the human food chain" (*SA, AEH, AED, SEERADFG, HIE, SNH, SF*). Typical statements of the latter include:

"Risk for the consumers from possible radioactive waste present in the fish" (SA).
"People have already stopped buying fish because they think they are full of chemicals and a lot of them go into the water affecting the marine ecosystem so that fish is neither healthy for them nor the environment" (SA).
"Health risk for the public might exist from the presence of things in the fish-feed. However, the official position is that the public should eat fish because it is healthy but there are concerns about that" (AEH, AED, HIE).
"Potential risk for the public health coming from the pigmentation of the salmon flesh. However, SSGA estimated that the amount of salmon one needs to eat in order to develop a problem is not humanly possible to consume" (SEEARDFG).
"Concerns over everything being produced on a mass basis in non-natural ways (without nature's assistance only) *and enters the human food chain" (AED).*

Other "public risks" relate to bad hygiene practices and waste discharges (dead fish, offal, etc.) (*AEH, SF*); different production rules in other competing countries because of more lax regulation (*SEERADFG*); environmental impacts[13] (*AEH, AED, HIE, SF*); and physical disturbances (noise, odour, etc.) from the industry's expansion in the local community.

The SA, SEPAD, and HIE, like the stakeholder representatives, identify risks for the covering of the human needs in fish protein from over-fishing for fish-feeding purposes, while at the same time a similar risk is seen if the industry moves away or disappears (*SEPAD, SF*).

On the social aspect of things, limited economic benefits accruing to the local communities because of the foreign ownership and increased consolidation of the industry (*AED,HIE*) and unemployment, reduced exports, and lack of training in the rural communities are seen as possible risks (*AEH, AED, SEERADFG, SEPAD, HIE, SNH, SF*). Finally, SNH identifies the

[13] *"Risk from what is going in the environment for the public health. Waste discharges of the industry can have impacts on the public health" (AEH).*

stricter regulation and higher regulatory cost that will result and be funded by the general public as an extra social risk coming from the industry's mentality/practice not to be environmentally friendly.

6.2.4 Disease and disasters - related risks

This category describes the risks relating to farming operations at sea. There is no real difference in the opinions of the different stakeholder groups with the exception of the disease risks posed by the organic sector because of inappropriate disease treatment or because of the impossibility of the AMA (Area Management Agreements) scheme for sea lice treatment coordination to work because of the proximity of "organic" farms to the conventional ones.

6.2.4.1 The actors

Specifically the industry views the risks in this category as an entry barrier to the organic market/sector (*Co17, Co18*), responsible for the loss of "organic status" of diseased fish if treatment is applied (*Co11, Co19, SSGA*) but also responsible for the creation of fish welfare problems if the appropriate treatment is not applied (*SSGA*). The nature of these risks is identified as the: ecological impacts, e.g. natural disasters, natural diseases, oil spills, etc. (*Co1, Co1*, SSGA*); movements of contaminated fish (*Co10, C020*); inappropriate site location (*Co1, Co1*, Co11, Co19, SSGA*); lack of AMA coordination (*SSGA*); lack of regulation in sea-lice (*Co7*); lack of strict regulation in organics (*Co18, Co20*); regulation for compulsory slaughtering with no compensation (*Co7*); and river restocking without disease control (*SSGA*). Some typical statements include:

"Risk for coordinated sea lice treatment through the AMA if there are organic salmon farmers in the area" (SSGA).

"Sea-lice is a major problem and better controls are needed for it" (Co7).

"No disease risk in the "A" Islands because of the strong tidal flows and also because of the very few producers being your neighbours, which results to less impacts on each other's production" (Co1).*

"Loss of organic fish status, in the case of treatment with something different than Hydrogen Peroxide, which you cannot even sell in the spot market as conventional fish" (Co11, Co19).

"If the organic fish lose their status because of treatment, intensive colouring of their flesh is needed in order to be sold in the mainstream market and that will lose you a phenomenal amount of money" (Co19).

"It is impossible to produce organic fish in areas with sea-lice problems. However, certain companies were given the organic label when they shouldn't have" (Co18).

"Welfare risk for the so called organic fish from the administration of medicines. If you allow treatment you compromise the organic principles, if you do not allow you compromise welfare" (SSGA).

6.2.4.2 The stakeholders

The stakeholders also identify disease risk as a serious farming threat (*AAssoc2, WWFS, RSPBA, FOE*) but they pay more emphasis on the possible lack of AMA co-ordination for sea-lice treatment with impacts on wild stocks, if organic farms operate in the vicinity (*AAssoc2*). It is interesting AAssoc2's view that there is *"Risk for the AMA from the inability of the organic sector to treat for sea-lice. If you have organic farms in an area you cannot use chemical treatment for sea lice and thus you cannot coordinate with other farms. So in a perverse way organic fish becomes worse than conventional. As far as the chemical usage in general is concerned, the lack of use of chemicals might be a fair point but if that absence of practice means that organic farming endangers other species it should not perhaps be there".*

Risks relating to the causes of disease are also identified as: the concentration of production (*FOE*); and the movements of fish (*FOE*) while a fish welfare risk is also identified if vegetable protein is used for the growing of salmon because this is deemed to be against its nature (carnivore) (*FOE*).

6.2.4.3 The rule enforcers and political institutions

Finally the regulators also see disease as responsible for the loss of "organic status" if treatment is applied (*SEERADFG, SEPAA, HIE*) and identify most of the risks seen by the previous groups. Specifically, they see disease risks for the salmon industry because of compulsory slaughtering with no compensation or insurance involved (*SEERADFG, SEPAD, SF*). Other risks arise from diversification in other species if there is not a good code of practice in place (*SF*); movements of live fish (*SEERADFG, HIE*); fish welfare risk from the use of vegetable protein (*SA*), and lack of appropriate or allowable treatment (*SA, SEPAA, SF*); and lack of sea-lice regulation (*SEAPO, SEPAD, HIE*). Organic farming is perceived to hold risks for the AMAs (*SA, SEERADFG, HIE, SF*) or for the spreading of Furunculosis[14] on farmed salmon if Wrasse is used for biological tackling of the sea lice (*SA*).

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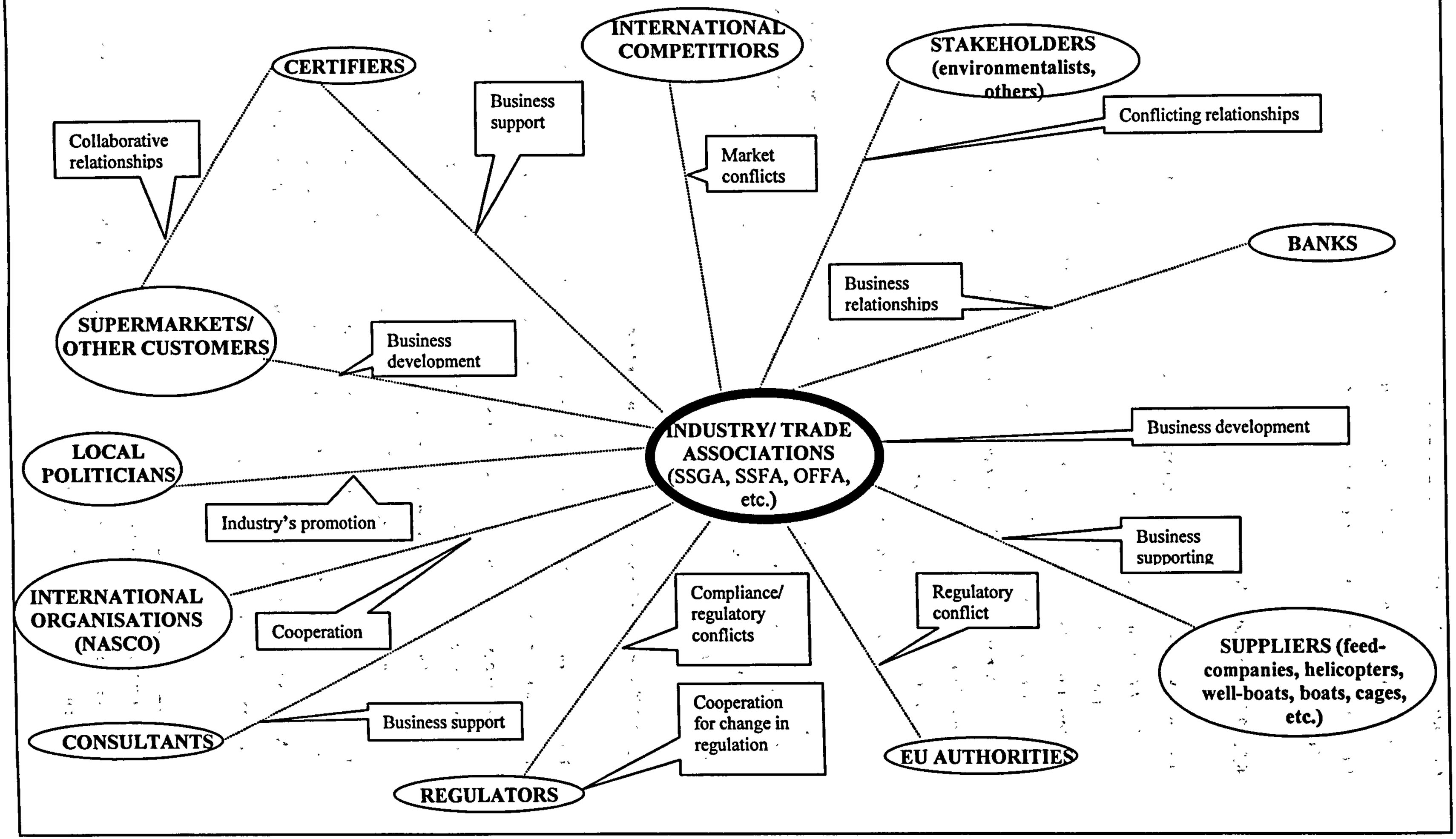
[14] Furunculosis is caused by the bacterium *Aeromonas salmonica* and it can be responsible for very high mortalities during summer. More information on salmon diseases can be found in Mills *(1989, p 76 - 86)*, Laird and Stead (*2000*), and Laird and Needham (*1988*).

Figure 6.2: *Risk communication – the producers*



6.3 Communication (relationships – messages) between the different arena participants

Following the construction of risk from the perceptions of different stakeholders within the chosen risk arena, this section seeks to examine the communication relationships within these groups and with other stakeholders the former have deemed important in their daily activities. Subsequently, insights may be gained into the ways such risk perceptions are communicated and affect decisions made in the aquaculture industry, and specifically their effect on the decision to move into greener forms of production such as of the production of organic salmon.

The relationships and the associated messages between those involved in the debate will be presented separately from the premises of those interviewed who represented the industry; stakeholder groups and rule enforcing agencies. The different levels of data and documentary analysis will be provided on request.

6.3.1 The actors (relationships – messages)

A map of communication routes with other arena actors is constructed from the perspectives of the producers (figure 6.2). As it can be seen there are a number of different actors involved in the day to day discussions with the industry. Co11 spoke about the salmon industry having rich interaction with other stakeholders, both at the business level as well as in the everyday life by holding discussions with various stakeholders, something that perhaps does not exist in other sectors such as in agriculture for example. However, most of the communication seems to be taking place at the level of: the industry itself; the certifiers; the regulators; and the stakeholders. The producers also described relationships with their customers (supermarkets or others), their suppliers, and their international competitors and with a number of other actors such as local politicians, international organisations, consultants, EU authorities, and banks.

In the continuation of this section these relationships and the messages conveyed between the industry and different actors will be described. Such description with emphasise the interactions between the producers, and with the certifiers, the regulators, and the stakeholders as these were perceived as the most influential.

6.3.1.1 The salmon farmers

The majority of the producers spoke about the industry itself being an important source of technical information and know-how in production, processing and marketing issues (*Co1*, Co7, Co10, Co11, Co17, Co18, Co19, Co20, SSGA*). Producers know how to do things and for

that reason they do not seek advice from third parties when making decisions. Their only obligation was described as informing regulators of what they do (*Co1*, Co7, Co10, Co19*).

Furthermore Co1* and Co20 spoke about a lack of business information or business advice of any kind from the regulatory authorities (at local or national level). The companies never asked for it, even though they suspect that such information would be provided to them if they did. It is typical of the fact that a lot of the initial entry in the sector was based on advice provided by other companies already operating in salmon farming (*Co10, Co18*). Business plans and the associated figures for entry to the industry were drawn up by the first fish farmers and copies were given to other prospective fish farmers in the locality to help them start up (*Co7*). The same lack of involvement of outside parties in the business decisions made by fish farmers was described for producers who entered the organic sector who are mainly seen as people operating on their own insights (*Co1*, Co7, Co20*). Organic producers spoke about communication having existed for organic product development *(Co11, Co17, Co18, Co19, Co20*). The decision for the small "A" Isles' producers to venture into organics was discussed and negotiated with other local companies, the Soil Association, and Stirling University (*Co11, Co17, Co18, Co19*). Co20 also talked about venturing into organic production after speaking to the "A" Islands organic salmon producers.

Interactions between producers occur via interdependent business activities and through their trade associations. A number of business relationships were described as existing between different producers. These range from the necessary purchasing or selling of salmon ova, fry, and salmon smolts between different producers, as these are involved in the different biological stages of salmon production, to processing and marketing agreements/cooperation (*Co1, Co1*, Co7, Co10, Co11, Co17, Co18, Co19, SSGA*) and arrangements with fish-feed Companies for the financial management of the producing companies (*Co7, SSGA*).

Co7 spoke about the Co1-group to have a short of arrangement with company "A" with the latter looking at the former's returns and arranging its business market ("*they bankroll them*"), whereas SSGA spoke about small producers being provided with the necessary cash flow and other financial information by the fish feed companies in order to arrange their businesses. A lot of in-house collaboration between the different managers for the everyday running of the businesses, especially within the larger companies, was also described by the producers (*Co1, CO1*, Co7, Co11, Co19, Co20*).

As expected, producers also communicate through competition in their effort to develop new markets or maintain existing ones (*Co10, SSGA*). Co10 for example mentioned that the industry is so small now in terms of number of people that (in smolt production) it is difficult for a

producer to convince his customers to buy from him because of excess smolt supply. For that reason a producer has to do whatever it takes to maintain his market share. SSGA also talked about the big companies in the industry thinking that they can out-do their neighbours (cost-wise) and for that reason everyone in the industry is involved in a fierce competition which drives the small producers out of business first and then the rest.

As a result of this competition, consolidation (joint ventures, vertical integration, and company buyouts) was described as a common feature of the industry (Co1*, Co7, *Co11, Co19, Co20, SSGA*). When the sector was first established there were 178 companies operating in Scotland. Now there are only 10 left that matter in terms of size. There are still some small producers but these are not expected to survive the current financial crisis. As a result big players are getting bigger but they also have problems (*SSGA*). "A" for example, gave extended credit to independent producers, which over time run into financial difficulties, and this also affected the smolt producers who had given credit to the respective on-growers. As a result, "A" found itself owning many salmon-farms (both smolt and salmon on-growing).

Producers communicate through their trade associations. The main issues of discussion are the industry's development; traceability; quality re-assurance; and disease control issues (*Co1, C01*, Co7, Co10, Co11, Co17, Co18, Co19, Co20, SSGA*). SSGA for example talked about cooperation for the Scottish Quality Salmon (SQS) scheme with Stirling University, the Crown Estate, and SEERAD (Marine Laboratory in Aberdeen) for aquaculture vaccine development against Furunculosis in the past. They also talked about having decided quite early to push the Scottish industry along the path of quality salmon and not to compete with the Norwegians on a tonne to tonne basis. The Scottish reputation is seen as valuable and it was developed through the quality scheme which is EN45011 European Certified with ISO environmental management standards integrated in that. All these are rounded and certified by Food Certification Scotland (FCS) and accredited by UKAS (United Kingdom Accreditation Service).

Messages between the producers and their trade associations related to the need for more support in the form of information for business decisions (*Co1*); new product/market development (*Co10, SSGA*); SQS participation for better public relationships (Co7, *Co10, Co11, Co20*); and supermarket control to prevent further domination of the fish market and to stop them forcing producers to sell at lower prices (*Co7, SSGA*).

Messages communicated between the producers relate to: the need for the industry to become more self aware (*Co19*); the need to be cautious when you venture into organic salmon production because of the vagaries of the respective market (*Co20*); and how problematic the

term "organic fish" is, and whether there is demand for it (Co7, Co17, Co20). Typical statements of the above include:

"Consumers' tastes have changed and want more hassle-free fish and this is why the industry has to move to added value products (ready meals) in which processors are ahead of the game for the time being"(SSGA).

"Scope for a big cod industry in the UK (imports of 100,000 tonnes of cod annually), which if it successful it could take out some of the sites used for salmon farming and reduce the latter's numbers in the market which might give to the finished salmon the little twick it needs (£0.10/kgr)" (Co10).

"Scottish Salmon Growers Association (SSGA) changed its name to Scottish Quality Salmon (SQS) in order to meet the requirements for a better public image towards the consumers and the environmental groups". (Co20).

"Supermarkets tend to control your production and they do not allow you to sell elsewhere" (Co7).

"Multiples are very powerful and by controlling the fish sales (85% of the fish is sold through the supermarkets and 67% of the production in the UK is dominated by the big companies) are destroying the producers (they take their margins and the consumers' surplus). The consumers might have benefited by the supermarkets during the Xmas and Easter periods but in general they have lost too" (SSGA).

"The multiples keep their prices relatively level but they take the margins from the producers" (SSGA).

"As the industry becomes politically more self aware it will start dictating to the rest of the bodies (regulators and certification bodies) what it should be done and not the opposite" (Co19).

"Organic market is probably a different market altogether in terms of supply chain and partnership. You cannot offer to pre-existing customers organic fish because they are geared towards processing volume production and not towards small niche markets" (Co20).

"There is demand for organic fish. Consumers know what an organic product is. It looks different and it tastes differently" (Co20).

"Organic means something produced as naturally as possible (with the use of natural products)" (Co18).

"People in Europe want organic fish because of healthy lifestyle issues" (Co18).

Established communication routes exist between the industry and the certification-accreditation bodies. The communication within these relationships relates to business issues (*Co20, SSGA*); monitoring/policing (*Co1, Co10, Co11, Co20, SSGA*); and organic standard development (*Co11, Co19, Co20, SSGA*). Accreditation is also sought from international certifiers for organic

certification so that producers are able to export organic fish to other countries (*Co11, Co19, Co20, SSGA*), and to pursue a better marketing image[15] (*Co1**).

The messages communicated between the industry and the certifying organisations seem somewhat polarised. SSGA talked about the need for certification because it differentiates on the grounds of quality. Thus, certification is able to provide a better marketing image (*Co1, Co1*, Co7, Co10, Co11, Co19, SSGA*). On the other, Co10 and Co20 talked about product quality not being defined as to what it means and they see it as rather subjective.

"The certification bodies assure that a specific company follows a certain code of practice in terms of production, medicine control, temperature, hygiene, food safety but this does not mean better quality than someone else or another country. You can say that the product is safer but not better. However, the Scottish salmon is promoted abroad both as safer and of better quality. Quality cannot be defined, safety can" (Co20).

"The necessity of the certification bodies is often questioned. Label Rouge for example is not necessarily better than any other type of salmon but it costs a lot of money to the industry in terms of compliance with the necessary standards" (Co10).

Co20 further argues that certification does not really help against international competition while Co7 sees certification as enforced by customer requirements. Co7 also underlines a need for the SQS scheme to be more pro-active than re-active in order to be able to tackle bad publicity, while Co1* describes SQS as not representing the whole of the industry and being dominated by big companies who lobby for conditions that suit their needs.

Other messages concern the organic sector; the sector which is seen by some industry representatives as being underspecified with respect to what organic fish is (*Co1, Co1*, Co7, SSGA*). Work is required to a) to educate the public about organics (Co11, *Co18, Co20, SSGA*); and b) to develop pan-European and robust organic standards (*Co20, SSGA*). In relation to this latter issue Co20 sees a need for continuous standard improvement and development, whether these relate to the organic sector or not. Finally, involvement of the Soil Association in fish-farming is seen to be due to political reasons rather than the "so called" sustainability of this production regime (*Co7*).

[15] Co1* said that work with the International Accreditation Scheme of VERITAS is essential to enable them to meet the standards of their Belgian supermarket customers.

6.3.1.2 The rule enforcers and political institutions

Regulators are seen as one of the most important groups if not the most important with which the industry interacts. The producers talked about having a good relationship, presentations on their activities and their economic importance to them in order to get rule enforcers and politicians "on their side".

Co10 talked about regular discussions with the regulators. They inform them on what they are trying to do and they try to reach a consensus with them rather than being polarised. A lot of communication is taking place with SEPA (mainly), the Local Authority, and the local counsellors in order for the latter to reach into their communities and make them more supportive towards the aquaculture industry (*Co19*).

Co17 talked about good relationships between the industry and the regulators in the "A" Islands with minor disputes existing in the past between Co11* and the Local Authority because of the former's practice to leave feedbags on shore.

The industry interacts with the regulators about: licensing issues (sea bed lease, work's licence, discharge consent) in order for a company to be able to start or expand its farming operations; Environment Impact Assessments (required by the Local Authorities); grants for development or research (*Co1, Co1*, Co7, Co10, Co11, Co17, Co18, Co19, Co20, SSGA*); discussions about changes in the regulatory remit (*Co1, Co19*); and discussions through the ministerial working group for the drafting of the "Strategic Framework for Scottish Aquaculture (*Co10, Co20, SSGA*).

The producers talked about a command & control regulatory regime (*Co1, Co1*, Co7, Co10, Co17, Co18, Co20, SSGA*), typified by monitoring and policing for diseases, illegal substances, land usage, discharges (*Co1, Co1*, Co7, Co10, Co11, Co17, Co18, Co20, SSGA*).

There are a number of messages directed towards the regulatory agencies. SEPA is perceived as the single most important regulator (*Co10, Co18*) which might be used by political institutions to contain indirectly the salmon industry's output through environmental regulation (*Co7*).

"Politicians think that the Scottish industry has grown too big too fast and for that reason they might be using environmental regulation to contain its production volume by reducing the biomass consents or by not giving out any other discharge consents. This growth in the industry's output has happened because multinationals got involved in fish farming and this is

the natural way of things. Even if regulators wish to see a small salmon industry again, this will not happen" (Co7).

The producers also talked about: regulation "being a hindrance for the industry's development"[16] (*Co7, Co20, SSGA*); higher regulatory costs than other competitive countries that have to be met in Scotland (*Co7, Co20, SSGA*), which make the industry less and less economically viable; and the need for an efficient insurance regime (*SSGA*). Typical statements include:

"The Scottish industry has always been slower than the Norwegian to get access to sea-lice medicines because of licensing issues (it was taking them 5 to 8 years for a licence) whereas the Norwegians have general exemption from licensing under their veterinary rules" (SSGA).
"When a fish farmer deals with the regulators involved, he needs to be a specialist in dealing with these kinds of organisations in order to make any progress" (Co7).
"Regulators (SEPA, the Crown Estate, Local Authorities, Certification Bodies, MSA - navigational matters) are pulling a levy to regulate the industry which in conjunction with the low salmon price, it stabs the industry in the back" (Co7).
"The regulators have been tough on the industry for no particular good reason" (Co7).
"The industry is too much regulated with enforced levies from: their own trade associations (SSGA is taking a levy through the SQS Scheme on the number of smolts or tonnage harvested); the Crown Estate (commission) which takes a levy based on tonnage apart from the nominal rent that it is charged; SEPA is taking a levy on its policing through the environmental consents; The Fishery Research Laboratory in Aberdeen (SEERAD) charges to check the disease status of the fish" (Co7).
"The results could suggest that the SE is supportive of the industry but in terms of competitiveness they do not make life any easier because of the additional costs that have to be met with all the different organisations" (Co20).

Other messages relate to the need for better understanding and communication with the regulators (*Co7, Co19, Co20*); more support from the regulators; and a better and clearer regulatory structure (Co1*, Co7, Co10, *Co19, Co20, SSGA*). Despite such "complaints", communication with the regulators is seen as much better than in the past (Co1*, Co7, *Co17, Co18*). Finally, Co20 commented on the need to define what environmental quality is meant by the regulators, whereas Co7, Co19, and Co20 see the results of the communication process that

[16] Co17 was the only company that argued about efficient regulatory structure, something that perhaps has to do with the remoteness of its location and its small size. Facts that result in very rare visits and demands from the regulators.

started through the Ministerial Working Group for the drafting of the "Strategic Framework for Scottish Aquaculture", as slanted in favour of the other stakeholder representatives.

"SQS represented the industry in the Ministerial Working Group but the number of the outside bodies was far too big (from 45 participants only three were producer representatives), so the Strategic Framework was slanted in favour of the statutory organisations" (Co20).

"The strategic framework was produced because the regulators want to have their noses clean and not to take decisions that will upset anybody. That does not progress the industry though" (Co20)

"The Strategic Framework reflects more the environmental points of view than the industry's. There is a negative point of view taken than a positive one" (Co7).

"The Framework for Aquaculture was written by someone who has read books about aquaculture but does not know the industry" (Co1, Co19).

However, both the Ministerial and the Tri-partite Working Groups are perceived as now having a better understanding of the participants and their concerns (*Co7, Co18, Co19, Co20, SSGA*).

6.3.1.3 The stakeholders

The industry described turbulent relationships with the stakeholder groups. They said that because of the small size of the "A" Islands community they know the issues of concern of the rest of the stakeholders (*Co1**). The producers spoke about frictions and poor relationships with them (*Co11, Co18, Co19*), and campaigns taking place from both sides targeting the public opinion. The stakeholders and the general public are described as having a poor image of the industry because of bad press (*Co1, Co7, Co10, Co11, SSGA*). The producers talked about mostly indirect ways of communication with them (comments, appeals, and development objections through: the local press; the local authority; environmental consultants for the drafting of EIAs; scoping letters; faxes) (Co1, *Co11, Co18*). Typical statements of this embattled situation[17] include:

"The industry has a poor image" (Co7, Co11, SSGA).

"Bad press for escapees and sea lice passing to wild migratory fish" (Co1, Co7, Co10).

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[17] Only Co10 talked about a supportive local community, which has to do with the understanding the local population has for the industry (or perhaps because of the fact that the aquaculture industry is an important employer in the area as it was claimed by the owner of the company). The reality of this view however, can only be demonstrated if a similar research is to be undertaken in the specific locality.

"If you are a good smoker selling in food show and people realise that the smoked salmon that is being sold is farmed they do want it. It takes a lot of convincing to persuade potential customers that there is not anything bad with farmed salmon" (Co7).

"The industry has had a terrible press from few people who are anti-fish farming campaigners. These are absolute nut-cases. In the beginning it was only Greenpeace and now there are other salmon protest groups" (SSGA).

"The media seems to be more pleased to hear bad things about the industry from environmentalists than from the industry promoting its product as good and healthy" (Co7).

"The media have never pointed out that salmon is produced under very good conditions and it has not caused any proven damage" (Co7).

"Disputes with AAssoc2 over sea-lice passing from farmed to wild stocks" (Co11, Co18, Co19).

"Counter arguing back and forth through the local press with AAssoc2" (Co11).

"(the objections for organic site developments) *in Island "Z" were mainly due to 2 outsiders* (non-native residents) *who wanted to lobby the population against the industry because they feel that the industry is bad. These developments will go ahead even though the residents still object since permission was granted by the Crown Estate and the "A" Islands' Council" (Co18).*

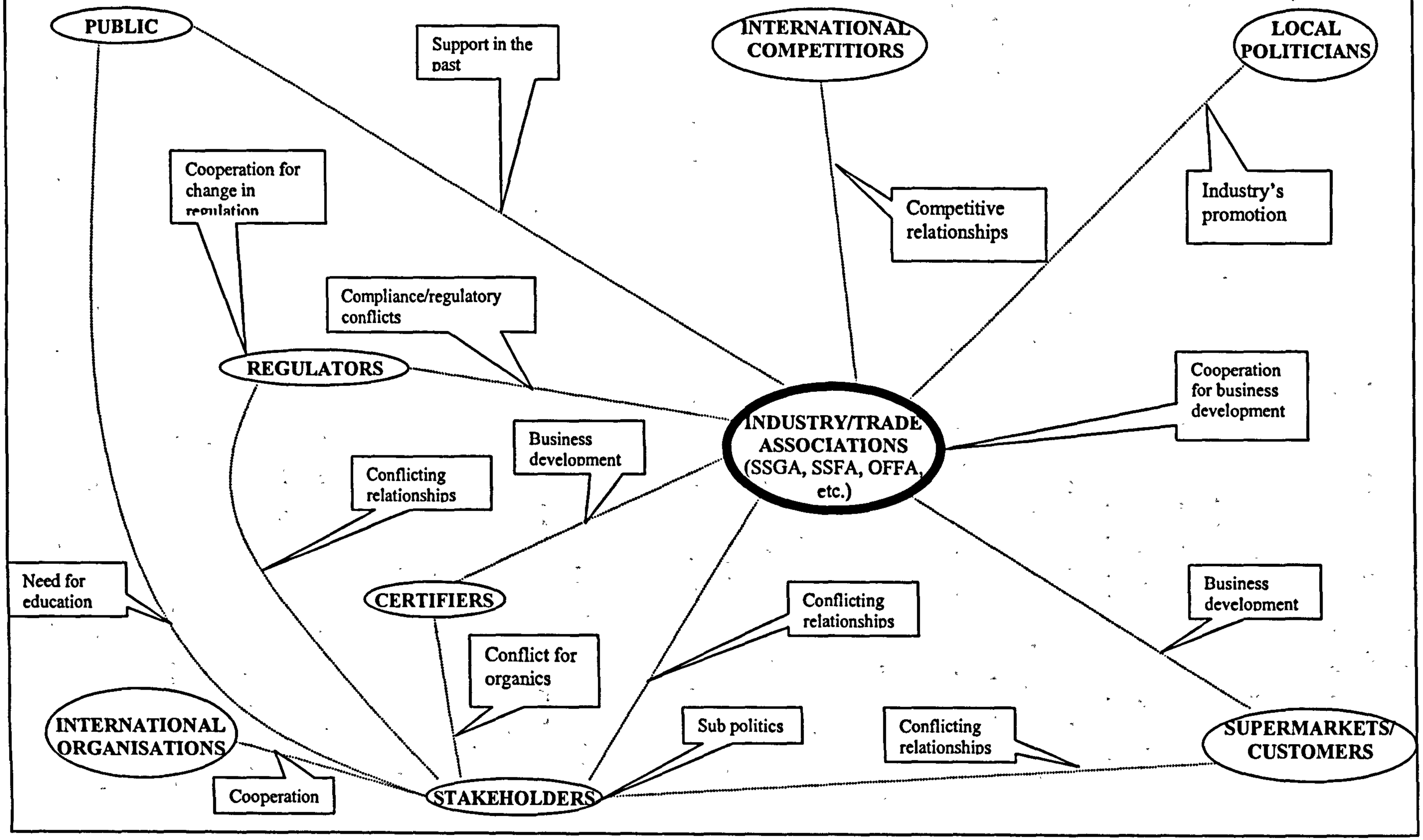
The industry reacts to these external pressures by: trying to promote itself at local or national level through its trade associations or each firm individually (*Co1, Co10, Co18*); by having open-day visits (*Co18*); and agreements with other stakeholders for the common management of hydrographic areas, through AMAs, or agreements for anti-predatory controls for example (*Co11*).

Messages towards the stakeholders aim to improve their opposed stance to the industry. The producers talked about a deliberate spread of misinformation about their practices and a need to educate the stakeholders about the industry's practices *(Co1, Co7 Co19, SSGA*). All of them said that there are not any threats for the environment because of efficient regulation and because the industry is nowadays scientific grounded, its mentality has changed, and it takes care of the environment (*Co1, Co7, Co10, Co19, SSGA*).

Co19, for example, said that "*there were environmental risks in the past because producers were experimenting and they did not really know what they were doing. But this has changed now and the industry is scientific grounded*". Co11 further talked about environmental impacts to be easy to demonstrate because of "*black and white scientific methods*" and Co7 said that the industry is so environmentally friendly that economically it is choking itself to death.

Producers believe that they are not responsible for the decline in wild stocks (*Co1*, Co7, SSGA*). They argue that aquaculture is an important industry for: the rural communities

Figure 6.3: *Risk communication – the stakeholders*



stimulating the local economies by having direct, indirect, and induced multiplier effects; the national fish exports; and for the covering of the human needs in healthy fish protein given the natural decline of the wild stocks (Co1, Co10, Co11, *Co17, Co18, Co19,*). They think that the industry needs more support from the local communities (*Co7, Co19, Co20, SSGA*) in order to react to the current stringent economic situation, and the emphasis of the stakeholders on issues of concern should perhaps change to stop over-fishing for example (*SSGA*).

With regards to their communication with the stakeholders, producers see a better understanding between the involved parties through the strategic framework and the tri-partite processes (Co1, *Co7, Co18, Co19, SSGA*). They believe that there is better communication than in the past but there is still scope for much improvement (*Co18*).

Some other messages include: organic fish is more sustainable (*Co18, Co20*); Scottish salmon is better (*SSGA*); and there is a need to change some supermarkets' mentality with regards to putting certified and uncertified products on the same shelf, which might be dangerous as far as food safety is concerned (*SSGA*).

6.3.2 The stakeholders (relationships – messages)

Figure 6.3 presents a map of the salmon industry's communication routes with other actors in the respective risk arena as these are seen from the premises of the stakeholder representatives. Again a number of different actors are identified as being involved in day-to-day discussions with the industry with most of the communication taking place between the stakeholders and: the industry; the certifiers; and the regulators. Relationships were also described among the industry and the regulators, and others as well as intra-group relationships to a lesser extent. However, the main "communication traffic" is seen to exist in the former group and for this reason this section emphasises the interactions of the stakeholders with the industry, the certifiers, and the regulators, as well as on those seen to exist between the industry and the regulators.

6.3.2.1 The salmon farmers

The stakeholders, just like the industry's representatives, described embattled relationships with the salmon producers. They talked about the industry facing a number of issues concerning its environmental performance. The farmers are seen as carrying a legacy of mistrust (*AAssoc1, WWFS, RSPBA, FOE*), facing bad press (*AAssoc1, WWFS*) and campaigns against their operations by environmental groups which they try to fight back in a similar mode (*AAssoc2*),

and having constantly friction and poor relationships (*AAssoc1, AAssoc2, WWFS, RSPBA, FOE*) with the rest of the stakeholders.

The fish industry representatives (AAssoc1) were the only from the stakeholders interviewed that had a lighter approach towards the aquaculture industry in the "A" Islands. Fishermen think that both industries are important for the socio-economic wellbeing of the rural communities and they think that the two industries should work closer together since they both face similar problems. They believe that environmental groups do not realise that the industry has perhaps cleaned up its practices because once they get something in their heads they do not change it. It is very difficult (from their own experience) to persuade environmental groups.

Typical statements include:

"The salmon industry has had a bad press justifiably for using materials (to kill sea-lice) that kill everything else fishermen might be interested in. The industry has left a stigma" (AAssoc1).
"The media like to create problems for the industry" (WWFS).
"A lot of opposition against the salmon industry from the public during the last years. Whole islands have got together to stop developments from going ahead...95% of the population of an island in the locality (60 people in total live there) objected in a proposal for an organic application to go ahead in their area but it was permitted much to everyone's astonishment. So you start wondering what can be stopped now" (RSPBA).
"There is a lack of understanding from the salmon farming industry that crabs and lobsters are in particular areas and they seem to find them where the salmon industry wants to go. Both industries work at the edge of the tide and this is where the difficulties come in...The salmon industry should stop showing off about its importance. Fish farmers should stop promoting what they are not and be realistic on what everyone can do for the community.... That continuous promotion of what the salmon industry offers in the rural areas causes resentment at the moment" (AAssoc1).
"People in the "A" Islands are divided in their opinions about the industry. The AAssoc2 opposes a lot the industry. Their main issue of concern is about sea lice passing on wild fish" (AAssoc1).
"Difficult relationships with the industry. There is not physical intimidation but at times the industry has not been far from that. It has been vitriolic with verbal threats (nasty things) on the phone towards AAssoc2, individuals, etc. The situation often gets to that point if there is a lot of money involved for expansion purposes" (AAssoc2).
"The angling groups would suggest that escapes have a very damaging impact on wild stocks" (WWFS).

"It has been easy for environmental NGOs to exaggerate the black list performers and to tar everyone with the same brush. Some NGOs are quite extreme and they do not offer any constructive views because they want the industry to disappear and not to make it more sustainable....The industry is very suspicious with environmental NGOs because it feels they threaten its commercial interests" (WWFS).

"The industry perhaps is trying to improve its environmental impacts and perhaps it has improved them but it has left a legacy of mistrust" (AAssoc1).

"There has been an absence of trust between the involved bodies. Salmon farms felt that NGOs were trying to destroy the industry, NGOs felt that the industry was trying to get away with environmental externalities, the regulators felt under-resourced to regulate the industry, the industry felt over burdened by regulation, the wild fish interests felt that sea lice populations have been increased by farmers endangering wild stocks, fish farmers felt that there is not a link between sea lice and wild stocks because they are using effective treatments" (WWFS).

"AAssoc2 has successfully in some instances had effective campaigns that stopped some farms from developing. They are aware of how the process works and they are in that sense quite frightening towards the industry...AAssoc2 has a local agenda and it tries to stop some developments from going ahead...In 1997 the first objection was put forward from AAssoc2 regarding industry's expansion in the "A" Islands" (AAssoc2).

"Because of the attention that has been brought forward regarding the salmon industry, fish farmers are getting organised. They are doing a lot of lobbying and go around saying how wonderful fish farming is. Because of this the AAssoc2 people do something similar and go to the city council presenting their views" (AAssoc2).

The stakeholders also identified a number of other relationships with the industry relating to agreements for the use of anti-predatory nets (*RSPBA*); direct communication with fish farmers in the form of informative visits (open-day visits – *AAssoc1, WWFS, FOE*); indirect forms of communication through: comments; appeals; development objections; newspapers; the Local Authority; environmental consultants for the drafting of EIAs; and others (*AAssoc1, RSPBA*); and through the ICIT coastal management forum in the past (*AAssoc2, RSPBA*).

For a while there was a coastal forum in the "A" Islands under the auspices of ICIT (branch of Heriott Watt University) where stakeholders were meeting to discuss all aspects of coastal zone management. This Forum had brought together all the involved parties in the same room with the salmon industry but it did not allow any consensus. There was disagreement over the industry's practices and that together with the continuous consolidation of the salmon producing companies that was taking place in the "A" Islands at that time (the companies and their representatives where changing all the time and it was difficult to follow what each new

company was doing because of the new agendas brought forward each time), caused the demise of the Forum (*AAssoc2*).

As a result of the embattled relationships the associated messages towards the industry relate to a call towards more sustainable environmental practices and performance as well as to a need for better communication and accountability relationships with the rest of the stakeholders. Specifically, in relation to the environment there is a call for balance between the environment and socioeconomic development issues (*WWFS, RSPBA, FOE*); as well as for the industry to realise that it is not more important than other sectors (*AAssoc1, FOE*); and for the industry to acknowledge its environmental and social responsibilities and in specific that salmon farming: has economic impacts (associated with environmental issues) on other industries (*AAssoc1, AAssoc2, FOE*); has environmental/public health responsibilities (*AAssoc1, AAssoc2, WWFS, RSPBA, FOE*); and that its practices/mentality need to change (*AAssoc1, AAssoc2, WWFS, RSPBA, FOE*).

Stakeholders believe that the industry has to become more sustainable (*AAssoc2, WWFS, RSPBA, FOE*) and they see a small or less intensive industry as more environmentally compatible (*AAssoc1, FOE*). They believe that salmon farmers and the indirect impacts they have on the wild fisheries because of their needs in fish-feed, have to be addressed and not just brushed aside as irrelevant (*AAssoc1, AAssoc2, FOE*). The general feeling was that stakeholders do not believe that there is a real change in the way the industry approaches the environment (*"no real change in the industry's - regulator's mentality"* (*FOE*)). On the other hand the industry claims that fish farming is environmentally friendly (*AAssoc1*).

Organic salmon farming is generally seen by all the stakeholder representatives involved as more environmentally friendly, or at least less unsustainable than conventional fish farming. However, AAssoc2 and FOE emphasise that organic farming is far from what they would call sustainable and it can become a major environmental threat. It is also believed that organics and its feasibility in fish farming is not clear and this is an issue that has to be addressed (*AAssoc2, WWFS, RSPBA, FOE*). Stakeholders believe that quality salmon might be more environmentally friendly and they would like to see the industry going along that path (*FOE*).

On the communication side, stakeholders talked about better communication with the industry than in the past (*AAssoc1, RSPBA*), and a better understanding between the involved in the arena parties through the "Strategic Framework" and tri-partite processes (*AAssoc2, WWFS, RSPBA*). However, they believe that better communication (*AAssoc1, WWFS*), more accountability (*WWFS, FOE*), and a clearer and better code of practice are still in need (*WWFS, RSPBA*).

6.3.2.2 The certifiers

A number of messages are directed towards the certifying mechanisms and specifically towards the Soil Association. AAssoc2 and FOE, as mentioned earlier, see organic farming as not a sustainable solution to the environmental problems of the salmon farming industry and a possible major threat for the wild marine stocks. AAssoc2 believes that organic should mean a compromise for the environment and not "to compromise the environment" and they think that the Soil Association got involved in certifying organic fish because of its own political agenda i.e. to be the main and perhaps the only organic certifier in the entire food chain in the UK. Organic feasibility is seen again as problematic because of a lack of clarification as to what organic fish is, and this is argued to be an issue that must be addressed (*AAssoc2, WWFS, RSPBA, FOE*). There is a call for more research in organic fish-feed safety (*FOE*), and a need for the consumers to be educated about organic fish (*AAssoc1, RSPBA, FOE*).

6.3.2.3 The rule enforcers

The stakeholders see a lot of economic development going into the fish farming industry in terms of effort and money (nowadays and in the past - *AAssoc1, AAssoc2, FOE*). They also talked about "typical" communication between the industry and the regulators relating to licensing issues for new developments or expansion of the existing sites (sea-bed leases, works' licences, discharge consents, EIAs), and development grants (*AAssoc1, RSPBA, FOE*); (disease) monitoring – policing (*FOE*); and disagreements with them over their economic priorities for the industry's development (*FOE*). They perceive SEPA as the major regulatory body having very close communication with the industry (*WWFS*), and see other agencies such as the Crown Estate for example, interested only in the revenue they get from the industry[18] (*RSPBA, FOE*) without really caring about its environmental responsibilities.

On the other hand, they describe their relationships with the regulators as "difficult" (*AAssoc2, RSPBA, FOE*) with a lot of friction because of perceived inadequate regulation (*FOE*). However, regulators do consult NGOs on their views on the industry's sustainable development, and on how sustainability incentives could be created to salmon farmers (*WWFS*), and there is a lot of interaction at formal and sub-political level (*AAssoc2, RSPBA, FOE*).

AAssoc2, for example, talked about scientists working in the Fishery Research Services who cannot publish their findings because they are not allowed by SEERAD. Politicians often tip them off about issues they cannot talk themselves and in that way they put them in the game, as

[18] *"Filling of the Crown Estate's coffers" (RSPBA).*

well as those environmental organisations they are in touch with. They also talked about the usefulness of extreme environmental activists at times and places where the "formal" interests of the organisation seem not to apply.

RSPBA also spoke about close relationships with the SNH which has statutory remit with similar interests to RSPB. The two organisations liaise over a lot of fish farming development applications and they normally contact each other at an informal level in order to check that they do not go down a different path. They do not want to object to an application the other body considers as a good one and vice versa.

With regards to the messages being sent to the regulators, stakeholders see a need for balance between the environment and socioeconomic issues of development (*WWFS, RSPBA, FOE*). Further expansion and development of fish farming is seen as economically fragile and unsustainable (*AAssoc2, RSPBA, FOE*). There is also a call for: relocation of the fish farms in less environmentally sensitive areas (*AAssoc2, WWFS, FOE*); and better environmental science (in terms of research or along the precautionary principle) and regulation (*AAssoc2, WWFS, RSPBA, FOE*). Typical statements include:

"The elected members of the council make their decisions based on economy and employment and on conservation issues" (RSPBA).
"The industry will probably always make the economic claim and that will always control its actions" (WWFS, RSPBA).
"The supermarkets only care about their profitability and do not want to make the industry sustainable because this will be more expensive and therefore less income for them" (RSPBA).
"The long term aim is to balance the socio-economic interests of the industry with less damaging impacts on the environment in a way that socio-economic and environmental interests co exit" (WWFS).
"The industry is not economically or socially stable. Because of the falling price of salmon more pressure is put on the environment by the farmers in their effort to cut their fixed costs. That is not justified by the claim of continuous employment in the rural areas or at least in the "A" Islands because there is a surplus of jobs. So further fish farming development in the "A" Isles at least is not an economic priority....There is structural instability in the industry because of the consolidation - foreign ownership that has been taking place. So what is happening in Chile might have impacts on what is happening in Scotland. So this structural fragility bears concerns about the economic development of the rural areas through aquaculture.... Because of the price pressure the structure of the industry will change even more (more consolidation)" (AAssoc2).

"The framework for Scottish aquaculture shows that at least SEERAD acknowledged that there is a lice problem. So the government accepted responsibility on that clear issue to hold the industry back. The government until recently was refusing to accept that responsibility on that linkage between the industry and the sea-lice but now they encourage farm relocation" (AAssoc2).

"The salmon farms are here so they have to get away from sensitive areas. Relocation is needed. The farms should be land locked and they should not use GMOs" (AAssoc2).

"More spatial planning is needed for the industry's development" (WWFS).

"The industry claims it is clean because it follows SEPA's regulation. But sea-lice is not regulated by anyone and SEPA's models used for the monitoring of the discharges (discharge consent) are too simplistic based on fjord type systems, unable to grasp the complexity of the issues involved at least in the "A" Isles where area "X" for example has been categorised as a category 2 area, something that does not grasp its complexity or reality. So there is a lot of prescriptive inflexible regulation which does not relate a lot to what is happening" (AAssoc2).

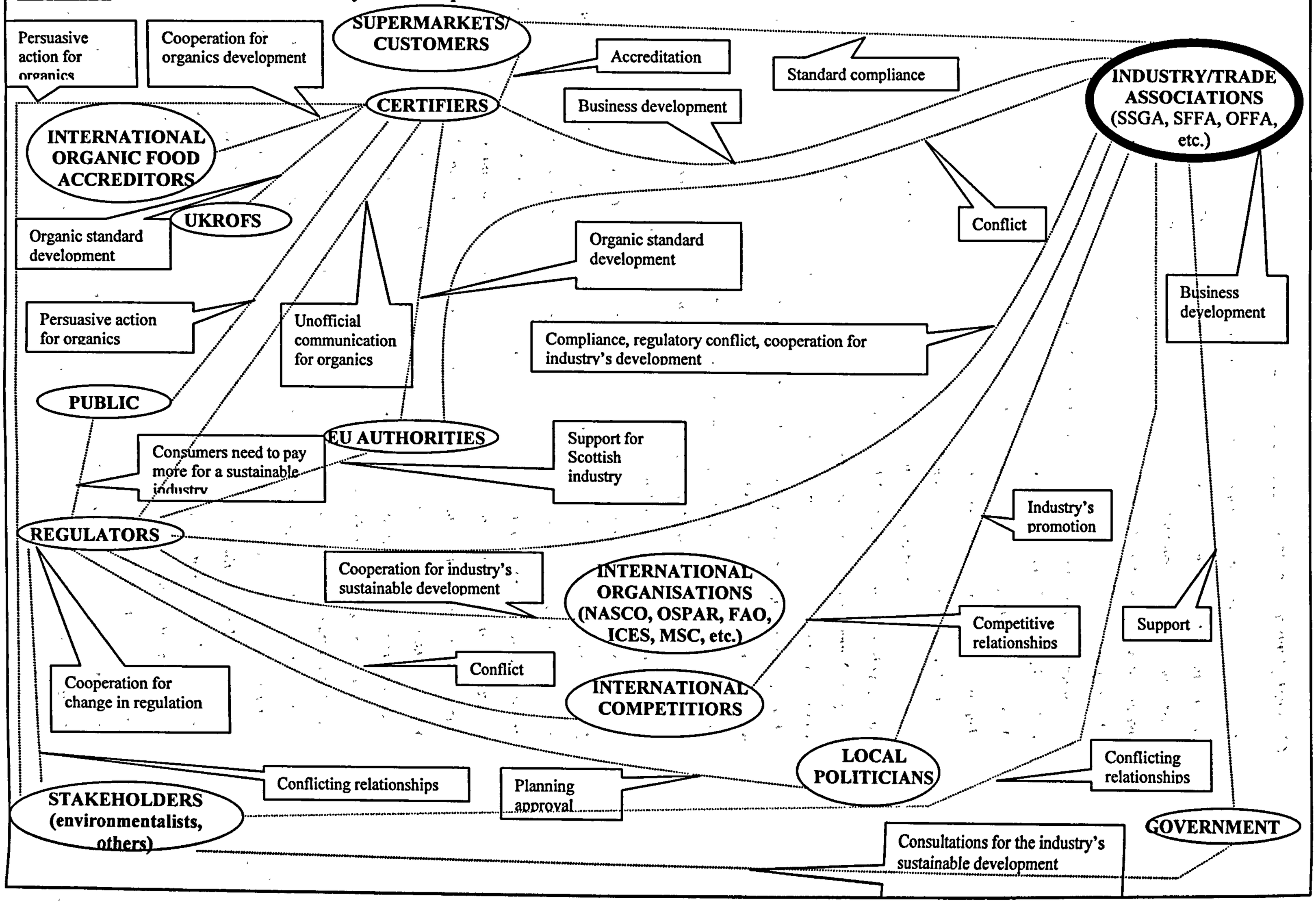
"The lack of info is very worrying. Good science is ought to be brought in and make sure that practices are implemented" (WWFS).

"The consequences of the whole genetic mixing between farmed and wild salmon are unknown. At the bottom line we do not know what is actually happening. There is not good monitoring of the escapees, we do not know where they go or the impacts they have" (WWFS).

"It is not possible to say which fish feed is coming from sustainable or over-fished stocks...the EIA does not take into consideration the wider impacts... There is a need to identify where the sensitive ecosystems are and this is more preferable than having measures of nutrient or nitrogen loading. The regulators have to take into account the sensitivity of the environment of an area rather than just setting standards...WWF would like to see the imposition of minimum fairly good standards in aquaculture like in agriculture....There is a huge knowledge gap on what is sustainable and how you can measure it. Not enough knowledge about fish-feed, chemical impacts, relationships between sea-lice populations and wild stocks" (WWFS).

"Lack of knowledge and information about the cumulative impacts of the fish farms...There is a lot of ignorance out there and there is not the necessary information that will convince a public inquiry that some developments are dangerous...RSPB is very concerned about cumulative impacts and the info does not seem to be out there to enable them to put it forward to their comments. They feel they do not know what the impacts of the salmon farms really are. They think that these are not good and there should be a hold on fish farming development until they have good info about the carrying capacity of the Scottish waters as a whole and area "X" in particular...It is difficult to prove some points on environmental impacts because of the difficulty to obtain good data...everyone feels that the limits SEPA puts on the industry are not stringent enough but RSPB or other stakeholders do not have good data to back this up" (RSPBA).

Figure 6.4: *Risk communication – rule enforcers and political institutions*



Finally, the stakeholders do not see any real change in the industry's or the regulator's mentality regarding the former's environmental responsibilities (*FOE*); and they perceive serious risks for the wild/industrial fisheries because of their use for fish meal purposes (*AAssoc1, AAssoc2, FOE*). On the communication side, they again talked about better understanding between the involved in the discussions for a sustainable aquaculture parties, through the "Strategic Framework" and tri-partite processes (*AAssoc2, WWFS, RSPBA*) but with a need for much better communication (*WWFS*).

6.3.3 The rule enforcers and political institutions (relationships – messages)

The salmon industry's routes of communication with other actors from the regulators' standpoint are presented in figure 6.4. The regulators identify a more complicated arena than the other two categories (i.e. industry, stakeholders) with a greater number of players interacting with the industry, with each other, and the rule enforcers. This communication traffic seems to be focused mainly: at the industry level (industry – regulators, industry – certifiers, industry – stakeholders); at the regulatory level (communication within the regulatory group, regulators – certifiers, regulators – stakeholders, regulators – EU authorities); and to a lesser degree between the certifiers, the stakeholders and the general public. In addition, relationships were described between other actors directly or indirectly involved with the industry. In the continuation of this section the categories in which most of the communication between the different actors seems to take place will be presented.

6.3.3.1 The salmon farmers

Most of the communication in this arena seems to exist between the regulators and the producers. The regulators talked about a "hands-off approach" in the past, that was dictated by the respective governments who saw the industry as something innovative that could help the rural economies, which resulted in the accumulation of environmental problems because of the fish farmers' practices (*SEPAD, HIE*). These problems came to a head in the late 80s early 90s with the industry running into disease problems, which led to a dramatic rise in its media profile relating to the salmon farmers' environmental and scenic impacts on the local communities as a whole (*HIE*). As a result, the whole "*laissez faire*" mentality was abandoned.

Nowadays a range of relationships exists with the producers. The most important of them were described as: monitoring – policing of the salmon industry (*AEH, SEERADFG, SEPAA,*

SEPAD, SNH, SF); communication about hygiene issues (*AEH*); development assistance[19] (now or in the past) (*AED, SEERADFG, SEPAA, SNH*); assistance for comparative cost studies, since the sector perceives the lack of knowledge on the production costs of other competitive nations as the main reason for the existence of dumping – overproduction issues (*SEERADFG, SF*); and training programmes (Lantra, etc.) (*SF*).

SEERADASD pointed out how difficult the communication on dumping and overproduction is since this is a "closed" industry, mostly foreign owned, and this might be its last chance to co-operate with the policy makers and with their international competitors in disclosing information on their production performance.

The regulators also talked about not very good communication with the salmon industry and disagreements over the economic priorities relating to the industry's development (*SA*).

Other forms of relationships involve those relating to typical licensing issues such as: sea-bed leases; works' licences; discharge consents; EIAs; development and research grants (*AEH, AL, AED, SEERADFG, SEPAA, HIE, SF*), appeals for licensing issues (*AEH, AL*), and briefings of the regulators from the Producers' Associations (*AED*).

The regulators emphasised the discussions taking place between the industry and the other involved. in the arena parties. These meetings' focus is on aquaculture's sustainable development regarding: escapes monitoring; fish health; welfare; area management; economic development and promotion of the industry in order for the rest of the stakeholders to get to know it (*SF*). In that context there is a lot of interaction between the producers and the regulatory and political institutions. The latter talked about: "Strategic Framework" previews/ reviews and feeding in them (*SEERADFG, SEPAD, SNH, SF*), meetings between the industry, the government, the regulators and the stakeholders through the ministerial and tri-partite working groups (*SA, AED, SEERADFG, SEPAA, SEPAD, HIE, SNH, SF*) in an effort to improve relationships and communication between the salmon industry and the environmental groups. SEPA was also described as having good communication with the industry and to act as an intermediary between the industry and the other stakeholders (*SEPAA, SEPAD*).

The messages that are passed back and forth between the industry and the regulators can be categorised in: messages involving economic and competitive issues; a call for an understanding

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[19] HIE talked about less and less developing assistance to be going into the finfish industry in terms of financing. There are still some funds going in however, for diversification purposes or shellfish development.

of the industry's responsibilities and an associated need for better communication with the others stakeholders; and sustainability issues.

Specifically on the economic side, there was the recognition of a need for a better understanding between the industry and the regulators, a change in the current regulatory structure (licensing, etc.) (*AEH, SEERADFG, SEPAD, SF*), and better regulatory support for the industry's competitiveness such as better FIFG money allocation, infrastructure, training, funding for technology and environmental research (*SF*). The industry sees an unnecessarily high regulatory cost which is a burden for its competitiveness (*SEERADFG*) and believes that all the problems it faces will be solved "*if more money is put in it*" (*AEH, SEERADFG, SF*). On the other hand, the regulators say that the industry needs to cooperate with its international competitors (*SEERADAFG*) and to become market led (*SEERADFG, SF*). The producers must become more economically and technologically efficient, able to attract investment and control their costs (*SF*). Diversification in other species is seen as a means of survival for the current and possible future crises (*SEERADFG, SF*) but it is stated that at the bottom line the industry is responsible for its own business decisions (*SEERADFG, SEERADASD, SEPAA*). Finally the high regulatory cost the industry claims to exist is there because of the producers' practices (*SNH, SF*).

Another message category relates to the environmental responsibilities of the salmon farming industry. It is claimed that there is a lack of sound evidence over the importance of the salmon producers' acclaimed economic benefits for the rest of the stakeholders (*AEH, SNH*). The industry is seen as having economic impacts on other industries, on itself, and on other stakeholders (*AEH, SNH, SF*); and as having environmental, health safety, and animal welfare responsibilities (*AL, AED, SEPAA, SEPAD, HIE, SNH, SF*). Producers are not seen as more important than other sectors such as the tourist industry, the fishing industry, etc. (*AEH, AED, SEPAA, SEPAD, HIE, SNH, SF*). There are calls for a change in the fish farmers' practices and mentality (*SEPAD, SNH, SF*) and for the industry to become more environmentally sustainable (*SEERADFG, SEPAA, SEPAD, HIE, SNH, SF*). In that context, regulators argue that there is a need: for increased stakeholder involvement in the industry's affairs and planning (*SEERADFG, SEPAD, SF*); more accountability (*SF*); better and clearer communication and code of practice from the producers and their trade associations (*AEH, AED, SEERADFG, SEERADASD, SF*); and more cooperation with other industries, sectors, and stakeholders through the AMAs (*SNH, SF*). Communication, however between the industry and the rest of the stakeholders is seen as having been improved through the tri-partite and ministerial working group processes[20] and these routes are further encouraged.

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[20] "Better u*nderstanding between organic production and sea lice issues through the tri-partite process*" *(SA).*

Regarding the issue of sustainability, a smaller–scale, less intensive industry is perceived as being more sustainable (*AED, SEERADFG, SNH*). Regulators believe that some areas should be kept free of aquaculture development for preservation and scientific control purposes (*SNH, SF*), while future development has to take place according to the precautionary principle and poly-culture and diversification in other species should be encouraged (*SEERADFG, SEEPAD, SNH, SF*), along with fish farms relocation (*AEH, AL, SEEPAD, SNH, SF*). Organics is something that has not been promoted and the industry is free to decide on its own about its applicability (*SEERADFG, SEPAA*). Such freedom exists despite the lack of clarification regarding what organic means in relation to fish farming and whether its acclaimed "better status" is indeed warranted in comparison to mainstream fish (*AEH, AED, SEERADFG, SEPAA, SEPAD, HIE*). However, organic fish farming is thought as a more environmentally friendly and a less unsustainable practice (*SA, SEPAA, SNH, SF*) and organic salmon could be an economic and environmental solution for the industry's problems (*SNH*).

6.3.3.2 Salmon farmers and certifiers

The main relationships identified between the industry and the certification mechanisms involve: compliance with the respective standards (*SF*); advice for organic production (*SERADFG*) and organic standard development by the SA (*SA, AEH, AED, SEERADFG, SEPAD, SF*).

On the side of the messages, the SA talked about difficulty in setting organic standards because of ineffective organic treatment for sea-lice; and the open character of the marine environment. Organic fish farms would ideally be closed systems but everyone has to be realistic and understand that this cannot happen. Both fish farmers and consumers need to be educated about the organic fish, which is seen as more environmentally friendly and less unsustainable than the conventional practice. Such views are held because of the organic fish-feed, which is supposed to be coming from by-products of human consumption and in that sense, it is environmentally sustainable, and because quality in general means better production practices; thus, organic salmon is of higher quality than the conventional product. There is also a need for better communication between the producers (both organic and mainstream) and a call for them to work together more and more because of the impacts they have on each other.

"Better understanding between the involved parties through the "Strategic Framework" and tri-partite processes" (SA, AED, SEERADFG, SEPAA, SEPAD, HIE).

6.3.3.3 Salmon farmers and stakeholders

The rule enforcers again identified an embattled situation between the salmon industry and other stakeholders. They talked about bad press (*SA*); campaigning against the industry (*SEERADFG*); of frictions and poor relationships (*AEH, AL, AED, SEERADFG, SEPAA, SEPAD, HIE, SF*), because mainly of the industry's removal in terms of ownership from the local communities in which it operates (*HIE*) and lack of communication with stakeholder groups (*SERADFG, SEPAD*). Typical statements include:

"Sea-lice is an issue played down by the industry on the one hand and on the other it is exaggerated by other lobbies taking it as an opportunity to go against the industry...The industry in terms of ownership has further been removed from the local communities. Because it is becoming more business like and more cost driven tends to lose sympathies within communities even though it claims to support them. The workforce is reduced on farms so there are fewer people around having direct interest in the existence of the farms. In addition to that there is a long-run media campaign (with a lot of truth in it). So there are a lot of issues running against the industry in the local communities. If there is something people do not want to see but provides 8 - 10 jobs in an area it may be accepted but if it only provides two or less jobs, which are taken by people coming in by boat from elsewhere for example, then it will not have the public's acceptance. The linkages of the industry into the communities have weakened to a big extent" (HIE).

"There is out there a polarised debate. The industry wants to expand and cut costs because it competes in a tight global market with low profits and the environmental lobby in its extreme case wants all fish farming activity to disappear...The divergence of views make constructive dialogue difficult because they throw rocks to each other and to SEPA which sits in the middle tries to avoid them...Salmon farming is not an activity based in thousand of years of practice such as agriculture. Suddenly there were proposals for farming at sea and an industry that got into it and a regulatory process trying to catch up with them. So for some people the debate of that practice's acceptance never happened" (SEPAD).

"Prior to the formation of the ministerial working group all the parties were polarised having shouting matches with each other" (SEERADFG).

"The industry is preaching to the public but its position is not envious in trying to win public opinion over" (AEH).

"Frictions between the salmon farming industry and organisations protecting wild fish (AAssoc2 or District Salmon Fishery Boards in the west coast)...In the "A" Isles there are these two polarised groups (the salmon industry and the AAssoc2) and SEPA wants to discuss with them whatever concerns they may have" (SEPAA).

"The industry asserts that its environmental footprint is minimal while environmentalists say that no-one can know that until more hard data is available" (SEERADFG).

For that reason it was suggested to the salmon producers' representatives, that environmentalists and the general public should get to know the industry better (*SEERADFG*). The relationships between those groups were, and could continue to be, established through open-day visits (*SF*); meetings between the industry, the government, the regulators and the stakeholders through the ministerial and tri-partite working groups (*SA, AED, SEERADFG, SEPAA, SEPAD, HIE, SNH, SF*); and "strategic framework" previews, reviews and feeding back to them (*SEERADFG, SEPAD, SNH, SF*).

Messages between the industry and the stakeholders include calls for better and clearer communication and code of practice on the part of the industry (*SA, SEERADFG, SEPAD, HIE, SF*). However, the industry's claims that it is legitimate because of compliance with regulation (*SEERADFG*). In addition, better understanding between the involved parties (organic and non-organic producers as well as other stakeholders) is sought through the Strategic Framework and the tri-partite processes (*SA, AED, SEERADFG, SEPAA, SEPAD, HIE*), which were means of opening up communication channels (*SEERADFG*).

The Strategic Framework is seen by the regulators as a successful exercise in bringing all the polarised groups together. As a result of that communication process a lot of the environmental NGOs moved softening their approach and also the industry developed a better understanding concerning its environmental responsibilities. However, it is still up to the industry to use it for a strategy that will attract more capital investment in it (*SEERADFG*).

Of particular interest is the indirect communication about the industry taking place at the level of the regulators with other stakeholders (i.e. between regulatory agencies themselves, EU authorities, certifiers, and NGOs) and at the level of the certification mechanisms (certifiers – stakeholders, certifiers – general public).

6.3.3.4 Communication between the rule enforcers and political institutions

At the level of the regulatory agencies, relationships were described between agencies of different remit over the industry's development and discussions about changes in that remit (*AL, AED, SEERADFG, SEPAA, SEPAD, SNH, SF*). Because of the fragmented structure of the associated different agencies[21] (*AEH, AED, SEERADFG, SEPAA, SEPAD, HIE, SF*) potential

[21] In this area were identified: SEERAD; HIE–REN; SNH; Regional Authorities; SEPA; FSA; HSE; CE; MCA; VMD; and EMEA (see the rule enforcers and the political institutions categories in figure 5.1).

policy clashes and regulatory inconsistencies may occur between SEPA and the different Local Authorities or the Crown Estate (*SEPAD, SNH*).

The messages conveyed relate to the nature of the remit of those different agencies. For example SNH, which has a "greener agenda", more similar to that of environmental groups than the rest of the regulators involved and operates in a consulting role to SEERAD regarding the industry's practices and development, calls for better environmental science, more research and development along the precautionary principle, and a need for better regulation (*AEH, AED, SEERADFG, SNH, SF*). SF, on the other hand, tries to encompass and highlight all the different views about the salmon farming industry. Other messages relate to the need for balance between the environment and socio-economic issues (*SEPAD, SNH, SF*), and better communication between the regulatory agencies (*AL, AED, SEPAD, HIE, SNH*), and a view that a clearer and better regulatory remit and expertise are needed (*AL, SEERADFG, SEPAD, HIE, SNH, SF*).

Regulators and politicians seem to be particularly concerned with the international competitive environment in which the Scottish salmon industry operates. For that reason they have been in contact with the EU Commission about anti-dumping measures against the Norwegian and Chilean industries, especially after the abolition of the Minimum Import Price for salmon products in the EU in 2003 (*SEERADFG*). For that purpose, SEERAD is considering to submit an application for market surveillance of salmon products entering the EU (in terms of volume and price) to the EU Commission. A scheme like this however, will need the support of the majority of the "Scottish" salmon farming industry whose 75% at least is of foreign (Norwegian) interests (*SEERADFG*). The Irish industry is in a similar position having also made an application for a monitoring scheme in the European Commission. It will be interesting to see how this will develop before any political decision for support of such a scheme is made in Scotland (*SEERADFG*). Relationships also exist with the EU authorities for the integration of EU Directives into the national legislation (Water Framework, Strategic Environmental Assessment, animal welfare issues, strategic development, and allocation of the FIFG funds) (*SNH, SF*).

6.3.3.5 Communication between the rule enforcers and certifiers

In relation to the relationships between the regulators and the industry's certification mechanisms, SEPAA talked about a lack of communication between SEPA and the Quality Certification Bodies. The latter do their inspections and if they find any problems they would most likely not tell SEPA. On the other hand SEPAD talked about unofficial consultations with the SA regarding "organic salmon".

The messages communicated expose a difference of opinions between the regulators and the SA regarding the "organic fish status". Specifically it is argued that it is unclear whether organic fish is feasible and why it is seen as being better than conventional fish (*AEH, AED, SEERADFG, SEPAA, SEPAD, HIE*), while there is also a need for the organic fish-feed to come from sustainable sources (*SEPAD, SNH, SF*).

SEPAA sees as the only differences between organic and conventional salmon farming relating to the: number of fish kept in a cage; lesser usage of chemical and therapeutants; and perhaps the larger area that can be allowed for farming as a result of the lower fish densities. However, all other outflows/inflows are thought to be the same with conventional salmon. Organic input and nutrient releases do not have a different status from those used in conventional farming. So there is not real difference between organic and conventional farming from that point of view. In addition HIE states that organic salmon farming might be a perhaps more sustainable practice but sea-lice remains a problem.

The SA replies by stating that organic is more environmentally friendly and thus less unsustainable, organic fish-feed comes from sustainable sources and that consumers need to be educated about organic fish[22].

It is argued by the SA that nothing in the world is really sustainable because everything changes all the time. The question is whether the aquaculture industry is desirable or not. Their view is that it is not in terms of fish farming (and salmon farming in particular). Every kind of intensive farming has large impact on the environment, but organic fish farming is a lot more sustainable than conventional. However, the possible cumulative and synergistic effects have to be considered yet. "*At the end of the day how ultimately sustainable organic fish farming is remains to be seen*" (*SA*).

It is further argued that there is a need for better environmental science and regulation (*SA*). The EIAs for example, are not that useful in covering the cumulative systemic impacts of fish farming. They examine the individual areas but they do not investigate the whole picture and the synergistic effects. These are expensive documents to produce but there is a need for a more holistic view of the salmon producers' impacts.

6.3.3.6 The stakeholders

The rule enforcers described turbulent relationships between them, political institutions and stakeholder groups because of the industry's operations. SEPA is seen as acting as an

[22] Similar messages are directed towards the stakeholders and the general public.

intermediary between the industry and the other stakeholders (*SEPAA, SEPAD*) and there is pressure at political level to show effective results over the industry (*SEERADFG, SEPAD, HIE*). Typical statements include:

"SEPA would talk with the industry or the environmentalists separately about its approach but the two polarised groups would not talk to each other. It was very difficult to actually bring them together in the same room" (SEPAD).

"SEPA acts as an intermediary between the salmon farming industry and AAssoc2 by inviting both parties for discussions but it wants first the industry to have two or three meetings with AAssoc2 before they go along...SEPA is not pushing anyone but they have given invitations for discussions to both polarised parties and the council might also be involved" (SEPAA).

"The strategic framework exists because of the refusal of the government for a public inquiry. However because the government is responsive to public opinion it brought the framework into existence (HIE).

"The framework was brought in place to show that something is done by the government to settle the polarised debate....The government did not go ahead with a public inquiry because it felt threatened" (SEPAD).

*"SEERAD has pressure to show that it is doing something (*about the industry's environmental responsibilities*). "Green" Members of the Parliament (MSPs) pressed the Minister to show results about the acclaimed problems caused by the industry. These argue that it took a long time to SEERAD to bring the Strategic Framework out. Pro-aquaculture MSPs want more support for the industry and the rural areas...Everyone has an interest in aquaculture and they want to know about the economic issues at hand" (SEERADFG).*

On the side of the messages, regulators seem to legitimate the producers' practices. They also talked about the need for the environment to be protected, whilst recognising a need to take socio-economic issues of development into account (*SEPAD, SF*). Aquaculture is an important industry for the rural communities and for national exports. Many of the employees spend their salaries in the rural communities in which they live and the sector, in addition to the direct and indirect income and employment effects it has on the rural communities, it further stimulates them with "induced" economic effects. Furthermore, the industry is seen as a national asset in producing the needed protein for the covering of the human needs in fish especially in light of the declined wild populations (*AED, SEERADFG, SEPAD, SEPAA, HIE, SF*). The regulators also talked about the unclear GMOs status, which could have positive impacts for the industry's competitiveness by reducing its production costs (*SF*), and that consumers demanding a more sustainable salmon industry will have to start paying more (*SNH, SF*).

SEPA is perceived as the main regulator applying national policy (*SEPAD, SF*) and the existing environmental regulation is perceived as clear, efficient and sound enough to base environmental policy upon (*AL, AED, SEERADFG, SEERADASD, SEPAA, SEPAD, SF*). Sea-lice is seen as a natural disease not caused by the sea farmers and therefore it is not regulated yet (*SEPAA*).

Regulators believe that the existing risk debate between the industry and the stakeholders is based on the nature of aquaculture. Aquaculture is a new industry compared to agriculture. Moral discussions regarding its acceptance had not taken place when suddenly some people began farming fish (*SEERADFG*). There is a lot of misinformation about the industry's practices (*SEPAD, HIE*) and stakeholders need to be educated about aquaculture (*HIE, SF*). NGOs when they are doing a good job make a point of bringing out areas where regulation is not strong enough or is lacking but they should perhaps change their emphasis on other issues of concern and start pushing for more sustainable fish-feed, for example (*SEPAD*).

"Environmental lobbies" state that SEPA is not effectively regulating the industry and that it should be doing more (*SERADFG, SEPAD*). A situation certainly not perceived as true by the rule enforcers and political institutions.

6.4. Summary – conclusions

This chapter presents an empirically grounded description of the risk construction and communication routes of the arena participants in the debate about the dangers posed by the Scottish salmon farming industry's practices. Particular attention was paid in examining how these different perceptions affected/affect the decision of some farmers to move into organic production[23].

What was made clear from the very beginning, in accordance to the associated literature on risk perception[24], was that the different views that were explored were dependent on the social and cultural contexts in which risk was understood and negotiated (*Lupton, 1999, p 24*). The importance of the threats posed or faced by the salmon industry were different for each of the three categories in which the industry, regulatory, and other stakeholder representatives were grouped. The focus of the debate is on the environmental responsibilities of the salmon industry and this is reflected in the various views and messages as these were previously presented. To sum up:

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[23] See section 3 of the introduction for a presentation of the research questions investigated in this study.

[24] See for example Adams (*1995*), Beck (*1992*), Beck et al (*1994*), Lupton (*1999*), Gross et al (*1985*) and others.

Table 6.2: *How fish farmers account for what they are doing*

Accountability processes in Salmon farming					
Frequency of contact	*Power*	*Information Flows*	*Mechanisms*	*Information Demands*	*Accountees*
• Regular – systematic ❖Weekly ❖Monthly ❖Annually • Contingent on Event ❖Start up/expansion ❖Business event ❖Specific crisis ❖General crisis	• Statutory demands ❖Symbolic ❖Enforceable (sanctions) • Recommended (good practice expectations) • Certification ❖ Voluntary demands (by accountees) ❖Voluntary (accounters)	• Outwards • Inwards • Two-way • Chains • Webs	• Statistical reports • Compliance ❖ Inspections ❖ Reports ❖ Site visits • Written reports ❖Free form ❖"Forms" ❖Financial Accounts • Statutory returns • Face to face meetings • Ad hoc communication • Formal round tables ❖Producer Organisations ❖AMAs ❖Tri – partite working groups ❖Ministerial working group • Voluntary groupings • Informal networking • Applications ❖Financial support ❖Licences ❖Accreditation • Policy consultations • Expert consultations • Media releases • CSR • The Web	• Scientific • Scope ❖Specific ❖Holistic ❖Fragmented • Quantitative • Qualitative • Financial (£s) • Content • Statistical	• Persistence ❖History • Links with other accountees • Dominant culture • Dominant ideology • Legitimate discourse • Concerns • Restrictions • Rules • Risk perceptions • Objectives • "Their Accountability"

Generally, producers do not see themselves as having significant, if any, environmental impact partly because of the friendliness of their practices to the environment but mainly because of compliance to strict environmental regulation, which is seen as imposing an unjustifiably high cost. Producers are more interested in the economic risks they face[25]. They perceive the sector as being an important employer for the rural areas and they see social risks arising from the risk of unemployment caused if the industry is forced to move away from Scotland, due to over-zealous environmental regulation.

Environmental groups and other stakeholders perceive the salmon industry and the associated regulatory regime as holding significant environmental threats because of their interest mainly on the economic benefits the industry might have and not on its environmental responsibilities. Environmental regulation and science are perceived as inflexible, unrelated, and not robust enough; environmental regulation is seen to legitimise the producers' practices. With regards to social issues, the industry is not seen to be such an important employer. Instead, environmental groups and stakeholders are concerned with the health threats the producers pose by allowing "stuff" to enter in the human food chain.

The rule enforcers' views lie between the above two polarised positions, perhaps closer to the industry's position, with the belief that the industry could have adverse environmental and health impacts but this will not happen because of a good and well-established regulatory regime upon which Scotland's environmental policy, with regards to fish farming, is based. They perceive international competition as a far greater threat for the industry than its impacts on the environment and they see the industry as a national asset.

The communication routes between the involved in the risk arena parties were also examined as these were seen from the premises of each of them. Through these the accountability processes existing in the arena are summarised in table 6.2 and will be discussed in chapter 7.

Fish farmers admitted to third parties having a minimal influence in their decision-making process. The producers hold conversations through their trade associations about the industry's future development, and they are predominantly concerned with competition and business relationships with each other and the quality certifying mechanisms. They see regulators as the most important group of people they interact with and they described turbulent relationships with environmental or other stakeholder groups. The messages they try to put across relate to the significance of the economic conditions they face (overproduction, poor prices, need for investment in the industry, etc.) and the associated development issues (market development,

[25] These risks were described by the salmon producers as detrimental in their decision making process.

organic standard robustness which will "secure" the organic market, new products, diversification, etc), the unnecessarily strict environmental regulation in which the industry operates, and to a need for better understanding and support by the regulators and the rest of the stakeholders (who are seen as being misinformed for the producers' practices).

Fish farmers see the existing accountability mechanisms as more than sufficient even though their need is perhaps unrealistic given the environmental friendliness of the sector. Nevertheless these serve to inform the rest of the stakeholders on things they do not know (i.e. their operations). There is a perception of better understanding through the tri-partite and ministerial working group processes with a scope for even better communication with the involved in the risk arena parties.

The stakeholders also described embattled relationships with the salmon producers, all of them relating to their environmental performance with a call for more sustainable environmental practices (organic salmon is seen as having less impacts but being far from what it would be called an environmentally sustainable solution) and performance and for a need for better communication and accountability relationships with the rest of the stakeholders. Communication with the industry is perceived as better than in the past but still problematic and there is a need for improvement. Rule enforcers and political institutions are seen as giving the industry a lot of economic support which is both environmentally and economically unsustainable. Rule enforcers try to legitimate such support by claiming that efficient environmental science and regulation is used; whilst stakeholders do not perceive the science and regulation being as such. Despite this, regulators also see a need for balance between the environment and socioeconomic issues of development.

The rule enforcers and political institutions described a lot more interaction between the various actors than the other two groups with a lot of the communication taking place through indirect channels. They see the industry as an important sector for the rural economies which they monitor and police efficiently and which they try to support through its current financial difficulties, even though there are disagreements over the economic priorities set by them. They see the existing turbulent relationships between the salmon industry and the other stakeholder groups as being based on the lack of good communication. Regulators believe that closer discussions with the other actors in the arena regarding the industry's environmental responsibilities will result in the public getting to know the industry better; thus resolving the problems relating to the "bad image" of salmon farming and perhaps reducing the financial difficulties experienced by the producers. For that reason they work together through the tri-partite and ministerial working groups with a scope for even better communication.

With regards to the social resources utilised within this arena[26], the industry's representatives spoke about lack of money and power as a result of global competition. In addition, compliance with numerous regulatory standards, as well as those of supermarket or other customers are followed using social influence and value commitment generated via various certification schemes. In that way the industry representatives seek to approach and persuade the other stakeholders and the general public that they "are socially responsible". They consider their practices environmentally benign and they try through certification to differentiate their final products in search for better price premia. As evidence to their claims producers promote their compliance to a strict regulatory regime, which is based on good environmental science.

On the other hand, environmental groups try to use sub-political influences in their effort to make the industry more environmentally sustainable. They argue that the so called "evidence claims" of both the regulators' and the sector's representatives in the arena, for good environmental science, are not valid since the former themselves acknowledge their inability to fully know the issues behind the complex marine ecosystems. Their main concern lies in the industry's financial robustness and for that reason things need to change.

The regulators and political institutions use their legal power to both underline the industry's operations and quieten the environmental groups' claims of scare stories. However, they recognise that all the noise created around the industry's operations is potentially financially damaging for the sector and the rural communities that are supposed to be supported by the latter. This situation has to be smoothed out and the best way to do this is by bringing all parties involved in the debate to the table in an effort to get to know each other better and to perhaps address in that way each other's concerns.

It is argued in this thesis that the decision to shift towards organic production is influenced by the underlying risk perception of those making the decision. Decision makers' perception of risk is one way of understanding how certain factors were considered legitimate/illegitimate and therefore powerful/weak in influencing the decision. The risk perception is also important in legitimating the costs/benefits associated with the decision. Unless risks are considered "real" by the decision-makers the associated costs/benefits of doing or not doing something are not going to figure in their decision heuristics, regardless of the nature of their calculation.

Risk perception/construction is one important factor to be considered in the development of CSR/SEA thinking and practice. In the case of Scottish Salmon Farming, as represented in this empirical study, SEA did not play an important role when decisions were made regarding ventures into greener forms of aquaculture production (i.e. organic salmon). This could be seen

[26] See section 3.3.2.

as a function of a number of different factors: for example, traditional lack of reliance on accounting data for agricultural decision making, and the lack of recognition of environmental or health risks caused by the production and consumption of their product. Environmental risks and concerns were dealt with and legitimated via the regulatory regime and the product certification schemes they operated within. The concerns of pressure groups were not internalised or regarded as legitimate, rather their views were rejected by the salmon farmers as misguided and ill-informed.

The risk debate discussed in this chapter was critically evaluated in the introductory chapter of this thesis, through the premises of the associated literature, where the notion of CSR/SEA was introduced. The existing "reflexivity" in the salmon risk arena (as perhaps represented by the risk communication taking place between the different interviewed organisations and the supposed improved communication channels opened up through the recent initiatives of the tri-partite and ministerial working groups) was also examined in that introductory chapter through a discussion on the ways institutional reflexivity is expected to be through the writings of Beck (*1992, 1995, 1996*), Giddens (*1991, 1994a, b*), Lash (*1993, 1994a, b, 2000*), Lash & Wynne (*1992*), and Wynne (*1989, 1992, 1996*). All the issues raised in this thesis are brought together in the next and concluding chapter where a discussion on the accountability processes existing in the sector takes place alongside the presentation of the main conclusions of this work and suggestions for future research.

Chapter 7: Discussion – Future Research – Conclusions

7.1 Introduction

From the presentation of the empirical work in the previous chapter three general issues of discussion emerged. These relate to: the decision of some salmon farmers to go into organic production; general accountability issues, and the relevance of the risk society thesis as a way of understanding the emergent discourses.

This chapter starts with an evaluation of the salmon farming arena (see figure 5.1); and continues with a discussion/critique of the accountability processes and environmentally enlightened practices observed. Section 7.3 then reviews the contribution to the knowledge and suggests areas for future research. This is followed by the main conclusions of this study (section 7.4). The chapter finishes with a summary of the work presented in this thesis.

7.2 Discussion

7.2.1 An evaluation of the arena

The governance structures (both political and sub-political[1]), the accountability mechanisms, and the legitimate risks of the different actors in the Scottish salmon farming arena were investigated in this thesis. The system-level analysis of the empirical data is consistent with the model derived from the emergent Risk Society literature. Within this model accountability is integral to an interdependent, co-evolving set of relationships between risk perceptions, risk legitimisation mechanisms, governance structures and institutions. Accountability processes are viewed as key elements of the reflexivity necessary to more effectively govern the risks (hazards and actual) linked with industrial modernity. The lack of effective reflexivity is seen to be connected with a legitimisation and proliferation of the hazards of industrial modernity rather than managing and mitigating its harm.

The analysis of the salmon farming arena provides empirical evidence to support a lack of reflexivity, fragmented "single-issue" political and non(sub)-political governance structures, polarised "legitimate" risks positions, lack of accountability between governance institutions and contested discourse between the different participants in this arena study. The researcher's evaluation is that the political governance structures legitimate fish-farming practices and

[1] See footnote 14 in section 4 for an explanation these notions have in this thesis.

dismiss the sub-political groups as irrational, "nutcases *throwing rocks to fish farmers and regulators*" (*SSGA*). Political institutions adopt an "objective" techno-scientific rationale to justify their position and to reject the criticisms of the others[2]. However, somewhat paradoxically they rely on scientific data provided to them by sub-political supporters of salmon-farming. Within the salmon farming arena[3] the political institutions, fish farmers and certain sub-political groups are acting in coalition to protect the industry, rather than to protect the eco-systems and wider society from potential harm. The "anti" sub-political movement are adopting a techno-scientific discourse to engage with the political institutions to legitimate their risk positions and therefore change the mode of risk governance.

The evidence gathered supports the contested nature of risks and the view that risk perceptions are locally, temporally and epistemologically defined[4]. Considerable diversity in risk perceptions were revealed to be at the core of the discourses between the different parties. Evidence was also available to support the de-politicising of the political institution on two key dimensions. Firstly, the reliance on techno-scientific evidence and thinking to underpin risk governance institutions and processes (*Beck 1992a*) and secondly, the number and nature of sub-political groups involved in rule-enforcing. Rule enforcement, normally assumed to be the function of political institutions, was partially enacted by "pro" sub-political groups. The exception to this assemblage was the Soil Association, which entered into the rule-enforcing role in order to legitimate and promote the notion of organic aquaculture. In many cases the most stringent conditions on farmers activities came from these sub-political rule-enforcers.

The main accountability mechanisms used by the salmon farmers were to satisfy the rule-enforcers of their compliance with their specific rules. It could be argued that there was an absence of what it could be termed a "formal" social and environmental accounting/reporting[5] in this arena because of the scientific nature of the engagement activities. Rather the existence of an economic discourse was revealed.

There is not an absence of social and environmental accountability however, in this arena. The salmon farmers provide a rich, diverse and comprehensive set of social, environmental and economic accounts to a range of political and sub-political institutions, dependent upon the perceived powers of these institutions. The salmon farmers provide far more information to

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[2] See the discussion on Beck's and Giddens's work in sections 1.2.1, 1.2.2, 3.2.2.2, 3.2.2.3, 4.3.1.2, 4.3.1.3, and 4.3.3.

[3] All the participants in this arena-study are presented in figure 5.1.

[4] See sections 3.2, 3.2.1, 3.2.2, 4.3, 4.4, 4.5 and 4.6.

[5] Discussed in sections 1.3, 1.4, 4.3.2, 4.3.2.1, 4.3.2.2, 4.3.2.3, 4.3.2.4, 4.3.2.5, and 4.3.2.6.

these stakeholders than these organisations provide to others. The chain of accountability processes is incomplete, opaque and fragmented or in other words "unreflexive". It is not argued by the researcher that all relevant risks are accounted for or that they are adequately measured and governed, however, the existing accounts have considerable potential for an emergent, holistic accounting of the social and environmental costs (and benefits) of salmon farming. This existing information, if made available, could be integrated into a useful re-presentation of the salmon sector that could be used as part of the dialogic engagement that is critical to the reflexive process[6]. It is not claimed that these emergent accounts would be a "true and fair" view, but rather could act as a heuristic learning device creating the space for a more meaningful mutual critique of the different positions held within the arena.

Salmon farmers provide numerous accounts of their actions, yet these institutions are largely unaccountable. Each institution (political and sub-political) has its own definition of its "legitimate" risks which they privilege and contest with other institutions. Their "legitimate" risk perception is intrinsically linked with their specific accountability demands on the salmon farmers. These fragmented accounts reinforce their legitimated risk perceptions, rather than reflexively critique them. The absence of a holistic, sustainable, stakeholder (who is possibly a mythical creature) and the relationship between the difference institutions means that the salmon farming accountability processes are extremely problematic.

Crudely, the different institutions can be characterised as "single-issue" demanding partial and specific "accounts" of the salmon farmers practices whilst prescribing specific "solutions" to minimise or eliminate specific "risks". No meta-governance process (reflexivity) exists that could integrate or synthesise these specific "accounts", "solutions" or "risks".

It could be argued that this study raises a number of important issues for the development of thinking on social and environmental accounting. The absence of formal social and environmental accounts does not necessarily imply an absence of social and environmental accountability. The demands for social and environmental accounts of organisations is likely to be reflexively linked to political and sub-political discourses on risks, the diversity of risk legitimisation practices in the relevant arena, the relative powers of the political and sub-political groups, the alignment and/or coalition of these different groups, the existing "accounts" in the public domain and the rule-enforcing bodies. Mapping the accountability routes and content can provide a valuable insight into the risk governance processes, the legitimate risk perceptions of different parties and powers of different rule enforcers.

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[6] Discussed in section 4.3.2.5.

In examining social and environmental accounting an awareness of both the political and sub-political dynamic is important, particularly given that change is normally driven by the sub-political dynamic (*Beck 1992a*). Political institutions tend to be non-politicised, working to defend the status quo, hampered by their epistemological dependence on scientism. If social and environmental accounting is to form part of a change process it must both be sensitive to the sub-political movement, as the driver of change, yet also be expressed in a way that would be regarded as legitimate by the relevant political institutions[7]. This is not an impossible task as can be observed from the growing success of sub-political movements using this strategy. On a more mundane level, recognising the existence of this accountability to rule enforcers would be an extremely fruitful resource for the emerging shadow accounting project, particularly given the introduction of the Freedom of Information Act in the UK.

Examining the sub-political dynamic raises problems for the appropriate entity of social and environmental accounting. The majority of the efforts of sub-political groups is not exerted on individual companies, but rather exerted at the rule-enforcers[8]. The logic is that if you concentrate engagement activities on reforming the rules of a sector then the efforts have an industry-wide impact. These rule enforcers, especially the political institutions, are potentially easier to change than individual companies who use compliance with rules as evidence of acceptable behaviours. Political institutions are, in theory anyway, subject to democratic accountability, control and reform. This study suggests that there is some merit in creating an additional "accounting entity" demanding social and environmental accountability of the rule-enforcers as to the effectiveness of their operations (*Beck 1992a*). Accountability of industry level governance structures would appear to be a critical part of the social and environmental accounting project.

What was perhaps an important insight from this study was the absence of the "sustainability" stakeholder. Despite the media scrutiny, scientific studies, sub-political campaigns and extensive political regulatory regimes, there was no holistic overview. Each party involved in the arena limited themselves to a narrow definition of sustainability[9], wild sea trout, birds, visual impact, chemical additives, linked to their specific interests and demanding accounts in relation to these interests. Little evidence of a concern for a full, interdisciplinary accounts and

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[7] See section 1.6.

[8] See chapter 6.

[9] More information on issues of sustainability, and its links with accounting and accountability can be found in Duncan (*1997*), Bebbington (*1999*), Bebbington et al (*1994a, b*), Bebbington and Thomson (*1996*), Bebbington et al (*2001, 2004*), Bebbington and Thomson (*2005*), Gray (*1990, 1997*), Gray and Bebbington (*2001*), Gray et al (*1993, 1996*), Greer (*1994*), Cooper (*1992*), Cooper et al (1992), Cooper and Thomson (*2000*).

the lack of reflexivity meant that the holistic account was not "demanded". It could be suggested that Social and Environmental Accounting, rather than producing accounts for that mythical stakeholder should become that mythical stakeholder, constructing them in the production of these accounts that form such a critical part of the dialogical process of establishing an effective reflexive system, particularly in the risk legitimisation debates (*ibid.: 27 – 29).*

7.2.2 Accountability processes observed

Fish farms were subject to a wide range of accountability mechanisms (see table 6.2). They produce numerous accounts of specific aspects of their operations. Some of these accounts are mandatory and others are voluntary disclosures. The accounts provided by the fish farms are a function of their governance regimes. The accounts were found to vary in terms of their frequency, the powers of the accountees, the objectives of the accountees, their information demands, the direction of the information flow and the media and mechanisms.

These accounts included statistical returns, site inspections by certifiers or regulators, compliance statements, written forms, questionnaires, annual accounts, statutory returns, face-to-face meetings, public meetings, press releases, newsletters, ad-hoc communications, formal roundtables e.g. Area Management Agreements (AMAs), tri-partite[10] working groups, expert consultations, scientific reports, membership of voluntary groups, applications for public funds, applications for licences, Environmental Impact Assessments, planning permission applications, policy consultations, web-based real time accounting. One of the more imaginative approaches was the installation of a web camera under a salmon cage so the public can observe for themselves salmon farming.

Arguably the fish farmers produce detailed highly specific accounts of their activities from the planning stage, before the farm is in operations, and accounts of their regular operations, and once the fish leaves the farm another set of accounts of the salmon are produced including accounts of the chemical residues, possible contamination and tainting of the consumed product.

Some of these accounts are provided on a systematic basis on predetermined time intervals (annual, monthly, weekly) and others are contingent on specific events, for example business start-ups, financial crises, planned expansions, local crises such as possible environmental accidents, incidence of notifiable diseases, general environmental events such as oil spills, reacting to new scientific discoveries, reacting to new publicity campaigns or planned changes to regulations.

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[10] This refers to Farmers, Regulators and Protest Groups

Within these different accounts, accountees prescribed different demands on the types of legitimate information content. These accounts included requirements to provide statistical data, financial information, scientific evidence, qualitative evaluations, information on inputs, process, outputs and outcomes. Some of these accounts required information on past, historic actions and other accounts require future forecasts on actions and outcomes. The extent to which accountees can prescribe the content, scope and information qualities is dependant upon the power of those bodies or groups over the salmon farmers.

This study has observed a range of different powers of the rule enforcers and sub-political groups. These ranged from statutory requirements, where non-compliance will be subject to enforceable sanctions such as revoking their licence to operate the farm or criminal prosecution for example in relation to Health and Safety issues, taxation system or civil breaches such as not publishing financial accounts. Other accounts, whilst being required by statutory organisations, were regarded as largely symbolic and non-compliance did not result in any meaningful sanctions. Sub-political groups also have the power to demand accounts of practice and in some cases can enforce meaningful sanctions. Supermarkets for example can put in place substantial economic sanctions by refusing to purchase whole harvests of salmon because of breaches of their certification processes. Other voluntary product certification schemes have the sanction to refuse to certify or withdraw labelling rights for their salmon. This is likely to have an economic sanction in that price premiums associated with these certification schemes will not be forthcoming.

It is not only economic sanctions that allow rule enforcing bodies and sub-political groups to "control" the accountability of fish farmers. These groups can damage the reputation of individual firms and the whole industry. This allows these groups to externally define their notion of acceptable salmon farming practice and thus request accounts in order to evaluate compliance with these standards. The provision of these accounts would therefore be a response to avoid this reputational damage, normally amplified via mass media channels. Another mode of power observed was the use of external social audits or shadow accounts by the "anti" sub-political groups. All of the anti sub-political could be seen to produce some form of shadow accounts of the industry. Perhaps the most radical and extensive example of this shadow accounting exercise is the monthly newsletter of the Salmon Farming Protest Group, the Salmon Farming Monitor (see *www.salmonfammonitor.org.uk*).

The accounting demands by the political and sub-political risk governance process on the salmon farmers are extensive and farmers are producing a considerable volume of mandatory and voluntary disclosures to a wide range of different external bodies in a variety of different modes. However, each of these accounts tend to be very specific and delivered to a range of

different accountees based on their powers, rules, ideological position and contextual definition of what counts as legitimate information. However, the same comment could not be made about the accountability of these political institutions and sub-political groups.

Mapping the significant communication links observed in this study[11] an absence of a number of key links necessary for a reflexive accountability process was observed. In terms of the nested communications in the political and sub-political nodes, there appeared to be a major deficit in the intra-political communications. The sub-political "anti" group (see figure 5.1) did appear to have a far greater degree of intra-sub-political communications. The sub-political anti groups did also appear to be more transparent and provide fuller accounts of their activities available for access by the general public. Whilst a number of sub-political groups accepted that there now was better communication with the industry they also strongly supported the need for better communication and more accountability.

These missing links support perhaps the existence of an "unreflexive" risk governance assemblage. However, in relation to certain risks where there is a degree of consensus there is evidence of a proto-reflexive relationship between a number of the sub-political and political institutions[12], as evidenced by the emergence of less antagonistic engagement process. For example the ministerial and tri-partite working groups when preparing the Strategic Framework for Scottish Aquaculture. The potential for an on-going dialogue is present and some of the antagonism between certain actors has begun to diminish as groups constructively engage and undertake mutually agreed actions. For example voluntary agreements on the use of anti-predatory nets, allowing sub-political groups to visit fish farms and co-operation in the preparation of EIAs. However, this process is new and relatively fragile and it is not possible to predict its future development with any degree of confidence, but it is the beginning of a reflexive process with representatives from all three sides reporting successful changes in the praxis of others, which past observers would have regarded as near impossible.

The forthcoming section aims to further elaborate on the findings of the main study to bring into perspective the role environmental account reporting could have played in the pursuit of a more sustainable position of the industry to be achieved. In addition, there will be an examination of the use of environmental accounting to smooth out the social anxiety caused by the alleged by environmental groups and NGOs relating to the practices of fish farmers.

Social and environmental accounting techniques are perceived as having the ability to provide a different perspective on the nature of risks organisations face and the costs (and benefits) of

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[11] See chapter 6.

[12] See section 1.6.

avoiding/minimising them. The current techno-scientific accountability process is seen as not working and it is possible that a different representation could shed additional light and aid understanding within the sector and change the discourse. It is difficult to predict which specific social and environmental accounting technique could fulfil this role in all circumstance but a dialogic approach as suggested by Bebbington and Thomson (*2005*) that will reflect the knowledge construction and dissemination process of salmon farming risks could be a way to move the sector in a more sustainable path.

7.2.3 Environmentally enlightened accounting and organic fish farming – a critique

Section 4.3.2.5 presents the pedagogic view of Bebbington and Thomson (*2005*) on the considerations SEA should take into account if it is to drive organisational practices to more environmentally sustainable paths. If this is brought into the context of the Scottish salmon faming industry a more appropriate role for social and environmental accounting would be in engaging reflexively at an industry level with the farmers, consumers, suppliers, regulators and all other stakeholders to explore the nature and implications of each others current risk perceptions, drawing upon insights from the writers associated with risk society concept[13].

Social and environmental accounting techniques have the ability to provide a different perspective on the nature of risks organisations face and the costs (and benefits) of avoiding/minimising them. Techniques such as full cost accounting (*Bebbington et al, 2001*) may allow the social and environmental risks to be represented in a different way from the current techno-scientific discourse[14]. Drawing upon the work of Bebbington and Thomson (*2005*) certain characteristics of these techniques that would assist in their effectiveness in particular engagement episodes could be identified. If social and environmental accounting is to play a positive part in these engagements then it must reflect the knowledge construction and dissemination process of salmon farming risks.

This approach to accounting for specific engagements, building upon a dialogic approach would require initially identifying the participants, content and context of existing discourse between different stakeholders associated with the salmon industry. Environmental accounting would take the form of working with the participants of each specific discourse in drawing up a shared representation of their risks. This risk representation could be expressed using one of many full costing techniques. The purpose of this representation would not be to accurately cost the whole

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[13] Something that seemingly is happening through the tri-partite and Ministerial working groups

[14] See sections 3.2.2 and 3.2.2.1. A parallelism between techno-scientific discourses and conventional accounting techniques is made in section 4.6.

life cycle impact of salmon, but to provide an alternative codification of their specific discourse as a way to mutually learn about alternative perspectives and to demystify their perception of the others perspective and to problematise their own perception. Accounting in this context is not about a static, objective representation, but should be viewed a heuristic learning device.

If this process was iterative and repeated amongst other specific discourses, then the outcomes of these specific dialogic encounters could be fed into other engagements (again based on the specific nature of their existing discourse) potentially leading to a new, constructive and shared understanding of the risks of salmon farming. This change in "risk-knowledge" could form the basis for designing a new mechanism for governing the risks of salmon farming.

It would be expected that social and environmental accounting techniques would form an important part of that new risk governance process, which would require greater levels of accountability and transparency than the current situation. These techniques would then form part of a wider critical discursive process that is an essential part of reflexive modernity outlined by Beck (*1992a, b, 1995, 1996*) and others (*Giddens 1991, 1994a, b, Lash 1993, 1994a, b, 2000, Lash & Wynne 1992, Wynne 1989, 1992, 1996*) as a solution to the risks and dangers of late modernity. Ideally the above process would lead to a synthesis of a shared knowledge of the sector and consensus over the risks, costs, benefits and course of action. However, given the entrenched position (economically, socially, environmentally, scientifically) of all sides in the salmon controversy this may prove to be difficult. Whilst accepting this difficulty, not engaging has not proved a successful strategy.

With reference to Dillard et al's (*2005*) work discussed in section 4.3.2.6 there was a lack of evidence supporting the existence of enlightened environmental accounting practice in the context of the salmon farming risk arena. In this light Dillard et al (*2005*) tried to operationalise their enlightened perspective by applying their proposed environmental action space framework in the environmentally sensitive case of the salmon farming industry in Scotland with regards to the decision of some fish farmers to move into alternative/greener forms of production[15] (e.g. organic salmon).

The framework suggested by them was used to structure a representation of the industry in order to better understand the environmentally related issues and the associated motivations for actions taken and they then tentatively gestured toward possible improvements in the information systems based on the framework's prescriptions.

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[15] As reported by Georgakopoulos and Thomson (*2004, 2005a*).

Dillard et al (*2005, p 30 – 32*) argued that representational capacities of the social systems can be operationalised in making environmental implications visible and understandable and, therefore, in protecting natural systems. In order to realise this potential, the participants need to understand why change is desirable and the means by which it can be brought about. For the Scottish salmon farmers, their norms and values regarding the natural system would have to change. Economic decision criteria need to be integrated with, and subordinated to, environmentally sustainable ones.

Recognising environmental implications as the primary and determining decision criteria must be viewed as the only viable long-term perspective for the salmon farmers. Such an enlightened perspective requires a fundamental shift in the farmers' current environmental action space. The representational logic associated with the competitive advantage strategy dominates the decision criteria and thus the associated information cues used in decision-making. The decision criteria must shift from price, profit margins, and market share to levels of toxic waste, natural resource depletion, and environmental sustainability. With respect to operations, salmon farmers need information systems that incorporate and monitor such dimensions as quality and environmental effects of fish meal and the chemical additives therein, the stock densities and the associated effluence implications, and the mortality rates from parasites and disease. Such measures provide environmental information beyond the minimum regulatory and certification requirements.

From a more proactive perspective, research and development efforts should be directed toward identifying and developing more environmentally enhancing inputs and processes that would result in aqua farming techniques that ultimately enhance the ecosystem and not just maintain it. Environmentally responsible market-related decision criteria and information should consider desirable product attributes (e.g., reduced mercury levels), energy efficient distribution channels, and organic product sales. Marketing programs should focus on educating customers to the benefits of organically farmed salmon including the environmental impacts. Reporting processes should relate economic factors directly to environmental implications. Production processes and value chain analyses should focus primarily on environmental sustainability as opposed to economic efficiency.

As a result, the decision horizon would be broadened to include multiple stakeholder groups. Mechanisms would then be developed and put in place that facilitate input from, and meaningful interaction with, various constituency groups. For example, the salmon farmers would develop direct communication channels with the various environmental groups as well as members of the local and regional community. Input would then be solicited on a wide range of

issues from operational decisions such as site location to long range ecological considerations such as the implications for wild salmon stock. Long-range planning would be driven primarily by the environmental implications of strategic initiatives and capital projects at local, regional, and global levels. An environmentally enlightened accounting and the accompanying information systems would be constituted of these relationships rendering the relationships more visible and comprehensible.

In concluding this section a note should be made on the importance regulation[16] and the other policy instruments examined in this study had in driving the value change in the organic sub-sector. Regulation was not seen to promote innovations that are more efficient in environmental resource use. Economic and environmental protection were not reconciled in this case where there was no evidence that organic applications in aquaculture as forms of "new" or "environmentally friendlier" production regimes will improve the environmental sustainability of the sector. Regulation is one of the main influences in friendlier environmental practices (see *Clayton et al 1999*) however this did not appear to have driven the value change here.

The next section briefly presents the contribution this study makes to knowledge and areas for future research before the main conclusions of this work are presented.

7.3 Contribution to knowledge

As was discussed in the introduction of this thesis, the research undertaken here is interdisciplinary in nature trying to bring together complex notions such as risk perception, risk communication, accountability, sustainability and organics in a study exploring the reasons why some fish farmers decided to move into organic salmon production. A first theoretical contribution to knowledge is seen to exist exactly in that linking discussed in the literature review chapter[17].

In addition, the contribution to knowledge is seen to lie in four more main areas, which could be further explored in future research:

The most obvious involves the gathering of data in a remote previously under-researched sector. Salmon farming in Scotland was and is a sector under crisis. The sector is in the media spotlight for its environmental practices. As a result it is difficult to gain access and speak to this sector since its members feel threatened, embattled, and are afraid to "open" areas that could create new "sores" for the industry. The few official reports exisitng at the time of the research and

[16] Whose importance for sustainability is discussed in section 4.3.2.2.

[17] See sections 4.3.2, 4.3.2.1, 4.3.2.2, 4.3.2.3, 4.3.2.4, 4.3.2.5, and 4.3.2.6.

writing (*ORGSAL 2000, Sutherland 2000, Highlands & Islands Enterprise and The Scottish Office 1998, SEERAD 2002, Scottish Executive 2003, FRS 1997, 1998, 1999, 2000, 2001*), pointed out the need for further research in the various aspects touched in these documents outlining difficulties due to the "closeness" of the sector. This issue was also mentioned by several interviewees later in the program. The work undertaken here addressed to some extent this aspect of the area of risk research and accountability with implications for social and environmental accounting.

A third area involves the extension of the corporate social accountability literature in agriculture. Many studies have been made in this latter sector. However the researcher is of the opinion that agriculture, despite its importance in everyday life, remains relatively isolated or is seen to be of lesser significance if compared with the depth of research undertaken in other industries and especially the financial sector. Corporate social accountability has not been a main area of research in agriculture and the research undertaken here opens channels for an expansion of this work in aquaculture; in other agricultural areas; or even other related industrial sectors.

In relation to this, helpful insights into how decision making is made in the field were offered from the evaluation of the decision-making and accountability processes in this sector. Accounting textbooks describe several methods and techniques that should be followed when making strategic decisions (Cost-Benefit analysis, Net Present Values, Internal Rates of Return, etc.). The only similar governmental report existing at the time of the research (see *Sutherland 2000*) was also based on a similar Cost-Benefit analysis. However no such technique was reported by the salmon farmers when deciding their venture into organic production. This was felt to be intuitive rather than based on formal accounting techniques. An indication insinuating that formal accounting techniques may be used to justify the decision when this has already been made based on other criteria or expectations.

Finally the most important area of contribution to the knowledge is the development of the risk arena metaphor as a way for exploring social accountability. The risk arena metaphor is a theoretical framework based on social mobilisation theory (*Renn 1992b*) and it was adapted for the purposes of this research. The mobilisation of social resources was not operationalised as such, as suggested by Renn (*1992b*). The framework was rather seen as a "tool" providing an initial way on "how" to conduct the respective work. This was an approach that was continuously enriched and updated with new information as the research unfolded. Its strength was rather seen in its "flexibility" to allow for the integration of positions held by social risk theorists (Beck, Giddens, Lash, Wynne and others) at the meso- and micro- level of risk

perceptions when seeking answers on the salmon farmers', rule enforcers' and other stakeholders' reasoning behind these.

7.3.1 Suggestions for future research

From the discussion in section 7.2 it is made obvious that potential future research could develop the work done by Bebbington and Thomson (*2005*), Dillard et al (*2005*), and Clayton et al (*1999*) in the context of the salmon farming industry in Scotland further investigating possible ways in leading the industry to a more sustainable path.

Specifically, Bebbington and Thomson´s (*2005*) dialogic approach[18] could be used to investigate how a more reflexive path to sustainability could be formed through such a process. Their views could be possibly cross-examined in the ways the tri-partite and ministerial working groups' processes have progressed in investigating possible ways for existing institutional reflexivity in the context of the salmon farming industry in Scotland.

Dillard et al's (*2005*)[19] suggestions for environmental stewardship to become a primary concern for management is also another potential area for future research. Management and accounting information systems should aggressively respond to these emerging requirements in order to support adequately the associated information needs as well as to design organisational systems that motivate and facilitate desired behaviour. Their suggested framework could be proven useful for developing environmentally enlightening management and accounting information systems that take into account alternative environmental perspectives and it can be used to develop prototypes representing different levels of environmental enlightenment and, as such, can provide general guidance for moving collectives and organisations toward a more environmentally responsible posture (*ibid.: 2*) not necessarily only within the context of the salmon farming industry but also in other business environments.

This latter aspect also highlights the potential of similar research that could be undertaken in other agricultural sectors which undoubtedly will present similar characteristics in the acceptance of respective practices as legitimate applications. The usage of the arena metaphor framework for risk debates could identify the existence of similar discourses which could bring forward the need for more generalised accountability/CSR responses.

In the context of the salmon farming industry the farmers' "trust" of the regulators meant that adhering to the higher standards of organic certification did not lead to any perceived reduction

[18] Discussed in section 4.3.2.5.

[19] See section 4.3.2.6.

in their social or environmental risk, but did lead to potential economic benefit. The view was consistent among all farmers interviewed, but there was a slight difference in their perception of the costs of going organic. Providing more accurate information on the costs/benefits of organic production could be a future area for research in the field, leading to a greater uptake of organic production, and there could be a role for environmental costing techniques. Whilst it is possible to develop methods of calculating these costs to allow farmers to make this decision, the analysis here suggests that at the time of the writing it would have made little impact on farmers' decisions. As farmers deny the existence of unacceptable levels of social and environmental costs from their activities[20], it is unlikely they would accept as a legitimate benefit any reduction in these costs.

It was observed in this study that organic salmon farmers had no great desire to see organic production becoming the industry norm as that would affect their ability to earn organic price premiums. In the present circumstances, at the level of the individual farms it is difficult to see how environmental accounting would contribute to the shift to organic production and this is another area for future research.

In concluding this section the author wants to highlight the need for investigation into the economic policies of major retailers (i.e. supermarkets), their accountability processes and the way incentives are created to producers for alternative forms of production. It has to be noted that the latter are perhaps the most vulnerable links of the food chain (whether these are small farmers or agribusiness corporations) subject to a number of financial incentives created by external factors, especially nowadays that the majority of the retailing outlets of food products is controlled by few multiple chains[21].

7.4 Conclusions

An important finding of this thesis concerns the decision process of some salmon farmers to switch into organic production. Initially it was expected that investigation into this transition would uncover high levels of environmental accounting, as conditions exist that would give rise to stakeholder accountability responses and the need for legitimacy actions[22]. However the information gathered from the interviews suggests that the decision to "go organic" was based on an instinctive assessment of future profitability relative to business-as-usual combined with

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[20] See chapter 6.

[21] It is indicative for example SSGA's view that food outlets are controlled at European and global levels by few multiple chains. Consumers might have benefited seasonably by their pricing policies but in general all have lost.

[22] See section 3.2.1.

fortunate[23] geographic location. Within the sector there were those, including SSGA, who felt the decision to go organic was premature. Little evidence of a shift by organic producers towards organic values was revealed. Organic certification in this case could be viewed as a legitimisation of existing farming practices that allowed greater profitability. The concerns of protestors were largely absent from the decision processes. Salmon farmers appear to have simplified their risk perception by conflating environmental and social risks with regulatory compliance. Social and environmental risks and concerns were removed via the regulatory regime and product certification schemes. The concerns of pressure groups were not internalised or regarded as legitimate.

Organic production was seen as a method of dealing with market risks by producing a differentiated product that was attractive to customers who were prepared to pay a price premium. Organic production was not seen as a method of dealing with external pressure groups, minimising their perceptions of the environmental or social risks associated with salmon farming. The decision to go organic was no different from normal farming decisions and not subjected to systematic accounting quantification. Greening organisations is often seen as problematic, involving considerable investments and significant changes in the organisations activities (*Clayton et al, 1999, Sutherland 2000*). In the case of salmon farming the early adopters were already "almost" organic. Some changes in practices were required, but the costs of organic production are not considered to be prohibitive by those who have gone organic[24]. The general feeling was that the transition was relatively easy. There seem to be a split in the perception of the costs and operational difficultly of organic production between those that did and did not choose to go organic. It was noticeable that this cost difference was intuitive and was not subjected to financial analysis or calculations; it was the farmers' belief as to what these costs would be.

The producers who switched to the production of organic salmon stressed the opportunity provided to them by the location of their sea-sites. Organic sites need to be reactive and energetic[25] with a historic low sea-lice problem and no tidal interaction with other conventional fish farms. The first organic producers were already operating in small sites, not treating for sea lice and not in contact with conventional farms in highly energetic locations.

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[23] Relating to the natural absence of sea-lice.

[24] In contrast to what was described by Sutherland (*2000*) which was the only official document used by the Scottish Executive at the time of this research project.

[25] These terms relate to the volume and rate of water flowing through the marine location where the sea-cages are located.

It was accepted by the fish farmers (and the rule enforcers) that some farm sites could not go organic. To become organic would require relocating to another site. However, within the current licensing regime it is very difficult to create new salmon farming sites. The current regulatory regime is partially obstructing the development of organic salmon farming.

The decision surrounding organic production was not distinguished from other salmon farming decisions, there was nothing special about this decision and appeared to be part of the normal business of salmon farming. This "business case" approach to organic agriculture[26] is similar to that observed in previous studies (see for example, *Buck et al 1997, Tovey 1997*).

Campbell and Liepins *(2001, p 23)* suggest that the development of organic agriculture in a particular context is the result of a discursive process between different contested terrains. These terrains include symbolic and biophysical notions of nature, social movements, consumers and food scares, regulatory politics, corporate involvement, the meaning and standards of organic. Drawing upon Campbell and Liepins (*2001*) notion of contested terrains, the main elements that featured in the farmers' interviews were different perceptions of harm and risks to nature; food scares; the dismissal of social movements concerns; regulatory politics and the differences in the meaning of organic certification. The farmers and their producer organisations could be seen to adopt a clear unproblematic business stance in this discursive process.

The discursive process featured many of the conflicts identified by Beck (*1992a*) in his wider systemic critique of late modernity. These include the reliance of experts and "legitimate-science" to define and control social and environmental risks, dismissal of "alternative-scientific" views and "non-legitimate-experts", causal denial of harm, the separation of "real" and "false" risks, a "techno-scientific" discourse to legitimate operations, contestation over the nature of organics, lack of reflexivity in the risk discourse in the industry, and a lack of change in risk knowledge of organic fish farmers[27]. This study identified a complex link between the risk perceptions, legitimating actions and risk governance procedures of different stakeholders, similar to that described by Beck (*1992a, b, 1995, 1996*) and others (*Giddens 1991, 1994a, b, Lash 1993, 1994a, b, 2000, Lash & Wynne 1992, Wynne 1989, 1992, 1996*). The decision to go organic was influenced by each farmer's particular perception of "legitimate" economic, social and environmental risks. The farmers' position in this social and environmental risk discourse was largely to deny the existence of these risks using other institutions to legitimate their operations.

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[26] See section 1.5.5.

[27] See sections 1.2.1, 1.2.2, and 4.3.1.3.

In this specific case "organic" certification was not a mainstream protectionist response from the industry. SSGA was largely critical of the organic farmers and challenged their motives. They dismissed them as profit-seeking, rather than environmentally concerned pioneers. SSGA felt that the switch to organic was premature as there are a number of unresolved issues such as: the lack of European organic standards, welfare of the fish and the drugs and medication, and sustainability of the fish-feed chain. SSGA stated that the early "organic" farmers embarked into the drafting of the organic standards, thinking only about the increased profit margins.

SSGA's arguments were largely confirmed in the interviews with the organic farmers who did not criticise "unorganic" salmon as a production method or as an inferior product. Despite an awareness of the negative publicity associated with farmed salmon, none of the farmers considered the removal of chemical residues in the finished product as a reason for switching to organic. The end-consumer of their fish was absent from their decision process. The benefits of organic production were limited to the possibility of removing some environmental production risks. However, farmers felt these risks were hypothetical and did not apply to Scottish Salmon farming.

The farmers seemed remote from the end-consumer, their "customers" were other firms marketing divisions, processors and supermarket buyers. Satisfying their quality requirements was critical as they were the gatekeepers to higher prices. Organic production did seem to be treated as yet another technical regulatory compliance exercise, rather than a fundamental re-appraisal of farming methods, livestock products, human and ecological health. Organic certification does not appear to have led to a questioning of methods or the start of process of change that is likely to lead to industry wide organic fish farming, despite the observed economic benefits.

The five interviewees who commented on the consumer's perception of organic salmon (Co11, Co17, Co18, Co19, Co20) did not state their organic product to be any safer or better for the consumer. Scottish Salmon was seen as a quality product and their organic product built upon that high level of quality. The organic farmers appeared to be happy to take advantage of the anxiety created by food scares and the trust of certain consumer groups in the organic certification process, yet did not accept these views as valid or real. It would appear as long as these fears translated into higher prices they would continue to produce organically. This stance does lead to a concern over future changes in the requirements for organic production, as it could lead to a dilution in the standards and enforcement of organic certification as observed in other studies (*Clunies-Ross 1990, Coombes and Campbell, 1998).*

The farmers denied the existence of environmental harm or risks as a result of their production methods. They relied upon the regulatory regimes, based on what they believed to be good science, as a way of removing environmental risks from their production processes and removing any risks to human health from consuming their product. Although they were aware of criticisms about the potential fallibility of this regulatory regime they did not accept these criticisms as valid. They "trusted" the official scientists as mediated through the regulators to remove any potential harm.

There was an acceptance, in theory, that un-regulated salmon farming could cause problems with sea-bed pollution and other species destruction, as could large scale salmon farming production. But the existence of bad practices was strongly denied. To reinforce these claims reference was made to the sanctions associated with non-compliance, which included immediate closure of farms. In addition to the regulatory definition of a safe natural environment, farmers referred to the importance of a clean environment for salmon farming.

The interviews with the farmers failed to identify external campaigns as a significant factor in choosing to go organic. Farmers perceive that compliance with a strict set of environmental regulations equates with acceptable environmental performance. This behaviour does appear to be consistent with Beck's (*1992a*) description of regulatory institution's legitimating acceptable levels of social and environment harm. The effectiveness of the regulatory framework is currently contested on a number of fronts by a large number of different bodies. If any of these critiques turn out to be correct, then compliance cannot be assumed to equate with acceptable levels of harm. Beck's general observation that the current scientific orthodoxy cannot be relied upon for effective regulations, questions the trust of farmers in the regulatory regime.

Regulations tend to set minimum levels of performance and there is nothing to prevent farmers voluntarily adopting higher than minimum standards to prevent social and environmental harm. Farmers would be likely to do this if they felt that there was a problem with the regulations and/or empathised with the claims of the environmental pressure groups. However, this was not the case, despite the extensive use of voluntary product certification schemes e.g. SQS, Organic Salmon, TQM, LRQM. Farmers and their official industrial organisation rejected the claims of campaign groups, felt falsely persecuted and unfairly blamed for something they were not doing. These views were held by all salmon farmers regardless of their decision on organic production. These labels were designed to demonstrate to consumers that the food scare stories were "false" and that they could be assured that consuming appropriately labelled salmon would not be harmful, but actually beneficial.

It is noticeable that the industry generally viewed moves toward organic certification as unnecessary or too costly to deal with this societal anxiety. There did appear to be a fear from organic production. SSGA in particular thought that the "organic" farmers could be seen as rocking the boat and called into question the quality of the assurance of existing organic labelling schemes. However, as reported earlier, those producing and marketing organic salmon are not actively promoting their product by denigrating "unorganic" salmon.

Other scientific studies, either independent or funded by pressure groups that contradicted the current regulatory regime were rejected as subjective, politically motivated or "bad" science by the SSGA and the farmers. SSGA played a major role in countering negative scientific findings, often criticising the scientific methods, e.g. poor sampling techniques, questioning test methods as the funding of research. All of these strategies were used in response to the Hite et al (*2004*) paper that identified Scottish Salmon as the most contaminated of all salmon sampled in their study. It was noticeable that similar critiques of the science underpinning "positive" research findings were not undertaken (see the archive of press releases at *www.scottishsalmon.co.uk*). Similarly detailed critical analysis of the science underpinning the regulations that currently legitimate their operations, was not undertaken.

The industry's response to food safety scares appears to be "scientifically" informed, either pointing to contradictory scientific evidence or characterising these "scares" as based on "illegitimate-science". Their use of scientism to denial causal links between their operations/products and reported social and environmental harm, again carries resonances of Beck's (*1992a*) causal denial of harm as a basis for doing nothing. SSGA is not embarking on a rigorous critique of scientism by radicalising scientific rationality, as would be the case in a reflexive process, but is selectively and strategically using science to defend it and its members' position. This does not mean that their position is incorrect, but that their method of defending their stance is problematic. A similar criticism exists for the anti-salmon-farming pressure groups and the rule enforcers who are also scientifically informed but like the producers, they use science in a rather selective way.

Many of the features of Beck's (*1992a*) critique therefore can be seen to apply in this case. For example, there are intense struggles over the meaning and definition of risk in salmon farming, debates over the knowledge construction processes about risks, the contested notion of adequate proof of harm, claims of institutional authorisation of polluting the environment and harming consumers, opportunity to deny harm by compliance with regulatory consents levels. The main actors in the salmon debate are making extensive use of techno-science to critique each others' claims and in contesting the "true" nature of the salmon farming/consumption risks. It would

appear that the accountability relationships in this sector are attempting to be discharged via a scientific discourse rather than through the more conventional accounting discourse or the social and environmental accounting discourse. Legitimacy in this context appears to be achieved at a techno-scientific level, rather than at an economic or business accounting level.

This thesis will conclude in the subsequent section with a summary of the work undertaken.

7.5 Summary of the thesis

The thesis sought to provide an account of how some fish farmers decided to switch to an allegedly more environmentally friendly production method, i.e. organic farming, in the context of the salmon industry in Scotland; subsequently, it sought to evaluate the significance SEA had/has or might have in the respective risk arena. Prior research on cleaner production implementation (*Clayton et al 1999*) would suggest that going organic would be regarded as difficult, and expensive; a reaction to external pressures, driven by changing environmental regulations; or as a consequence of a value shift by key actors in the organisation (see for example: *Clayton et al, 1999; Sutherland, 2000; and ORGSAL, 2000*).

However, the farmers did not describe such a process. The decision to go organic was intuitive using general agricultural decision heuristics, based on market price forecasts (*Hill 1980, Hill and Ingersent 1977, Rogers 1983, FAO 1984*). The shift to organic production was unproblematic and relatively inexpensive. It was not a reaction to the risk perception of other stakeholder parties nor was organic salmon viewed as a safer, healthier, product. The decision was not subjected to systematic accounting evaluations. The shift to organic production was driven by the prospect of higher market prices, and securing sales in a climate of declining market prices and volumes for "unorganic" salmon. Instinctively, farmers felt that the costs of organic certification would be justified in terms of higher prices, avoiding a predicted drop in prices and increased overseas competition.

In chapter one it was discussed how the salmon industry in Scotland emerged almost 30 years ago and how through its growth it has become a perhaps unusual environmental cause-célèbre. The contested nature of salmon farming is seen to exhibit many of the characteristics described by Beck's Risk Society thesis (*Beck 1992a, b, 1995, 1996 see also Giddens 1991, 1994a, b, Lash 1993, 1994a, b, 2000, Lash & Wynne 1992, Wynne 1989, 1992, 1996*). Risk was a recurring theme revealed in the interviews that were undertaken as the main part of the fieldwork.

An attempt was made in this thesis not to resolve the salmon farming problematique, even though the potential role of SEA was examined. Instead the thesis reported on how farmers perceive and manage their risks in the field and how these risks were informed by the respective perceptions of other stakeholder parties in the risk arena. In particular the focus of the research was on the adoption of one risk management strategy (i.e. organic production methods).

There are many definitions of organic salmon farming, depending on the production standards of each certification body and on the surface organic salmon production appears to address the criticisms of the conventional sector (i.e. chemical residues, non genetically modified organisms or consumption of genetically modified ingredients, fish rearing at almost natural conditions or as close as possible to wild salmon, which results in minimisation of quality differences, etc.).

In the above context this thesis took the form of a case study and investigated the decision processes of farmers in relation to organic production. It attempted to understand the absence of environmental accounting and it suggested in section 7.2 how the latter could improve risk governance in the salmon farming sector.

The questions the researcher addressed concerned: a) how and why some fish-farmers made the transition into organic fish farming; and in specific, how their decisions concerning moves to "greener" production regimes were affected by the perceptions of other stakeholders; b) who are the important players in the risk-arena and how their risk perceptions influenced the fish farmers' decision making process; c) why and how the stakeholders involved, think the industry should change and which is the underlying rationale for that change; d) the risk construction for all the parties involved; and e) the individual understanding of the governing process.,

Analysis focused on: a) what risk is for the salmon farmers (both mainstream and organic producers); b) what it means for the rest of the involved parties; and c) how risk communication (messages on risk communicated back and forth between the involved into the debate parties) affects/has affected the decision making process of the salmon farmers..

In order for answers to be given to these questions the subject under investigation had to be defined first. This task took place in chapters 3, 4 and 5 where the methodological position and framework for the conduct of research adopted; alongside a review of the associated literature; and the research methods of data collection and analysis used, were discussed. Due to the study's interdisciplinary character where complex notions such as sustainability, social and environmental accounting, risk perception and organics were brought together in relation to the salmon farming industry it was deemed important to provide the reader with the necessary

linkages between these meanings early in this work. This took place in chapter 1 which provided an overview and an evaluation of the research undertaken.

The environmental debate described in chapter 6 based on arguments of "good or bad" science, was evaluated in the first chapter through the writings of the risk society thesis exponents and a link was made for the discussion in section 7.2 on how SEA could help in the context of the industry under investigation to become perhaps more sustainable. To sum up, the conclusions of this chapter could be seen as: a) risk to have been identified as a main theme in the interviews with the debate around the industry's legitimisation to have been reported to be in agreement with the risk society's position; an environmental argument focused on the application of "good science and regulation"; and b) organic salmon farming was seen as a method of dealing with market risks by producing a differentiated product that was attractive to companies who were prepared to pay a price premium and not as a method of dealing with societal anxieties. The associated issues concerning sustainability and accounting touched in this chapter were further discussed in the literature review chapter. However the focus of this work was in the field of risk perception and how that affected the decisions of the specific fish farmers who switched into organic production to do so. For that reason extensive discussion of these notions did not take place.

In chapter 2 an effort was made to present an initial picture of the arena in which the salmon farming industry operates as this is perceived by the fish farmers. In summary the majority of the participants in this part of the research program were small, of independently owned companies with operations from 11 to 15 years, who were focused mainly in the production of mature salmon with annual production of less than 2,000 tonnes. They mainly sell in the domestic UK market and France to fish processing companies, wholesalers, supermarkets, and associates & packing stations. They primarily identified aspects of their operations management of their production cycle and associated financial issues as being important. They view certifiers as important actors, alongside regulatory authorities, in the salmon farming risk arena due to their ability to perhaps boost the sales of salmon products. In addition, they indicated regulatory and political institutions, foreign competitors in salmon farming, customers or other purchasers of their products, and multinationals as important actors in the arena having impacts on the financial viability and efficiency of their businesses.

Initial reflections from this survey seemed to show that the importance of environmental issues and associated groups or other stakeholders was underplayed, and the industry generally regards itself as environmentally friendly with a lot of unnecessary regulation coming from a lot of different sources that perhaps hinders the sector's future development and viability. The

position held towards organic salmon was somewhat negative and the view of that production regime was not seen favourably as a solution to the industry's financial problems.

With regards to the social resources described by the arena framework (see section 3.3.2), the producers mentioned money or rather the lack of it, the lack of power on their behalf and compliance with the unnecessary demands of a number of regulatory and political institutions, certifying mechanisms, and customers. They spoke about the certifying mechanisms and their code of practice as possible ways of creating social influence, value commitment and better understanding of their industry from the general public in an effort to improve their financial positions. Finally, published scientific evidence at that time was mentioned as not supporting the environmental concerns of the various stakeholder groups.

This initial picture was used to enrich an intra-sectoral presentation of the industry through an adaptation of the arena metaphor framework. This is an internationally highly competitive sector with intense profitability and overproduction problems. As expected the main concern of the producers in that environment is their financial survival which they try to tackle through certification schemes that can potentially differentiate their products in the eyes of the general public. All those associated with the industry's operations groups have similar profitability problems and they also try to maintain their position in that environment.

In chapter 3 the epistemological positions of different social theorists in the field of risk research were briefly examined. The author's position was traced alongside those described by the exponents of the social theories of risk on the continuum presented in table 3.1. Specifically, the position held is in accordance with the view of Adam et al (*2000, p 2*) that "*it is not of real importance whether the ontology of risk is real or mere construction, when investigating associated issues, rather there is a need to understand the latter as a practice of manufacturing particular uncertainties that may have harmful consequences to life in the broadest sense of the term*". This position, in conjunction with the critical realism's view which underlines the open character of social systems (*Tsang et al, 1999*), brings into perspective the need for a flexible tool (i.e. the risk arena framework) for the conduct of research into the Scottish salmon farming risk arena, that can take into account the open character of social systems and at the same time allows the identification of potential explaining theories.

The risk arena metaphor presented in chapter 3 was further enriched in chapter 4 with a discussion of the positions held by the exponents of the risk society thesis termed in chapter 3 as "weak constructionists". Primarily chapter 4 aimed to present in more detail these perspectives deemed as the most suitable for the explanation of the results of the work undertaken, and at the same time to further discuss the notions of sustainability, accounting and risk introduced in

chapter 1. Thus, the chapter explored the issues that were deemed relevant when venturing into the field, and a discussion with a focus on the strengths and weaknesses of each of the risk perspectives presented took place.

At the end of the chapter a richer picture of the framework of the arena metaphor was constructed and it was concluded that research into the field of risk perception needs an approach that could integrate the perspectives of the different sociological schools of thought as these had been described earlier. Such frameworks were found within the risk communication theme in the forms of the social amplification/attenuation of risk (*Kasperson 1992*), and the social drama (*Palmlund 1992*) and risk arena metaphors (*Renn 1992b*); frameworks that could provide the necessary openness for integration of other theoretical positions in the interpretation of the findings, without putting the researcher into pre-constructed realities. The arena concept was seen at that time as the easiest approach to operationalise and was further adopted.

In chapter 5 the effort made to introduce the reader to the rationale behind this study was completed by presenting the research methods of data collection and analysis used for the purposes of this thesis. At the same time a "selective" picture of the risk arena in the context of the salmon farming industry in Scotland was sketched out by presenting the participating organisations. Price data had been collected for a period of 80 weeks in order to provide insights on the UK's retailing market prices of fresh salmon products. In addition to that, data were gathered in the form of a postal survey; interviews were held with the salmon farming industry, regulatory and political, as well as other stakeholder representatives; desk research and documentary analysis were conducted to construct a detailed picture of the industry and the issues behind the salmon farming risk arena.

Chapter 6 reports on the results of the interview and documentary data analysis that bring into the salmon farming risk arena the risk perspectives of the fish farmers, regulatory bodies and other stakeholder organisations in an effort to structure and evaluate the existing risk debate as well as to investigate the changes that environmental account reporting could potentially bring[28]. This evaluation took place through an examination of the risk perceptions the different stakeholder parties hold and an investigation of the communication routes and messages between them.

To sum up the findings of chapter 6, what was made clear from the very beginning, in accordance to the associated literature on risk perception, was that the different views that were explored were dependent on the social and cultural contexts in which risk was understood and negotiated (*Lupton, 1999*). The importance of the threats posed or faced by the salmon industry

[28] Discussed in section 7.2.

were different for each of the three categories in which the industry, regulatory, and other stakeholder representatives were grouped. The debate focused on the environmental responsibilities of the salmon industry and this was reflected in the various views and messages as these were presented through the analysis process. Producers in general did not see themselves as having significant, if any, environmental impacts partly because of the friendliness of their practices but mainly because of compliance to "strict" environmental regulation and they were more interested in the economic risks they face.

Environmental groups and other stakeholders, on the other hand, perceive the salmon industry and the associated regulatory regime as holding significant environmental threats because of their interest mainly on the economic benefits the industry might have and not on its environmental responsibilities. The regulators' views lie between the above two polarised positions much closer to that presented by the industry, legitimising the latter's operations through the claim of an "effective" regulatory regime in place. Fish farmers admitted to third parties having minimal influence in their decision making process; rather they see regulators' as the most important group of people with whom they interact, whilst they described having turbulent relationships with environmental or other stakeholder groups.

Stakeholders also described embattled relationships with the salmon farming industry, all of them relating to its environmental performance with a call towards more sustainable environmental practices and for a need for better communication and accountability relationships with the rest of the stakeholders. Regulators see the industry as an important sector for the rural economies; they monitor and police it effectively and they try to support it through its current financial difficulties, even though there are disagreements over the economic priorities set by them. They see the existing turbulent relationships between the salmon industry and the other stakeholder groups based on the lack of good communication. The regulators believe that closer discussions with the rest of those involved in the arena regarding the industry's environmental responsibilities will result in the public getting to know the industry better and will solve the "bad image" problems and perhaps financial difficulties that are being experienced by the producers.

The author would like to close this thesis by emphasising that within the context of this study accountability and reflexivity appear fundamental as a means of social change especially in the light of ameliorating environmental risk towards environmental sustainability. The role of a "reflexive state" (rule enforcers and political institutions)[29] is critical to such a change.

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[29] See Beck *(1992a, p 139* – 142) on the metamorphosis of the state and the reflexive sub-politicisation of society.

"All problem fields that are in principle "negotiable" between groups of people and organisations can be "societalised". This means that can be worked out in the multilateral negotiating system, with the participation of the state...The classical areas of symbolic politics can be moved out and delegated back to the organised sub-politics of society...In ecological issues the state must permit and even want the tasks assigned to it in each case not to belong permanently to it, but rather to be re-worked off again and again (societalised) by the competition that occurs (different competing risk rationalities that exist)" (*Beck, 1992a, p 141*).

"Reflexive politics does not just mean the re-invention (redefinition of governmental fields of responsibility) but also the clearing out of politics. It is not a plea for new governmental task within the old forms (of governance). *To the contrary, the state must give up some monopolies and temporarily conquer others and so forth"* (*ibid.: 141 - 142*).

Or to put it in Willke's words (*1992, p 296, 303,* as quoted by *Beck, 1992a, p 142* and translated by Mark Ritter):

"Neither the "laissez-faire" of a caretaker state nor the authoritarian overall planning of an interventionist state is appropriate to the operational needs of a highly modern society...The goal is the construction of realities in which the constructions of realities of other systems have some freedom of action. In the face of externalities that are no longer internally controllable, what is at stake are self-limitations of fully differentiated functional systems by a process of supervision in which the perspective of mutual intervention – of politics in science perhaps, or of science in politics – is complemented by the perspective of the intervention of mutually compatible identities".

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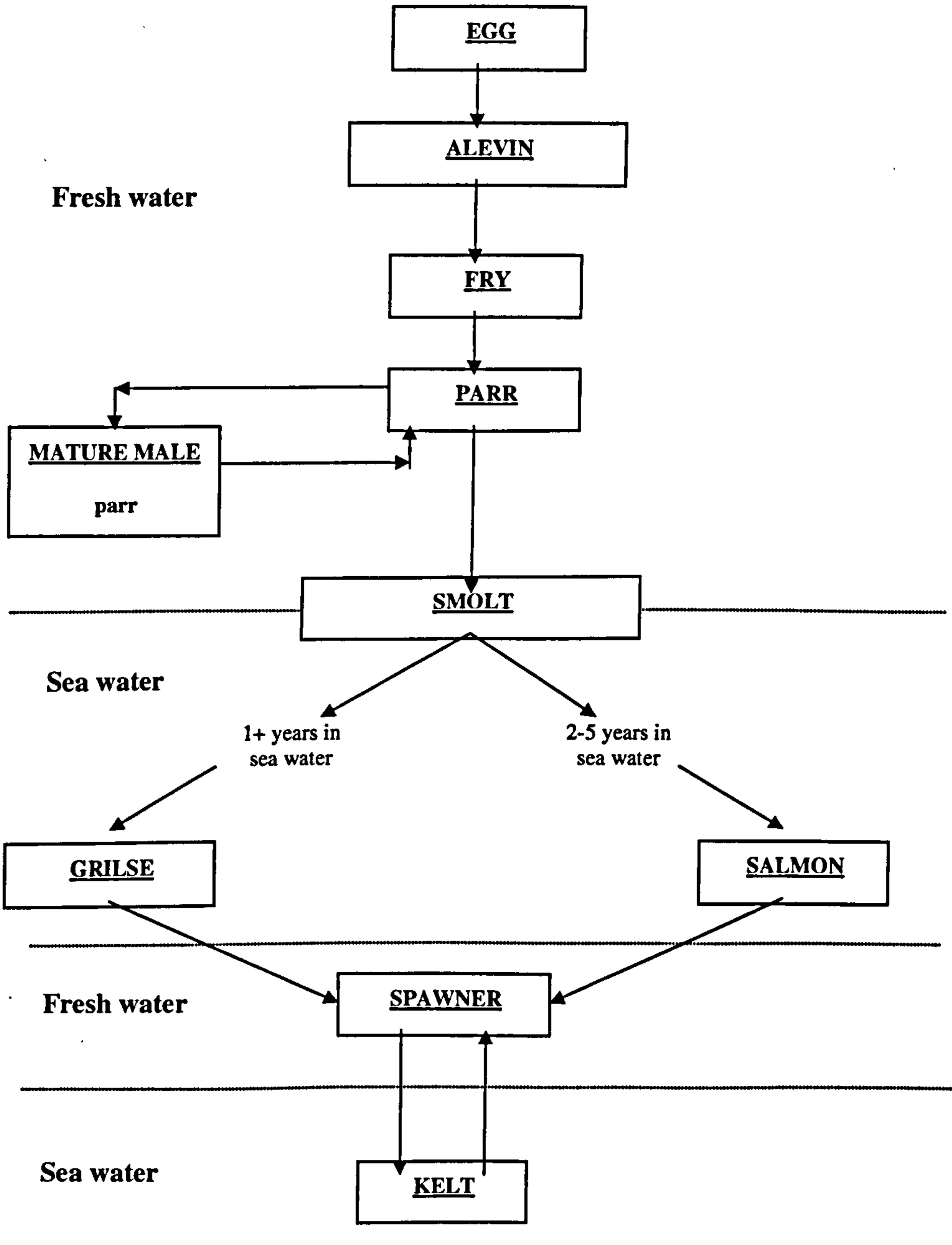
APPENDIX

Appendix Figure 1: *An overview of wild salmon's life cycle.*



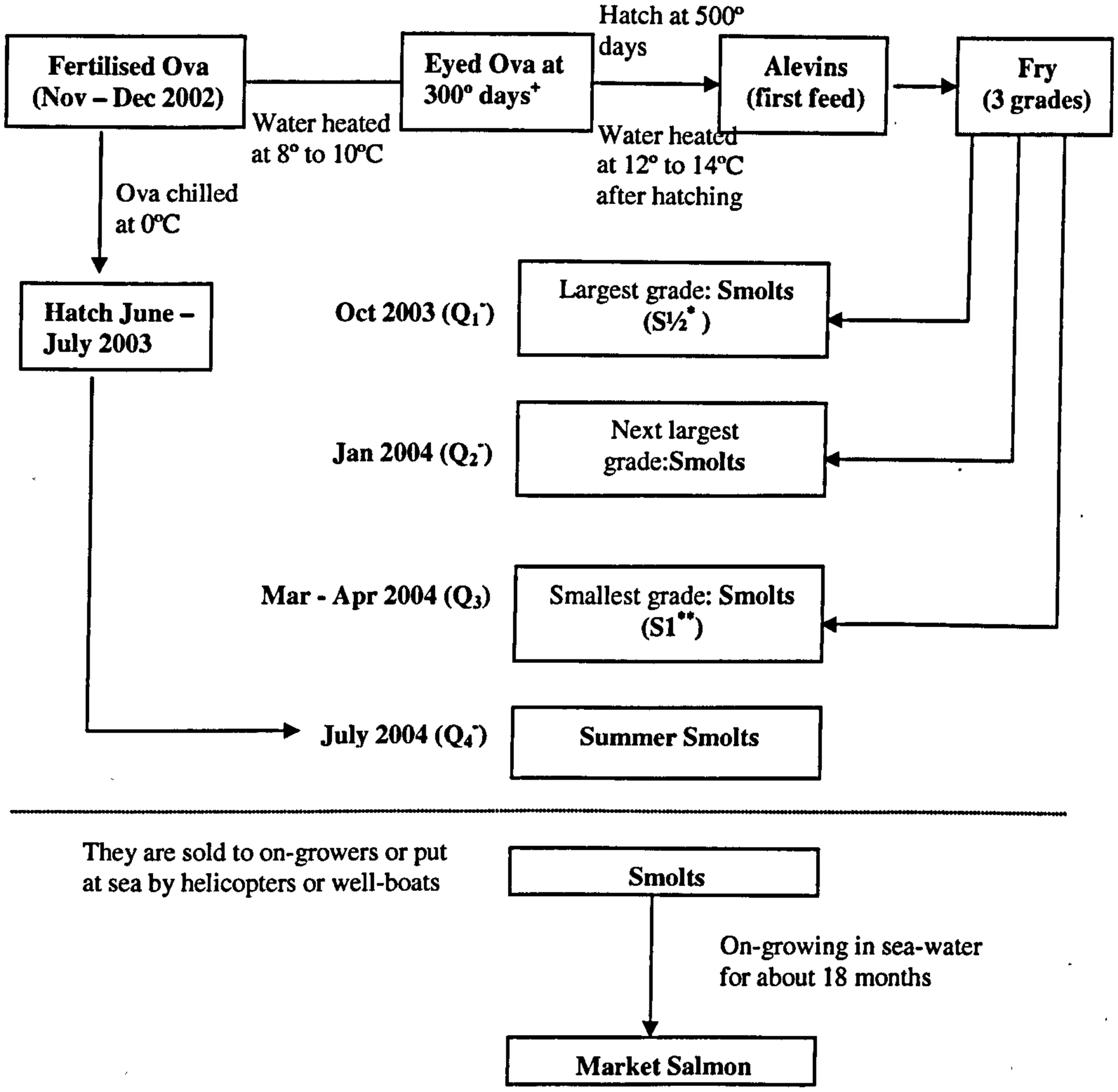
Atlantic salmon enters the rivers at all the times of the year and if it has spent two or three or four years at sea before returning to fresh water is known as a salmon and depending on the period of the year during which it returns, is called spring, summer or autumn fish. If the salmon has spent only a little over a year at sea before returning, it is termed as grilse. Often, there is a little difference in the size of grilse and salmon but their age can be determined by examining their scales, which lay rings in a seasonal pattern (*Mills, 1989*). On approaching fresh water, salmon will not feed again, until it returns back to the sea as a spent fish or Kelt, from six

months to a year later. During the spawning, the female, or hen, salmon excavates a redd in stable, silt free gravel. Suitable conditions for redds are usually found in tributary streams. However spawning also takes place in major rivers. Eggs are buried at depth and develop in darkness (*Laird et al, 1988*). The salmon, relatively speaking does not lay too many eggs. Their amount depends on fish size. The number ranges from 2,000 to 15,000. After spawning most of the males die but a small proportion of the females (kelts) return to spawn for a second time (usually fewer than 5% of Atlantic salmon survive to spawn on more than one occasion (*Mills, 1989*).

On hatching the young fish (alevins) remain in the gravel utilising the remaining yolk (four or five weeks after their birth). The next stage for the young ones is to be transformed to fry. They are exclusively carnivorous with a diet consisting mainly of aquatic insect larvae. In the wild, the survival of fry is extremely low due to predation and to mortalities caused by pollution (*Laird et al, 1988*). At the end of their first year of life, fry are known as parr. They remain in that stage from 1 to 8 years after that the surviving fish (5-10% of the fertilised eggs) undergo physiological and behavioural changes and migrate to the sea as smolts. The progeny of one fish do not necessarily all go to the sea in the same year or return at the same time. This phenomenon gives survival advantages to the species (*Mills, 1989*). In some places, races of landlocked salmon have developed and seaward migration has been eliminated from their life cycle (*Laird et al, 1988*).

Feeding grounds for the Scottish salmon in the open sea, seem to be the areas west of the Greenland coast and the Faeroes islands. However, active feeding and growth occurs during the migration itself. Salmon may return to their parent rivers as grilse (these are usually male fish with a weight between 1.5 and 4kg to over than 7kg). Most of the remaining salmon return to freshwater after two or three winters at sea (some may remain for up to 5 years and reach weights of 25kg or more). Their ability to home to their natal rivers (homing instinct) has given rise to the development of local races in the species (*Laird et al, 1988*).

Appendix Figure 2: *An overview of farmed salmon's life cycle*



+It takes 300 days of ova development at 8° to 10°C).

*S ½: Salmon or sea trout smolting at approximately six months from hatch (usually by photoperiod and/or temperature manipulation) (*Fisheries Research Services, 2001*)

**S1: Salmon or sea trout smolting at approximately one year from hatch. It is possible for S1½ and S2 to be produced (*Fisheries Research Services, 2001*).

-Q_1, Q_2, and Q_4 are produced by artificial lighting: 7 weeks at 8 hours per day daylight and then for 280 days at 24 hour light (*Co7).*

The companies participating in the (secondary) survey

Co1*:* Large independent company based on the "A" Islands with 47 employees and annual production of 5,000 tonnes of mature salmon, which markets mainly in the UK through their marketing company, Co1*. France is also considered to be an important market and for that reason they used to participate in the *"Label Rouge Quality Mark"* but now they have VERITAS (international quality scheme) accreditation. The rest of Europe, US and Japan are markets of lesser importance. At the micro level, important customers are smokers and processors; associates and packing stations; supermarkets; and wholesalers. Their fresh salmon are grown in fast currents located around the "A" islands in offshore exposed sites. The supply of smolts (juvenile salmon) is from their own farms where only borehole water is used. In that way it is maintained their disease-free status and their year-round supply (*company's website, 6/3/2003).*

Co2*:* Small (subsidiary) company with 5 employees and annual production of 3 million fry fish. They sell their produce domestically in the UK by supplying with fry, smolt producers. They are currently participating in the Tartan Quality Mark, while in the past they used to participate in the Label Rouge Quality Mark[1]. They feel that an important issue in the management of the farms regards the falling prices and they also believe that the term organic cannot be applied to carnivorous fish (i.e. salmon).

Co3: Small independent company with 11 employees and annual production of 2,000 tonnes of mature salmon[2]. They currently participate in the Superior Quality Shetland Salmon (SQSS) scheme run by the Shetland Seafood Quality Control and they have contractual agreements with large multinationals for which, they conduct fish husbandry on the company's sites. According to them the salmon industry is going through tough financial difficulties. All companies, even the large multinationals, are making losses and the reason is primarily the low market prices due to increased supply and nervous financial institutions. These make farmers sell their stocks at low prices. In addition to that, negative campaigns lower the market price causing the farmers to stock at higher rates thus lowering further the market price.

Co4*:* Medium independent company, located in the northwest coast of Sutherland, with 30 – 35 employees and annual production of 1,600 – 1,800 tonnes of mature salmon. They participate in

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[1] They have stopped participating in the specific scheme because they do not produce sea salmon any more.

[2]They are also diversified in mussel production (*company's website, 6/3/2003*).

the Freedom Food Salmon Certification Scheme (FFSCS)[3] and they consider France as their most important market. UK and continental Europe rate second, whereas the US and Japan are considered of lesser importance for their activities. They market their product as the outcome of a responsible and sustainable production system (*company's website, 6/3/2003*) at a premium price. At micro level smokers and processors, wholesalers, and fishmongers are considered as important customers.

Co5: Medium independent company with 25 employees (without including part-timers) and annual production of 3,000 tonnes of mature salmon. They currently participate in the Tartan and the Label Rouge Quality marks and consider both the domestic and the French market as very important for their activities. The rest of Europe, the US, and Japan are of lesser importance. At micro level, important customers for them are smokers and processors and supermarkets. As far as the organic production regimes are concerned they feel that there is a limit to how much expansion there can be in "organic" salmon farming. If it expands too much it will not be a niche market any longer and it will not command any premium.

Co6: Small, family managed, subsidiary of Co6*[4] with 12 employees and annual production of 1,500,000 of salmon smolts. The company commenced operating in 1989. The production sites are located in the Highlands of Scotland with graded parr transferred from Co6* hatcheries in June, and ongrown to smolt (*company's website, 6/3/2003*). The produced smolts are either used for the operations of the other members of the Co6* Group or are sold out to on-growers. They participate in the Smolt Quality Assurance scheme (SQA functions within the Scottish Quality Salmon Scheme) and they believe that certification of the salmon produce is important because it assures traceability of the finished product.

Co7: Small independent company with 12 employees. It used to produce mature salmon (less than 800 tonnes p.a.) and sea trout (up to 7 tonnes p.a.), but they switched into processing

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[3]Freedom Food is an independent farm assurance and food labelling scheme set up by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) and covers all aspects of salmon rearing. The Company presents it as one that provides their fish with good life, and with no impact on the environment. A scheme of responsible farming that demonstrates their commitment to their customers' welfare (*company's website, 6/3/2003).*

[4]Co6* is one of the UK subsidiaries of the Norwegian multinational Co6** with operations in Norway, UK, Spain and Chile (*mother company's website, 6/3/2003*). The Co6* group of companies specialises in vertically integrated production of Atlantic salmon, from the egg right through to market size fish. This gives total control over every stage of the production cycle (*company's website, 6/3/2003).*

activities in order to tackle the problems of poor prices and diseases[5]. Apart from their processing activities, they are also involved in smolt producing operations. They participate in the Smolt Quality Scheme operated by Food Certification Scotland for the above freshwater operations and they have a contractual agreement with Co7*[6], which they supply with the smolts they grow. They consider both UK and France as the most important markets for their activities, while at micro-level, wholesalers, hotels, restaurants, and direct consumers are considered as important customers for their processed products[7] (*company's website, 6/3/2003*).

Co8*:* Large subsidiary of the Co8*-Group[8] of companies, with 60 employees. They are vertically integrated/diversified in salmon production[9]. They act as suppliers of fish for other salmon on-growers and smolt producers, in the UK, Ireland and Chile[10]. They are participating in the Smolt Quality Scheme operated by Food Certification Scotland.

Co9: Small independent company with 8 employees and annual production of 1,000 tonnes of mature salmon which sell through their sales agent Co9* for processing. They participate in the Shetland Seafood Quality Control (SSQC) certification Scheme.

Co10*:* Medium independent, smolt producing, company with 40 employees and annual production of 6 million fish. They sell their final product in the domestic market. They participate in the Smolt Quality Scheme operated by Food Certification Scotland

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[5] Most of their mature salmon stock was wiped out by jellyfish swarms in 2001. They feel that responsible for the poor prices, which the industry faces, are the change in currency exchange rates; and over-production by Chile and Norway. These have put all but the largest producers out of business, including themselves. They are surviving on processing activities while the buy their raw product in.

[6] A big salmon producing company subsidiary of the Norwegian Co7**-Group, which has leased their sea-sites for salmon production.

[7] That is smoked salmon produced from fillets bought in.

[8] The Co8*-Group is a "Global Business" with its Head offices in Glasgow and whose interests range from fish farming to hi-tech engineering (*company's website,* 6/3/2003).

[9] They produce annually: 35 million eggs; 1 million parr; 5 million smolts; and 3,000 fish of mature salmon. Genotyping technology at Co8 allows for full stock traceability from egg to fillet. They also provide technical services and support to customers (*company's website, 6/3/2003*).

[10] The company is a partner of Co8-Chile (Joint Venture of Co8 with a Chilean aquaculture company), which breeds and produces Co8 juveniles in South America (*company's website, 6/3/2003*).

Co11 (Subsidiary of Co11*[11]): Large company with 106 employees and annual production of 8,000 tonnes of mature salmon. It is integrated in processing activities[12] and also integrated/diversified in the production of salmon smolts (250,000 fish p.a.), halibut (500 tonnes p.a); cod (broodstock and fry); and organic salmon[13]. It mainly sells its produce domestically, but it also considers France as an important market. They used to belong to the Tartan Quality Mark, and they are currently certified only by the Soil Association (SA). According to them the quality certification scheme they used to belong "did not have any value for money" but they intend to participate in other schemes in the future because this is underlined both by the company's and their customers' (Waitrose is an important purchaser of their produce) code of practice[14]. Markets of lesser importance in which they sell to involve the rest of continental Europe, US, Japan and Far East. At micro level, important customers for their activities are: smokers and processors; associates and packing stations; sales organisations; and supermarkets.

Co12: Small independent company (located in an isolated area of the Scottish Islands), with 4 employees and annual production of 300 tonnes of organic salmon. They switched in organic production[15] 3 years ago and because of the nature of their final product they are vertically

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[11] Co11* has its headquarters in the Scottish Highlands and is involved in the sustainable farming of salmon, sea-grown trout and turbot. The fish are processed into a wide range of value added products and dispatched across the UK and Europe. The company has farms in Scotland, Chile, Canada and Norway (*company's website, 6/3/2003).* At the time of the writing Co11* has been owned by a Norwegian multinational (the Co11**-Group). The Co11 was initially a consortium of five salmon farmers committed to grow salmon using low intensity methods. All the farm sites are owner managed. Individual farms are quite small but their co-operation in marketing offers their customers a reliable supply (*company's website, 6/3/2003*).

[12] The produced salmon and shellfish are graded, packed and processed in their own processing premises (*company's website, 6/3/2003).*

[13]Produced according to the organic aquaculture standard set by the Soil Association in the UK (*company's website, 6/3/2003*).

[14] In their website is explained that the company operates its own Quality Assurance Scheme (developed, audited and monitored by a department of the University of Aberdeen), incorporating a comprehensive standard for broodstock, hatchery, and marine site management. Salmon sold under this standard is distinguished by a green label on each box or pack (*company's website, 6/3/2003*).

[15] The combination of low stocking densities with the tidal nature of their sites and the geographical isolation from other salmon farming companies is claimed to have allowed them not to use chemical treatments for sea-lice control or medical remedies to combat diseases (*company's website, 6/3/2003)*

integrated/diversified[16] in the production of salmon roe, fry and smolts, as well as in small scale sea-trout production (30 tonnes p.a.). They participate in The Soil Association Organic Standard Scheme and they believe that product certification is important to the final consumer. The latter expect independent scrutiny of farming practice and want reassurance that food is safe, wholesome and environmental friendly. According to them, organic production is not feasible for many farms. Organic producers have to meet high costs while at the same time the organic premium is eroded as fish volume increases. They market their product in UK, France and continental Europe. At micro level important customers are: smokers and processors; wholesalers and hotels.

Co13 (Subsidiary of Co11*): Large subsidiary with 60 employees and annual production of 4,500 tonnes of mature salmon. Like the Co11 subsidiary, they do not participate in any quality certification scheme, while they used to participate in the Tartan, Label Rouge quality marks and in a local quality scheme. Important markets for them is the UK, France, Continental Europe, the US, and Japan. At the micro level, important customers are smokers and processors, associates and packing stations, sales organisations, supermarkets, wholesalers, and direct consumers.

Co14*:* Small independent company with 9 employees and annual production of 750 tonnes of mature salmon. They participate both in the Tartan and the Label Rouge Quality marks. They sell their produce mainly to multinational corporations. UK, France and continental Europe are considered as important markets for their activities while, at micro level, they mainly sell to smokers and processors; associates and packing stations; supermarkets and wholesalers.

Co15[17]*:* Small independent company with 2 employees and annual production of 150 tonnes of mature salmon. They are also diversified in the production of mussels (100 tonnes p.a.) and they participate in the Shetland Seafood Quality Control scheme. They consider as very important markets for their activities both the UK and the French market. Continental Europe is also considered important, whereas the US and Japan are of lesser importance. At micro level important customers are: smokers and processors; associates and packing stations; sales organisations; supermarkets; wholesalers; and fishmongers.

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[16] Since 1998, Co12 and Co12* have been working together to establish systems and procedures which will allow the production of organic fish (*company's website, 6/3/2003*)

[17] The fourth and largest part of the questionnaire was somehow lost for this company when they were faxing back their responses. Several follow ups did not succeed in making them answer the missing questions. For that reason only the quantitative characteristics of the firm are described.

Co16*:* Medium independent company with 20 employees and annual production of 10,000 tonnes of mature salmon which they sell both in the UK and in France. At micro level, most important customers are considered to be smokers and processors, associates and packing stations, sales organisations, and wholesalers. They participate in the Shetland Salmon Quality Control scheme and they feel that no participation would mean no-assistance for the needs of their company.

SALMON FARMING: NEW PRODUCT DEVELOPMENT, CURRENT PRACTICES & FUTURE PROPSPECTS

Company..... **Site Location**.....
County/Region..... **Location of Headquarters**.....
Years in Business..... **Number of employees**.....

A: Information about yourself (tick as appropriate)

Are you an independent owner/manager? Yes No
If yes, do you work with one or more large purchasers (i.e. multinational corporations, etc.)? Yes No
Are you the group or divisional manager of a larger company (i.e. multinational corporations, etc.)? Yes No
If yes, please specify (company name).....
Are you responsible for more than one farm? Yes No
If yes, for how many?.....

Do you participate in any of the following quality certification schemes? (tick as appropriate)

	Previously	Currently	Not heard of
The Tartan Quality Mark			
The Label Rouge Quality Mark			
Others (please specify)			

If you ticked previously, above, why did you stop participating in that particular quality certification scheme?

.....
.....
.....

Do you intend to participate in any quality certification scheme in the future? (tick as appropriate)
Yes ☐ No ☐
Please explain why.....
.....
.....

B: About the farms

Does your company have any of the following premises? If yes how many?

Broodstock site(s)
Sea site(s)
Freshwater site(s)
Hatcherie(s)
Engineering workshop(s)
Office(s)
Marketing department(s)
Retailing outlet(s)
Others (please specify)
.....
.....
.....

Do you produce organic salmon at any of your farms? (tick as appropriate) Yes No

Do you produce any of the following species? If yes, how much annually? Fill in as appropriate (e.g. number of fish/ kg/tones).

Salmon roe (eggs)	_____	Mature Salmon	_____
Salmon fry	_____	Sea-trout	_____
Salmon parr	_____	Halibut	_____
Salmon smolts	_____	Scallops	_____

Others (please specify)

.....

.....

The following is a list of issues in managing your farm(s). Indicate below the level of their importance by ticking the appropriate cell (1=very important, 2=important, 3=marginally important, 4=of little importance, or NR = not relevant).

Issues	1	2	3	4	NR
The health status of the stocks					
The stocking rates in use					
The diets in use					
The management of the seasonality patterns in smolt and mature salmon production					
The fish handling					
The use of chemicals for disease control					
Environmental problems					

Others (please specify)

.....

.....

C: About the markets your farm(s) sells to.

The following is a list of possible customers for your operations. Indicate their importance (1=very important, 2=important, 3=marginally important, 4=of little importance, or NR = not relevant).

Customers	1	2	3	4	NR
Smokers & Processors					
Associates & Packing Stations					
Sales Organisations					
Supermarkets					
Wholesalers					
Fishmongers					
Hotels					
Restaurants					
Direct consumers					

Others (please specify)

.....

.....

The following is a list of possible markets for your products. Indicate their importance

Markets	1	2	3	4	NR
United Kingdom					
France					
Rest of Continental Europe					
United States					
Japan					

Others (please specify)

.....

.....

D: Your views on issues in salmon farming.
Please comment on the following statements by ticking the appropriate cell.
(1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree or NR = not relevant)

	1	2	3	4	NR
Market issues					
The supply chain is too long					
The farmer gets an insufficient share of the retail value					
The trend in the salmon production sector is toward large industrial scale farms					
Quality management in salmon farming is restricted to compliance monitoring					
Farm labour availability or staff turnover are not critical issues					
International recognition of the Scottish Brand on salmon products is a significant strength for the industry					
The income earned from salmon farming is enough to guarantee business survival					
The fish farming sector is sufficiently dynamic to attract persons with the necessary management skills					
Most production is on contract for a predetermined supply chain					
A wide range of niche markets has developed over the recent years					
The sector is important for the financial wellbeing of the Scottish rural areas					
Support					
Continuous training at all levels in the sector is a business priority					
Published scientific research acts against the image of the sector					
The government adequately funds management and workforce skill development					
The sector benefits from the activities of the Highlands & Islands Enterprise					
Government ensures that the importance of salmon farming receives informative public debate					
Government policy effectively deals with the competitiveness of the sector					
The salmon industry is effectively subsidised					
Government adequately supports the transition to organic farming					
Government policy hinders the industry from producing what the market wants					
Government policy acts as an obstacle to transition to organic salmon farming					
Regulation – environmental concerns					
I would expect regulation to become more stringent in the future					
Regulations are preventing the management from efficiently running the farms					
I am aware in my organisation that alternatives to antibiotics are routinely used					
Strong and enforced legislation/regulations are the norm in this country					
Producers are responding to consumer concerns regarding animal welfare and environmental issues					
Government is responding to consumer concerns regarding animal welfare and environmental issues					
Compliance with environmental regulations is a major component of overall costs					
Genetic technology will benefit salmon farming					
Regulations are in line with international standards					
Performance enhancers, such as growth promoters, are in routine use on most farms					

Future prospects of salmon farming	1	2	3	4	NR
Demand has been affected by controversy over the risks of consuming farmed salmon					
Benchmarking of unit costs, service levels and best practice are the norm in this industry					
The cost base of Scottish salmon industry is uncompetitive					
There is a high degree of confidence in future commercial success					
There is insufficient profitability in salmon farming to maintain the sector					
The domestic UK market is sufficiently developed to act as a platform for exports					
Total domestic demand is increasing					
Multiple retailers are the driving force of the domestic consumer market					
EU enlargement represents an opportunity for the sector					
Supply significantly exceeds domestic demand and so forces export development					
There is significant investment by international companies in the Scottish salmon farming industry					
There is sufficient investment in updating capital assets in the sector					
The viability of Scottish Salmon Farming is adversely affected by salmon produced abroad					

Organically farmed salmon					
A strategy towards moving to organic production would solve many of the sector's problems					
Organic salmon farming is unlikely to become the norm in the next 10 years					
I see myself in switching into organic production within the next 5 years					
The price premium for organically farmed salmon is too low					
Organically farmed salmon is not effectively marketed					
Organically farmed salmon is a niche market with a high potential for expanding					
Total domestic demand is increasing for organic salmon					
The risk of switching into organic production is too high					
Organic salmon is a healthy product					
The term organic is well defined in fish husbandry					

What do you think are the main problems experienced by organic salmon-farmers? Indicate the level of their importance by ticking the appropriate cell (1=very important, 2=important, 3=marginally important, 4=of little importance, or NR = not relevant).

Issues	1	2	3	4	NR
The health status of the stocks					
The limits on the stocking rates					
The constraints on the diets used					
The management of the seasonality patterns in smolt and mature salmon production					
The constraints on fish-handling					
The constraints on the use of chemicals for disease control					
Environmental problems					

Others (please specify)

.....

.....

Do you have any further comments?

.....

.....

(tick as appropriate)

	Yes	No
• **Would you like feedback on the results of the survey?**		
• **Would you be interested in participating later in the program?**		

Table 2.15: *Producers' views on the salmon arena*

MARKET ISSUES	Strongly Agree	Agree	Disagree	Strongly Disagree	Non relevant	Total	Agreement	Disagreement
The supply chain is too long	6.25%	25.00%	43.75%	12.50%	12.50%	100.00%	31.25%	56.25%
The farmer gets an insufficient share of the retail value	81.25%	18.75%	-	-	-	100.00%	100.00%	-
The trend in the salmon production sector is toward large industrial scale farms	60.00%	20.00%	13.33%	-	6.67%	100.00%	80.00%	13.33%
Quality management in salmon farming is restricted to compliance monitoring	6.67%	40.00%	53.33%	-	-	100.00%	46.67%	53.33%
Farm labour availability or staff turnover are not critical issues	-	28.57%	21.43%	42.86%	7.14%	100.00%	28.57%	64.29%
International recognition of the Scottish Brand on salmon products is a significant strength for the industry	26.67%	40.00%	13.33%	20.00%	-	100.00%	66.67%	33.33%
The income earned from salmon farming is enough to guarantee business survival	-	7.14%	35.71%	57.14%	-	100.00%	7.14%	92.86%
The fish farming sector is sufficiently dynamic to attract persons with the necessary management skills	-	73.33%	20.00%	6.67%	-	100.00%	73.33%	26.67%
Most production is on contract for a predetermined supply chain	7.14%	42.86%	35.71%	14.29%	-	100.00%	50.00%	50.00%
A wide range of niche markets has developed over the recent years	7.14%	42.86%	42.86%	7.14%	-	100.00%	50.00%	50.00%
The sector is important for the financial wellbeing of the Scottish rural areas	92.86%	7.14%	-	-	-	100.00%	100.00%	-

Table 2.15 (continues): *Producers' views on the salmon arena*

SUPPORT ISSUES	Strongly Agree	Agree	Disagree	Strongly Disagree	Non relevant	Total	Agreement	Disagreement
Continuous training at all levels in the sector is a business priority	40.00%	33.33%	26.67%	-	-	100.00%	73.33%	26.67%
Published scientific research acts against the image of the sector	15.38%	15.38%	53.85%	15.38%	-	100.00%	30.77%	69.23%
The government adequately funds management and workforce skill development	-	13.33%	73.33%	6.67%	6.67%	100.00%	13.33%	80.00%
The sector benefits from the activities of the Highlands & Islands Enterprise	33.33%	46.67%	6.67%	6.67%	6.67%	100.00%	80.00%	13.33%
Government ensures that the importance of salmon farming receives informative public debate	6.67%	6.67%	40.00%	46.67%	-	100.00%	13.33%	86.67%
Government policy effectively deals with the competitiveness of the sector	-	-	40.00%	60.00%	-	100.00%	-	100.00%
The salmon industry is effectively subsidised	6.67%	-	33.33%	60.00%	-	100.00%	6.67%	93.33%
Government adequately supports the transition to organic farming	-	13.33%	20.00%	40.00%	26.67%	100.00%	13.33%	60.00%
Government policy hinders the industry from producing what the market wants	-	26.67%	26.67%	26.67%	20.00%	100.00%	26.67%	53.33%
Government policy acts as an obstacle to transition to organic salmon farming	6.67%	6.67%	13.33%	40.00%	33.33%	100.00%	13.33%	53.33%

Table 2.15 (continues): *Producers' views on the salmon arena*

REGULATION – HEALTH ISSUES	Strongly Agree	Agree	Disagree	Strongly Disagree	Non relevant	Total	Agreement	Disagreement
I would expect regulation to become more stringent in the future	33.33%	53.33%	6.67%	6.67%	-	100.00%	86.67%	13.33%
Regulations are preventing the management from efficiently running the farms	26.67%	53.33%	20.00%	-	-	100.00%	80.00%	20.00%
I am aware in my organisation that alternatives to antibiotics are routinely used	40.00%	20.00%	13.33%	6.67%	20.00%	100.00%	60.00%	20.00%
Strong and enforced legislation/regulations are the norm in this country	46.67%	40.00%	6.67%	6.67%	-	100.00%	86.67%	13.33%
Producers are responding to consumer concerns regarding animal welfare and environmental issues	71.43%	21.43%	7.14%	-	-	100.00%	92.86%	7.14%
Government is responding to consumer concerns regarding animal welfare and environmental issues	20.00%	26.67%	40.00%	13.33%	-	100.00%	46.67%	53.33%
Compliance with environmental regulations is a major component of overall costs	33.33%	53.33%	-	13.33%	-	100.00%	86.67%	13.33%
Genetic technology will benefit salmon farming	13.33%	20.00%	46.67%	13.33%	6.67%	100.00%	33.33%	60.00%
Regulations are in line with international standards	21.43%	14.29%	50.00%	14.29%	-	100.00%	35.71%	64.29%
Performance enhancers, such as growth promoters, are in routine use on most farms	-	-	13.33%	86.67%	-	100.00%	-	100.00%

Table 2.15 (continues): *Producers' views on the salmon arena*

FUTURE PROSPECTS	Strongly Agree	Agree	Disagree	Strongly Disagree	Non relevant	Total	Agreement	Disagreement
Demand has been affected by controversy over the risks of consuming farmed salmon	26.67%	40.00%	26.67%	6.67%	-	100.00%	66.67%	33.33%
Benchmarking of unit costs, service levels and best practice are the norm in this industry	13.33%	66.67%	13.33%	-	6.67%	100.00%	80.00%	13.33%
The cost base of Scottish salmon industry is uncompetitive	-	53.33%	33.33%	13.33%	-	100.00%	53.33%	46.67%
There is a high degree of confidence in future commercial success	13.33%	-	73.33%	13.33%	-	100.00%	13.33%	86.67%
There is insufficient profitability in salmon farming to maintain the sector	13.33%	60.00%	20.00%	6.67%	-	100.00%	73.33%	26.67%
The domestic UK market is sufficiently developed to act as a platform for exports	-	84.62%	7.69%	7.69%	-	100.00%	84.62%	15.38%
Total domestic demand is increasing	7.14%	92.86%	-	-	-	100.00%	100.00%	-
Multiple retailers are the driving force of the domestic consumer market	42.86%	50.00%	7.14%	-	-	100.00%	92.86%	7.14%
EU enlargement represents an opportunity for the sector	21.43%	42.86%	28.57%	-	7.14%	100.00%	64.29%	28.57%
Supply significantly exceeds domestic demand and so forces export development	15.38%	69.23%	15.38%	-	-	100.00%	84.62%	15.38%
There is significant investment by international companies in the Scottish salmon farming industry	40.00%	53.33%	-	-	6.67%	100.00%	93.33%	-
There is sufficient investment in updating capital assets in the sector	-	33.33%	53.33%	6.67%	6.67%	100.00%	33.33%	60.00%
The viability of Scottish Salmon Farming is adversely affected by salmon produced abroad	46.67%	46.67%	6.67%	-	-	100.00%	93.33%	6.67%

Table 2.15 (continues): *Producers' views on the salmon arena*

ORGANIC SALMON	Strongly Agree	Agree	Disagree	Strongly Disagree	Non relevant	Total	Agreement	Disagreement
A strategy towards moving to organic production would solve many of the sector's problems	7.14%	-	35.71%	57.14%	-	100.00%	7.14%	92.86%
Organic salmon farming is unlikely to become the norm in the next 10 years	42.86%	42.86%	14.29%	-	-	100.00%	85.71%	14.29%
I see myself in switching into organic production within the next 5 years	-	7.69%	30.77%	46.15%	15.38%	100.00%	7.69%	76.92%
The price premium for organically farmed salmon is too low	14.29%	42.86%	14.29%	7.14%	21.43%	100.00%	57.14%	21.43%
Organically farmed salmon is not effectively marketed	7.14%	57.14%	21.43%	7.14%	7.14%	100.00%	64.29%	28.57%
Organically farmed salmon is a niche market with a high potential for expansion	14.29%	28.57%	42.86%	14.29%	-	100.00%	42.86%	57.14%
Total domestic demand is increasing for organic salmon	15.38%	61.54%	15.38%	-	7.69%	100.00%	76.92%	15.38%
The risk of switching into organic production is too high	28.57%	50.00%	14.29%	-	7.14%	100.00%	78.57%	14.29%
Organic salmon is a healthy product	28.57%	71.43%	-	-	-	100.00%	100.00%	-
The term organic is well defined in fish husbandry	21.43%	-	28.57%	50.00%	-	100.00%	21.43%	78.57%