Urban Fragmentation and Integration of Saudi Cities: The Case of Riyadh, Saudi Arabia

By

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A thesis submitted to the University of Strathclyde

in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

Department of Architecture

University of Strathclyde

2022

Declaration of Authenticity and Author's rights

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Abstract

The development of defensive strategies leading to the fortification and privatisation of large parts of contemporary cities has attracted significant attention within a number of disciplines, with much focus on gated communities. This thesis is articulated in the light of these debates and expands it to other forms of fragmentary urban typologies.

The study focuses on spatial transformation and changing urban landscapes by constructing walls, gates, and fences. However, it does not consider spatial transformation in isolation but the impact and implications of such a phenomenon. Therefore, apart from investigating the various physical manifestations of gated developments in Saudi Arabia, the study investigates their relation to their impact and implications for quality of life and socio-spatial integration.

These relationships were explored through a theoretical framework and research matrix developed to understand the impact of fragmentary urban typologies across a multitude of domains. The study used a broader approach to spatial research through a multidimensional (socio-spatial), dynamic and multi-scale approach. Determining the location, extent, and typology in Riyadh, Saudi Arabia and identifying the impact on the macro and micro scales and other social implications required a mixed-methods approach to data collection.

This thesis has explored residents' and experts' attitudes towards gated developments concerning urban fragmentation: spatially, socially, and in terms of micro- and macro urban contexts. It has been noted that gating contributes to urban fragmentation and segregation and that this impact can be severe. However, it also shows that the impact differs according to different communities in different locations and that the implications of these developments will therefore also vary. The study, therefore, recommends a context- and type-specific approach to deal with the shorter and longer-term implications of gated developments in Saudi Arabia and abroad.

This thesis contributes to the much-needed empirical evidence by developing a framework that draws from different fields, including urban planning, architecture, geography, sociology, psychology, anthropology, ethnography, political economy, and philosophy; the theoretical framework provided a multi-disciplinary perspective of both historical and current scholarship on the phenomenon of urban fragmentation and is one of the contributions of the thesis. The methodological approach adopted in this thesis is also one of its contributions. This thesis showed that the social dynamics are intrinsically related to the spatial organisation and form and the interpretation thereof by users of the urban space or specific places in

cities. This thesis showed that through a mix of methods, multiple perspectives on the issue of urban fragmentation were compiled, resulting in a more complete, embedded, and accurate understanding of the phenomenon. The thesis also contributed to the urban planning and design fields in countries of the south. Moreover, it provided a new case study, giving new information about gated developments and urban fragmentation in a major Saudi city and contributing to the scholarly knowledge on the subject. Finally, by looking at gated developments, the thesis contributed to incorporating new topics into the urban and social development agendas.

Acknowledgements

I put forward this study, hopefully offering some explanations and a proposal for improvement. I want to thank God, who has sustained me through these, the best and toughest years of my life, and without whom nothing is possible. My thanks are due to many individuals who kindly contributed to the production of this study. In particular, I wish to thank Professor Ashraf Salama, who patiently accepted the task of guiding my research with special attention in addition to his intellectual insight, encouragement, and challenging supervision. His enlightening views and constructive criticism gave me a broader grasp of many relevant issues.

In Saudi Arabia, many individuals awarded their time and advice to me and to whom I acknowledge appreciation. Among them are Dr Saleh AlHathloul and Dr Abdulaziz AlKhedheiri. I am also grateful to Umm Al-Qura University for funding this research.

I am grateful to my wife, Aishah Yousef, who has patiently endured so much, and Without her moral support, this work wouldn't have been possible. Finally, I dedicate this study to my parents, Abdullah and Khadija Almahdi, who have reared me to appreciate knowledge, so to them, I confess eternal indebtedness.

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Chapter 1: Introduction

1.1 Urban Fragmentation in Saudi-Arabian Context

As witnessed in the last decades, a new type of city has unquestionably been taking shape. The city as we knew it from the pre-growth era — the compact city, precisely limited, relatively socially homogenous, existing in cohesion, has been torn and broken into a variety of distinct fragments. Urban readability and continuity receded in favour of discontinuous and complex urban formations consisting of social and spatial enclaves. This process has been taking place due to the rapid growth of cities, particularly in the second half of the 20th century.

The debate over urban fragmentation has become a priority in the agendas of urban development as well as public administration. Due to the urgency of the problem, it has become an integral part of re-designing current strategies and hierarchies dealing with the globalising dynamics.

There appears to be an interdisciplinary interest in analysing the issue on different scales of the urban context. The problem receives particular attention in the phases of "shifting paradigms" in urban development, in the moments of crisis, such as right now.

Such projections make it imperative for the future planning of cities of the Global South. Due to mega-urbanisation, the authorities are urged to abandon their rigid planning standards that seem to ignore realities and fail to adapt to the challenges or current trends, which generates further fragmentary dissolution of systems.

Due to the country's phenomenal growth, the form and structure of Saudi cities have undergone a fascinating transformation, moving from small settlements to vast metropolitan areas. The growth has been associated with problems in management due to the unregulated urban development causing fragmenting spatial pathologies. Despite attempts for improvement, the country has yet to find a solution for a long-term challenge of its growth.

1.2 Conceptual Considerations

There appears to be a certain fluidity to the term "fragmentation". Its frequent use to describe various phenomena in the context of the post-modern city often misses its true merit. Michelutti (2008) notes that despite its presence in urban discourse, the

conceptualisation of urban fragmentation is still lacking. Further, other authors also point out the fragility of the existing analytical interpretations (Navez-Bouchanine, 2002). Deffner and Hoerning describe urban fragmentation as "a theoretically only poorly outlined and empirically hardly analysed concept with regard to its production and perception in daily practices" (2011, p. 1). The terms' abundant usage in the multitude of contexts is striking. They are either relating to the transformation of the social structures and experience, or the morphological and territorial aspects of the structures and their relation to social structure, as well as the decentralising tendencies in the administrative structures (ibid). It is often used synonymously to "segregation" or "segmentation", furthering its varying and often baffling application.

The discourse has been united on the fact that the cities suffer due to the ongoing process of fragmentation. The debates appear to have a common denominator — they all perceive fragmentation as a process of deconstruction of the former "wholeness" or "entirety" instead of creating fragmentary urban space as a reflection of a fragmentary state of social existence. Urban space and the society of the fragmented city should, according to these notions, experience various levels of disconnection, even to a level of isolation, while contributing to strong awareness of otherness in the public realm.

In the existing literature, urban fragmentation is discussed in four main contexts (Altınok, Cengiz 2008):

- **Spatial** — this scope offers insights into the discordance of urban land use, particularly spatial atomisation, the lack of spatial integration, and the increasing separation of functions over the urban space.
- **Environmental** — this aspect speaks about the depletion and disintegration of the agricultural and forest land through the urban development processes.
- **Political-administrative** — focuses on divisive mechanisms of large cities and metropolitan regions in terms of fragmenting the governmental force into numerous units and failure of these local units to introduce an integrated approach cooperative with other units.
- **Social** — describes a phenomenon of fragmentation based on social "otherness". This side of fragmentation is closely related to segregation due to factors such as

poverty, deprivation, racial discrimination, being a member of a minority, in principle — differences based on social class.

Additionally, Michelutti (2008) points out two other aspects citing corresponding studies:

- **Economic** — where fragmentation refers to inequalities in resources and investments differently localised in the city (Morgan and Marechal, 1999) and consequently a degree of economic polarisation and inequality in terms of access to the labour market (Van Kempen, 1994; Sassen, 2002)
- **Cultural** — referring to the unavoidable creation of distinct expression of segregation and "ghettoisation" (Coy, 2006; Powell and Graham, 2002) due to co-presence of different and conflicting identities in the city (Harrison et al., 2003) and resulting conflicts and fear-based behaviour in different urban contexts (Low, 2006).

The polysemic character of the term "fragmentation" has already been indicated as well as many contents that may be attributed to it. Sposito and Sposito (2020) note that the reason for this adaptation is to deal with contemporary urban processes that are of different shades. So far, it seemingly functions as an operational term used by urban scientists to describe the phenomenon of increased differentiation within cities. Yet, it remains unclear if "fragmentation" is meant a new structure of the socio-spatial realm, or if it is a mere temporary and auxiliary term for a pathological influence that is threatening us by its complexity due to the sizes of today's cities (Deffner, Hoerning 2011, p. 1).

Sposito and Sposito (2020) further note that adopting the idea that there is certain ”urban pathology" might lead to establishing a correlation between the city and the beings living in it to emphasise the form instead of the content. For example, focusing on the form by introducing new rigid spatial models might lead to further alienation and an increased formation of private enclaves. In that sense, Rhein and Elissalde confirm that to insist only on the fragmentary aspect hides the dimension of encounters and exchanges, which is the basis of all social life (2004, p.125). The actors' attitudes are the critical component in "diagnosing” the metropolis as the relationships between these attitudes, from which the state of the urban fabric is evident.

Navez-Bouchanine (2002) also seeks to overcome the emphasis on forms. She argues that fragmentation can often be viewed from a perspective of narrow and totalising functionalism, which correspondents with Lefebvre's (2003) conceptualisation of

fragmentation as an "explosion" of the city and serves as a criticism of modernity. In their study, Guzmán and Hernández (2013) argue that fragmentation in the context of modernist city works as a two-end comparison between an "ideal city" and "urban pathology", whereas in the context of the post-modern city it serves as a tool of assessing the complexities and the individual fragments. Their state can thus be used as indicators of urban evolution and interpreters of social behaviour.

From this context and in the name of such evolution — is there a possibility to reframe the understanding of fragmentation in order to gain access to new analytical tools?

1.3 Gaps in Research

The academic sources offer a rich inventory of concepts on fragmentation. Even though its polysemic character presents difficulties in scholarly debates the history of the emergence of [this] notion indicates a strength capable of transcending all contradictions" (Navez-Bouchanine, 2002, p. 45). The polysemy is considered to be one of the pitfalls by Michelutti, who notes that for most authors, the interest seems to lie exclusively in exploring the consequences of the phenomenon or focusing respectively on fragmentation trends derived by socio-economic restructuring (2008, p. 2). Such approaches appear to have severe limitations as they tend to fall into abstractions by showing a general incapacity to identify the very mechanisms that generate fragmentation (ibid). There appears to be a difficulty with accurate calculations of the dimensions to analyse the triggers in the phase of planning and map the subjective experiences of the urban actors. Therefore, the existing literature can be considered to be prevalently concentrated either on the abstract conceptualisations, or analysis and descriptions of the effects of the mechanism instead of its generators. In terms of scale, the focus lies in large development trends and urban geography, while small-scale analysis on the architecture level is almost non-existent.

Due to these reasons and despite its interdisciplinary relevance and a persistent focus, it is still perceived as lacking in empirical validity. Practically, it is rather difficult to develop precise analytical tools. The research methodology as we knew it — linearly outlined procedures and methods within disciplinary fields — might be insufficient for conceiving solutions for such multidimensional, multi-scale problematics. Sposito and Sposito (2020) point out the tendency to associate fragmentation with the geographic scale, which potentially limits the range of investigative input by spatial researchers working on a smaller

scale, for example, architecture. In order to develop a more holistic approach, the representatives of individual disciplines should strive not to limit their understanding of fragmentation on a particular scale, traditional to their discipline.

Giving these points to grasp the substance of the problematics, the studies suggest to associate overcoming the effects of fragmentation — the morphological discontinuities and physical disconnection as well as exclusive logics and consequently a community withdrawal (Prévôt-Schapira, 2001) — by integrative tactics and unification strategies. Urban fragmentation thus directly emphasizes the question of the unity Navez-Bouchanine (2002, p. 47) — one of the greatest challenges of global humanity today.

1.4 Developments in Saudi Arabia over the 20th century

At the beginning of the 20th century, Saudi cities functioned on an elementary and uncomplicated structural basis. They were compact, densely integrated, and dominated by pedestrians. The developments over the 20th century contributed to the transformation of the common model. According to Garba (2004), the 20th century can be divided into four growth phases: (1) the pre-establishment phase (1900-1930), (2) the establishment phase (1930-1970), (3) the oil-boom phase (1970-1990), and (4) the post-oil boom (1990-present).

Despite the culture's long history, in the early 20th century, the cities' residents were still living a tribal life. The population counted in thousands on a land coverage of one square kilometre and less (Garba 2004). The initiator of a fundamental change towards developments was the desire to transform the tribal life and improve living conditions. These were the first attempts to ordain a governance framework laying down basic regulations, form ministries, and develop training and educational programs to obtain an institutional workforce. This initiated the growing trends and established the first management of Saudi-Arabian settlements.

Firstly, regulations to guide the development of the street patterns and building construction were introduced in the 1930's. Imported modernist models of planning and new technologies were applied without considering the traditional socio-cultural structures and the organically developed spatial patterns. Notable milestones of this transformation process included the foundation of the city of Al Khobar initiated by King Abdulaziz in 1938, the home ownership plan in 1951, and the 1960 circular by the Deputy Ministry of Interior for Municipalities. They set a foundation for the development of the contemporary urban fabric in Saudi Arabia. The

following economic boom in the 1970s caused even greater urban transformation and subsequently an inauguration of the Five Year Development Planning, enabling a large-scale systemic intervention in urban production (Eben Saleh 2002). A newly established urban form was based on the formation of a grid-iron spatial scheme regulating zoning, spacing, and compulsory coverage of the site.

1.5 Current Problems & Challenges

The UN-Habitat (1) statistics show that 82,1% of the Saudi-Arabian population lives in cities, whereas 17,9% reside in rural areas. The rate of urbanisation at the regional level shows that six regions have been recorded to exceed the rate of 80%, including Eastern Province (93.2%), Riyadh (90.9%), Makkah (87.6%), the Northern Borders (86.7%), Tabuk (85.9%), and Jouf (84.5%).

The extraordinary urban growth has had a significant impact on the large metropoles as well as smaller cities and other urban agglomerations. The total number of cities increased from 58 in 1936 to 285 in 2015, and are now under the authority of 118 governorates distributed over 13 regions. The urbanisation rate is expected to continue, with predictions reaching up to 97,6% by the year 2030. The kingdom's estimate for demographic growth is expected to reach the rate of 2,15% per annum. The most populated areas include the capital Riyadh, the cities of Jeddah and Dammam, and the holy cities of Makkah and Medina.

Understandably, the major challenge of the present time and the years to come lies in managing the multi-level consequences of the rapid expansion. A result of this process occurring relatively quickly is generational unbalance when 60% of the Saudi population are youth. People under the age of 24 make up approximately half of the nation's population, while people under the age of 15 constitute 34,1% out of the total population of almost 30 million. This poses a huge challenge concerning organising economic opportunities, housing, and age-appropriate services. Additionally, the country deals with the consequences of increased industrialisation, water shortage or high consumption patterns, and resource insensitive lifestyles. The increased demand for services and responsive planning of infrastructure are not at capacity at the moment, which is enabling the private sector to enter the role of a provider to ensure quality housing, services, and transit options.

Despite the government's attempt to introduce programs to search for sustainable urban development options, addressing the demands has been difficult. Due to the

multidimensional and complex problems, the solutions have not been sufficient and have not ensured quality of life for all Saudi people. While the central areas of the cities offer a luxurious lifestyle for those who can afford it, an estimated quarter of the population live in poverty and often reside in the outskirts of the metropoles. Saudi cities show all signs of a fragmented system - spatially and socially.

1.6 Research Aim, Objectives, and Questions

Studies into social phenomena using qualitative or mixed methods benefit from the explicit definition of research aims, objectives, and questions which structure the conceptual, empirical, and analytical work (Creswell, 2007). Therefore, the purpose of this section is to present these research components and outline how they interrelate to form the basis of the study. The next section will expound upon how the structure was advanced through applied qualitative modes of data collection, discussing each methodological phase, how it was deployed, and its relation to the research objectives.

The present research has aimed to unpack the effects of urban fragmentation on the socio-spatial composition of the city to better understand how gated developments impact the quality of life in neighbouring communities.

To empirically and conceptually advance this aim, the research interprets urban experiences by "drawing linkages between activities, events, processes, and their spatial outcomes" (Andranovich & Riposa, 1993). To uncover and trace how these types of linkages underpin urban fragmentation, the present study has relied on the following six research objectives:

- **Objective 1:** To establish how urban fragmentation is conceptualised in scholarly literature in general and, specifically, in the context of Saudi cities.
- **Objective 2:** To determine the location and spread of fragmentary gated developments in Riyadh.
- **Objective 3:** To document the general understanding of urban fragmentation within the local professional community of scholars, practitioners, and policymakers.
- **Objective 4:** To explore professionals' opinion on drivers of urban fragmentation and the possible ways for dealing with it.
- **Objective 5:** To determine the collective impact of all fragmentary building types on the wider urban context.

- **Objective 6:** To identify the impact of gated/fenced developments on their immediate urban context.
- **Objective 7:** To determine the impact of living in or around fragmentary building types on the experiences of residents.

These research objectives operate as concrete signposts through which the study into urban fragmentation was advanced. Yet, in order to follow these phases and ensure that they relate back to the research aim, four open-ended and exploratory research questions were simultaneously established (Creswell, 2007; Esterberg, 2002). Directly linked to the study's research objectives, these questions provided structure for the advancing empirical work:

- **Question 1:** What is urban spatial fragmentation, and how do gated/fenced developments contribute to its emergence in Saudi cities?
- **Question 2:** To what extent is Riyadh seen as a fragmented city, and how widespread are gated/fenced developments in it?
- **Question 3:** How can the effects of gated/fenced developments be mitigated in Riyadh?
- **Question 4:** What are the effects of gated/fenced developments on the city of Riyadh?

(1) The first question allowed the researcher to set up the conceptual framework underpinning the present study, thus identifying a contribution to knowledge and adding to conceptual understandings of the socio-spatial impact of gated developments and urban fragmentation in Saudi cities. **(2)** The second, compounded research question served to focus the empirical work on recording how urban fragmentation was, at the time in which fieldwork was conducted, understood by scholars, practitioners, and policymakers in Riyadh. Moreover, this question underpinned a mapping of the positions of gated developments within Riyadh's metropolitan area. **(3)** The third research question prompted the empirical data collection to turn once more to how scholars, practitioners, and policymakers envision extenuating any detrimental effects of urban fragmentation and gated developments through governance, planning practice, and policy. **(4)** Finally, the fourth research question guided the study in uncovering the impact of fragmentary urbanisation on the experiences of nearby residents as well as on the immediate and wider urban context.

1.7 Methodological Approach

The methodological approach for this study responds to gaps in knowledge identified through a systematic review of the literature around urban fragmentation and gated developments in Saudi cities. The study makes a twofold contribution to knowledge. Firstly, in response to calls in the literature to substantialise definitions of urban fragmentation (Michelutti, 2008), it contributes conceptually to knowledge by strengthening how the specific attributes of socio-spatial fragmentation are understood. Secondly, the research builds upon valuable contributions from previous works unpacking the impact of urban fragmentation upon urban governance, quality of life within gated developments, city management, and urban growth strategies in Saudi cities (Glasze, 2006; Glasze & Alkhayyal, 2002; Mandeli, 2010; Mubarak, 2004b). To these works, the research adds a contribution as the first study unpacking the socio-spatial impacts of fragmentation in a Saudi urban context.

To achieve the two contributions to knowledge, the research has adopted a mixed methods approach to data collection, using an array of predominantly qualitative methods with some quantitative elements to support the findings. Bryman (2016) has noted that quantitative methods often produce a static picture of social life which is particularly valuable when the research is concerned with uncovering regularities in the data. As this chapter discusses, the quantitative element of the methodology here was predominantly a resource used to extract descriptive statistics from respondents to questionnaire surveys, providing valuable insight into the perception trends amongst participants. While these quantitative insights were important to the findings, the research principally relied on qualitative data collection methods. Qualitative research designs permit findings to focus on contextual specificity, with the advantage of delivering a more profound comprehension of subjective interpretations, contextual nuances, and implied meanings of phenomena and/or identities associated with urban fragmentation and gated development (Patten & Newhart, 2018). As Geertz (1973) argues, qualitative research produces "rich accounts of the detail of a culture", a goal with quantitative methods could not achieve. To understand and analyse urban fragmentation associated with gated developments in the specific territorial realities of Riyadh, and to further develop the robustness of the quantitative data secured during this study, the use of qualitative data was a critical counter-point (Jick, 1979).

The heterogeneity afforded by mixed methods tactics – as opposed to mono-method research – increased the reliability of research findings (Johnson & Onwuegbuzie, 2004). It can be used to capture a more complete, holistic, and contextual portrayal of a phenomenon (Jick, 1979). Likewise, it can relate to different data sources such as verbal and visual data and build a greater insight and knowledge during data collection (Flick, 2018). It is through such detail that judgements can be made about the possibility of transferability of the findings to other milieu and robust conclusions drawn for this research (Johnson & Onwuegbuzie, 2004).

The mixed methodological approach in the study has, moreover, been combined with an exploratory research design. As Reiter (2017) explains, exploratory research is used when the researcher/s engages the field of study without attempting to confirm a presupposed hypothesis, as would be the case when using a confirmatory research design. Rather, in exploratory studies, researcher/s discover and unpack embedded social phenomena gradually by paying heed to social relations and their everyday contexts (Reiter, 2017). While exploratory studies set out with a research structure to follow during the initial forays into the data collection, this structure remains porous enough to encompass the vicissitudes of the field, including the use of snowballing techniques for participant recruitment, the contextually driven (re)definition of theoretical concepts, and engagement with carefully selected and highly informed sources (Andranovich & Riposa, 1993; Reiter, 2013). Habitually, exploratory research designs are used to unpack subjects of which little is known. Whilst it is true that scholars have increasingly unpacked urban fragmentation over the past two decades, no studies exist thus far that have explored its impact on urban communities in Riyadh. Therefore, the exploratory approach was appropriate, as it allowed for both conceptual and contextual idiosyncrasies to come to the fore. Applied within the present study, the exploratory research approach facilitated a systematic tracing of urban fragmentation within the context of Riyadh beyond constraints of preconceived ideas.

In Table 1.1 the aim, research objectives, and research questions have been collated to convey how they relate to one another to form the basis for the research design. In the section that follows, the methods of data collection applied in the study are discussed, beginning with their relation to the aim, objectives, and research questions and, subsequently, proceeding to unpack the steps taken during each phase of data collection.

Table 1.1 Research Design

Aim	Questions	Objectives	Methods
To unpack the effects of urban fragmentation on the socio-spatial composition of the city to better understand how gated developments impact the quality of life in neighbouring communities.	**Q1:** What is urban spatial fragmentation, and how do gated/fenced developments contribute to its emergence in Saudi cities?	**O1:** To establish how urban fragmentation is conceptualised in scholarly literature in general and, specifically, in the context of Saudi cities	Literature Review
	Q2: To what extent is Riyadh seen as a fragmented city, and how widespread are gated/fenced developments in it?	**O2:** To determine the location and spread of fragmentary gated developments in Riyadh	Urban Mapping and Coding
		O3: To document the general understanding of the issue of urban fragmentation within the local professional community of scholars, practitioners, and policymakers.	Experts Surveys
	Q3: How can the effects of gated/fenced developments be mitigated in Riyadh?	**O4:** To explore professionals' opinion on drivers of urban fragmentation and the possible ways for dealing with it.	
	Q4: What are the effects of gated/fenced developments on the city of Riyadh?	**O5:** To determine the collective impact of all fragmentary building types on the wider urban context	Urban Network Analysis (space syntax)
		O6: To identify the impact of gated/fenced developments on their immediate urban context	Comparative Case Study Appraisals
		O7: To determine the impact of living in or around fragmentary building types on the experience of residents	Residents Surveys

1.8 Thesis Structure

This thesis consists of ten chapters arranged in three main parts. Following the introduction, Part One (Chapters 2 to 5) considers the conceptual and contextual basis for the thesis. Part Two (Chapters 6 to 9) focuses on Urban fragmentation in Riyadh, Saudi Arabia, at both macro

and micro scales. It outlines and discusses the main research findings (results). Finally, part Three (Chapter 10) offers conclusions about the discussions in Parts One and Two in terms of Urban fragmentation and urban transformation in the 21st century.

Chapter 2 introduces a few concepts that need to be explored in order to have a nuanced debate on the causes of urban fragmentation and see how the Riyadh case study fits into this larger context. The chapter covers the widely contested definitions of urban fragmentation, various approaches to studying fragmentation; characteristics of contemporary urban life and how these features have led to the rise in gated developments; and the features and impacts of gated developments on cities and the social fabric.

Chapter 3 takes this discussion further by using the Drivers–Pressures–State–Impacts–Responses (DPSIR) framework to discuss the process of spatial transformation through gated developments and its impact on the quality of life in their neighbouring communities. The study outlines a broader view of the existing and current research and debates on social, political, economic, cultural, and spatial aspects of gating and spatial segregation on an urban scale, framing, at the same time, disciplinary responses for overcoming these problems.

Chapter 4 introduces the city of Riyadh's context and demonstrates the main elements of its urban transformation. It also highlights major challenges facing the city today and shows its relevance for studying urban fragmentation and its impact on future urban transformation.

Chapter 5 discusses the overall research methodology of the study. It builds on the previous chapters by taking the conceptual framework and how it applies to gated developments to formulate a suitable research strategy and design to investigate the main research questions. It employs a multidimensional (socio-spatial) dynamic and multi-scale approach to spatial research. It sets the study's remit and justifies the analytical approach adopted and the use of a range of methods to obtain the relevant information.

Chapter 6 analyses a survey of scholars, practitioners, and policymakers on the existence, impact, and possible response to fragmentary building types, policies, and practices. This chapter builds on the urban survey of fragmentary building types presented in detail in Appendix H. The chapter reports on the expert's professional expertise and experience, their views on urban fragmentation, and the structural elements, policy frameworks, and development types that contribute to it. The experts were also asked for their opinion on several design guidelines. This chapter aims to understand expert opinion on fragmentary

urban typologies and the impact on the built environment and residents of Saudi Arabian cities.

Chapter 7 reports the first level of spatial analysis at the macro-scale. Employing the Space Syntax theory, a network analysis was done on the city of Riyadh to determine the collective impact of all the city's fragmentary building types on the wider urban context.

Chapter 8 delivers the next level of spatial analysis at the micro-scale. It presents a comparative study of the urban impact of gating across three building types in three urban contexts. The chapter begins with a review of the urban fabric types in which all nine cases being examined are situated. The selection of sports stadiums, university campuses, and medical facilities is then rationalised by reviewing their neighbourhood impact.

Chapter 9 reports on the analysis of a survey on the impact of urban fragmentation on residents of Riyadh. It summarises the results of the survey of residents, which gathered views on a variety of questions regarding their residential history and preferences, the built environment, and quality of life in their neighbourhood.

Chapter 10 (conclusion) presents answers to the research questions and the attainment of its objectives. The chapter also highlights the research limitations before concluding with recommendations for future research.

Chapter 2: The Study of Urban Fragmentation in Perspective

2.1 Introduction

This chapter will introduce the concept of urban fragmentation and the debate over definitions of urban fragmentation will be introduced. This chapter will then review various approaches to urban fragmentation, including political/administrative approaches, economic approaches, social approaches, cultural/anthropological approaches, and spatial (physical/morphological) approaches. After examining each approach to urban fragmentation, the chapter will explore the validity of each. Next, this chapter will introduce a variety of methods of urban development that have been used throughout history. This discussion begins with the idea of the fortress city. Using examples like LA and Newcastle in England, this chapter discusses how the focus in a fortress city development uses defence as a pillar of development. This practice will be explored in the modern context with a focus on cities that use this method as a way to increase perceptions of safety for residents. Constructs of financial power will be discussed as well, in particular, how powerful financial centre's influence urban development. The notion of militarisation and privatisation of urban landscapes will then be discussed with particular emphasis on gated residential communities. Various types of gated communities will be explored, including academic developments, medical developments, commercial developments, and military developments. The global financial impacts of gated communities will be discussed in relation to the disparity of housing values of those properties inside the gated community versus those outside the gated community. Several socio-political impacts of gated communities will be considered, including impacts on crime, demographic makeup, gentrification for those who cannot afford to live in the community, and the environmental impacts of gated communities before concluding the chapter.

2.2 Introduction to Urban Fragmentation Concepts and Manifestations

In order to have a nuanced debate on the causes of urban fragmentation and see how the Riyadh case study fits into this larger context, a few concepts must first be explored. These include the widely-contested definitions of urban fragmentation; various approaches to studying fragmentation; characteristics of contemporary urban life and how these features

have led to the rise in gated developments; and the features and impacts of gated developments on cities and the social fabric.

2.3 The Debate on Urban Fragmentation

As Cusinato and Michelutti (2007) point out, 'urban fragmentation' lacks a shared definition, despite conceptualisation attempts involving several disciplines, which creates subsequent uncertainty as academics and politicians attempt to comprehend and evaluate the concept. This lack of a common definition and analytical foundations contributes to a continued misunderstanding regarding urban fragmentation. Thus, it is unlikely this concept will be used appropriately in governance or policies. The absence of a definition also affects the ability to understand processes, dynamics, or the evolution of urban fragmentation and its resulting effects. In literature, the debate on this concept is characterised by two dispositions: (a) ascribing other meanings to urban fragmentation, making the concept synonymous with other 'divisionary' concepts such as segregation, segmentation, or social studies-related topics; and (b) confining urban fragmentation to simply being a consequence of other specific domains (e.g., economic, social, political, etc.).

When a common, conceptual-level definition is lacking, it is difficult to establish evaluation criteria for a phenomenon. The analyst or politician rendering judgement of urban fragmentation many have a cultural background or epistemological position that contrasts the city's implied rationale (and ethical framework). Michelutti (2008) notes that many consider fragmentation to be negative, that urban fragmentation breaks up the supposed unity, or 'fabric' of the city. This negative mindset implies urban fragmentation causes a myriad of fatalistic issues, such as: loss of a city's unified image/identity; an illogical/inefficient occupation of territory; inequality in terms of access to services and resources; unequal legal rights or protections for the vulnerable population; division along socio-economic lines, leading to the exclusion of the vulnerable/disadvantaged population; or the difficulty in executing 'good' governance or planning policies due to conflicting interests of different fragments and demands from urban powers.

In literature discussing urban fragmentation, this phenomenon is viewed as either having different levels of fragmentation (down to an individual level, such as in the van Kempen (1994) 'social pulverization' hypothesis) or as a product of its dynamic nature (i.e., considering the processes involving the fabric). The majority of authors describe

fragmentation processes according to their own backgrounds and interests, using static ideas despite recognising urban fragmentation is, in fact, a process. Much of the literature surrounding fragmentation does not analyse the mechanisms and hypothetical phases of fragmentation processes in urban areas and is reluctant to explore the concept's root causes (understood here as 'constitutive conditions'). This negatively affects understanding the relationship between fragmentation and other phenomena such as urban sprawl. It also denigrates how various urban actors shape (or are affected by) the fragmentation process and hinder innovative actions that might mitigate or promote the phenomenon.

In analysing the results of a city's fragmentation, it is important to reflect on fragmentation processes and mechanisms. 'Fragments' are understood in very different ways by authors. They are viewed as a percentage of territory (using different physical/morphological, socio-economic, or political/legal conditions). In certain conditions (e.g., for people sharing a common space), fragments are viewed as levels relating to the same spatial area. Or, where the fragmentation is confined to different methods of access and levels of connection of goods/services, fragments can be viewed as splintered networks and 'lines of connection'. In addition to the difficulty raised by having various working definitions of 'fragments', the relationship between different fragments has been only moderately explored by authors. This can imply there is a lack of any relationship between fragments.

Finally, the hypothetical differences in the nature and interpretation of urban fragmentation in the North and the South (Navez-Bouchanine, 2002; Cusinato and Michelutti, 2007) result in an additional topic of debate. Some researchers assume that urban fragmentation provides city developers comparable mechanisms and causes in the two contexts; fragmentation, in this case, is not dependent upon location but seen as an introduction for examples belonging to splintering urbanism literature (Coutard, 2008). Yet other researchers (Balbo, 1992) claim the South has distinct fragmentation dynamics; these authors claim that the North-South distinction is key to understanding urban fragmentation. Navez-Bouchanine (2002), for example, argues that cities in the South illustrate extreme fragmentation where this dynamic is more comprehensible, which can be used to anticipate possible evolutions of fragmentation in the North.

All these elements of discussion – lack of a standard definition, unestablished criteria for analyses/evaluation, lack of agreed-upon fragmentation mechanisms/processes,

disagreement about the extent of North/South importance – highlight the varied approaches to urban fragmentation found in the literature. As Karina Landman notes:

> Urban fragmentation has by now become a well-discussed subject in international urban studies, with many of the leading urbanists of the time debating the causes and consequences of this phenomenon (including Graham & Marvin, 2001; Soja, 2000). The debate is, however, often just as fragmented as the subject being discussed, and as a result Harrison (2003) maintains that urban fragmentation is a 'slippery concept—a catchphrase that everyone recognises and yet no-one seems able to define with any precision'. (p. 39)

2.4 Approaches to Urban Fragmentation

Because studies involving fragmentation use diverse methodologies and have varied aims, there are several ways to classify approaches to urban fragmentation: (a) as a theoretical conceptualisation of 'social fragmentation' which reflects on the geographical breaking up of the city, and which is seen as the originator of urban fragmentation dynamics (Navez-Bouchanine, 2002); (b) as a collection of case studies characterised by fragmentation which describe how the fragmentation process affects the urban fabric (Harrison, 2003); or (c) as a collection of case studies characterised by a reflection on 'splintering urbanism', which causes rethinking the theory in the current scenario (Coutard, 2008). Despite attempts to neatly classify this phenomenon, it is clear in the literature that urban fragmentation is multidimensional, limiting authors' ability to fully understand and explain this phenomenon to their own satisfactory purposes. To alleviate this, researchers use multidisciplinary approaches (e.g., detailing two or three dimensions, such as the social and the economic) while still focusing on monodisciplinary tools to build their theories.

When reviewing the available literature, Michelutti (2008) first linked the institutionalist approach (which from the beginning appeared as a key methodological need) to the different disciplinary approaches most authors took when describing urban fragmentation. Initially, he explored the idea of integrating institutional elements such as those noted by Balbo and Navez-Bouchanine (1995) to his hypothesis and providing feedback on possible institutional paths the different disciplines could use in subsequent literature. However, the result did not fit the needs of the chosen institutionalist approach; these attempts contained institutional elements but were not consistent with the global definition of 'institution'. Michelutti altered

his interpretation to view the different disciplinary approaches through institutional parameters (such as the formal/informal dichotomy). He adopted a more nuanced approach to the literature about urban fragmentation and used a global, multidimensional meaning of 'institution' to locate the different theories, which he could then evaluate within institutional coordinates. Ultimately, Michelutti classified the urban fragmentation literature he reviewed as focusing on political, economic, social, anthropological, and spatial approaches.

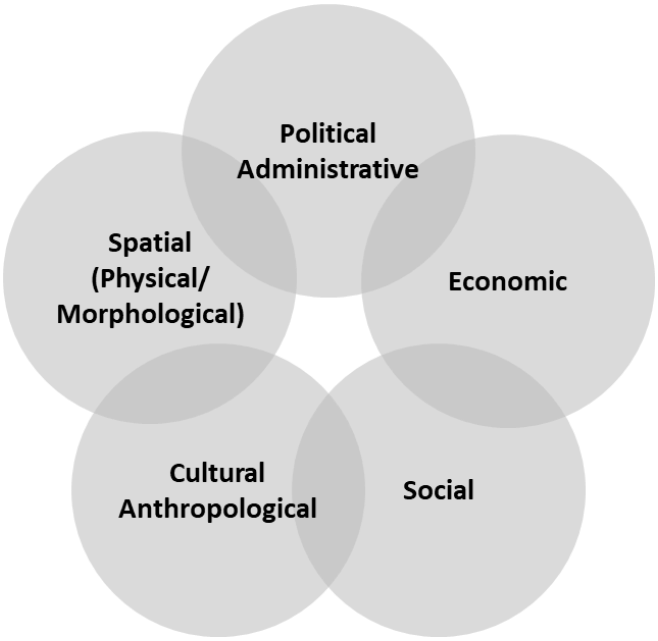


Figure 2.1 Approaches to Urban Fragmentation

2.4.1 Political/Administrative Approaches

Urban fragmentation theories using the political approach investigate: (a) the State's administrative practices in relation to the territory; (b) the theme of rights and the recognition of 'other' (i.e., private, informal) forms of territory governance; and (c) urban policies and how they shape the global vision of the city, including its design. While they often fall short of advancing fully-developed theories, these approaches offer important reflections on institutional elements that affect urban fragmentation. For example, political approaches highlight the frequently overlapping and contrasting organisations with varied frameworks for territory decision-making and point out the diverse mental models that shape decision-making processes. Chevalier (2002) notes that in these approaches, spatial components are mainly considered in terms of the implicit fragments denoted as 'territories' (under diverse urban use and rights status).

The administrative approach to fragmentation tends to focus on either geo-political (horizontal) or territorial (vertical) fragmentation. Horizontal fragmentation is seen as a result of successive administrative boundaries changing the urban fabric and therefore is a hypothetical loss of territory unity. Vertical fragmentation consists of overlapping competencies of different public administration organisations. The geo-political territorial fragments of horizontal fragmentation follow certain rules/standards and are controlled by defined authorities; by contrast, the fragments of vertical fragmentation are considered the spatial result of a lack of political coherence in decision-making processes.

Political approaches focus on the fragmentation of urban policies, including the profound changes in public action. Many researchers focus their theories on where changes are obvious, and the effects on communities are drastic and immediate: the services sector. The disengagement of public actors from planning and production of urban policies is also of interest in this approach, as urban policies and public interventions (reliant on economic or political will) can be instruments of fragmentation (Navez-Bouchanine, 2002). Political-functional gaps in the city create isolated socio-spatial pockets, which can become fragments.

2.4.2 Economic Approaches

The economic approach to urban fragmentation is predominantly focused on inequalities in resource distribution in different city areas and how the development of corresponding economic circuits fragment the city fabric. Economic-based theories seek to describe this fragmentation through analysis focused on socio-spatial elements. These theories identify root causes of fragmentation and note how institutional elements are central in shaping economic categories and analytical tools. Many economic approaches focus on inequality, defining it as the income difference between populations, the access or lack of access to resources, and the investments in some neighbourhoods over others.

Fragment relational geographies (i.e., locations with differing levels of access to goods/services) are still considered in economic approaches. Some authors equate economic inequality with the exclusion or marginalisation of vulnerable populations. They associate inequality with geography and claim fragmentation results from uneven resource allocation, highlighting a political dimension of fragmentation. Areas with different economic conditions are involved in isolation procedures, which incite marginalisation/dependency of disadvantaged city fragments. In these theories, studies of relational geographies are centred

on the economic domain, while socio-spatial elements are secondary aspects of the fragmentation.

Other researchers (Cusinato & Michelutti, 2007) using the economic approach explore urban fragmentation by considering institutions in economic terms, as arrangements/solutions within the organisational framework of the city, expressed as an increasing gap and separation between citizens. They note this economic and institutional fragmentation manifests differently according to the context; sometimes, the phenomenon is clearer and more visible in the physical aspect of an area, sometimes it is more complex, and the micro-articulation can overcome fragmentation. Regardless, fragments are considered through the lens of economic solutions rather than through a spatial definition.

2.4.3 Social Approaches

Many authors use the social approach to fragmentation with a sociological background. Social approaches view this phenomenon as a product of: (a) the modern to post-modern age cultural transition; or (b) economic revolutions involving the entire society, driven by globalising tendencies. In the first stance, fragmentation results from new local social instances due to globalisation and integration/assimilation (Bauman, 1995). In the second, fragmentation is considered to be based on labour market division and the increased exclusion of sections of the population from formal circuits (van Kempen, 1994).

For researchers using social theories, the context where the social phenomenon takes place is important. But while the city environment is where socio-cultural and economic transformations impact society, the social approach does not focus on the geographies of fragmentation. In this approach, 'fragments' are associated with social group polarisation based on various locales in different city areas. Social approaches also link cultural transformations (e.g., 'weakening social ties') and social fabric dynamics (e.g., rewriting the social fabric "rules"/agreements) (Vranken, 2001).

Finally, some social approaches to fragmentation also focus on how economic transformations have affected the social fabric (van Kempen, 1994). The social polarisation of labour and the growing 'poor' population (due to middle-class impoverishment) are the main factors here.

2.4.4 Cultural/Anthropological Approaches

Urban fragmentation theories approached through a cultural/anthropological framework consider diverse cultural characteristics (e.g., religion, ethnicity, cultural identity, etc.) as the elements which transform and fragment city spaces (Harrison, 2003). The anthropological approach also applies to the cultural-spatial phenomenon of gated communities, which clearly isolate social classes/groups in off-limits parts of a city (Low, 2006). This approach has an institutional vision of fragmentation and considers mainly mental models of communities and individuals in fragmented contexts. Spatial elements and their role in fragmentation is a complex concept in which authors focus on the cultural components (and thus urban environments become a container of processes created by other dimensions) or authors can work from case studies (and thus are tied to specific contexts but leave these as attributes of processes working at cultural or ethnic levels) (Low, 2006). Cultural approaches and social approaches to fragmentation frequently share the same philosophical background.

One key focus in cultural approaches is gated communities, which opens the conversation regarding the private sphere and the individual scale of fragmentation. Gated communities seek to create a sort of ideal urban community, excluded from negative dynamics, but as a consequence, these fragments create exclusion and segregation. The leading cause of their proliferation is a generalised fear of crime and an attempt to distribute goods and services to certain groups. In an anthropological approach, gated communities are connected to urban fragmentation through spatial elements categorised as ‘territory’ (particularly as a reflection on ‘boundaries’) and ‘place’ (and more specifically, how inhabitants of gated communities use private and public places, both within the gates and without).

2.4.5 Spatial (Physical/Morphological) Approaches

The spatial (or physical, or morphological) approach to urban fragmentation has hypothetical elements or conceptual components which refer to the spatial dimension. This approach constitutes one of the main interest topics for research into fragmentation; for some authors, urban fragmentation is strictly a spatial phenomenon, and the physical aspect is the primary (and often only) focus of research. Socio-economic or political effects of fragmentation are regarded as consequences of spatial dynamics, not as part of the process. Physical approaches ascribe various meanings to fragmentation and associate different elements or processes with this phenomenon, such as: (a) urban morphology disjointedness, which ‘break’ a city’s identity (in a hypothetical urban fabric which is characterised by

comprehensive designs); (b) the physical division of the urban fabric, which produces city space and network boundaries and discontinuities; and (c) the process of using an extreme polarisation of functions and divergent use of places to separate the city, which leads to social conflict and distrust in governance practices.

Though there are exceptions (Balbo & Navez-Bouchanine, 1995, for example), authors using these morphological approach theories tend to also evaluate institutional elements simultaneously. Their theories frequently reflect how organisations (e.g., public institutions) play a role in governance and how these organisations respond to the forces fragmenting city spaces. Spatial approach theories tend to disregard the discourse on population mental models and cultural backgrounds or only consider these elements in a reduced capacity. The authors who use the spatial approach to research understand that urban fragmentation is multifaceted, advanced by various actors and political/economic powers, producing multiple incoherent fragments as the city loses its identity (Barberis, 2008). Their physical approach theories focus on the loss of continuity in the city fabric and the expression of specific socio-cultural (and economic) conditions connected with the cultural background of a community. In this version of spatial theory, fragments are seen at different scales and are made of territories/places with evident morphological patterns separated by physical barriers and categorised by distance/disconnection.

Michelutti (2008) points out that the fragmentation theories using the spatial approach to focus on the physical break-up of the social fabric often explore the fragmentation processes that divide hypothetical city unity, such as a loss of or decline in the relationship between different fragments (which results in discontinuity and isolation). Other analysts use the physical approach to highlight the connection between planning, political, and socio-economic elements. It is the lack of a standard definition of 'fragment' which creates dissension between these theories. Balbo and Navez-Bouchanine (1995), for example, define fragments as parts of the city characterised by a predominant function (e.g., residential, productive, etc.) and which exhibit specific structural, architectural, or design characteristics. Different social and socio-economic classes inhabit each fragment and create particular relationships with each other. In such a context, fragmentation can exacerbate segregation, and social and political elements become essential to understanding and alleviating fragmentation.

2.5 Contemporary Urban Life

No matter which approach an researcher takes to advance an understanding of urban fragmentation, all theories examine the spatial aspect of this phenomenon in some form. A common method of proving spatial relevance in fragmentation is to use case studies of contemporary urban living situations. As studied from a spatial framework, contemporary urban fragmentation focuses on the rise of fortress cities and fortification, landscapes of power, city privatisation and militarisation, and territoriality and new enclaving.

2.5.1 The Fortress City

Coaffe (2009) details the history of contemporary Western cities, making explicit attempts to structure the urban landscape using defence. In the United States, the relationship between defensive architecture and urban design received widespread attention in the 1960s due to rising crime rates and the deteriorating state of high-rise residential dwellings (Jacobs, 1961; Boal, 1975; Gold, 1982; Newman, 1995). By the early 1970s, the idea of 'designing out crime' through the addition or removal of physical features gained traction. Planners attempted to control access and increase surveillance, thus limiting the opportunities for crime (Flachsbart, 1969). By the 1990s, further increases in resource inequality, violent crime, and racial/cultural conflict in U.S. cities increasingly fragmented the urban landscape; such fragmentation was further exacerbated by the proliferation of fortification and surveillance devices. Residential areas, commercial centres, retail spaces, entertainment districts, and public facilities were increasingly fortified and privatised as the result of the actions of urban authorities, private businesses, and wealthier citizens (Christopherson, 1994; Dillion, 1994; Flusty, 1994; Fyfe, 1997; Oc and Tiesdell, 1997).

A key feature of urban life is the concept of the 'fortress city', which first came to prominence when authors used Los Angeles, California as a case study. In the past few decades, L.A. has become the prime example of an overly militarised urban landscape, and continued analyses of the City of Angels have ensured L.A.'s primacy in urban geography studies (Soja, 1989; Dear & Flusty, 1998; Dear, 2000). Mike Davis has researched 'Fortress L.A.' for years, writing numerous works on the subject of this city's fortification (Davis, 1990, 1992, 1995, 1998). Davis (1995) notes that:

> [In L.A.] defence of luxury has given birth to an arsenal of security systems and an obsession with the policing of social boundaries through architecture. This

> militarization of city life is increasingly visible everywhere in the built environment of the 1990s. (p. 355)

Most urban landscapes fall prey to similar tendencies, though they are often not as extremes. Still, fortress cities have been studied in South Africa (Worden, 1994; Sutcliffe, 1996; Napier, 2000), Australia and New Zealand (Doekson, 1997), Brazil (Calderia, 1996; De Souza, 1995), and the UK (Widgery, 1991; Harvey, 1996; Fyfe, 1998).

Many cities have taken a 'fortification approach', adding copious electronic surveillance and restricting access to turn residential areas, business centres, and shopping venues into territorial enclaves. This fortification has led to more privatisation, forging an environment where there is a 'replacement of public access with private spaces that can be controlled by security guards and the ability to pay' (Wekerle & Whitzman, 1995, p. 6). This, in turn, creates greater urban fragmentation of a city, causing 'a patchwork quilt of private buildings and privately-appropriated space' (Trancik, 1986).

For an example of a British fortress city, Newcastle presents an interesting case. When a flagship office park planned to open in run-down West End, initially, it could only attract occupants if security was seen as a priority and CCTV was given an important role (Graham, Brooks, & Heery, 1995). Despite the promise of grant and rent subsidy, no businesses would locate the proposed site, which was to be developed next to what many considered Britain's most deprived neighbourhoods. However, when fences, gates, and CCTV were added to the development design, and the local police advised where to place such fortifications, the business park became more attractive to consumers. And since its completion, the office park has suffered less crime and vandalism than the adjoining neighbourhoods, and has been able to obtain a significant reduction in insurance premiums, despite declining property values nearby.

There are a number of fundamental trends that drive the idea of the necessity of city defence; these trends are generally related to the management, fortification, and surveillance of urban space. Developers now incorporate building security into the design phase, and the militarisation of commercial buildings has become a strong selling point for occupiers (Flusty, 1994; Dear & Flusty, 1998). Fortifying a city fragment (or territory, or public space) creates insurance reductions, provides a venue for increased police influence during planning stages, allows for private security to play an increased role, and juxtaposes controlled, regulated

areas with areas of social exclusion and poverty within the urban landscapes. And apart from the positives lauded by developers, the trend towards more city fortification gains approval when there are enhanced fear perceptions amongst urban residents. That is, people in areas thought of as 'risky areas' feel justified in constructing defensive enclaves to protect themselves. But in order to construct these defensive fortifications, consumers must have the ability to pay for them. This truth leads many to argue that urban life has been reorganised on a fundamental level; certain wealthier or resource-rich sections can segregate themselves away from the rest of the city, thereby creating new types of 'privatised' public space which all members of society cannot access (Sorkin, 1995; Lees, 1998).

As more consumers signal their preference for fortified territories, residential areas in the United States have begun to again employ the Defensible Space principles in designing new spaces to make certain urban areas more 'desirable' (see Cisneros, 1996; Ekbolm, 1995; Newman, 1995, 1996, 1997; Harvey, 1997; or Blakely & Snyder, 1999). Brown (1995) points out that 'barricades and bollards have become the newest accessory on [the United States'] psychic frontier [...] You might call it the architecture of paranoia. They call it "defensible space"'. Indeed, Ellin (1996) observed that Oscar Newman, the architect of the Defensible Space policy, won a grant in the mid-1990s from the United States Justice Department to strengthen the security of 50 residential areas. Newman firmly believed he could reduce crime in these neighbourhoods by 'limiting access and egress to one opening [… because] such a street system would be perceived by criminals and their clientele as too risky to do business in' (1995, p. 151). Two years later, findings from his work seemed to support this assertion, with crime down by 25% and violent crime by 50% (Newman, 1997) in these areas. A few years later, Cozens et al. (1999, 2000) tested features of Newman's theory and seemed to corroborate his findings; the environmental design, they found, was just as important to the 'image' of a residential area as the area's perceived 'criminogenic potential'.

However, other authors disagree that design based on defensible space overwhelmingly changes the crime and perceived crime of a territory. Griffiths (1995) and Wagner (1997) claim that something as 'simple' as street closures or traffic modification in residential areas will pointedly diminish the fear of crime, but it may not actually have a major effect on the actual crime rate itself. But in the context of urban fragmentation due to fortification practices, alleviating the fear of crime is often just as important as actually reducing crime; fear of crime is much more likely to fragment urban communities than actual criminal activity

(Box, Hale, & Andrews, 1988; Pain, 2000). And the factors which contribute most strongly to a keen fear of crime are vulnerability, personal knowledge of crime and victimisation, confidence in the police, and, most importantly, environmental cues and conditions.

Despite Newman's 'proven' success, some researchers still see fortification measures as ineffective against crime. Architecture of Fear, a series of contemporary essays edited by Ellin (1997), examines how focusing on the design of a contemporary urban landscape is a 'placebo'; instead, the focus should centre on how a preoccupation with fear shapes urban fragments: "This fixation [with security] manifests itself in such efforts [...] despite the evidence that they [defensive design elements] do not lessen crime [... and] that such disjointed efforts exacerbate rather than eradicate the sources of fear and insecurity (Ellin, 1997, back cover).

Marcuse (1993) supports Ellin's point, arguing that city walls are simultaneously walls of fear and support. And though Ellin (1997) notes that 'form follows fear' in the urban landscape, this correlation can also be inverted so that fear follows form. Put another way, though modifications may intend to diminish crime, they can actually worsen the fear of crime instead. It's a difficult scale to balance. As Ellin (1996) noted, "The gates, policing, and other surveillance systems, [and] defensive architecture [...] do contribute to giving people a greater sense of security. But such settings no doubt also contribute to accentuating fear by increasing paranoia and distrust among people" (p. 153).

2.5.2 Landscapes of Power

The contemporary urban landscape differs from past versions due to economic globalisation and the local processes of institutional change (Hubbard, 1996). The landscape of large cities has become 'the terrain where a multiplicity of globalisation processes assume concrete, localised forms' (Sassen, 2000b, p. 147). Market forces and consumer preferences directly tie to urban redevelopment, which generally occurs in a city's central business areas or along formerly under-developed waterfronts and dock areas (Harvey, 1990; Zwingle, 1991; Crilley, 1993a). As Zukin (1988) noted, these landscapes 'directly mediate economic power by both conforming to and structuring norms of market-driven investment, production and consumption' (p. 435).

Financial centres are powerful landscapes that shape urban environments. In order to compete with other cities, environments in today's global economy must build an

infrastructure designed to attract and retain financial institutions. This infrastructure should include ‘advanced telecommunications, a computer-literate workforce and new office skyscrapers that lift urban identity from the modern to the spectacular’ (Zukin, 1992, p. 196). Zukin (1992) also notes, “The interrelated effect of economic structure, institutional intervention, and cultural re-organisation are most directly perceived in change in the landscape: creating the city as a landscape of power” (p. 197).

However, ‘landscapes of power’ are not a new phenomenon. Skyscrapers have been the symbol of wealth and power throughout city business centres for most of the previous century, especially in North America (Domosh, 1987; Bonshek, 1990). This trend continues in the contemporary city, leading to a continuation of the skyscraper's numerous distinctive characteristics as a landscape of power. This has led to both construction of a plethora of modernised buildings, as well as highlighting of the absolute asymmetry of power between wealth and poverty in cities.

Increasingly, a city’s commercial architecture is seen as a tool for advertising and is used to manipulate the environment to convey a message to the urban audience; new urban architectures (as well as expensive place promotion) symbolise the very marketable image of success, growth, and vitality (Harvey, 1990; Crilley, 1993a). As Crilley (1993b, p. 127) notes, ‘amid the dramatic reformation of the urban landscape [...] nothing epitomises the emergent character of the late capitalist space more graphically than the production of commercial megastructures’. Short (1996, p. 32) further indicated that a ‘postmodern shift’ has resulted in cities aspiring to present an image of being ‘at the cutting edge’. Harvey (1990, p. 77) reiterates this theme of ‘pursuing consumption dollars through differentiation of urban and architectural design’.

In recent decades, researchers have studied a variety of new urban landscapes to see how architecture (particularly financial districts) conveys economic power (Knox, 1987; Zukin, 1992; Brosseau, 1995; Moore, 1996; Eade, 1997). During the mid- to late-1980s and early 1990s, London was enveloped by a wave of construction that exemplified this trend. London’s 1986 Local Plan encouraged the building of new office complexes, accelerating planning applications so that within 18 months, nearly 20 million square feet of office space (one-third of the total city floorspace) was approved for construction. Much of this construction was for new buildings and larger spaces than were common in London at the time. These ‘groundscapers’ required larger floorplates and height-to-ceiling ratios, and the

construction of these monoliths was essential to achieve the requirements of modern business (William, 1992).

But there is a downside to reorganisation efforts of local powers in urban areas, despite the economic significance of new business structures: this new construction causes 'the urban landscape [to be] remodelled into visual spectacles of revitalised urban space and imagined community that mask real geographies of decay and neglect' (Goss, 1997, p. 181). Complications within the urban environment (e.g., the disproportionality of resources) increase along the lines of social class, gender, and ethnicity as globalisation increasingly impacts Western cities. The contemporary city regularly sees injustice and inequality to dub these urban landscapes 'carceral' (Soja, 1989, 1996; Davis, 1990). Power and wealth so often subsist side by side with powerlessness and poverty. Unequal power is increasingly a manifestation of capitalism and its inequalities reproduced in the landscape of today's cities. The new construction that rises in these modern landscapes of power often directly contrasts with the reality of the local low-cost residences (Zukin, 1992). Zukin notes that:

> Just as landscape shows the imprint of powerful business and political institutions on both the built environment and its symbolic representation, so does the vernacular express the resistance, autonomy, and originality of the powerless. Their opposition moreover suggests an important asymmetry of power. (Zukin, 1992, p. 198)

2.5.3 Privatisation and Militarisation

When 'form follows fear' (Ellin, 1997), privatisation and 'militarisation' become hallmarks of contemporary urban life, causing a change in physical landscapes due to occupants imagining (whether it is true or not) that heightened crime exists in a particular area (Davis, 1992, 1998). Today, in Western cities, one can find a range of fortified landscape features either already built or planned for construction. From curtailing services meant to provide housing resources to the homeless to the rise in popularity of gated and residential and commercial zones, the manifestation of city militarisation is common and frequently noted (Davis, 1990; Flusty, 1994; Jones & Lowrey, 1995; Dear & Flusty, 1998).

Although the urban environment has always been under control of the wealthy and politically powerful, in recent decades this control has been made progressively more obvious by the physical and technological measures put in place with the explicit goal of excluding parts of the social fabric which threaten the 'normal' way of life. To prove this trend, authors point

to the rise of the private security industry funded by individuals of wealth and power (Sorkin, 1995; Lees, 1998). While talking about the erosion of what he termed 'spatial justice' in Los Angeles, Flusty (1994) noted:

> Traditional public spaces are increasingly supplanted by such privately produced (although often publicly subsidised) 'privately owned and administered spaces for public aggregation' such as shopping malls [and] corporate plazas […] In these new post-public spaces, access is predicted upon real or apparent ability to pay. (p. 67)

Economic productivity, Flusty claims, affects major changes in urban environments; 'in such spaces, exclusivity is an inevitable by-product of the high levels of control necessary to ensure that irregularity, unpredictability, and inefficiency do not interfere with the orderly flow of commerce' (Flusty, 1994).

2.5.4 Territoriality and the New Enclaving of the City

The contemporary urban landscape is undoubtedly controlled by the needs and desires of higher-income residents and wealthy commercial interests who seek to defend and mould the spaces where they work and live. This territoriality is exemplified by the two types of defended enclaves, global and local, though it also manifests in social/cultural organisation (Norfolk, 1994; Dillon, 1994).

Global enclaves are defined by the conglomeration and territorialisation of Western city financial areas, universities, hospitals, and/or pleasure parks to create landscapes of power as a result of world economic pressures. As discussed, these landscapes of power boast modern architecture, heightened defence, and excessive levels of place promotion and usually contrast greatly with neighbouring territories. The retention of fortified solutions most frequently 'help protect and enforce the privileges of social elite areas, and areas of economic investment—the corporate office enclaves and new consumption spaces of the post-modern city' (Graham & Marvin, 1996, p. 222). But though global enclaves use these landscapes of power and territorial boundaries to exclude themselves from some urban areas, they embrace a city's inclusion in the globalisation process.

By contrast, local enclaves such as shopping malls, libraries, and schools are equally important to a functioning city, though they lack a global function and instead operate on a more focused, 'micro' scale of targeted neighbourhoods. But like global enclaves, these local enclaves are also increasingly more fortified, at least in America (Davis, 1990; Lees, 1998).

‘Gated communities’ are a prime example of this militarised architecture, where urban dwellers attempt to create privately-owned, defensible spaces. Merrifield and Swyngedouw (1996) indicate the sudden increase in gated communities is due to consumer preference and the prevalence of new technologies in Western cities:

> The powerful […] can now insulate themselves in hermetically sealed enclaves, where gated communities and sophisticated modes of surveillance are the order of the day. Concurrently the rich and powerful can decant and steer the poor into clearly demarcated zones in the city, where implicit and explicit forms of social control keep them in place. (p. 11)

In many areas of the United States, nearly one-third of newly constructed communities add defensive aspects to the building plans because of consumer wishes. Dillon asserts that ‘terrified by crime and worried about property values, Americans are flocking to gated enclaves in what experts call a fundamental reorganisation of community life’ (1994, p. 8). But other advanced countries, not just the United States, are also seeing this militarisation trend, albeit to a different degree. In Brazil, enclaving is altering both the physical and cultural landscape (Caldeira, 1996); New Zealand and Australia also report similar changes (Doeksen, 1997). In Britain, there is an ‘urban apartheid’ in London’s East End (according to Marxist commentator David Widgery (1991)), which keeps ‘working class’ citizens away from ‘the new proletarian-free yuppie zones’. Gold and Revill (1999) describe these urban areas as a ‘landscape of defence’, which they define as:

> a landscape shaped or otherwise materially affected by formal or informal defensive strategies to achieve recognisable social, political, or cultural goals [… which] may be seen in terms of rich diversity which extends from the loci of violently contested conflict to places heavily invested with symbolic meaning that helps provide a reliable background to everyday life. (p. 235)

These enclaves create clearly demarcated geography by fragmenting territory, and both types of enclaves are meant to exclude certain groups within urban areas. Sibley (1995, p. 6) notes ‘there are implicit rules of exclusion [...] that contribute to the structuring of society and space in a way that some will find oppressive and other appalling’—and there is no need to guess which socio-economic groups belong to which category. But some (Luymes, 1997; McLaughlin & Muncie, 1999) argue that the increased territoriality and use of fortification

can stabilise the 'unstable' urban landscape and create a new idea of localism. Luymes (1997) claims that gated communities are actually a response to urban fragmentation, as they allow for privacy and private property ownership as well as offer a sense of community and place to groups that might otherwise feel isolated and deprived of this agency. He observes that 'given the fragmented nature of contemporary urban structure and the suburban culture emphasising localism, privacy and security, it is not surprising that "closed" subdivisions are becoming commonplace' (Luymes, 1997, p. 191). The counterargument to this idea of 'renewed localism' is expressed by McLaughlin and Muncie (1999), who note that the spread of gated communities in the urban landscape has restricted ideas of governance and citizenship and can create discrimination based on fear and paranoia of those inhabitants outside the fortified territory.

Ultimately, enclaving, whether global or local, is an attempt by social groups to reach 'spatial purification' (Sibley, 1995), and promote 'landscapes of exclusion' where higher socio-economic groups control the most desirable spaces to the exclusion of other groups.

2.6 Types of Gated Developments

As discussed, a large part of contemporary urban life is the trend towards fortification and privatisation, creating local enclaves in a territory, and subsidising landscapes of power with equally elite spaces only accessible to a few. Gated developments are just the most recent in this long trend of self-segregation, which further contributes to urban fragmentation.

Gated developments are rapidly growing throughout the world. They are often favoured as a way to control factors of security, economics, and lifestyle for development residents and users. However, these developments have impacts that extend beyond the borders of their gates and fences into the wider community. These effects must be accounted for by urban planning in order to successfully integrate gated developments of any type into the communal fabric.

2.6.1 Residential

The concept of gated and fenced developments is commonly associated with residential communities. These comprise wide breadth of community types, including retirement communities, master-planned neighbourhoods, luxury housing developments, golf course properties, lakeside properties, apartment complexes, condominium towers, and neighbourhoods controlled by homeowner's associations (HOAs).

Generally, the purpose of these developments is to either offer lifestyle-related amenities or enhanced security (Blakely & Snyder, 1999). In many communities, both of these purposes are fulfilled.

2.6.2 Non-residential

Despite the typical connotation, gated developments are not limited to purely residential areas. There are also growing numbers of gated developments in the academic, medical, commercial, and military sectors. Some of these development types incorporate residential housing, but their primary function is separate from traditional residential communities.

2.6.2.1 Academic Developments

Many campuses of all education levels are fully or partially enclosed, from private primary schools to college institutions. Some academic organisations, such as the majority of Chinese universities, require students to reside in on-campus gated communities (Sun, Webster, & Chiaradia, 2017), and a majority of the universities in Beijing have enclosed campuses (Gu et al., 2019).

Like other fenced development types, such campuses have been widely criticised for obstructing transit efficiency within high-density urban spaces, limiting public transport accessibility, imposing too much spatial demand, and privatizing public space. While campuses may tout valuable amenities and features, privatisation of the campus area excludes the wider public from these benefits. However, research has also found that if a campus has a dense, diverse student population, it can positively contribute to cityscapes. In the case of colleges and universities, a self-sustaining mixed-use infrastructure is also identified as a requisite for development sustainability.

Enclosing campus spaces is frequently preferred by school administrations to simplify matters of governance and liability. Fencing is most often incorporated into academic campus design to enhance safety for students and faculty. In places where school grounds meet the public space without barriers, issues have arisen from vandalism, littering, and insecure contact between students and private citizens (Abbate, 2019).

However, in cases where schools have sought to remedy these problems with the erection of fencing, they have sometimes faced community backlash. One such example is the Midcoast School of Technology in Rockland, Maine. After proposing a fence to mitigate issues with security and littering, city officials reacted negatively over the loss of public access, as

the school grounds had long been used as a connecting path and dog park. Contentious negotiations followed for the approval of a proposed fence design. Another school in New York's Greenwich Village sparked public concerns over encroaching privatisation after they installed view-obstructing screen fencing to upgrade campus security (Gunts, 2020). These instances serve as clear examples of how fenced academic developments can be in conflict with public interest.

2.6.2.2 Medical Developments

Gated developments are also used to house medical facilities and complexes, sometimes serving the public, and sometimes remaining private. Encompassing everything from large hospital sites to private in-patient rehabilitation centres, these developments can be sprawling and contain a multitude of individual or connected buildings.

Like with academic developments, the expansive, park-like grounds of some un-gated medical properties can be a fixture of the community's public space. For example, in Bethesda, Maryland, the 332-acre campus of the National Institutes of Health (NIH) was once used by the public for outdoor leisure activities. But when terrorism concerns sparked after the September 11 attacks in New York, NIH announced plans to turn the campus into a fenced site. The change prompted negative community feedback, with the lack of public access seen by the community as a significant loss. Members felt that a large fenced-off site was out of place in the suburban neighbourhood fabric (The Washington Times, 2002).

Proposed fortification of rehabilitation developments can yield mixed community responses. In the case of the Palmetto Behavioral Health facility in Summerville, South Carolina, neighbourhood residents had widely differing sentiments regarding the erection of a 12-foot chain-link fence around the property's perimeter (Smith, 2018). Many residents voiced that the fence was an eyesore that evoked the image of a high-security prison. Others reported relief that the new fencing would be able to prevent the once-commonplace escapes of the centre's sometimes mentally-unstable patients, some of whom have been linked to violent crimes.

2.6.2.3 Commercial Developments

While most commercial developments depend on easy access by the public, certain types utilise extensive gating and fortification. These include, but are not limited to, luxury shopping centres, theme parks, zoos, and many business and industrial parks.

Research identifying commercial developments as a primary source of greenhouse gas emissions has suggested that industrial and business park properties are major contributors (Timmerman, Vandevelde, & Van Eetvelde, 2014). Despite a push for making such developments 'more green', there remain significant obstacles to adopting mitigation practices, mainly regarding project costs (Hwang, Zhu, & Tan, 2017). And though environmental effects are a major concern of residents near fenced business and industrial park developments, there are many other ways that commercial developments can negatively impact the community.

The 175-acre Apple Park campus in Cupertino, California, is one of the most noteworthy examples of a gated business park with significant negative impacts on the surrounding community, despite having a 'green' build. The park's initial construction caused significant local disruption: its purchase of over 9,000 trees left a massive hole in the market, forcing contractors working on other California landscaping projects to source trees from out of state (Campbell, 2017). City officials also went head-to-head with Apple over the campus development, anticipating a further strain on the local infrastructure. Cupertino's then-mayor, Barry Chang, issued a proposition that Apple contribute $100 million toward the necessary transportation system upgrades (Fingas, 2016). When the proposition failed to gain approval, Chang turned to raising corporate taxes as a means to cover the costs.

Though the park-like office property touts many positive features (such as containing 80% greenspace), it is removed from public use (Apple Insider). In fact, only the site's visitors centre is open to the public. Additional criticisms against the development include the site's contribution to urban sprawl, dependence on personal vehicle transport, reduction of street connectivity, and cut-off of walking routes (Benfield, 2012). It has also received backlash for taking up real estate in high demand, an especially sensitive topic considering the region's urgent need for affordable housing. The Apple Park campus remains a divisive development due to its role in gentrification and community fragmentation.

Shopping and service areas within gated town developments also qualify as enclosed commercial developments. These self-sustaining business districts typically only serve the residents of the containing community. Other privatised shopping areas may serve the public but use gating and security personnel to regulate entry. The Taj Mahal Shopping Center in Ocho Rios, Jamaica, is one such example. As a centre that primarily caters to foreign tourists, the development was built to provide travellers with a shopping experience that excluded

much of the common aggressive behaviour of street vendors in the city's open areas. While this helps to provide foreign shoppers with a more pleasant shopping experience, it does serve to segregate tourist spending from local businesses and vendors.

2.6.2.4 Military Developments

For security purposes, military developments are usually gated and fenced entirely. Military bases worldwide contain a multitude of facilities, such as warehouses, offices, training grounds, infirmaries, commissaries, cafeterias, correctional buildings, utility rooms, research labs, technology stations, intelligence quarters, barracks, and, in many cases, family housing units and schools. A combination of military and academic development types is seen in properties like the U.S. Military Academy at West Point; admission to the campus is regulated via gated entry points where identification must be provided.

Military developments are intended to support military operations both in the immediate locale and at other regional bases. Much research has been devoted to the impact of military bases and similar developments both domestically and internationally. Because the United States claims more military bases than any other nation, the current literature demonstrates an intense focus on the impacts of American-owned sites in particular (Department of Defense, 2018).

Overall, the influence of these developments is highly complex. Research shows that military bases tend to stimulate economic growth in their local areas (Hawkins, 2005). This effect is most substantial in rural areas with small, low-diversity economies. Local communities receive an influx of funds through military personnel spending and the base itself purchasing resources from nearby suppliers. Additionally, studies have found that there is often positive growth of commercial and/or residential areas around major transport corridors near military bases.

It follows then that the closure of military bases is linked to negative economic effects (Dardia et al., 1996). Factors such as employment, school enrolment, and business patronage show downward trends after base closures. However, findings indicate that these negative effects are often mitigated thanks to the insular nature of on-base services. Because military personnel and their dependents often source their employment, housing, groceries, fuel, banking, and other goods and services from the base itself, their departure has a lower

economic impact on surrounding communities than the loss of entire civilian groups that rely on local infrastructure.

The segregated nature of military bases and their internal communities can also be a documented strain on some local municipalities (Cowan, 2012). This is primarily attributed to the fact that a base commonly results in a steep population increase but not an increase in the tax revenues typically yielded from a civilian influx. As a result, the heightened demand (and thus expense) for expanding local services are often not compensated by a proportional increase in revenues such as property taxes. However, it is important to note that, case by case, this type of economic strain can be mitigated by other types of tax revenues that do net a positive result, as well as funds that come from defence contracts.

When it comes to international treaties, negotiations regarding the maintenance of foreign military bases can be unfavourable to native governments. In Turkey, the Military Facilities Agreement signed in 1954 made the Turkish government financially responsible for costs associated with an American base's land expropriation, site protection, and environmental security maintenance—a burden amounting to $11 million per year (Holmes, 2014). Other negative impacts can result from the sheer territorial demand of military base developments. The impact of U.S. bases in Okinawa, Japan, serves as a strong example. Half of the lands seized for base territory were agricultural, comprising parcels owned by tens of thousands of Japanese citizens (Pajon & Sowells, 2010). In total, base territory accounts for 20% of the land on the island. Also, because military base grounds are open to personnel only, surrounding Okinawan transit routes are forced to divert around the massive properties. Traffic congestion is consequently a significant problem caused by these developments. The local community has also documented grievances over increased noise, pollution, and safety hazards due to the bases.

Despite the local economy's dependence on base presence, Okinawan leadership has long been lobbying the Japanese government to downsize base territories, and in some cases, fully close those that have proven most detrimental to the local community. Okinawa is perhaps one of the clearest case studies for the complex mixture of positive and negative impacts gated military developments can have on surrounding communities.

2.7 Global Prevalence of Gated Developments and Their Study

Many large urban centres throughout the globe have become home to a concentration of gated developments. The literature referenced here spans a study of gated developments in many regions throughout the globe, including North America, South America, Africa, Asia, Europe, and the Middle East. Current research primarily evaluates three key modes of impact in respect to gated developments and their surrounding locales: economic, socio-political, and environmental.

2.7.1 Economic Impact of Gated Developments

Economic impacts of gated developments can be incredibly complex, thanks not only to the wide variety of functions these developments may serve, but also in the chain reactions that their arrival sparks. The literature to date documents a breadth of connected economic effects, from macro to micro levels.

2.7.1.1 Property Values

Much of the time, the property values of plots and buildings within gated developments are higher than those in the surrounding areas. This is frequently a result of improved security and organisational effort to preserve and improve property values within the developments (Ghonimi et al., 2010). One study of homes in Charleston, South Carolina, found that buyers pay 18.6% more for properties in gated communities (Pompe, 2008). This trend of gated property value increases is fairly consistent, even in non-Western nations such as Nigeria (Ajibola et al., 2011).

The value of properties in close proximity to gated developments can also be positively impacted, particularly if the development improves local amenities or employment opportunities. For example, the Apple Park development is expected to further push property values upward (Martin, 2020).

2.7.1.2 Government Revenue

Because gated developments tend to attract more affluent residents, municipalities often welcome them as sources of increased property and income tax revenue (Blakely & Snyder, 1999; Grant, 2007). The tendency for gated developments to spark further development of local businesses, or commerce via tourism, can cause other tax revenues to grow as well (Sauter, 2014).

Municipalities may receive government subsidies and other forms of funding in return for allowing and maintaining specific types of gated developments. In some cases, local economies may become dependent on this funding. As covered previously, the city of Okinawa, Japan is a notable example (Pajon & Sowells, 2010). Though the city is working against many of the negative effects of American military bases, the municipality is not financially sustainable without the subsidies issued for the existence of those bases.

2.7.1.3 Local Businesses and Workforce

Gated developments have been found to be a positive catalyst for the growth of low-skill job opportunities, which can be a great boon to working-class neighbourhoods (Salcedo & Torres, 2004). Research has uncovered testimonies of non-gated residents in developing regions such as Ghana, who have reported that the employment opportunities provided by local gated developments are important to their income security (Asiedu and Arku, 2009). And employment options do not just originate from the developments themselves but also from the new businesses that arise to meet the resulting demand increase for goods and services. It is common for new shopping centres, dining venues, offices, and professional services to soon follow after the arrival of gated developments (Houston, 2013).

Many gated communities contain houses that function as secondary vacation homes that eventually become full-time residences when owners retire (Blakely & Snyder, 1999). Therefore, such communities often experience seasonal fluctuations in population. This can affect local economies, amplifying tourism-based business in surrounding towns. Results can be a mixture of positive and negative effects. While tourism growth can boost economic gains (Houston, 2013), communities can develop a dependence upon the seasonal influx of gated development residents, resulting in the pattern of pronounced ‘slow seasons’ and ‘busy seasons’ (Low & Smith, 2006).

The rise of tourism businesses and facilities can produce communal profits and employment opportunities that elevate the socio-economic status of local residents, thereby mitigating issues of class and wealth segregation. However, other issues can introduce strain, such as increased traffic demand on road and parking infrastructure, unsustainable resource consumption, rental price increases, and loss of public green space (Samsirina, Pratiwi, & Harun, 2018). A growing tourism economy can also prompt the migration of workers from other towns and regions, potentially adding to a community’s strain on carrying capacity (Sauter, 2014).

2.7.2 Socio-Political Impact of Gated Developments

Examination of the socio-political impact of gated communities encapsulates the way these developments affect both social and political factors within a community. The socio-political impact is often strongly influenced by the type of fenced development that appears in a local area and the demographic groups which live there.

2.7.2.1 Crime

Crime is one aspect often affected by gated developments. Military compounds, for example, have been linked to increased crime rates in surrounding communities. Japanese citizens have historically held negative sentiments regarding the widespread presence of U.S. military bases due to the demographics of the personnel they bring (often 18- to 25-year-old males) and violent crimes this group has been linked to (Pajon & Sowells, 2010). Notable crimes have sparked community protests and demonstrations against these developments.

Indeed, though enhanced safety is a primary reason for the fencing of most types of gated developments, the wider community often experiences the opposite. For example, emergency service response times are frequently negatively impacted by gated developments (Landman, 2000), as the most efficient routes to a scene are sometimes interrupted by the closed borders of these developments, resulting in slower response times—which can yield higher rates of property damage and human harm.

Ultimately, enclosed developments can deteriorate public safety by the simple existence of their closed borders, thereby potentially impacting overall socio-economic conditions, as well as the physical characteristics of the community landscape itself. In some scenarios, the erection of a gated development can result in crime displacement (Landman, 2000). While fencing in the development space may help prevent crime within, this forces external criminals to seek more opportunities in the surrounding community. For example, in Johannesburg, South Africa, this type of crime displacement has been so dramatic in some communities that affected neighbourhoods may resort to gating themselves.

This trend can have far-reaching consequences for how the urban fabric evolves over time. The increasing privatisation of the urban landscape decreases the accessibility of public spaces, complicates matters of urban planning, contributes to segregation, and drains resident funds from the broader local economy. Such intricate effects of increased enclosure and fortification within communities are examined more deeply in a publication by Simone

Tulumello (2015), using the city of Palermo, Italy as a model. Tulumello covers how the area's history of organised crime and poverty contributed to the prevalence of walled developments within the city and how it continues today despite ever-lowering levels of crime (Tulumello, 2015). This trend is identified as being common throughout Western society as a whole.

But the concept of gating for security has also been identified as a positive factor in maintaining socio-economic stability within a community. Neighbourhoods that turn to gating to alleviate crime issues prevent the exodus of middle- and upper-class residents and taxpayers. Instead of moving to more affluent communities, residents who take up gating stay invested in poorer communities, contributing to the betterment of the area (Manzi & Smith-Bowers, 2005).

2.7.2.2 Demographics

In the case of upper-income residential and commercial developments, socio-political impacts may include gentrification and the 'pricing out' of community residents. This can lead to a shift in community demographics, and cause significant economic stress. It can also contribute to migration patterns as displaced locals move to more affordable neighbourhoods and cities, changing the socio-economic conditions of these areas too.

Gated developments often have a strong causal relationship with communal segregation (Le Goix & Webster, 2008). Most California gated communities, for example, are made up of residents who are predominantly white and middle- to upper-class. Residents of such communities typically skew older, falling into the middle-aged and senior age brackets. In Latin America, gated communities also skew to the upper end of the socio-economic spectrum, and tend to arise in city peripheries (Coy & Pöhler, 2002; Thuillier, 2005). Given that these outskirts are typically working-class, low-income areas, the disparity between the two residential groups is exacerbated by the fact that the communities often have difficulty harnessing the benefits of an affluent influx.

Disparities in property values and socio-economic status between gated community residents and surrounding, non-enclosed communities have been documented as a significant contributor to higher rates of communal segregation. Though certain places, such as Los Angeles and Bangkok (Boonjubun, 2019), may successfully incorporate gated developments of greater socio-economic diversity or even leverage the higher

socio-economic influx to uplift the local economy, the general correlation is one of enhanced segregation in communities throughout the world (Akgün & Baycan, 2012; Mantey, 2016; Polat and Çelik, 2016).

In some regions, gated community populations become homogenised based on both economic and religious factors. For example, certain gated communities within Basaksehir, Istanbul cater specifically to middle-class Muslims who seek a specific Islamic lifestyle aligned with modern middle-class values while protecting against 'moral-urban' threats (Çavdar, 2016).

Of course, as population demographics become more fragmented in a community, political leanings may grow more polarised. An imbalance of represented interests may occur if one population dominates, either by size or influence, resulting from increased connections and funding to enable more effective lobbying (Grant, 2007). This can be seen when wealth-backed HOAs successfully lobby for legislation that serves only their segment of the community or when politically-relevant developments, such as military bases, leverage their political power to secure more favourable agreements with local municipalities. The problem is further exacerbated by the fact that local community members are rarely given the opportunity to participate in the decision-making process regarding whether or not these gated developments are built in the first place (Veal, 2013; Sauter, 2014). Overall, the barriers and regulated access between the gated development and the outer community introduce strong in-group versus out-group dynamics and perceptions (Roitman, 2005).

2.7.3 Environmental Impact of Gated Developments

Research shows that the environmental impact of fenced developments has a wide reach in both the natural and man-made realms. Spanning land consumption, ecosystem disruption, and quality of life, these impacts can be multifaceted, rippling outward to eventually have economic and socio-political impacts as well.

As previously noted, one of the largest environmental impacts that can result from fenced developments is spatial. Such properties often take up large stretches of land and, because of their restricted access, they often function as significant obstacles within the larger environment. This can force the development of inefficient transit routes, contributing to an increase in vehicle miles of travel and community traffic congestion (Polzin, 2004). A broad collection of literature documents the negative effects of traffic congestion, which includes,

but is not limited to, increased rates of fuel consumption, pollution, traffic accidents, travel and freight costs, and economic productivity losses (Falcocchio et al., 2015). Additionally, traffic congestion has been identified as a strong contributor to poor mental and physical health among affected citizens (Levy et al., 2010; Hilbrecht et al., 2014; Nadrian et al., 2019).

Allowing the public to use community roads and pathways would alleviate some of this environmental impact. In a study evaluating traffic congestion in high-density Chinese cities such as Beijing and Shanghai, it was found that opening gated community routes to public traffic would have significant mitigating effects (Yao et al., 2018). Road network connectivity and accessibility would increase by 9.43% to 29.80%, resulting in a 2.57% to 4.50% drop in resident commuting time for short-distance travel. Additional decreases would be seen in urban trunk road traffic streams and the number of congested intersections. These findings identify gated communities as key points of traffic influence in urban planning.

The same point applies with respect to walkable routes within a community. One study of Nanchang, China, discovered that un-gating the city's many gated developments would dramatically improve permeability for pedestrians (Sun, Webster, & Chiaradia, 2017). Total pedestrian network length would increase by 138%, adding an extra 31,731 road segments and 17,974 road intersections. The average link size would reduce by 79%. Such findings have prompted the Chinese government to aggressively inhibit the building of new gated developments and instead encourage projects that will maximize pedestrian and/or vehicular traffic permeability.

But there are other features of gated developments that have environmental impacts. Because so many gated developments seek choice locations where scenic views and outdoor amenities may be provided, the demand for land can create an unsustainable pressure on the natural environment. The limited green space in and surrounding urban zones is often targeted for these developments. Horizontal developments are particularly consumptive, and their popularity poses a serious environmental threat. In one analysis of Istanbul, horizontal developments accounted for more than 80% of the city's gated communities and were identified as a significant environmental pressure for the metropolitan area (Akgün & Baycan, 2012). The rapid development of horizontal gated communities within Egypt's Cairo area has also proven to be an environmental stressor due to planning that failed to account for any sustainability measures (Faggal, 2012). The problem is particularly pressing given that

the communities have higher demands for water and energy consumption because of the harsh desert environment, an issue exacerbated by urban sprawl.

This demand for green space also means that fenced developments have the potential to intrude upon the territories of wild animals, disrupting their travel routes, feeding, and mating opportunities, overall behaviour, and even genetics (Kriebitzsch et al., 2000; Wilson et al., 2015; Edwards et al., 2019). Properties along transit routes may influence how and where wild animals cross with vehicular traffic. Specific fencing patterns were found to create hotspots for wildlife-vehicle collisions, often forcing animals to cross at limited opening spaces, usually near interchanges (Cserkész et al., 2013).

In some cases, fenced developments may make environmentally-significant alterations to the land. For example, HOA-run gated communities have been known to remove beaver dams or dam up waterways themselves that were not convenient for the residents of the developments (Lloyd, 2018). Additionally, many gated developments form around bodies of water, some natural, and some created by extensive landscape engineering (Blakely & Snyder, 1999). This results in natural water habitats suddenly surrounded and used by a larger human population, or the formation of new habitats that attract local and migratory species. All of these actions impact local ecosystems, for better or for worse.

2.8 Conclusion

It is difficult to discuss urban fragmentation in simple terms, particularly since the very definition is often open to interpretation. As such, there are many approaches researchers take to studying and understanding urban fragmentation and its causes. Fragmentation can be looked at through a spatial lens or an economic one, studied through a social approach or a cultural methodology, or taken in terms of its political effects. Regardless of which approach a researcher takes, some standard trends about contemporary urban life will emerge. These include the rise of the fortress city and landscapes of power, which highlight the consumer desire for heightened security features in modern construction. Modern city living is often privatised or militarised, creating both global and local enclaves, which serve as a vehicle for stronger fortification. And nowhere are these trends more obvious than in gated developments. This type of community focuses on safety for the gated community's residents and can have serious impacts to the surrounding area. Some examples of gated

developments include military developments, medical developments, academic developments, and commercial developments.

Though current research does not go into depth regarding a few of the non-residential types of gated developments, the general study of gated developments does reveal that the varying types often have similar communal impacts. While certain types of gated developments may introduce specific problems or benefits to a community, many of the common effects come down to patterns of land use typical of most gated developments, regardless of their individual purpose. Erecting barriers and restricting public access widely impacts the availability of public space, transportation efficiency, economic dynamics, and community cohesion. The impacts on the surrounding community include gentrification where properties inside the gated community increase to the point that those outside can never afford to join the community. In addition, studies in China have shown that gated communities have the capacity to increase environmental issues since the demand for property in naturally beautiful areas can lead to development that can negatively impact the natural environment. This can also reduce natural areas in urban areas. Urban planners must maintain awareness of these impacts in order to adequately mitigate the negative effects and amplify those that will be beneficial to the locales where gated developments are present.

Chapter 3: Theoretical Framework for Analysing the Spatial Transformations in Cities

3.1 Introduction

This literature review provides a theoretical framework for a study on the impact of gated developments on the quality of life in their neighbouring communities in the context of Riyadh, Saudi Arabia. This chapter outlines a broader view of the existing and current research and debates on social, political, economic, cultural, and spatial aspects of *gating* and spatial segregation on an urban scale, framing, at the same time, disciplinary responses for overcoming these problems. Drawing from different fields, including urban planning, architecture, geography, sociology, psychology, anthropology, ethnography, political economy, and philosophy, this literature review aims to provide a multi-disciplinary perspective of both historical and current scholarship on the aforementioned topic.

3.2 Drivers - Pressures - State - Impacts - Responses (DPSIR) Framework

This chapter is based on the structure generated through the Drivers–Pressures–State–Impacts–Responses (DPSIR) framework. Conceptualised in 1993 by the Organization of Economic Co-Operation and Development (OECD) as the Pressure-State-Response Framework, DPSIR was further developed and adopted in 1999 by the European Environmental Agency (EEA). The DPSIR framework is usually applied to research that analyses interactions and relationships between society and the environment and involves the design of models and management responses for solving or overcoming the observed problems (Kristensen, 2004; Jago-on et al., 2009). The advantages of the DPSIR framework lie in its integrative approach data that can help to "understand the external societal and economic forces of change comprehensively and evaluate the effects of environmental systems on human well-being" (Liu et al., 2020, p. 7). As such, the DPSIR framework has been largely used as a methodology for coastal and environmental research (Ness, Anderberg, & Olsson, 2010; Gregory et al., 2013; Lewison et al., 2016). Since recently, however, the DPSIR framework has found its place in the research of urban sustainability and urbanisation more broadly, where it is seen as a tool for enhancing urban governance and decision-making processes, by providing a more holistic view of the complex social, economic, political and

environmental forces that shape contemporary cities and influence the quality of life of their inhabitants (Jago-on et al., 2009; Landman, 2011; Sekovski, Newton, & Dennison, 2012; Liu, Ding, Xue, Zhu, & Gao, 2020). The DPSIR framework, along with its earlier incarnations, is a widely accepted and commonly used framework for interdisciplinary indicator development, system and model conceptualization, and the structuring of integrated research programmes and assessments (see, for example, EEA, 2005; OECD, 2003; UNEP, 2002; Walmsley, 2002).

This literature review takes Karina Landman's study of urban fragmentation in the Global South through applying the DPSIR as its starting point (Landman, 2011). Arguing that complex socio-spatial questions such as urban fragmentation and sustainability cannot be analysed as isolated and linear processes, Landman underlined the need for an integrated framework that would "incorporate an understanding of the different internal lines of influences and relationships through a systemic approach" (Landman, 2011, p. 53). One such framework, as the author suggests, is the DPSIR framework, since it allows us to understand how "human activities and external forces produce pressures on the environment and development that can induce changes on the state of human settlements"—changes that instigate responses, and which in turn "produce new pressures" (Landman, 2011, p. 40-41). As she further observes, this implies the need for a more systemic approach to understanding complex urban processes, which can help in devising more productive institutional responses to the problems such as "fragmentation, differentiation, growing inequalities, poverty concentrations, decentralization, polarization, and 'spatial mismatch'" (Landman, 2011, p. 56).

However, in contrast to typical application of the framework, this study adopts a linear understanding of the DPSIR framework as Figure 3.1 shows. Such configuration allows us to see the relationships between the elements of the DPSIR framework in terms of 'cause and effect'—a perspective that allows us to develop design proposals to the discussed problems, representing a central aim of this research project. Thus, before outlining the structure of this research, it is useful to briefly describe each of the five elements of the DPSIR framework, namely 'Drivers', 'Pressures', 'State', 'Impacts' and 'Responses.' Defined by the EEA as "the social, demographic and economic developments in societies and the corresponding changes in lifestyles, overall levels of consumption and production patterns" (EEA, 2007, p. 13), 'Drives' encompass a range of demographic, cultural, lifestyle, ideological, economic or legal forces, emerging from particular social needs, that further create 'Pressures' on the

environment. The ‘Pressures’ result in the change of ‘State’ of the environmental or socio-spatial systems, which can refer to "a wide range of features, from the qualitative and the quantitative characteristics of ecosystems, the quantity and quality of resources, living conditions of humans, exposure to the effects of Pressures on humans, to even larger socio-economic issues" (Walter, 2013). The changes in the ‘State’ of the system then produce broader social ‘Impacts’, thus changing the nature of spatial and environmental functions. Finally, the perception created by the ‘Impacts’ triggers ‘Responses’, marking the institutional, policy, or design-level solutions to the perception of ‘Impacts’ and their consequences on the well-being of those affected.

It is important to note that in addition to its simplicity and widespread application as a causal analytical framework for examining the interactions between human societies and the environment, the (DPSIR) framework was used in this study as an organizational tool and not at all operational.

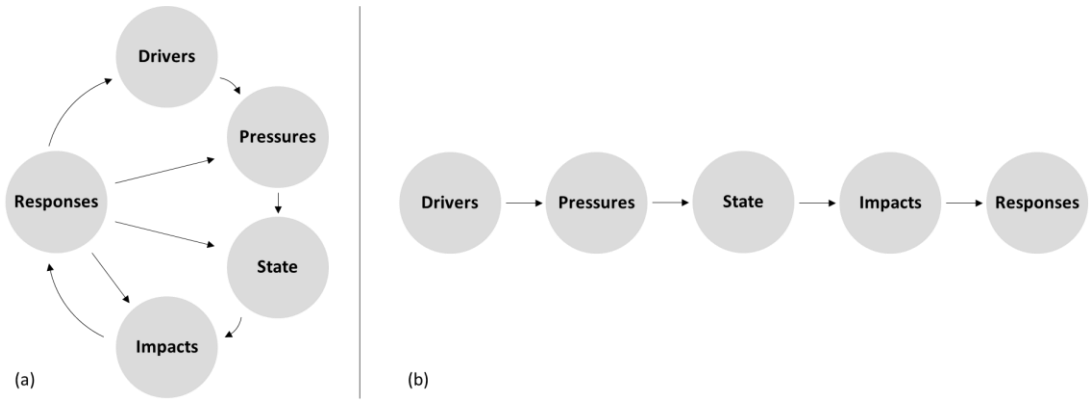


Figure 3.1 (a) The non-linearity typical application of the DPSIR framework vs (b) the linear application of the framework in this research

Following the DPSIR framework, this research framed 13 processes, which are seen as central forces in shaping the contemporary urban landscape of the Gulf city in relation to its fragmentation, and that will serve as a basic structure of this research. They are classified as follows:

Table 3.1 Processes central in shaping contemporary urban landscapes in relation to its fragmentation

1. Drivers	2. Pressures	3. State	4. Impacts	5. Responses
Urbanisation	Privatisation	Urban Sprawl	“Neighbourhood Effect”	Sustainable Urbanism
	Fear and Security			
	Control			
Globalisation	Territoriality	Urban Fragmentation		New Urbanism
	Car-Dependency			
	Land-Use Segregation			

3.2.1 Drivers

3.2.1.1 Urbanisation

Changes in urban landscapes of cities around the world are influenced by a number of factors, one of them being the fast pace of urbanisation. In 1996, UN-Habitat pointed out that by the beginning of the 21st century, for the first time in history, the majority of the global population will live in urban areas (UN Centre for Human Settlements, 1996). Since then, other studies confirmed this trend, predicting the rise of global urban population to 60% until 2030 (UN Centre for Human Settlements, 2004) and to a staggering 68% until 2050 (UN Department of Economic and Social Affairs, 2018), thus pointing out the increasingly urbanised state of our environment. However, in many parts of the world, the emergence of mega-cities and the transformation of their surrounding territories into urban and semi-urban zones did not take a structured and balanced path. Instead, cities, especially those in the developing world, became places of extreme class, race, and ethnic divisions (Marcuse, 1989; Davis, 2006).

Understanding this complex relationship between growth and transformation of urban space has been a subject of various studies. David Harvey analysed spatial segregation as an 'urbanisation of capital' that evolved from the ruins of the welfare state and the emergence of the neoliberal economy since the 1970s (Harvey, 1985, 1990, 2001). As Manuel Castells pointed out, segregation through urbanisation has been placed in the "emergence of an internationally integrated and increasingly urbanised, and yet highly fragmented network society that straddles the planet" (cited in Landman, 2011, p. 42). Others have underlined the scope of urban transformation beyond the scale of the city, through the form of 'planetary urbanisation' (Lefebvre, 2003; Brenner and Schmid, 2012; Brenner, 2014), or framed entire regions and national territories as urban spaces. The role of the nation states in these processes has been framed as an enabler of the spatialisation of capital through policy-making, privatisations, provision or construction of infrastructures that would facilitate urbanisation and spatial fragmentation (Harvey, 1989; Ferguson & Gupta, 2002; Brenner, Jessop, Jones, & Macleod, 2003; Brenner, 2004; Harvey, 2005).

And while urbanisation appeared as a global phenomenon, still, its forms, scales on which it took place, and principles on which it was based, varied from city to city. Thus, for instance, urbanisation of the Gulf region was primarily influenced by the discovery and exploitation of

oil since the 1930s, and especially 1970s (Qutub, 1983; El-Arifi, 1986; Glasze & Alkhayyal, 2002). Existing cities, mainly concentrated in the coastal areas due to the harsh environmental conditions of the region, became centres of oil-driven financial boom and destinations for migration of local and foreign workers and professionals. This economic shift laid the ground for the unprecedented demographic changes in the Gulf region, which the urban population increased 14 times between 1950 and 1980 (El-Arifi, 1986), leading to the massive construction of housing and infrastructure.

Saudi Arabian cities evolved similarly. Thus, for instance, Riyadh grew from a small town of 30.000 inhabitants in 1950 to a mega-city of almost eight million as it exists today. The discovery of oil in the 1930s and its exploitation during the mid-20th century served as a main driving force of modernisation and urbanisation in Saudi Arabia, a context in which Riyadh became a destination for the influx of workers ariving both from inner, mainly rural, areas of the country, as well as from different parts of the world (Glasze & Alkhayyal, 2002; Garba, 2004). Saleh Al-Hathloul outlined six critical phases of Riyadh's urbanisation: (1) the construction of the Al-Murabba complex in the 1930s by King Abdulaziz, that encouraged the migration of the rich outside of the previously defined city walls; (2) fragmented urbanisation through the construction of large public buildings during the 1950s and 1960s; (3) the development of the Riyadh Master Plan by Doxiadis Associates in 1968 whose grid structure provided conditions for the city's rapid growth; (4) the oil boom of the 1970s and France-based SCET International's update of the Doxiadis Master Plan that extended the existing planning and transportation network, allowing further growth of the city in all of its directions; (5) establishment of the Riayadh Development Authority (RDA), the institution in charge of managing Riyadh's urban growth; and (6) the launch of the Metropolitan Development Strategy for Arriyadh (MEDSTAR) during the late 1990s which restructured the city's organisation by introducing a multi-center system, and was followed by the launch of the Riyadh Public Transport Network (RPTN) in 2012 (Al-Hathloul, 2017).

This rate of urbanisation, coupled with the existing religious and social principles of the Saudi Arabian society, created conditions for urban compartmentalisation. In the case of Riyadh, this fragmentation continues to take place on multiple levels. Next to the geographic segregation between rich and poor areas, the city has also seen intense construction of gated developments, especially since the 1960s, and a massive 'import' of the 'Mediterranean-style

villas', which eventually started to group into gated compounds during 1980s, thus creating a real estate 'formula' for the city's urban fragmentation (Glasze & Alkhayyal, 2002).

Here, Glasze and Alkhayyal outlined two historical reasons for urban fragmentation in Saudi Arabian cities, as seen from the scale of 'the quarter': (1) "the quarter as an extension of private space", referring to the long tradition of coutryards in Saudi urban culture as a form of 'retreat from the public sphere'; and (2) "the quarter as a self-governing, protective community", referring to the history of political and administrative autonomy of residential quarters in the pre-modern Saudi state (Glasze & Alkhayyal, 2002, p. 321-322). Society's existing social norms, combined with the 'imported lifestyles' of the foreign blue-collar and white-collar workers, positioned gating as a central principle of urbanisation in Riyadh, thus creating foundations for race, class, and ethnic segregation through spatial fragmentation.

3.2.1.2 Globalisation

Closely tied to urbanisation, globalisation has also been one of the central drivers of urban fragmentation. The rise of neoliberalism since the 1970s, weakening of the power of the welfare state, expansion of multinational corporations, emergence of global financial markets, changing forms of labour, and incorporation of women into the working force, to name just a few, resulted in the concentration of production in the Global South and consumption in the Global North (Harvey, 1990; Castells 1997). This economic and geopolitical shift on a global scale was also visible on the city's scale, which now became a node in a network of the global circulation of capital.

Manuel Castells discussed this social, technological, economic, and informational inter-connectedness in space on a global scale through his concept of 'space of flows'. (Castells, 1997; 2010). Castells described the 'space of flows' as 'material arrangements' that 'allow for simultaneity of social practices without territorial contiguity', and which are comprised of (1) technological infrastructure such as IT systems, telecommunication or transportation lines, as well as networks of interaction such as the financial markets, media news, science, and technology; (2) nodes and hubs as actual spatial sites, such as institutions, cities or places, that structure the connections; (3) habitats for social actors of the network, and (4) electronic spaces, including websites and media spaces (Castells, 1999, p. 294-295). Similarly, Arjun Appadurai pointed out how "the new global cultural economy has to be seen as a complex, overlapping, disjunctive order, which cannot any longer be understood in terms of existing center-periphery models" (Appadurai, 1990, p. 6). Continuing from here, Appadurai

proposes five dimensions of 'global cultural flows' which he terms 'ethnoscapes', 'mediascapes', 'technoscapes', 'finanscapes', and 'ideoscapes', designating these different forms of 'landscapes' as 'the building blocks of (…) imagined worlds, that is, the multiple worlds which are constituted by historically situated imaginations of persons and groups spread around the globe (Appadurai, 1990, p. 7).

Architectural theorist Keller Easterling analysed the production of cities through the production of global 'infrastructure space', referring to the invisible structures and mechanisms, such as broadband networks, free zones, or international standards, that organise our urban life (Easterling, 2014). Saskia Sassen framed the rise of a 'global city' as a materialisation of a global movement of capital (Sassen 1998, 2000a, 2005). The 'global city' has also often been seen as a 'universal' model of economic and urban development that can be applied to different places. This logic usually involved replicating Western urban ideas in the context of the Global South, thus contributing to the 'worlding' agendas of many national and urban governments in the developing world (Roy & Ong, 2011). Edward W. Soja outlined the 'postmetropolis' concept as a product of the late global capitalist economy and as an urban form in which the notion of place disappears, while boundaries between urban interior and exterior become impossible to separate (Soja, 2000).

Globalisation has also transformed our understanding of scale and re-distribution of power across scales of the city, nation, and the Globe. Authors such as Anna Löwenhaupt Tsing have framed 'the global' as a constructed scale (Tsing, 2000 and 2005). Others have analysed the changing role of the state in the context of a global, neoliberal economy, framing it as one of the central actors in market and spatial deregulation (Brenner, Jessop, Jones, & Macleod, 2003; Brenner, 2003). David Harvey discussed the practices of offloading of economic responsibility from the scale of the state to that of the city, and the subsequent turn from 'managerial' to 'entrepreneurial' approach to urban development and governance typical for several cities around the world (Harvey, 1989).

Globalisation did not only help reshuffle the existing political and economic power hierarchies, but it also provided the foundation for the spatialisation of new forms of social inequalities. Cities have become places of high concentration of both extremely rich and extremely poor. Already in 1973, David Harvey offered a materialist critique of the rapidly transforming urban landscape under the globalised capitalist economy, focusing mainly on practices of urban land-use and increasing 'ghettoisation' of urban space (Harvey, 1973). This

analysis was extended by Andy Merrifield and Erik Swyngedouw, who described these processes as ‘urbanisation of injustice’ (Merrifield & Swyngedouw, 1996). Urban class and race segregation further resulted in what Peter Marcuse called ‘dual city’, referring to the extreme spatial polarisation of social differences (Marcuse, 1989; Marcuse & van Kempen, 2002). Looking from the perspective of a growing population of slum dwellers, Mike Davis offered a global analysis of urban poverty and its equally gated communities (Davis, 2006).

Following the oil-based economic boom, many Gulf countries became new financial centres and destinations for the migration of low-skilled workers from different developing countries around the world. The segregated labour camps in which the immigrant workers are concentrated stand in stark opposition to the gated developments of the middle and upper classes, both appearing as genuine urban typologies of globalisation. Looking into the urban fragmentation of Riyadh—Webster, Glasze and Frantz (2002) have described these gated compounds as the ‘new genre of modern urban habitat’. Here, Glasze and Alkhayyal offered a comprehensive view of gating in the context of Riyadh, outlining the phenomenon not only as a consequence of the historical and religious context of the Saudi Arabian society, but also as a product of internationalisation, globalisation, and modernisation of the country since the 1950s (Glasze & Alkhayyal, 2002).

3.2.2 Pressures

3.2.2.1 Privatisation (Privacy)

Urban landscapes are produced in tensions existing between private and public spaces. The relationship between the two spatial and social dichotomies has changed throughout history and has heavily depended on the place's cultural, political, and economic context. Ali Madanipour examined how the existence of public and private spheres “affects individuals’ mental states, regulates their behaviour, and superimposes a long-lasting structure onto human societies and the spaces they inhabit” (Madanipour, 2003, p.1). He offered a complex perspective on the relationship between public and private, in economic (property and land ownership), political (modern democracies), and social (routines of everyday life) terms, as well as through different scales such as ‘the personal space of the body’, ‘exclusive space of the property’, ‘intimate space of the home’, ‘interpersonal space of sociability’, ‘communal space of the neighbourhood’, ‘material and institutional spaces of the common world’, and ‘impersonal space of the city’ (Madanipour, 2003).

Seen in the context of the Saudi Arabian society, privacy and seclusion represent one of the central aspects of its culture that is clearly manifested in the production of the urban form. One of the reasons for this social and spatial practice lies in Islam's principles, the country's dominant religion (Bahammam, 1987; Abu-Gazzeh, 1996; Glasze & Alkhayyal, 2002; Glasze, 2006; Alkhateeb, Humphries-Smithand & Eves, 2014).

One could also observe other historical, economic, and cultural forces that positioned privacy at the forefront of urban life in Saudi Arabian cities, thus allowing us to see not just how social values shape space, but how spatial form can also shape back social relations. As Stefan Maneval pointed out, the construction of new infrastructure in Saudi Arabian cities during the 1950s and 1960s displaced and concentrated work in separate areas of the city, leaving home to exclusively private, family life (Maneval, 2019). This separation between public and private zones of the city was further deepened during the 1970s when The Real Estate Development Fund launched a variety of financing programs aimed at boosting the homeownership rate, and that resulted in the massive construction of single-family houses across the country (Bokhari, 1978; Maneval, 2019). The internationalisation of Saudi Arabian cities and the adoption of Western housing typologies, such as the villa-type during 1970s (Bahammam, 1987; Glasze & Alkhayyal 2002), were met with sharp criticism by architects and urban planners of the the 1980s and 1990s conservative political climate, who argued that this lifestyle is endangering traditional Saudi family-values (Maneval, 2019). Building on these rhetorics, the 'new Islamic urbanism' successfully combined conservative social norms of Islam with Western models of housing and urban development and segregation (Maneval, 2019). This 'obsession with privacy' manifested back into the physical design of housing enclaves, which now became increasingly gated. Their fences (and height regulation) further navigated urban development practices towards horizontal expansion instead of densification (Abu-Gazzeh, 1996).

However, the heightened sense of privacy in Saudi Arabian cities could be seen as a phenomenon that cuts across the entire society and is manifested in a general lack of public spaces in the city (Almahmood et al., 2018). Taking parks and gardens as historically relevant forms of public space in Saudi cities, for instance, Addas and Maghrabi point out the disparities between the rapid urban growth and lack of public open spaces in three Saudi Arabian cities—Jeddah, Riyadh, and Dammam. At the same time, they point out the role of "inadequate design policies, poor planning, and insufficient resources" in creating this gap

(Addas & Maghrabi, 2020). Comparing international standards for public open spaces per capita, such as 9 m^2 by the World Health Organisation, 26 m^2 by the European Union, or 30 m^2 by the United Nations, for example, their survey which was based on extensive interviews with residents coupled with the GIS analysis of Riyadh's urban space, showed that public open spaces constitute a mere 1.18 m^2 per capita, thus underlining the present problem of a lack of public spaces in Saudi cities (Addas and Maghrabi, 2020).

3.2.2.2 Fear and Security

Fear and desire for security have always been important aspects of spatial organisation, whether on the level of a building, neighbourhood, or an entire city. However, globalisation and rapid urban growth during the last several decades have turned cities into places of decay and unrest (Ellin, 2001). Karina Landman observed how, in contrast to the old image of cities as centres of diversity, cities today are experienced as "dangerous places where differences are considered overwhelming and threatening" (Landman, 2011, p.43). The flux of people of various class, racial, and ethnic backgrounds, combined with the role of media in shaping everyday life and the dominant paradigm of private property and territoriality, has helped instill fear of the other. In this context, the fear of crime appears as an important social pressure that also has its spatial manifestation—fortification, privatisation, and gating of housing, amongst others, but also spatial segregation of social groups that are considered to be dangerous.

Architects and planners have played an important role in this process. Taking a position of a 'neutral' expert, many turned to environmental design as a tool for crime prevention. An example of this practice is the work of Oscar Newman, known for his 'Defensible Space Theory'—a study of crime in New York housing units, that led him to conclude how the anonymity and social detachment, typical for life in high-rise urban dwellings, leads to the lack of responsibility of the individuals inhabiting them, and thus, also, to the higher crime rates in these housing typologies (Newman, 1972 and 1996). Newman's work could be challenged as a technocratic approach to urban planning, or in other words, a belief that spatial configuration alone can resolve complex, structural, social problems, such as class, racial, and ethnic inequalities.

Other authors observed how urban governments and private corporations efficiently use fear of crime to impose restrictions and legitimise various forms of exclusion in cities. Focusing on the case of Sao Paulo, Teresa P. R. Caldeira showed how the maintenance of the discourse of

fear leads to the reproduction of racial and class prejudices, pointing out also how this atmosphere further stimulates the development of two novel forms of discrimination—namely, "the privatisation of security, and the seclusion of some social groups in fortified and private enclaves" (Caldeira, 2000, p.2). Privatisation of security, as Caldeira writes, "challenges the state's monopoly of the legitimate use of force, which has been considered a defining characteristic of modern nation-states", thus opening doors to the profitable industries focused on providing private security and designing security technologies (Caldeira, 2000, p.2). At the same time, the proliferation of the fortified enclaves in cities such as Sao Paulo implies such a direct level of segregation which, in turn, changes the nature of the city's public spaces (Caldeira, 2000). Next to the general fear of crime and intrusion—since the last several decades, the fear of urban terrorism has contributed to contemporary cities' even more pervasive fortification (Coaffee, 2003). As Jon Coaffee observed, this led to attempts of urban governments to 'design out terrorism', resulting in the construction of physical barriers, implementation of comprehensive surveillance systems, and more broadly, exercising new types of control over the urban population (Coaffee, 2003).

Returning to the context of Saudi Arabia, one could observe similar social and cultural pressures and spatial responses to them, as in other, both developed and developing countries. Although the crime rate in Saudi Arabian cities did not increase as much as in the Western cities (Eben Saleh, 2001), fear of intrusion and violence remains a significant driving force that shapes contemporary Saudi urban landscapes. Research has shown how accentuated desire for safety is not limited solely to upper classes, nor only to Saudis or non-Saudis, but is instead shared among the entire population, and particularly some of its social strata, such as young women (Glasze & Alkhayyal, 2002; Grant & Mittelsteadt, 2004; Glasze, 2006; Maneval, 2019). As a result, Saudi Arabian cities have seen intense urban fragmentation, manifested through different gating and fencing practices and a massive reliance on cars as a means of urban transportation (Maneval, 2019).

3.2.2.3 Control

Michel Foucault's research on power, control, and the city could be seen as foundational for understanding the role of the modern nation-state in urban planning and development (Foucault, 1972, 1984, 1995, 2007, 2008). Foucault studied a 'disciplinary turn' of the modern nation-state, in which power and governmentality over population are exercised through technologies of measurement, surveillance, classification, division, registration, and strategic

spatial design, that he collectively framed under the concept of 'biopolitics' (Foucault, 1995 and 2008; Pløger, 2008). He saw the space of the city as a particularly important field of social control and had outlined different aspects of this relationship, spanning from Spatio-temporal categories such as heterotopias (Foucault, 1984) to the discussion of models of institutional control through spatial design, such as Jeremy Bentham's Panopticon (Foucault, 1995; Bentham, 2011).

Next to Foucault, several other authors offered their perspectives on the relationship between state control and spatial production. Henri Lefebvre pointed out that space represents a product of complex social relationships and argued that every society materialises its social relations in space (Lefebvre, 1991, 2009). Inspired by Lefebvre's work, Neil Brenner analysed the transformation of statehood under a neoliberal economy, positioning "urban regions as key sites of contemporary state institutional and spatial restructuring", and more specifically, urban policy as the most important mechanism through which transformation of national states takes place (Lefebvre, Brenner & Elden, 2009, p.2). Taking the point of view of the state itself, James C. Scott outlined how governments often employ abstraction and turn towards simplification, manipulation, and ordering in their desire to control and govern populations (Scott, 1998). As Scott further pointed out, this state approach is visible in spheres such as urban planning, land administration, and agriculture. And, one notable example of this 'way of seeing' is the vision of the modernist city, built on the paradigm of reduction of urban complexity and focus on functionalist parameters of 'light', 'space', and 'air' (Scott, 1998).

Similarly, the Saudi Arabian state has had substantial influence and control over its urban landscapes, whose developments have been shaped by top-down and centralised policy-making processes (Aina et al., 2019). Mubarak positioned the Saudi state as the key force in modernisation and urban development of the country, pointing out how "the enlistment of large sums of national financial resources and man power in the consolidation of the new nation-state resulted in a tremendous allocation in the cities", resulting indirectly in "an increase in urban living standards of the population" (Mubarak, 1992, p.58). As Mubarak further pointed out, the control of the state over its population through urban development is also visible in the character and role of urban planning expertise in society. Describing it as "an apolitical activity performed within a given agenda sealed from public scrutiny", planning processes essentially represent a manifestation of the state control and its bureaucracy,

while “the application of these top-down decisions has resulted in the production of urban forms that share similar features, the grid iron layout, rectangular land subdivisions, and utter lack of relevance to the physical environment, among others” (Mubarak, 1992, p.119).

The history of the direct control of the state through urban planning in the context of Saudi Arabian cities could be traced back to 1947, when the Saudi government, together with Aramco (then Arabian-American Oil Company), first tried to control urban growth around oil extraction areas (Al-Naim, 2008). This process resulted in the emergence of the first planned cities in Saudi Arabia—Dammam and Al-khobar (Al-Naim, 2008). Similarly, during the 1960s, as the capital and the fastest growing city in the country, the Saudi government started devising plans to control and direct the growth of the urban areas of Riyadh (Al-Hathloul, 2017). The first move in this direction was the appointment of Doxiadis Associates, a planning office headed by Constantinos Doxiadis, who developed the first systematic Master Plan of Riyadh in 1968. The plan, which was supposed to provide a framework for the city's expansion until 2000, was adopted in 1973 by the Council of Ministers. It outlined a grid-like framework that was meant to order housing construction into manageable urban space. As Stefan Maneval observed, “the grid pattern of Riyadh and Jeddah not only makes the provision of civic services easier, it also facilitates policing and the control of streets and citizens” (Maneval, 2019, p.176). Further, with the massive use of car transportation and complete neglect of pedestrian spaces, the city's grid pattern allowed for easier control of any potential protests and demonstrations that could challenge the authority of the state (Maneval, 2019).

Additionally, the Saudi state has successfully exercised control over the production of urban space through different forms of financialisation. Firstly, as Maneval observed, the nation-state appears as a sole sponsor of the infrastructure construction, with funding provided by the oil revenues instead of taxpayers’ contributions (Maneval, 2019). This mode of financialisation gave the state an important level of control in planning and developing urban settlements (Al-Hathloul, 2004; Maneval, 2019). Secondly, the establishment of the Real Estate Development Fund in 1974 and its interest-free loan program completely transformed the property landscape of the city, boosting homeownership, destabilising real estate markets, and triggering urban sprawl. This program, however, also had an element of social control. It was only Saudi citizens, who already owned the land and could finance construction independently with the 30% of the prospective loan amount, that were eligible

to apply for the Real Estate Development Fund program (Maneval, 2019), thus marginalising the poorest citizens and deepening the schism between domestic and foreign population.

Finally, the state's role in the development of Saudi cities could also be seen in its efforts to define national identity through design and popularisation of the very architectural and urban form. One illustrative example of this practice is, as Al-Naim pointed out, the 1980s revival of the historical parts of Riyadh, such as Qasr Alhokom, in which the Saudi state played an important role. As Al-Naim suggested, the new traditionalism imposed through these projects could be perceived as an attempt to design a unique cultural identity (Al-Naim, 2008). Today's focus of the Saudi state on the construction and propagation of 'smart cities' as a new model of urban development could be seen in a similar light—as an attempt of the state to control not only the production but also the future visions of urbanity. One such example is The King Abdullah Economic City. This ambitious 100 billion USD-worth project successfully combines entrepreneurial financial strategies with the strong control of the state over urban planning (Al-Naim, 2008).

3.2.2.4 Territoriality

Territoriality represents an important aspect of research on housing, urban planning, and environment, as well as human behaviour more broadly. John R. Gold observed how a "significant proportion of human behaviour is directed (…) towards partitioning space and towards maintaining the territories and boundaries so formed" (Gold, 1982, p.44). Gold further positioned dwelling as a form of individual's territory that serves as an entry point into one's perception of urbanity and a spatio-temporal framework for organisation of life, showing how home appears as a "microcosm that can be molded and ordered to satisfy the need for self-expression" (Dovey, 1978; Gold, 1982, p.55). Following from here, one could observe the interconnectedness of housing, territoriality and construction of identity and subjectivity. The research on territoriality is closely tied to studies of ecosystems, communities, and neighbourhoods (Gold, 1982).

Seen as inseparable from the questions of control and freedom, territoriality represents one of the central elements of studies on gated communities (Wilson-Doenges, 2000). As such, it is studied in terms of physical environments and places, which are inseparable from broader issues of psychological states of individuals and communities (Wortley & McFarlane, 2011). As Graham Brown and Helena Zhu observed, it could be seen as a "person's behavioural expression of her/his feelings of ownership toward a physical or social object" (Brown & Zhu,

2016, p.55). Defined by symbolic and physical borders that differentiate between private and public spaces, and those within which one can exercise power and control, territoriality could be viewed in relation to Oscar Newman's concept of 'defensible space', which is based precisely on the idea of a lack of one's personal territory and sense of community in high-rise buildings (Newman 1972), or in the relationship between social interactions and perceived density (Mousavinia, Pourdeihimi, & Madani, 2019).

Discussing the imperativeness of privacy in Saudi Arabian culture, Tawfiq Abu-Gazzeh pointed out how a "direct relationship exists between urbanisation and the increased use of boundaries and spatial segmentation" (Abu-Gazzeh, 1996, p.273). Analysing the problem of segregation between public and private spaces in Saudi cities, he showed how, next to the physical barriers, the symbolic boundaries and rules of social behaviour separate one's territory from the rest of urban space (Abu-Gazzeh, 1996). Altman analysed this kind of territorial behaviour to control interaction with the public (Altman, 1975). Abu-Gazzeh extended this analysis, showing how it rather serves to establish an order in space between different groups and individuals, framing territorial behaviour as a 'mechanism used to achieve privacy', and territories as 'stabilizing and regulatory' tools used "at community levels, to smooth social interaction, to provide a set of cues to others, and to create explicit role relationships and readily observable status hierarchies" (Abu-Gazzeh, 1996, p.283). Such focus on one's territory through gating turns the private realm into an isolated enclave that does not communicate with the public, thus aiding spatial and social urban fragmentation.

Going beyond the scale of the individual or the community, it is also the state in which territorial behaviour manifests in the production of urban space, and more precisely, its public realm. As previously discussed, with its power and control over the processes of urbanisation, housing, and infrastructure construction and maintenance, as well as its lack of interest and strategic investment into the development of public spaces—the Saudi Arabian state continues to play a role in the delineation of private and public life in its cities, thus contributing to the growing problem of urban fragmentation.

3.2.2.5 Car-Dependency

The 20th-century city transformations as a result of the massive production and use of private cars has been a subject of critique since the 1960s (Mumford, 1961; Jacobs, 1961). With all the research on the negative effects of car-based transportation and city planning, spanning from environmental pollution, the creation of urban sprawl, and more broadly,

reduction of the quality of life, still, many cities around the world are still car-dependent, or even witness a rise in the use of cars. This trend, paradoxically, often runs in parallel with the popularisation of urban railway systems and urbanists' efforts to provide cities with more walkable areas (Newman & Kenworthy, 2015).

Drawing from the data of 46 cities around the world, Jeffrey Kenworthy and Felix Laube tried to offer a more complex perspective for a better understanding of urban car dependency. They introduced questions around land-use, public and private transportation, climate change, energy use, and economy, as integral elements of this phenomenon (Kenworthy & Laube, 1999). The two authors pointed out that, in order to overcome the problem of dominantly car-based transportation, we need to learn to involve different stakeholders in the process of urban planning, such as policy-makers, industry, local communities, and citizens. Similarly, Peter Newman and Jeffrey Kenworthy proclaimed 'the end of automobile dependence' (Newman and Kenworthy, 2015), arguing that urban developments should turn towards a combination of walking, transit and car-movement, and proposing three different planning approaches to achieve this strategy (Newman, Kosonen & Kenworthy, 2016).

In Saudi Arabia, the problem of car dependency is particularly visible. Thus, for instance, the city of Riyadh saw an immense rise in automobile ownership during the last several decades (Al-Mosaind, 2001; Aldalbahi & Walker, 2016). There are multiple reasons for this hazardous trend. The oil-driven economic boom of Saudi Arabia, which started in the 1950s and accelerated since the 1970s, did not only lead to intense urbanisation of the country, but it has also positioned the car as a dominant means of transportation. Low prices of oil, car taxation, and car registration made cars widely available to Saudi citizens across different social strata, including those with lower incomes (Aldalbahi & Walker, 2016). Additionally, the 1973 Master Plan of Riyadh, developed by Doxiadis Associates, organised around the freeways that cut across the city connecting it to other parts of the Kingdom, and expressways, collector and local streets that hierarchically divide urban fabric could be seen as a form of planning devised entirely for car transportation (Aldalbahi & Walker, 2016). The 1978 update of the plan by SCET International introduced a ring road around the city to manage its growing urban fabric, thus opening up space for even easier automobile movement and growth of urban sprawl (Al-Hathloul, 2017).

Similarly, one of the reasons for the strong car dependency in Riyadh and other Saudi Arabian cities could also be seen in the lack of coherent strategies for the implementation of public

transport. The question of public transport in Riyadh was strategically tackled for the first time as part of the Metropolitan Development Strategy of Arriyadh (MEDSTAR) developed by Riyadh Development Authority (RDA), which aimed to manage the city's fast growth. As Al-Hathloul noted, only in 2012, a portion of the state budget was allocated to the design of Riyadh's public transport network, composed of "Metro lines with Bus Rapid Transit, community bus lines, feeder buses and park and ride facilities at the city's gates" (Al-Hathloul, 2017, p.115). The slow and late implementation of public transport strategies in Riyadh, thus, also contributed to the city's spatial organisation that is essentially dependent on private cars as the central means of transportation.

It was not only economic growth and urban planning practices that helped anchor Riyadh's dependency on cars. Instead, the cultural and religious values of the Saudi society also had a role in this process. The choice of the means of transportation could also be seen through the prism of class differences, where the use of the already limited options of public transport is mainly associated with poverty and especially related to foreign, low-income workers (Aldalbahi & Walker, 2016). In summary, despite their very different social and political contexts, contemporary Saudi Arabian cities followed a North American urban model that still largely centres cars as a dominant way of moving throughout the city.

3.2.2.6 Land-Use Segregation

Various authors analysed the relationship between zoning policies and urban fragmentation. Sonia Hirt examined the ways in which land-use laws and zoning practices have shaped American cities throughout history (Hirt, 2014). As Hirt pointed out, "by regulating what gets built and where, it (zoning) sets the basic spatial parameters of where and thus how we live, work, play, socialize, and exercise our rights to citizenship" (Hirt, 2014). Beyond spatial materialisation of the existing social values, zoning also shapes and produces new social relationships, and as such, could be seen as an inherently political tool that enables social ordering through the spatial organisation. Hirt built her argument on the critique of the early proponents of land-use segregation. They believed that separation in space would make safer environments by positioning these views as simplistic and ignorant of the fact that large social problems cannot be resolved only through environmental and urban design (Hirt, 2014). Her work outlined the numerous failures of zoning to solve various problems associated with living in cities, such as traffic safety, homeownership, and even public health. Instead, these practices have not only helped spur the growth of urban sprawl, but have also

allowed for the increase in the existing social, racial, ethnic, and class segregation (Hirt, 2014).

Similarly, by focusing on the relationship between zoning and 'main streets' in Chicago, referring to the walkable streets with small, local businesses—Emily Talen and Hyesun Jeong showed how land-use segregation continuously lowered the quality of streetscape, favouring car-based traffic over the pedestrian one (Talen & Jeong, 2018). Talen further underlined the negative effects of zoning practices on social diversity in urban areas (Talen, 2005).

In its expansion from a small town to the capital and largest city of Saudi Arabia, Riyadh has also gone through multiple phases of urban development and land-use changes. The 1973 Master Plan of Riyadh, thus, proposed segregation of the central business district from the rest of the city, which would be connected with the commercial 'spine' running in the north-south direction from the city centre. According to the Plan, the residential districts would be positioned on the left and right. Industrial areas would be concentrated on the east, and Wadi Hanifah would form a natural barrier on the city's west side (Al-Hathloul, 2017). With the growth rate quickly surpassing that predicted in the 1973 Plan, the following, 1978 'update' of Riyadh's urban strategy, proposed to connect the existing city fabric with big construction projects happening on the city's outskirts, the new airport, the 'diplomatic quarter', and new neighbourhoods on the east by constructing the ring road, while the southwest of the city was designated as an area for the low-income population (Middleton, 2009, Al-Hathloul, 2017).

During the 1980s, the expansion of Riyadh was already out of control. As Al-Hathloul pointed out, the 1978 Master Plan of Riyadh "was more of an organisational tool than a controlling force" driven by a pressure to provide enough new land for the construction of new housing units and infrastructure for the growing population (Al-Hathloul & Mughol, 2004; Al-Hathloul, 2017, p.111;). Al-Hathloul further observed how, with the already subdivided land in Riyadh, the boundary of the new Master Plan 'was not based on future requirements of land alone' but instead, "the judicious use of subdivided land became a crucial factor" in the city's urban growth (Al-Hathloul, 2017, p.111).

3.2.3 State

3.2.3.1 Urban Sprawl

Urban (over)growth and the rise of urban sprawl have been a common characteristic for almost all metropolitan areas worldwide. The origins of 'suburbia' or what Fishman described as settlements appearing 'beyond the city' (Fishman, 2002), in the Western context, could be traced back to the 18th and 19th century England and the construction of the middle-class detached villas on the outskirts of cities. The 'commercialisation' of the ideal suburban house, as Mubarak pointed out, led to the construction of 'less than the ideal' houses, and the rise of uniformed urban sprawls (Mubarak, 2004b). Over time, these tendencies, coupled with other social and economic transformations, have led to what Michael Dear and Edward Soja described as "complex, decentred, sprawling and polycentric landscapes" (cited in Landman, 2011, p.52; Soja, 1989; Dear, 2000).

Dolores Hayden discussed the emergence of urban sprawl in the United States over the last two decades, looking into how both residents and developers, and their opposing aspirations for freedom and profit, have helped shape American urban landscapes (Hayden, 2004). The suburban model of development in the US was born in the intersection of developers' turn towards peripheries as spaces of investment, construction industry lobby, and support of local governments in subsidising homeownership and providing investment for infrastructural development of peripheral urban settlements (Hayden, 2004). Renaud Le Goix framed gated communities themselves as an urban sprawl typology that local governments supported as a financially viable model in which most of the construction costs are offloaded to the developer and the home-buyer (Le Goix, 2005). In contrast to the popular discourse on suburban development that connects urban sprawl exclusively with the mass production of cars, Hayden's research offered a more complex perspective that involves both real estate developers and residents, giving space to analysis of natural and built elements of the environment, gendered positions on suburbia, and its relationship with political lobby and opportunism (Hayden, 2004).

The emergence and growth of urban sprawl have been criticised from various perspectives, with many of its negative effects on social and spatial relations being continuously underlined. Urban sprawl has been seen as a form of urban development that deepens gender (Frank & Hutchison, 2008), racial (Danielson, 2001; Ragusett, 2016) and class inequalities (Danielson, 2001), while its extensive occupation of land and car-dependency it

promotes, have also been framed in terms of its negative effect on the environment (Rome, 2001).

In his research on urban growth in Riyadh, Faisal Mubarak contextualised the development of the city's urban sprawl, pointing out the centralised government policies, inefficient urban planning practices, and real estate speculation as central elements of Riyadh's uncontrolled suburban expansion (Mubarak, 2004b). Suggesting that "the suburbanization process encompasses a multitude of cultural factors, including political, economic, organizational, and social trends of the society", Mubarak situated the emergence of Riyadh's urban sprawl into the context of the oil boom of Saudi Arabia, and the changing patterns of living that followed—raise of living standard and consumption, increased use of cars, and introduction of the typology of a semi-detached suburban villa during 1960s and 1970s (Mubarak, 2004b, p.577). In order to better understand such large-scale and fast-paced development of urban sprawl in Riyadh, it might be useful to unlock some of these processes in more detail.

As Stefan Maneval pointed out, the rapid economic development of Saudi Arabia, and the labour migration that followed it, created significant pressure for the construction of new housing and infrastructure in major cities (Maneval, 2019). To respond to these pressures, as previously mentioned, the Saudi government established the Real Estate Development Fund in 1974, which provided Saudi citizens with interest-free loans for the construction of private homes, thus initiating a 'construction boom' and setting off the land and real estate speculation (Bokhari, 1978; Maneval, 2019;). Maneval showed how, "as landowners speculated on higher future values, many central areas already enclosed by the network of roads remained undeveloped for years" (Maneval, 2019, p.33).

The 1973 Master Plan could be seen as the first large-scale, strategic effort of the Saudi government to control Riyadh's growth. The two square kilometre 'super-block' structure of the city proposed by the Plan, as Mubarak noted, "institutionalised the segregation of the city by income, hence imposing an economic map on the population" (Mubarak, 2004b, p.581). Additionally, it involved the construction of roads that laid ground for the suburban expansion (Aldalbahi and Walker, 2016). However, the unprecedented population growth did not correspond to the planned and built infrastructure, leading to the emergence of urban sprawl in other parts of the city (Al-Hathloul & Mughal, 2004). As Mubarak further observed, with the change of the Master Plan in 1976 "mega-landowners realised that money

could be made laying out roads and plots at the periphery", thus moving the housing and infrastructure construction to the city's outer territories (Mubarak, 2004b, p.582).

During the 1980s, limiting urban growth became the most important preoccupation of planning authorities in Riyadh and Saudi Arabia. In order to curb suburbanisation of cities, the Saudi government set the plan for 'Urban Growth Boundaries' in a number of cities across the country, which stated that the state would provide infrastructure only in the designated, planned urban areas (Mubarak, 2004b; Maneval, 2019). The strategy aimed to discourage construction outside of the Master Plan. Here, Maneval showed how this strategy, instead, led to the new level of real estate speculation—increase the prices of land within Urban Growth Boundaries and lower land prices at the city fringes, which now remained disconnected from the water and sewage system of the city, as well as other public services—a process that paradoxically still did not completely discourage the growth of urban sprawls (Maneval, 2019).

In summary, the emergence of urban sprawl in Saudi cities could be attributed to the multiplicity of factors, from privatisation of life, rise in consumption, and real estate speculation to inappropriate urban planning policies that failed to provide a sustainable framework for urban renewal development. Mubarak suggested that these processes resulted in a type of sprawl similar to the one in the United States and characterised by 'leapfrog development', 'commercial strip development', and 'large expanses of scattered, low-density residential development' (Mubarak, 2004b, p. 582). In contrast to the US suburbs, which, as mentioned, resulted from the offloading of infrastructural costs from the state to citizens and real estate developers—urban sprawl in Saudi cities continues to be heavily dependent on state investment into infrastructure and public services. As a result, vast zones of unplanned urban peripheries that function more like housing assemblages than as functional urban districts have emerged. Additionally, the conception of the city's Master Plans with its 'open grids' does not, in any way, limit the potential expansion of urban fabric, but instead, lays the ground for its endless expansion (Mubarak, 2004b). As Mubarak concludes, "instead of strengthening traditional forms of urban management, the monarchy eclipsed traditional organization structures and institutions, by pumping the housing market with the wealth derived from the sale of petroleum", and this manifested in the production of largely dysfunctional urban space and decrease in the quality of life of its inhabitants (Mubarak, 2004b, p. 573).

3.2.3.2 Urban Fragmentation

In her research, Karina Landman provided a framework for the systemic approach to urban fragmentation in contemporary cities, particularly those located in the Global South, using the DPSIR framework. Landman analysed the role of different drivers (globalisation, neoliberalism, and urbanisation) and pressures (fear of crime and violence) on the change of state of human settlements, characterised through the emergence of typologies such as gated communities or 'urban ghettos' (Landman, 2011). Occurring on both micro and macro scales, these changes in human settlements, by a mere act of creating physical divisions between different parts of population, contribute to social segregation in cities, thus resulting in sprawling urban landscapes and construction of contemporary cities as 'multi-nodal, variegated and spatially divided in terms of ethnicity and class' (Soja, 1989; Landman, 2011, p. 52).

Various authors offered different classifications of the types of spatial segregation in contemporary cities. Teresa P.R. Caldeira talked about modern metropolises as 'walled cities', whose spatial production is based on the construction of different walls, gates, and fences (Caldeira, 1996; Landman, 2011). Positioning the 'fortified enclaves' of Sao Paulo in relation to privatisation of security and transformation of the concept of the public, she noted how this spatial model represents "a new way of organizing social differences in urban space" thus helping generate "another type of public space and (…) interaction among citizens" (Caldeira, 2000, p.3-4). In this context, "privatizations, enclosures, policing of boundaries, and distancing devices create a public space fragmented and articulated in terms of rigid separations and high-tech security: a space in which inequality is an organizing value" (Caldeira, 2000, p. 3-4).

Outlining the racial and class dimensions of this kind of segregation, Mike Davis described this urban phenomena as a 'fortress city' (Davis, 1990) and Peter Marcuse a 'citadel formation' (Marcuse, 2001). Additionally, Marcuse and van Kempen framed a 'partitioned city' or a 'dual city' as the urban model based on the existing class and race divisions in the society, positioning the nation-state as one of the key actors in the production of this type of space (Marcuse & van Kempen, 2002). Marcuse further defined the building elements of the 'dual city', namely (1) 'the luxury city' describing it as 'the city of the wealthy', which is 'less important to its users as a residential location than as a location of power and profit'; (2) 'the gentrified city' inhabited by young professionals of different backgrounds; (3) 'the suburban

city' for the traditional family and lower middle class; (4) 'the tenement city' for the lower-paid workers; and finally (5) 'the ghetto' as 'the abandoned city', signifying urban areas of intense class, and often, race-based segregation (Marcuse, 1989).

Steven Flusty analysed spatial manifestations of what he calls 'urban paranoia' thus outlining five 'species' of space (1) 'stealthy space', referring to the 'space that cannot be found', and which 'is camouflaged or, more commonly, is obscured by such impediments as intervening objects or grade changes'; (2) 'slippery space', or 'space that cannot be reached, due to contorted, protracted or missing paths of approach'; (3) 'crusty space', signifying 'space that cannot be accessed, due to obstructions such as walls, gates, and checkpoints'; (4) 'prickly space', designating 'space that cannot be comfortably occupied', and finally (5) 'jittery space' or 'space that cannot be utilized unobserved due to active monitoring by roving patrols and/or remote technologies feeding to security stations' (Flusty, 1994, p. 48-49).

Stephen Graham and Simon Marvin positioned networked infrastructure as the core element of social and physical development of urban space, pointing out how the changes in infrastructure, its market-oriented production, and transformation lead to changes in social hierarchies within the city, thus resulting in some elements of infrastructure being accessible to one part of the population, and not to the other (Graham & Marvin, 2001). Graham and Marvin underlined how these hierarchies lead to the "palpable and increasing sense of local disconnection in such places from physically close, but socially and economically distant, places and people" (Graham & Marvin 2001, p.15). They coined the term 'splintering urbanism' to explain the ways in which infrastructure helps fragment the experience of the city.

Glasze and Alkhayyal suggested a classification of gated housing estates in Riyadh into three dominant types: (1) extended-family compounds, (2) cultural enclaves, and (3) governmental staff housing (Glasze and Alkhayyal, 2002). Consisting of a group of villas, fenced off with a common wall from the rest of the public space, gated communities, as authors noted, could be seen as a 'revival of the traditional living environment'—a trend boosted by real estate developers who recognised the potential in the popularity of Mediterranean-style villas during the 1970s (Glasze & Alkhayyal, 2002). The discovery of oil in Saudi Arabia by Western companies, as Glasze and Alkhayyal suggested, led to the massive influx of foreign professionals to Riyadh, and more broadly, to the Gulf region, who solved the pressing housing issues caused by these migrations by building residential compounds for their

employees (Glasze and Alkhayyal, 2002). Describing them as a form of urban life that takes place 'behind the gates', Glasze pointed out how "the Western enclaves were developed as the result of a confluence of traditional socio-religious urban segmentation and western models of gated master planned communities" (Glasze, 2006). Similarly, in a movement of workers from different parts of the Kingdom to large cities such as Riyadh, the need for housing increased substantially, and with the help of Western expertise, the Saudi government designed and constructed complete housing projects for its employees. One such project, called Al-Malaz, as Glasze and Alkhayyal write, "follows a gridiron plan with a formal geometric hierarchy of streets; a pattern which was nonexistent in the traditional urban structures" (Glasze & Alkhayyal, 2002, p.324). These practices, among others, testify to the state's role in increasing social fragmentation through spatial design in different Saudi Arabian cities (Mubarak, 1992; Al-Naim, 2008).

Jill Grant and Lindsey Mittelsteadt analysed the physical features of gated communities, suggesting how they show so much diversity that it may be misleading to consider them as a unified set of urban forms (Grant & Mittelsteadt, 2004). Discussing the social complexity behind gating practices, Grant further pointed out that "although walls and gates may look similar across cultures, they have a range of functions: physical, economic, social, and symbolic" (Grant & Mittelsteadt, 2004, p.919). Edward James Blakely and Mary Gail Snyder outlined three main categories of gated communities, namely (1) 'lifestyle communities' such as the retirement communities, golf and leisure communities, as well as suburban new towns, in which "gates provide security and separation for the leisure activities and amenities offered within"; (2)'prestige communities' referring to the enclaves for rich citizens, where 'gates symbolize distinction and prestige and create and protect a secure place on the social ladder, and (3) 'security zone communities' organised around the fear of crime and intrusion (Blakely & Snyder, 1999).

Drawing from his study of urban fragmentation in Buenos Aires, Daniel Kozak framed the following urban typologies that manifest spatial segregation: (1) squatter settlements; (2) urban areas divided by highways or railways; (3) social housing blocks; (4) social housing neighbourhoods; (5) mono-functional business districts; (6) business and industrial parks; (7) shopping centres and hypermarkets; (8) gated tower complexes; (9) gated communities, and (10) self-contained urban projects (Kozak, 2008). He outlined 'a fragmented city' as a city "in which the ability to use and traverse space is dominated by the principle of exclusivity and

there is a reduction in the number of places of universal encounter" (Kozak, 2008, p.256). As such, Kozak's understanding of urban fragmentation and his expansive classification of its typologies, represents an important reference for this research project.

3.2.4 Impacts

3.2.4.1 "Neighbourhood Effect"

The social and spatial configurations of cities have a powerful effect on the behaviours and quality of life of people who inhabit them. These effects are particularly visible on the scale of the neighbourhood. William Julius Wilson formulated the concept of the 'neighbourhood effect' in 1987 in his research on race and poverty in the inner-city ghetto communities, and since then, it was actively applied to studies in the fields of social science, public health, psychology, political engagement of citizens, as well as urban design (Wilson, 1987). Similarly, Robert J. Sampson analysed the effect of neighbourhoods on different aspects of social life, including crime and health civic participation (Sampson, 2012). Sampson further observed that the social characteristics of neighbourhoods and communities, including elements such as social ties and control, mutual trust, but also institutional resources, also have an impact on the well-being of their inhabitants (Sampson, 2003), or, on the other side, their problematic behaviour (Sampson, Morenoff, & Gannon-Rowley, 2002). His position starts from the assumption that, although globalisation significantly changed our built environment and our ways of inhabiting it, the specificity of the place still plays an important role in shaping our lives. Building upon the work of the Chicago School and extending their research by an inclusion of datasets obtained through new technologies and analysis of global urban case studies, Sampson analysed the 'neighbourhood effect' of Chicago's communities, thus pointing out the role of economic factors, such as availability of public housing, to give just one example, in the construction of a place (Harvey 1973; Castells & Sheridan, 1977; Sampson, 2012).

As Wang, Shaw and Yuan showed in their research on residents' experiences with the public amenities and communal spaces in the neighbourhoods of Shenzhen, measuring of the quality of life in residential spaces can take either an objective or subjective approach (Wang, Shaw & Yuan, 2018). While the objective approach focuses on the physical and environmental conditions of analysed neighbourhoods, such as its density, green areas, or infrastructure—the subjective approach usually relies on direct opinions and experiences of the residents and is seen as having "more weight in discussing the quality of space than

objective environmental characteristics" (Hur, Nasar, & Chun, 2010; Permentier, Bolt, & van Ham, 2010; Wang, Shaw & Yuan, 2018). In devising methodologies for accessing this type of research, as Wang, Shaw and Yuan further suggest, authors such as Earle Davis and Margaret Fine-Davis (1981) and David Chapman and John R. Lombard (2006) focused on individual-household characteristics and neighbourhood-level characteristics (Wang, Shaw & Yuan, 2018). On the other hand, authors such as Gan, Zuo, Ye, and Li (2016) created a more complex framework to measure neighbourhood satisfaction by its residents, focusing on the housing units, neighbourhood, estate management, and social environment (Wang, Shaw & Yuan, 2018).

Thus, for instance, NHS Health Scotland outlined the 'Place Standard Tool' (PST), signifying a framework for measuring the quality of life in analysed neighbourhoods, including relationships to both physical elements of a place and its social aspects (NHS Scotland, 2017). The PST is structured around the following topics: (1) 'moving around', (2) 'traffic and parking', (3) 'natural space', (4) 'facilities and amenities', (5) 'housing and community', (6) 'identity and belonging', (7) 'care and maintenance', (8) 'public transport', (9) 'streets and spaces', (10) 'play and recreation', (11) 'work and local economy', (12) 'social contact', (13) 'feeling safe', and (14) 'influence and sense of control' (NHS Scotland, 2017). In their research on the relationship between place and inhabitants' well-being, in the case of Skopje in North Macedonia and based on the use of the PST, Gjorgjev et al. concluded how, despite significant contextual differences between the two countries, the PST proved to be an efficient way of obtaining results in the context beyond that in Scotland (Gjorgjev et al, 2020).

Similarly, UN-Habitat also proposed a tool, namely the 'Cities Prosperity Index' (CPI), as a "multidimensional framework that integrates six carefully selected dimensions and several indicators that relate to factors and conditions necessary for a city to thrive and prosper", which also operates as an "asessment tool that enables city authorities as well as local and national stakeholders, to identify opportunities and potential areas of intervention for their cities to become more prosperous" (MOMRA & UN-Habitat, 2018, p.3). The six dimensions include (1) 'productivity', (2) 'infrastructure development', (3) 'quality of life', (4) 'equity and social inclusion', (5) 'environmental sustainability', and (6) 'governance and legislation' (MOMRA & UN-Habitat, 2018). Together with the Ministry of Municipal and Rural Affairs in the Kingdom of Saudi Arabia (MOMRA), UN-Habitat has launched a platform titled Future Saudi Cities Programme that analysed 17 key Saudi cities according to the above-mentioned

criteria, thus also laying groundwork for the future steps for social, spatial, and economic development of these urban areas.

In their research on the sense of community in gated and non-gated residential neighbourhoods through interviews with residents of neighbourhoods in Putrajaya and Bandar Baru Bangi in Malaysia, Sakip, Johari, and Salleh came to the conclusion that residents of non-gated housing areas demonstrated a higher sense of community (Sakip, Johari & Salleh, 2012). Similarly, and as discussed previously in this text, a number of authors observed how gated developments contribute to social differentiation (Ellin 1997; Marcuse, 2001; Caldeira, 2000; Davis, 2006; Landman, 2011). Landman suggested how "physical boundaries often lead to, or facilitate social exclusion, creating a barrier to interaction among people of different races, cultures and classes, which in turn adds to the difficulty of building social networks that form the basis of social and economic activities" (Landman, 2011, p.50). By privatising public space, diminishing the notion of a community and helping social exclusion, gated developments could thus be seen as an urban model that decreases the residents' quality of life who live in their immediate proximity.

Ultimately understanding this effect becomes more urgent, especially in the wake of the COVID-19 pandemic, where there was growing interest in designing healthier neighbourhoods. Adopting this perspective brings attention to how neighbourhood conditions (directly and indirectly) affect their inhabitants' physical health and mental wellbeing (Alwaer, Speedie, & Cooper, 2021).

3.2.5 Responses

3.2.5.1 Sustainable Urbanism

As Landman pointed out, there has been a multitude of responses to urban fragmentation, including (1) alternative forms of partnership between public and private stakeholders; (2) extension of types of relationships and networks between individuals and economic enterprises to include community ties, personal networks and social trust; (3) policy coherence; (4) focus on spatial integration and compact city approach through movements and programs such as 'new urbanism', oriented towards 'increasing urban densities', 'containing sprawl', 'mixed-use development' and 'housing and support for public transport'; and finally (5) focus on 'communicative rationality' by planners, referring to the position that assumes that "the spatial dimensions of various concerns of a range of stakeholders in cities

should be addressed through a process of inter-discursive reasoning, giving rise to consensus building through communication" (Harrison, 2003; Landman, 2011, p.52-53).

Here, the term 'sustainable urbanism' is often used to encompass a variety of urban planning principles and strategies associated with achieving the long-term well-being of citizens in the ecological, architectural, social, economic, health, and cultural spheres. Thus, for instance, Douglas Farr propagated sustainable urban design reform that focuses on walkability and diversity in relation to pressures to construct high-performance buildings and infrastructure typical for contemporary cities (Farr, 2007). Together with a group of authors, Farr outlined a number of principles of sustainable urban practice, including increasing sustainability through density, integration of transport, land-use and technology, development of 'biodiversity corridors', focus on the neighbourhood as the scale of design intervention, planning of car-free housing, popularisation of car-sharing, boosting of locally owned business and stores, universal basic home access, implementation of energy efficiency strategies, and others (Farr, 2007).

Similarly, Nan Ellin responded to the issues of urban fragmentation through her model of 'integral urbanism' (Ellin, 2006). Describing it as a guideline for a design of a 'more sustainable human habitat', Ellin framed 'integral urbanism' as an attempt to "heal wounds inflicted upon the landscape by the modern and postmodern eras such as visually unappealing places, impoverishment of public space and heightened perception of fear, diminished sense of place and sense of community and environmental degradation" (Ellin, 2006, p.13). In order to overcome these problems, Ellin's 'integral urbanism' evolved around the following principles: (1) 'hybridity and connectivity', which 'treat people and nature as symbiotic' referring to both buildings and landscapes; (2) 'porosity' which aims at connecting elements and integrity of human-natural landscapes, rather than applying the modernist logic of division, zoning and segregation; (3) 'authenticity', or engaging with the actual social and physical conditions; and (4) 'vulnerability', referring to efforts to "relinquish control, listen deeply, value process as well as product, and re-integrate with space and time" (Ellin, 2006, p.14).

At the same time, a number of authors offered a critique of the often simplistic propagation of 'sustainability' in urban planning. Pointing out how the narratives of sustainability often draw from the narratives of crisis, which is inherent to capitalism, Ross Exo Adams described the 'eco-city' as a "mechanism conceived by neoliberal state politics" (Adams, 2010, p.2).

Adams further observed how architects and urban planners often adopt this 'rhetoric of sustainability' uncritically, contributing to this discourse with data and designs but rarely questioning this concept's contemporary socio-political context and dualities. He described the 'eco-city' visual ideology as a form of 'nostalgia for the present', effectively pointing out:

> Far from a concern for the annihilation of nature—for nature in such images appears not as an endangered wilderness, but as an abundant and manipulable surface, an (overused) accessory to the urban—such imagery makes visible another far deeper fear: the fear of loss, not of a threatened nature and its capacity to sustain life, but of the conditions which sustain a threatened liberal utopia'. (Adams, 2010, p.7)

3.2.5.2 New Urbanism

One of the responses to the increased urban fragmentation has also been 'New Urbanism'—the urban planning movement initiated during the 1980s in the United States, whose proponents advocated for the "restructuring of public policy and development to make cities and towns more engaging, vibrant and livable" and who supported the creation of "sustainable, walkable, mixed-use neighbourhoods that provide for better health and economic outcomes" (Besel & Andreescu, 2013, p.xiv). Emily Tallen described the goal of New Urbanism as the creation of "vital, beautiful, just, environmentally benign human settlements" (Tallen, 2005, p.1). The ideas at the core of New Urbanism draw from the previous work of scholars and planners who criticised post-WWII modern principles of planning, as defined through spatial segregation and zoning, and in the United States, also the emergence of car-oriented urban sprawl of single-family houses. Some of the central propagators of this critique were Lewis Mumford, who described the post-war development as 'anti-urban' (Mumford, 1961), and Jane Jacobs, who called for planners to rethink urban planning principles centred around car transportation, single-family housing, and segregation of commercial centres (Jacobs, 1961, Besel & Andreescu, 2013). Officially founded in 1993 through the Congress for the New Urbanism organised by the American architects and planners, as Besel and Andreescu show, with the principles of New Urbanism such as "walkability, connectivity, mixed-use and density, mixed housing, quality architecture and urban design, traditional neighbourhood structure, increased population density, green transportation, and sustainability", the final objective of the movement was to "increase the residents' quality of life" (Besel & Andreescu, 2013, p.xv). To do that, New Urbanists pointed

out how questions of environmental protection, community, sustainable economy, and public health need to be closely intertwined with urban planning (Besel & Andreescu, 2013).

Arguing that urban design needs to involve both local and global, as well as market and regulatory contexts, Carmona, Heath, Oc and Tiesdell outline several dimensions of urban planning, such as the morphological dimension, referring to the layout and configuration of urban form and space; the social dimension, that argues for the inter-connectedness between space and society, positioning that, it is not just the people who modify space, but also space that, in turn, changes social relations; the functional dimension, focused on how places work and what is the role of urban planners in improving the quality of inhabiting spaces and places; and, the temporal dimension, that underlines the importance of time and change in spatial relationships (Carmona et al., 2003).

As part of the New Urbanism movement, various authors offered design ideas and strategies for more sustainable urban planning. Allan Jacobs and Donald Appleyard pointed out the eight central problems of modern urban design: 'giantism and loss of control', 'large-scale privatisation and the loss of public life', 'centrifugal fragmentation', 'destruction of valued places', 'placelessness', 'injustice', and 'rootless professionalism' (Jacobs & Appleyard, 1987). Starting from here, Jacobs and Appleyard outlined 'goals for urban life', seen as principles for sustainable future of urban environments, including values such as: 'livability'; 'identity and control'; 'access to opportunity'; 'imagination and joy'; 'open communities and public life'; 'self-reliance and justice' (Jacobs & Appleyard, 1987). Positioning walkability as one of the central features of his urban design agenda, Jeff speck outlined 'ten steps of walkability' as following: (1) 'put cars in their places'; (2) 'mix the uses'; (3) get the parking right'; (4) let transit work; (5) 'protect the pedestrian'; (6) 'welcome bikes'; (7) 'shape the spaces'; (8) 'plant trees'; (9) 'make friendly and unique faces'; and, (10) 'pick your winners' (Speck, 2012). Similarly, Duany, Lydon, and Speck argued that sustainable urban planning requires design across various spatial scales, such as region, neighbourhood, street, and building, offering guidelines for implementing smart growth principles (Duany, Speck & Lydon, 2009).

3.3 Conclusion

As this literature review has shown, the problem of urban fragmentation, both as a historical and contemporary phenomenon emerging as a consequence of a variety of social, political, economic, and spatial factors and practices on both global and local scale, still represents

one of the central problems of urban design. The Drivers-Pressures-State-Impacts-Responses (DPSIR Framework) has been used in the literature to study urban sustainability and urbanisation more broadly. The drivers in research studies include urbanisation, globalisation, and privatisation. The literature also illustrates that fear and security also play a prominent role in spatial organisation. Architects and planners play a role in enhancing the role of fear and security's prominent role in development as the tools of environmental design are used as methods to promote crime prevention. Foucault's research on power plays out in the literature into urbanisation as a locus of control that further segregates society and increases urban sprawl.

The consequences of urban fragmentation are not merely spatial, but instead, they cut across all spheres of society, directly influencing the quality of life in cities. Manifested in a wide range of urban typologies, spanning from gated communities to urban ghettos, and involving both residential, but also public spaces—urban fragmentation, as this literature review showed, is particularly visible in urban landscapes of the Global South. Focusing on the case of Riyadh, this chapter aimed to map and outline central forces that led to the current state of urban fragmentation in the context of Saudi Arabian cities, thus laying the foundations for the next part of this research.

Chapter 4: The Research Context and the Changing Urban Landscape of Riyadh

4.1 Introduction

Due to economic growth stimulated by government policies, urban areas in Saudi Arabia have had unprecedented expansion in the last several years (Al-Hathloul and Mughal, 2004; Mubarak, 1999, 2003). The cities of Dammam, Jeddah, and Riyadh are just three Saudi metropolises that have expanded rapidly. But this rapid urban development has created some major urban growth management complications. This chapter will discuss the various planning methods for inevitable expansion and controlling urban growth by focussing on a case study of Riyadh, Saudi Arabia's capital city. Firstly, this chapter will focus on the beginning stages of development in Riyadh before moving on to a discussion of the various stages of growth, beginning with the most significant event in Saudi Arabian development, the discovery of oil, which led to rapid development in the 1960s and '70s as populations flocked to the capital seeking employment. The 1980s and '90s will then be discussed as the first decades where urban planning began to take place in Riyadh. The chapter will then discuss the 2000s and beyond when the Saudi Arabian government began promoting the urbanisation and economic development of smaller, mid-sized cities to reduce immigration to the larger cities. Next, this chapter will focus on the structure of planning in Saudi Arabia, the ministries involved in urban development, and the five-year plans and planning guides they are responsible for overseeing. Next, urban growth in Riyadh, including the first and second master plans for Riyadh, urban growth boundaries, and local governance, will be discussed. Finally, traditional and modern urbanisation will be discussed, including land grants for citizens, the real estate development fund, energy issues, and problems associated with growth before concluding the chapter.

4.2 Growth and Development in Saudi Arabia

Saudi Arabia emerged as a nation-state in the late 18th century and eventually unified into a monarchy, the form of government still practiced today. The Saudi Basic Law of Governance was created in 1937, during the early period of unification. The Council of Ministers was established in 1953, formalising a structure of government. Shortly thereafter, the Saudi

government began the first of several attempts to shape the structure of development (Al-Qahtani, 2003). Still, it wasn't until about 20 years later, in 1970, that the government supplied the first inclusive plan for economic and social development in Saudi Arabia. This significant achievement was the first development plan in Saudi Arabian history (Al-Hathloul & Anis-ur-Rahmaan, 1985).

As a relatively 'new' country, Saudi Arabia has many challenges to consider: an absence of a skilled workforce (Mashabi, 1988; Al-Hammad, 1995; Berch et al., 1995); a strong centralised government that must deal with the weak local autonomy (Mubarak, 2004a); and the lack of plans and policy ideas for alleviating urban crises (Al-Hathloul & Narayanan, 1995). Since the 1970s, however, the growing oil production revenue has created opportunities to 'modernise' Saudi Arabia, and the government has been pushing systematic development. The increase in oil money has allowed Saudi Arabia to invest heavily in modern infrastructure and establish better public services (Mashabi, 1995; Mubarak, 1999). The urban areas received the most extensive improvements due to the government's concentrated development efforts in the cities which, subsequently, created a sudden rise in attractive urban jobs (Al-Ankary & El-Bushra, 1989; Mubarak, 1995).

In the five decades since the government began focusing on development, Saudi Arabia has worked through many internal and external difficulties (Heller & Safran, 1985; Al-Mobarak, 1993; Al-khalifah, 1995; Mubarak, 2004a). Because of this, the Saudi government favours new development over reforming the existing economic and social systems. Traditional jobs, particularly seasonal trade and agriculture, are slowly being abandoned as people migrate to urban areas from rural ones, leaving behind weak social relationships in favour of better-paying jobs and amenities (Mubarak, 2003). The various stages of economic, social, and urban development Saudi Arabia has witnessed in the past few decades will be discussed in the following subsections.

4.2.1 The Beginnings of Development

Al-Rasheed (2002) notes that trade and Hajj routes, which passed through Saudi Arabia, have shaped the Arabian Peninsula's economic and urban systems since long before the country's unification. Makkah and Medina, the Islamic holy cities, relied on the trade routes passing through them and were among the first to urbanise due to their rich economies (Al-Hathloul, 1991). The status and influence of these cities were further elevated by a large number of

Muslims travelling to these holy cities (Held, Cummings, & Cotter, 2014). But development wasn't just confined to the holy cities themselves; cities and villages along these trade and Hajj routes also saw an improved economy and subsequent urbanisation and development (Al-Rasheed, 2002).

Still, since development in this pre-unification period was limited to the holy places and the cities located on the way to these holy places, analyses of this stage of urban development have little bearing on this study. For although these forms and patterns of urbanisation are important in the historical context, most historically urban cities have changed considerably by more recent economic and political factors.

4.2.2 Stages of Development and Growth

Development again went through a spike in the 1930s and the highly-political unification of Saudi Arabia, an event that fostered a change in the old economic and urban systems (Al-Hathloul, 1991). However, this alteration was gradual (Al-Rasheed, 2002) at least until 1938, when the single most important event in Saudi Arabian history (besides unification) occurred: the discovery of oil.

Oil altered the economic and urban systems in two fundamental ways. The first was that the influx of oil revenue allowed for an increase in public spending. The second was that cities and villages spatially adjacent to oil industry operations were quickly urbanised due to this spending, as well as other factors (Al-Ibrahim, 1982). This period of Saudi Arabian development can be divided into three distinct phases: the 1960s and 1970s; the 1980s and 1990s; and the 2000s through to today.

4.2.2.1 The 1960s and 1970s

Rapid urbanisation is the central aspect that characterises the 1960s and '70s (Al-Hathloul, 1991). Between 1963 and 1974, the urban population grew from 0.98 to 3.1 million people, representing a 10.5% annual growth (Al-Ibrahim, 1982). The main cities saw the most growth; Riyadh, the capital city, grew from about 168,000 residents in 1962 to 666,000 in 1974, while Jeddah increased from 147,000 residents to 506,000 (Al-Hathloul, 1991). In just these two cities, there is an increase of almost one million people—roughly half of the urban population increase.

Growth in these decades was mainly caused by the internal migration of people flocking to cities as the source of new job opportunities. Unfortunately, as Al-Rasheed (2002) points out,

the Saudi Arabian government was not prepared for this population influx and thus agreed there was a need for direct planning and development in urban centres (Al-Hathloul and Anis-ur-Rahmaan, 1985).

4.2.2.2 The 1980s and 1990s

The first urban planning began during the 1980s and '90s, with Riyadh as the first proving ground for development ideas and processes (Al-Rasheed, 2002). Al-Hathloul (1991) notes that even though the concept of urban planning was already in practice by this point, the actual processes had to be re-evaluated as city populations continued to grow. Thus, during these decades, the government began granting land and 25-year interest-free loans to consumers, sparking an increase in migration from rural villages to urban centres. There was also an influx of non-local residents from outside Saudi Arabia who came to the country to work in oil-related industries. This wasn't necessarily organic population growth; the Saudi government had to entice skilled workers into the country since, at the time, the Saudi workforce lacked sufficient experience in planning.

Both the rural-urban migration and the international migration spiked growth and development within Saudi Arabia, but not always in equitable ways. Al-Ibrahim (1982) mentions how the government observed a decrease in the populations of villages and rural areas, as well as a decrease in mid-sized cities located close to larger urban areas. He describes how pervasive this population shift was by the end of the '90s and how it forced the government to take action. The Saudi government ultimately used the findings of regional and local studies in an attempt to reduce migration to those cities.

But the government couldn't slow immigration completely. As the Ministry of Planning and Economy (1980) wrote:

> There was definitely a big change in the physical environment for all cities and many villages of Saudi Arabia, in material standards of living, and some changes in lifestyle, and there have been significant changes in the distribution of the population, with a high rate of drift in the urban areas and the migration of the rural population. (p. 67)

Moving to larger urban environments, especially major city centres that provided greater services, increasingly became the hallmark way to attain a better quality of life (Al-Yemeni, 1986). After all, big cities provided opportunities for quality higher education or high-paying government jobs (Arishi, 1991).

4.2.2.3 The 2000s and Beyond

It was in the 2000s that the Saudi government realised it was in the country's best interest to act on the findings of the regional and urban studies by promoting the urbanisation and economic development of mid-sized and small cities in order to reduce immigration to the big cities, a trend which continues today (Al-Hathloul & Mughal, 2004). One recommendation from the studies, for example, was to raise the standard of living in small and mid-sized cities by allocating funds to city municipalities for increased economic and social development (Looney, 2004). However, despite the government taking action to halt migration, too many people are still relocating to urban centres. Garba (2004) notes a considerable concentration of urban growth and heightened economic activity in Riyadh and the capital city region, even though other cities in the same region have retained weak levels of economic urbanisation.

There is a clear difference in the amount of development between major cities and other cities. Only 25% of the population in the Riyadh region live in cities or villages outside the capital itself—which means almost 75% of people live directly in Riyadh (GaStat, 2012). By 2016, Riyadh's population had increased to 79% of the total regional population (RDA, 2016).

This increase in population causes a subsequent rise in the standard of living. Due to Riyadh's swift urban development and the shift in Saudi Arabia's general economic structure, there has been a 1900% increase in Riyadh's gross domestic product (GDP) in the past 20 years, bringing the GDP to approximately 60 million riyals (Riyadh Principality, 2011). Population growth and increased employment are the main factors contributing to this economic development, though there are others. But a rapid influx of people brings urban and economic development difficulties along with the wealth. In particular, the Riyadh region suffers from an uneven population distribution, urbanisation, and subsequent economic distribution, which has led to vast residential and economic development in the city of Riyadh to the detriment of other cities and villages in the capital's region.

Figure 4.1 shows Saudi Arabia's population distribution remains centred in three provinces: Riyadh, Makkah, and the Eastern Region. It highlights the disparity of urban development resources, which are parcelled out to more densely populated regions and cities at the expense of rural communities, and the need for strategic plans to be implemented to ensure more balanced development.

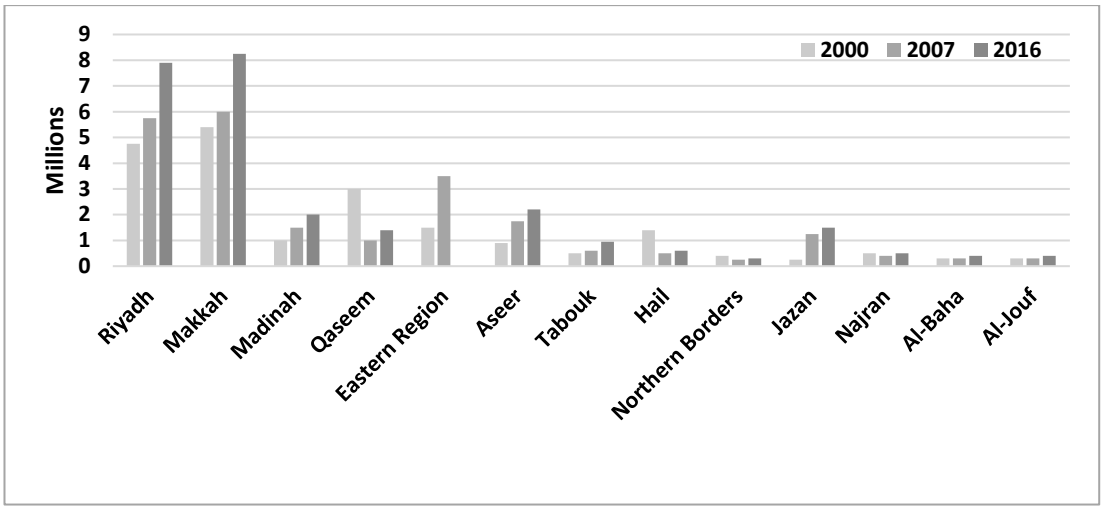


Figure 4.1 The population in the region of Saudi Arabia (2000, 2007, 2016)

4.2.3 The Structure of Planning

Saudi Arabia is led by a king, with the Council of Ministers acting as the formal body enacting legislative and executive powers. The law establishes the Majlis Al-Shura as a consultative council and creates regional assemblies (i.e., councils) appointed by the prime minister and regional governors (Cordesman & Obaid, 2005). Overarching, national legislation is the focus of the national level of government while the regional/local levels concentrate on implementing government projects.

Urban planning, however, is confined to the local level (despite its national impacts) and is based on the administrative framework and planning structure applied in urban developments. There are three ministries that have the power to provide development planning in Saudi Arabia (RDA, 2005). The Ministry of Interior organises the scale of planning and outlines the roles and responsibilities for each administrative unit; it is a more central, internal body. The Ministry of Economy and Planning is characterised by its efforts to create national, five-year plans. The Ministry of Municipal and Rural Affairs (MOMRA) focuses on spatial planning for regional and urban areas. But these three government entities only provide planning and development guidelines; it is up to the municipal and services sectors to execute the necessary programs and projects.

4.2.3.1 Five-Year Plans

Urban centres that have experienced significant increases in population have had to deal with a surge in energy and water use, a lack of infrastructure to support the burgeoning

population, and how industrial, agricultural, and commercial areas are distributed and used. They also must deal with added pressure to develop more residential space to support the demand for housing. These realities of urban growth issues forced the Saudi government to standardise growth management practices in all regions of the country, instead of targeting only the large urban environments. To that end, the government adopted a cycle of five-year plans for national development.

Currently, Saudi Arabia is in the ninth cycle in the sequence (2010 to 2014); as of the writing of this research (2021), the country should be in its 11th Developmental Plan, but the last published developmental plan was the ninth, and there isn't any evidence of the creation of additional five-year plans. The Eighth Development Plan (as shown in Table 4.1) spanned 2005 to 2009. It addressed environmental protection challenges, encouraged sustainable urban development, and promoted the national vision for future urban growth.

Table 4.1 The Eighth Five-Year Development Plan (MEP, 2005)

	Goals
1	Transferring most powers from the central level to the regional and local.
2	Establishing the legal framework for spatial planning at the national and regional levels through a comprehensive and standardized system of urban planning which clearly defines the powers and responsibilities of all concerned agencies' development directions and growth centres.
3	Upgrading environmental health with defined and effective environmental criteria including protection of the air, water, soil, and fauna and flora, as well as protection of the built environment through proper planning of land use noise control recycling, and treatment of urban waste and wastewater.

This focus continued in the Ninth Development Plan from 2010 to 2015 as the government set out environmental requirements and continued promoting sustainable urban development. These mandates were intended to reinforce the idea that natural resource sustainability is essential to the future of Saudi Arabia. This Ninth Plan also noted it would enforce the General Environmental Law and Rules for Implementation and highlighted the strategic role environmental management plays in development (MEP, 2010). But the Ninth Plan also recognised the sprawling, haphazard nature of Saudi city growth, and committed to facing the multidimensional challenges to sustainable development inherent in such a system (shown in Table 4.2). The plan outlined 13 national objectives; the urban growth objectives are shown in Table 4.3. Unfortunately, however, these growth-related goals did not contribute to the success of growth in Saudi cities.

Table 4.2 The Ninth Five-year Development Plan, responses to development challenges (MEP, 2010)

	Goals
1	Adherence to long-term strategic plan as a national goal by prescribing Structure Planning as a mandatory style of planning for all municipal authorities.
2	Inter-agency coordination to provide adequate public services in health, education, and infrastructure for water, sanitation, electricity, transport, communication through a comprehensive database.
3	Strict application of urban boundary and land use regulations;
4	Encouraging vertical development of cities within the capabilities of services such as water and sanitation;
5	Providing an integrated, modern public transport system in major cities and suburbs;
6	Developing radical solutions for vacant lands within cities, to ensure their optimal utilization; and
7	Distributing economic opportunities and services facilities in a way that reduces horizontal expansion of large cities.
8	Application of technologies for safe disposal of organic waste; enhancing technologies for recycling solid waste; ensuring widespread coverage of the sanitation system; reducing pollutants in petroleum products; and reducing carbon pollutants emitted by vehicles and means of transport through strict traffic controls
9	Expanding participation of citizens through empowerment of elected members in the municipal councils.

Table 4.3 The Ninth Five-year Development Plan, urban growth objectives (MEP, 2010)

	Goals
1	To achieve balanced development among regions of the Kingdom and enhance their role in social and economic development.
2	To enhance human development, expand the range of options open to individuals to enable them to acquire and use knowledge, skills and expertise, and provide appropriate healthcare services.
3	To raise the standard of living and improve the quality of life of all citizens.
4	To diversify the economic base horizontally and vertically, expand the absorptive and productive capacities of the national economy and enhance its competitiveness, and maximize the return on competitive advantages.
5	To move towards a knowledge-based economy and consolidate the basis of an information society.
6	To enhance the role of the private sector in socioeconomic and environmental development and expand domains of private investments (domestic and foreign) and public-private partnerships.

It is important to note that in 2016 the government introduced the Saudi Vision 2030 plan, which is a strategic framework meant to reduce Saudi Arabia's dependence on oil, diversify its economy, and develop public service sectors such as health, education, infrastructure, recreation, and tourism. It is unclear how this national guidance will affect the five-year plan model.

4.2.3.2 The Planning Guides

To aid Saudi Arabia’s attempt to mitigate urban growth, six planning guides were developed. These are updated regularly and used for more local/regional planning in conjunction with the five-year plans (which focus on larger, country-wide frameworks).

1. The **National Spatial Strategy (NSS)** provides a general framework to manage spatial development. The NSS is a national, high-level view of planning practices and is based on national goals integrating with the regional and local goals.
2. The **Regional Plan Guide (RPG)** provides a mid-level urban planning perspective. It details the long-term vision for Saudi Arabian development and should be used to facilitate impacts on urban activities during a specific time period. It highlights

some of the key aspects of development, including managing the expected distribution of land for various uses, the population structure, and the economic, service, and network infrastructures. Finally, the RPG serves as the link between the National Spatial Strategy and the Structural Plan Guide.

3. The **Structural Plan Guide (SPG)** lays out the governmental vision of how land should be distributed for various uses. It also details the operations of a city's main development and subsequent development projects until the target year. The SPG is based on the recommendations in the NNS and RPG.
4. The **Master Plans Guide (MPG)** is the urban development plan for the local level. This plan focuses on infrastructure and the developmental vision it promotes. The MPG provides the framework to detail and identify land uses, facilities, and road networks and lays out the requirements and controls for development.
5. The **Rules of Urban Boundary (RUB)** is a spatial framework guide that notes the limitations of both current and future urban infrastructures. It highlights the urban development operations, land use, population centres, services, and places significant to the urban environment and the influential parts of the city.
6. The **Roads and Buildings Guide (RBG)** was the first planning guide created in 1941. This guide created a system that focused on urban development planning and physical infrastructure building instructions and specifications. It is still considered the primary method of evaluating urban construction and planning procedures and actions.

In addition to these nationally-recognised guides for improving urban planning practices, MOMRA and private consulting firms have collaborated to produce about 20 planning booklets to aid urban planning development. These booklets cover a wide variety of topics, including neighbourhood planning and urban design. However, overall these booklets have been unable to meet the needs of cities like Riyadh; they do not reflect sustainability practices that allow for such exponential growth.

4.3 Urban Growth in Riyadh

Understanding the policies of urban growth, how these growth stages progress over time, and how non-sustainable growth often worsens based on these policies is critical to finding urban development solutions, according to many scholars (Albrechts and Swyngedouw, 1989; Bengston et al., 2004; Glaeser and Kahn, 2004; Moulaert and Nussbaumer, 2005;

Bhatta, 2010). Riyadh is the best example of how all these aspects intertwine. Riyadh's infrastructure, transportation, housing, and urban sprawl have all been affected by the city's unreliable population growth rates and its fragmented urban spatial environment. This section will analyse the growth framework of Riyadh by presenting the population growth factors and demographics, as well as a brief history of Riyadh's past and future urban development plans based on these demographics and trends.

4.3.1 Population Growth Factors and Demographics

Urban population growth in Saudi Arabia can be divided into three eras: pre-oil, pre-planning, and post-planning. The pre-oil era is characterised by the creation of government policies that were a factor in the settlement and resettlement of urban areas, leading to a modernisation of the everyday lives of rural citizens. Thus the growth of cities during this period was mostly driven by significant rural-urban migration (Al-Hathloul & Mughal, 2004). The real beginning of the urban landscape in Saudi Arabia began in 1940 when commercial oil production was launched, subsequently creating new cities. Urban population growth during this 'pre-planning era' was driven by oil revenue wealth (which prompted rural citizens to come to cities in search of better living conditions and jobs) in addition to the natural population increase (Smith, 1985). The post-planning era dates to 1996, when the Ministry of Municipal and Rural Affairs set goals to enable more carefully-planned urban development. These goals are based on the values and principles that support Saudi Arabia's future development objectives and include the guidelines noted in Table 4.4.

Table 4.4 Objectives for future development (MOMRA, 1996)

	Goals
1	Seeking to make the urban cities healthier and convenient places to live.
2	Seeking to make the big and medium cities as centers operate commercial, industrial and service.
3	The provision of basic municipal services and infrastructure and improving housing and living conditions in urban and rural areas.
4	Promote the health, social and environmental aspects of urban and rural areas.
5	The development of residential and commercial areas and the potential for industrial action in cities and towns.
6	Seeking to develop and improve transportation and communication systems.
7	Improve the organizational and administrative structures of the sectors of municipal and rural services.

Between 1960 and 1985 (the pre-planning era), the rate of urbanisation increased from 15% to 75% (Daghistani, 1991), exemplified by the rapid expansion of already large Saudi cities such as Riyadh, Dammam, and Jeddah. However, as already noted, there were no procedures in place during this period to regulate the growth process (Al-Hathloul & Narayanan, 1995). As a result, in 1985 (during the Third 5-year Development Plan), the government started to

focus on the pressing need to plan the layout of all Saudi Arabian regions and provinces. The Saudi government engaged the Ministry of Municipal Affairs and local authorities and cities to aid in creating specific urban development goals within these five-year plans (Daghistani, 1991). This future-looking focus led to the emergence of infrastructure to improve the ability to provide public utilities (e.g., electricity, telecommunications, and safe drinking water) and municipal utilities (e.g., roads, healthcare, and education facilities) for local communities.

Though urban population growth is caused by multiple factors, the most influential are economic (Al-Hathloul & Narayanan, 1995); economic prosperity in a city result in job opportunities, often especially attractive to people in rural areas. Another element contributing to population growth is the increase of foreign workers. Some researchers (Richardson, 1993) point out that the shift to a more stable political system was another factor in populations moving from rural, nomadic life to static urban environments. No matter the reason for urban population growth, the increase in urban demographics will continue to strain municipal, health, and education services and sectors, thus affirming the need for fully-developed urban planning to sustain such growth, something expressed by the 2008 United Nations Goals.

The population estimates and growth projections for Riyadh (compiled from a variety of sources and shown in Table 4.5 and Figure 4.2) highlight the serious challenges facing the capital city and showcase the need for urban development planning to undergo continuous revision—and these numbers may not fully capture the reality of Riyadh demographics. The official government estimate puts the current population of Riyadh much higher than these results show. This official population growth estimate was substantially higher than earlier estimates (RDA, 2015) of Riyadh's population, which landed at more than six million people. And, of course, development planners expect to see a continued increase in population growth and urbanisation rates.

Table 4.5 Growth of Riyadh's Population to 2016

Year	Population	Source
1862	7,500	Palgrave, W.G. (1908)
1919	19,000	Phillby, J.P. (1922)
1930	27,000	Rough, W. (1969)
1940	47,000	Ministry of Interior (1969) Building Survey
1949	83,000	Ministry of Interior (1968)
1954	106,000	Ministry of Finance & Nt'l Economy(Census,1962)
1962	169,000	Ministry of Interior (1968) T.P.O.
1970	350,000	Ministry of Finance & Nt'l Economy (Census,1976)
1974	609,000	Ministry of Municipalities & Rural Affairs (1978)
1977	690,000	Al-But'hie Dissertation (1996)— RAMP Socio-econ. Survey
1982	1,206,700	Daghistani (1985)
1983	1,323,750	Mecci (1987)/Daghistani Forecast (Al-But'hie Dissertation)
1986	1,389,000	Riyadh Development Authority (1987)
1990	2,200,000	Based on the rate of growth between the two (Al-Naim,1990;Mecci,1986 estimate)
2000	4,194,000	Riyadh Development Authority
2006	4,600,000	Riyadh Development Authority
2010	5,271,991	General Authority for Statistics
2016	6,506,000	Riyadh Development Authority

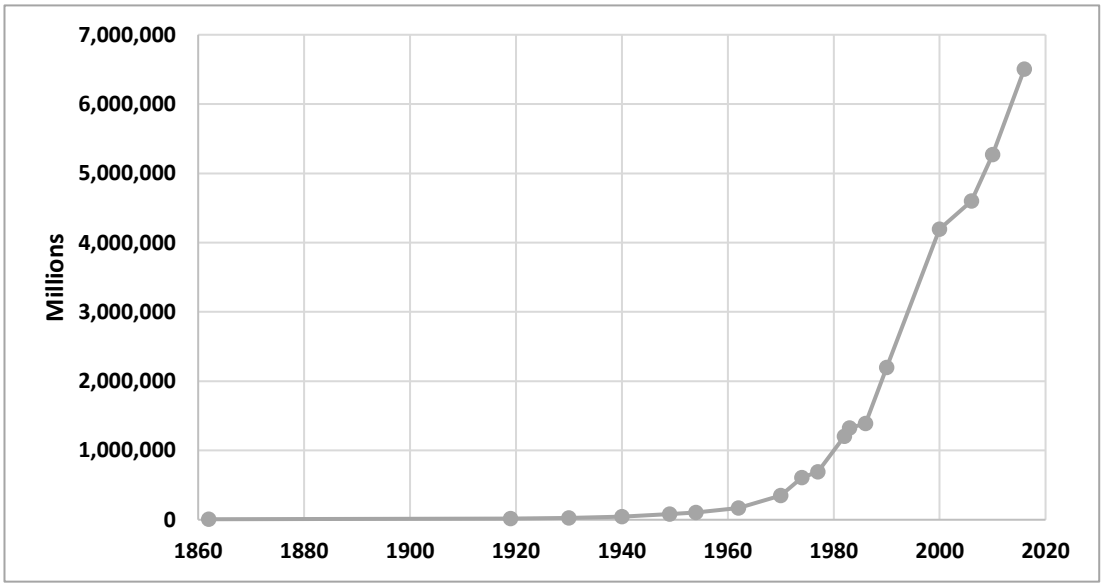


Figure 4.2 Growth of Riyadh's Population from 1862 to 2016

4.4 The First Master Plans in Riyadh

It was obvious very early in the post-oil period that Riyadh would require some direction to guide and control its growth. But urban planning at that time was limited; the Saudi government lacked personnel with adequate planning expertise and therefore had to rely on foreign planning firms. In 1971, the Doxiadis Associates created the First 5-year Development Plan (Middleton, 2009). The plan focused on driving urban growth along a north-south axis (as shown in Figure 4.3 below). It also presented the idea of constructing Riyadh

neighbourhoods in a modular grid of 2 square kilometres, a practice known as 'growth boundaries', to encourage urban sprawl. But by the end of the 1970s, a Second Development Plan had to be created due to Riyadh surpassing the First Plan's boundaries (RDA, 2005).

Middleton (2009) writes that:

> By 1979, according to Al- Sahhaf the areal extents of the city had expanded to 162.3 square kilometres and included 38.60 square kilometres of vegetated lands. The city had achieved the Doxiadis projections of urban growth in seven years, a sharp contrast to the area expansion outlined by Doxiadis, which was to unfold over thirteen years. (p. 139)

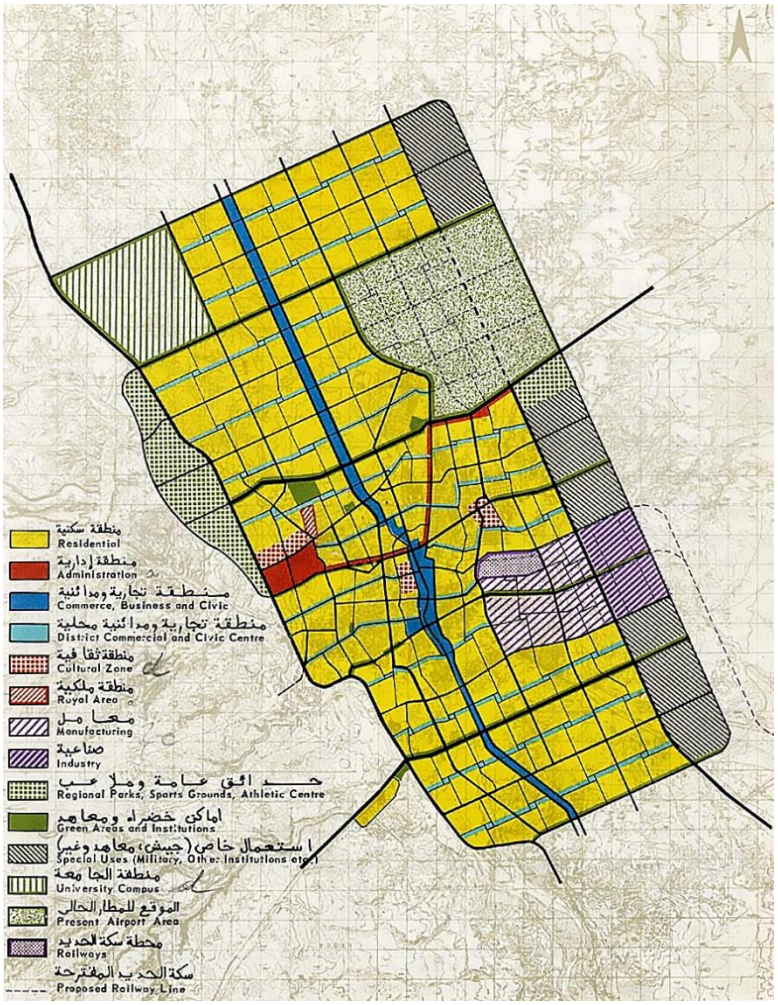


Figure 4.3 The First Master Plan Riyadh, 1972, Doxiadis Associates Source: (Middleton, 2009, p.116 and p.132)

Al-Nowaiser (1994) notes that Doxiadis' Master Plan failed in Riyadh because it was nowhere near accurate in predicting the magnitude of Riyadh's growth, nor the speed with which the

urban population would increase. Furthermore, some of the Doxiadis Plan goals and provisions contradicted the plan itself. For instance, the Plan suggested the optimal population density would be 60 people per hectare for overall population density and 200 people per hectare for the total net density of residents. But the Plan's regulations and processes ensured overall density would be 87 residents or less per hectare, and net density would be 142 residents or less per hectare (Al-Hathloul, 1981).

The Doxiadis Plan, written by non-Saudis, also neglected to account for Saudi cultural traditions. City planning included a provision to leave the front and sides of all houses in the city clear (Middleton, 2009). This modern development style contrasted with the traditional Saudi city characteristics prevalent in the older infrastructure of Riyadh.

Despite the wasted residential space, current urban planning still follows this style. The frontal space takes up five-tenths of the street display between three and six metres, while the other sides of the land take up two metres on each side. Continuing to build using this style will cause a deficit in residential housing territory within Riyadh, which in turn will drive the demand for greater urban sprawl.

To combat this misuse of space, many families, especially middle-income households, subdivide residential land. According to research by Al-Wahaibi (2009), the Riyadh Municipality was divided into approximately 9,067 plots, but was further subdivided into 18,283 plots—an increase of approximately 201%—until 2009 (the date of the study). The study anticipated this trend would continue unabated until 2018 due to consumer demand. Development plans subsequently have aimed to decrease the number of residential land tracts to keep pace with Saudi families who will continue to divide land.

4.5 The Second Master Plans in Riyadh

In 1982, the Second 5-year Development Plan was created by the French company SCET International. It included detailed systems and processes for land-use and zoning in Riyadh to slow population growth and urban sprawl and establish a new growth boundary (Al-Nowaiser, 1994). Figure 4.4 details more aspects of the SCET Plan. Though this plan was eventually replaced in 1996 (due to continued growth), at least SCET acknowledged urban sprawl in Riyadh was an issue that could be tackled through urban planning (RDA, 2005).

In general, Doxiadis's First Plan and SCET's Second Plan share similar mistakes and failures (Al-Nowaiser, 1994; Middleton, 2009), though the deficiencies of the Second Plan are

moderate compared to those of the First Plan. The primary failure of both was the inability to create accurate urban and population growth predictions. The First Plan, for instance, had predicted Riyadh would grow to 300 km^2 of the urban landscape by the year 2000—but Riyadh actually reached this size by 1986 (Middleton, 2009). This lack of an accurate population projection did not allow developers to plan the need for utilities and services appropriately.

Ultimately, the First and the Second Development Plans were scrapped in favour of the Action Master Plan for Riyadh, developed by Dar Ar-Riyadh and Parsons in 1996, which attempted to solve these problems associated with rapid urban growth and to synchronise land-use activities (Al-Hathloul, 2017).

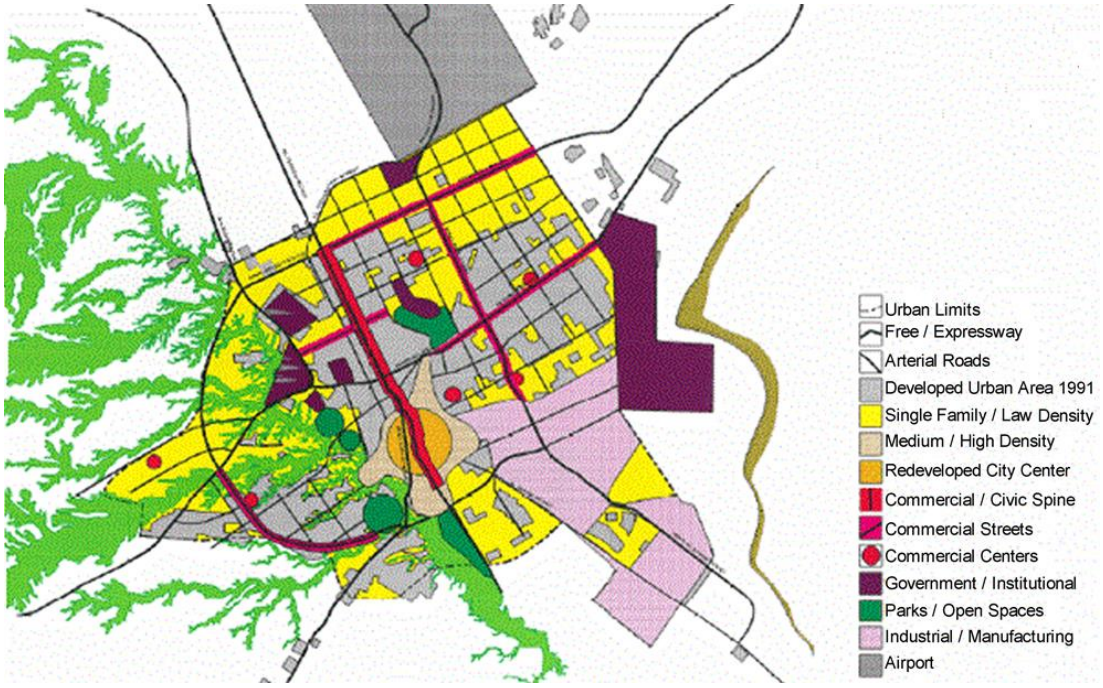


Figure 4.4 SCET Master Plan Source: (RDA, 2003, p.5)

4.6 Drawing Urban Growth Boundaries

There is existing dissatisfaction with the Doxiadis and SCET plans, although development based on these plans fuels ongoing urban expansion; expansion continues to use a grid layout where each neighbourhood is a block of two km by two km. In response, MOMRA instituted a nationwide suspension on expansion and has established boundary controls, both policies aimed at restricting unplanned growth and development until new urban development plans and strategies can be developed. These Urban Growth Boundaries have had several

evolutions, with the current plan seeking to establish regulations that can remain in effect until 2029.

In 1996, the RDA decided to focus on Urban Growth Boundary planning in Riyadh and divided their efforts into three stages: phase one would span 1996 until 2009, phase two 2010 to 2024, and phase three 2025 to 2029. Each phase would allow for certain controls; for example, the limits on urban development in phase two included allowing for many infrastructure schemas that have not been upgraded, although they are available on public utilities' networks (RDA, 2015).

4.6.1 The First Urban Growth Boundary

The First Urban Growth Boundary was adopted in 1994 by the Saudi Council of Ministers, and implementation was planned to take place via two phases to accommodate changing population growth over time (RDA, 2004). The phases ran in multi-year increments, from 1995 to 1999 and 2000 to 2005 (RDA, 2005). Figure 4.5 below illustrates this First Urban Growth Boundary.

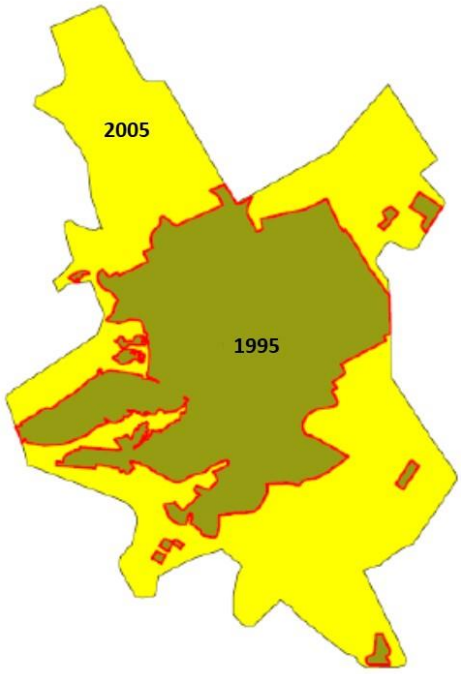


Figure 4.5 The first urban growth boundary Source: (Aina et al., 2008, p.53)

The first phase covered 632 km^2, which was the total Riyadh land available for development until 1999 (RDA, 2003). This phase looked at existing development patterns and used them

as a base from which to springboard. It alleviated residential and urban facilities requirements by providing sufficient land space. It also focused on the development activities in areas adjacent to Riyadh to ensure both ease and efficiency of movement between residential, work, and service areas (RDA, 2013).

The second phase covered 1149 km^2, the land available for development until 2005 (RDA, 2003). The residential space denoted in this phase was planned to accommodate nearly 1.7 million people. The carrying capacity (i.e., the ability for the land to support other rural and residential purposes) within the urban boundary was planned for 10 million people (RDA, 2005).

Setting a growth boundary was Riyadh's most significant urban planning procedure up to that point. The setting of an urban growth boundary allowed the city managers to develop the necessary time schedules and financial plans for urban development adequately. Setting up these boundaries also helped in reducing urban fragmentation. Ultimately, the urban boundary policies were successful in focusing urban growth within the first phase (1995 to 2000) and achieved their objective; this policy decreased urban growth from 50% to less than 30% (RDA, 2013).

4.6.2 The Second Urban Growth Boundary

The Second Urban Growth Boundary was enacted in 2005 following the Council of Ministers' enactment of Resolution Number 157, which increased the Riyadh urban boundary 27% from previous bounds (increasing the area to 3,115 km^2) and increased the total development area 9.5% (to 5,961 km^2) (RDA, 2009). The reason for this total development area increase was that citizens owned the land north and east of Riyadh as well as the residential schemes outside of the boundaries of the urban development area. This new Second Urban Growth Boundary affected the previous strategic plan's policies, including many planning, economic, and social directives (RDA, 2013). Figure 4.6 illustrates this Second Urban Growth Boundary, which was slated to cover all development from 2005 to 2014.

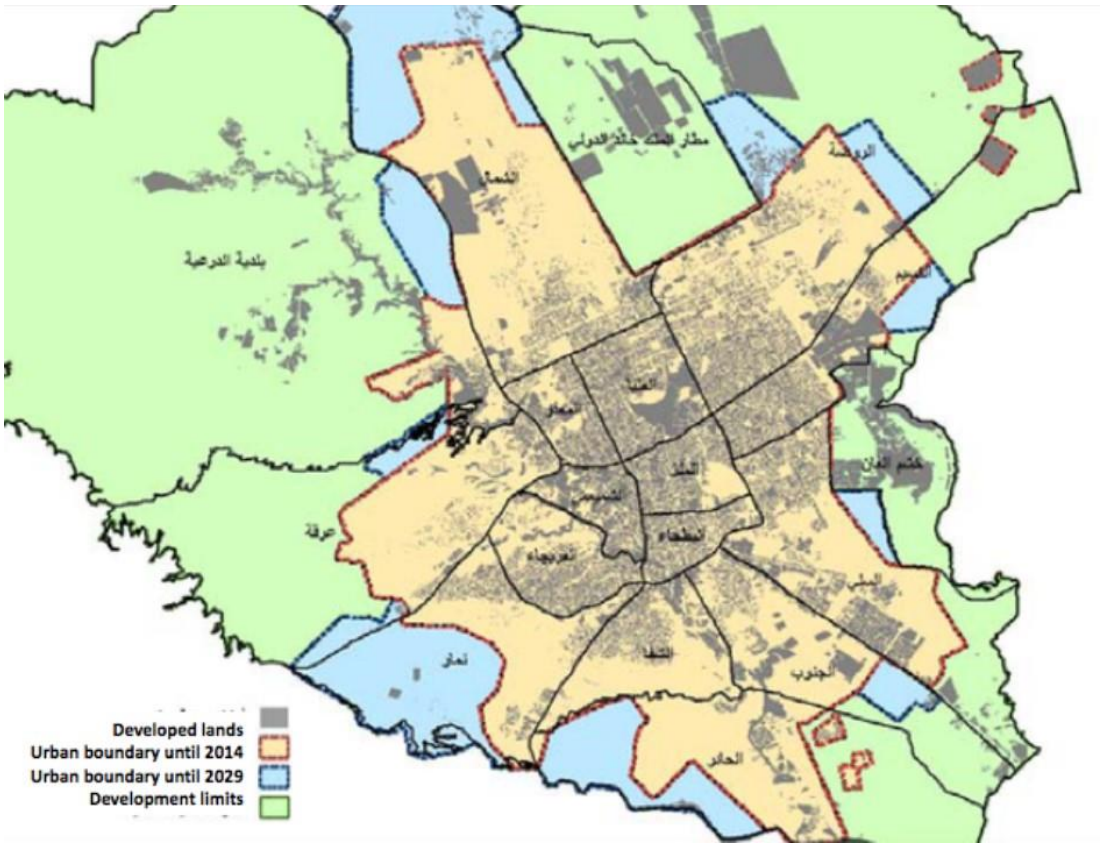


Figure 4.6 The second Urban Growth Boundary Source: (RDA, 2009, p.6)

In 2009, the Riyadh Development Authority (RDA) conducted a study reiterating Riyadh's continued rapid urban growth, especially in the city outskirts. Between 2005 to 2009, urban growth reached 176 km^2, a 16.8% increase from the previous survey. Urban growth and expansion generally concentrate in city outskirts, particularly the north and northeast part of Riyadh. Within the city's urban boundaries there is also a significant amount of what is constituted as undeveloped land (known as 'white land'). Planning for white land made up approximately 49% of Riyadh development in the plan which lasted until 2014 (RDA, 2013).

The apparent pressure on space resulted in the emergence of new residential neighbourhoods distant from the city centre, causing some movement of the population to these neighbourhoods (RDA, 2013; 2015). For example, neighbourhoods appeared on the city's outskirts, despite the fact that there are neighbourhoods closer to the city and had not been completed, and most of the lands were vacant.

4.6.3 The Third Urban Growth Boundary

The Third Urban Growth Boundary is set to begin in 2025. The retention of white land in phase two was a calculated move. This unplanned land was something of a placeholder; if needed, it could accommodate more than the population increase predicted in phase three (RDA, 2015). White land accounts for 58% of development in the Third Urban Growth Boundary plan (RDA, 2013). As part of its development plan goals, the RDA has adopted procedures and controls for the development of suburbs in the northern and eastern parts of Riyadh; one policy includes improving the process of granting land to citizens (RDA, 2015). The total area of these suburbs is approximately 804 km^2 (Figure 4.7).

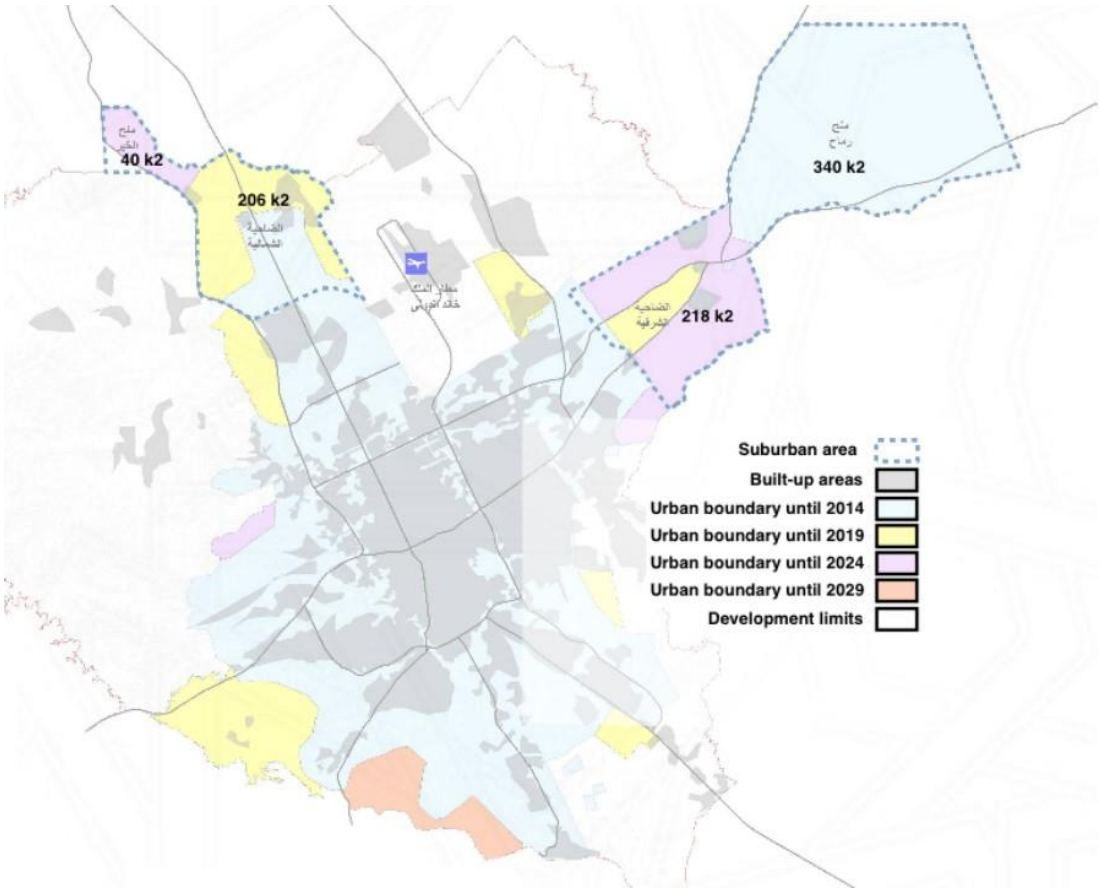


Figure 4.7 The northern and eastern suburbs in Riyadh Source: (RDA, 2015, p.5)

4.7 The Causes of Exponential Growth

Researchers (Herold et al., 2005) claim that Riyadh's urban growth is consistent with the theory of diffusion and coalescence. Figure 4.8 depicts how urban growth has expanded, beginning in the 1940s within city walls until the 2010s, where we see unregulated urban

sprawl. This leap-frogging growth greatly exceeded the city boundaries defined by the Doxiadis and SCET 5-year Development Plans (Al-Hathloul, 2017), creating a number of issues.

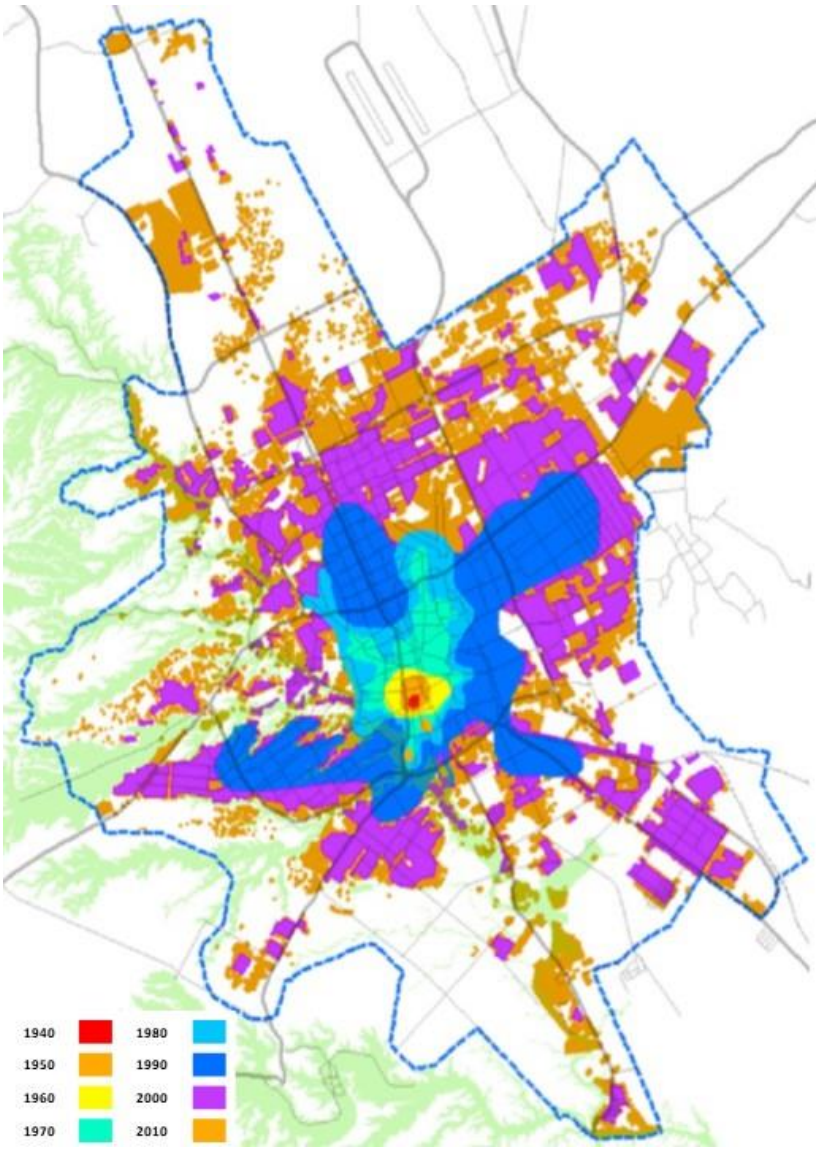


Figure 4.8 Stages of the expansion of the growth in Riyadh Source: (Riyadh Development Authority)

The Saudi government bears the blame for many of Riyadh's growth problems. As discussed, to establish Riyadh as a functional capital after Saudi Arabia unified, the government instigated various phases of city development. But the unanticipated pace of growth and urban sprawl caused problems well beyond the walled city as the lack of adequate facilities became apparent (Al-Hemaidi, 2001). However, the discovery of oil and the subsequent economic boom of the 1970s are responsible for creating the city's modern state. The influx

of oil money boosted government resources, which allowed Saudi Arabia to focus on modernisation efforts and planning for continued urban development (Mubarak, 2004a).

The following sections will look at the most important causes of Riyadh's urban expansion: local governance, the change in urban planning practices over time, land grant access for citizens, real estate development funds, and energy issues.

4.7.1 Local Governance

Governance in Saudi Arabia remains dependent on the bureaucratic model of political cooperation. Local governments face difficulties that stem from the absence of a single national body overseeing management and policy-making (Al-Shiha, 2008). For example, municipal services are supervised by the individual city or town, which does not have administrative and financial leverage. Instead, the municipal branches deliver services following the decisions of the national government ministries. Similarly, planning decisions and policies neglect to draw on the local opinion of the proffered services and instead depend on the bureaucracy of the central ministry.

Currently, local governance is organised based on power delegation, where the executive administration is considered part of the central government. But despite being a part of the administrative context, local governing bodies do not have the power to make policy and development decisions for their own cities and towns. This means the local government has limited to no control over public service branches such as transportation, education, etc.

Due to this separation of powers, communication deficiencies between ministries is a major setback to enacting good urban development policies. For example, road construction and residential construction are often not coordinated with each other, leading to transportation and movement problems. This lack of coordination became such a widespread problem that in 1985 the national government officially halted most projects until better urban development provisions could be created (Mubarak, 2004b). In reality, many projects (especially in Riyadh) are ongoing, and the development problems remain the responsibility of the local government, causing a delay in finding solutions. Nationally mandated changes to infrastructure and land use could alleviate some of these issues that arise due to urban sprawl (which the local governments must currently tackle on their own). But changing the bureaucratic nature of governance may take several generations.

4.7.2 Urban Planning from Traditional to Modern Form

Saudi Arabian cities traditionally have followed the layout of Islamic cities: streets follow irregular zigzag patterns, and housing is characterised by an organic, homogenous, and contiguous arrangement (Aina, 2013). Initially, urban growth in Riyadh was focused around mosques, the neighbourhood centres for social and educational benefits. Religious, environmental, social, economic, and cultural factors affected urban development designs and processes. For example, houses opened into courtyards of various designs (Figure 4.9), a trend based upon religious concepts of privacy but influenced by the local climate, where courtyards provided shade from the unrelenting sun.

Figure 4.9 Traditional Form of Riyadh Source: (RDA, 2011, p.16)

Traditional urban development and planning derived from Islamic styles and included privacy, public space, and private space provisions. Bianca (2000) notes that traditional design was purely based on dividing areas quantitatively or dividing spaces into smaller plots. Instead, the urban environment was divided based on household. Therefore, the irregular

patterns in the layout of traditional cities are not the result of an absence of planning, but instead signifies an incorporation of various elements, creating a harmonious and coherent layout (Aina, 2013). These traditional urban layouts developed without official urban planning practices to guide them, and yet they were flexible enough to allow for the diverse needs of individual residents and the whole community in Riyadh.

The first modern urban design appeared in Riyadh in the 1930s, bringing new architecture and street patterns based on a more Western style. These new infrastructure models did not accommodate traditional design style principles and soon impacted the Saudi way of life (Aina, 2013). And within a few more decades, the large urban growth caused by the economic boom of the 1970s prompted the cycle of 5-year development plans, which further distanced from traditional city design. The Saudi government's planning concepts were characterised by new spatial standards, including 'villa' residential architecture and low-density living (Eben Saleh, 2002).

Contemporary Saudi urban development design is characterised by hierarchical streets, rectangular blocks, and square-shaped houses. A typical example is the Al-Malaz neighbourhood. Main roads are 30 metres wide, secondary streets are 20 metres wide, and access streets are 10 to 15 metres across. Neighbourhood blocks are rectangles of 100 metres by 50 metres, and each building is 25 metres by 25 metres; the only variation is in the outer trappings and presentation of the structures (Al-Said, 1992).

The foreign-inspired, house-style dwellings touted by modern urban development have affected Riyadh's urban expansion (Struyk, 2005). The design of these single-family units has contributed to city sprawl (Al-Gabbani, 1991). Although an exterior garden offers more space than the traditional courtyard, the garden space is often not utilised. Struyk (2005) notes that less than 10% of households in Riyadh use the garden surrounding their homes. As in many other Arab countries, there is a disconnect in Saudi cities between the need to be seen as a globalised, modern city and the need to retain traditional Muslim ideals.

The purpose of establishing wide roads was to enable car traffic to move rapidly between different city sectors, and wider streets serve as an example of how modern urban development focuses primarily on efficiency and economic factors at the expense of social, cultural, and environmental ones. Elaraby (1996) is emphatic that these recent Western urban development models have changed many Islamic cities, and not for the better.

Al-Hemaidi (2001) points out that as people begin to travel to services and facilities (e.g., schools, parks, clinics, mosques, or stores) by car instead of on foot, the social dynamics of the neighbourhood changed as well. Also, Western design encourages large-scale spaces. Thus the contemporary arrangement is changing and dynamic, while the more traditional design is steady and individual in scale.

Western urbanisation theories and design concepts do not unilaterally apply to all cities. For example, though approximately 30% of all dwellings in Saudi Arabia function as single-family units, the majority of residences in Saudi Arabia are Western-style houses (RDA, 2004). This low-density, Western suburban residential model results from the development plans of the 1970s, which reflected the standards of the international advisers who created them but lacked an understanding of the actual needs of Riyadh citizens, many of whom lived in extended-family situations. In Riyadh, this de-densification of residences resulted in the development of over 175,000 villas, which were a deep contrast to the traditional Saudi style. Moreover, some government loan subsidies (such as the no-interest individual mortgages) came with design requirements. These requirements, as well as the expanded road network, have greatly changed Saudi cities to a less traditional framework (Al-Hathloul, 1981).

4.7.3 Land Grants for Citizens

Currently, the Saudi government grants free plots of land to citizens for residential construction. To be eligible for the land grant, Saudi citizens must be at least 18 years old, have not owned land before, and have proof of residence (Alskait, 1993). This practice could easily be used to guide growth in directions that benefit cities, but since the granted land is at the city outskirts most of the time, the land grant program actually promotes urban sprawl outside cities.

Additionally, some citizens apply for and receive land they have no desire to actually build on. Generally, this hesitance to construct is because the person already owns a house or intends to wait until the land grows in value. This lack of construction then adds to the already high percentage of white land (Alasiari, 2010). Conversely, and in just under 100 years, the Riyadh metropolitan zone has grown from 2.2 km^2 to more than 1,554 km^2 (Riyadh Municipality, 2015).

From 1990 to 2008, residential land for sale (that land which was not granted to citizens freely by the government) ranged from 441 square metres (m^2) to 1,309 m^2, with the most

common plots at 750 m^2. The land dispensed by government grants, by contrast, ranged from 400 m^2 to 900 m^2 (Al-Hathloul, 2010). This disparity of size influenced the developers and investors as they planned and selected land for residential development. In addition, the plans and perceptions developers had for residential schemes were based on previous experiences and personal opinions, not on a thorough scientific analysis consistent with the social and economic characteristics and needs of the population.

4.7.4 Real Estate Development Fund (REDF)

The Real Estate Development Fund (REDF), established in 1970 and given a budget of $71 million, also contributes to urban sprawl (Al-Hathloul & Narayanan, 1995). The goal of the REDF is to increase citizen homeownership by providing long-term, no-interest loans. Saudi citizens can use the REDF to build their houses, but they must already have the land before applying for the REDF. This program, therefore, has pushed consumer demand for land by encouraging Saudi families to build houses. However, low-income individuals (or those who don't qualify for the government land grant) often look for cheap land to be eligible for the REDF. And since cheap land is usually on the outskirts far from the city centre, this causes urban sprawl and low-density development (Alasiari, 2010).

4.7.5 Energy Issues

Energy issues are often linked to city growth and urban planning (Phdungsilp, 2006). The availability of oil creates a very low cost for energy, which greatly affects urban growth in Saudi cities. The largest segments of Saudi society are middle- and low-income classes, and the country's government has subsidised energy within Saudi cities to support these populations. This is especially important as Saudi households are seeing a decline in annual income (once inflation and cost of living increases are factored out). The average income in 2007 was approximately 1,947 SR (or $519 US) per month; this only increased to 2,262 SR ($603 US) in 2013 (GaStat, 2014).

The Saudi Arabian government pays roughly 70% to 75% of locally-consumed true energy costs. According to UN estimates, the Saudi government's energy subsidy makes up about 10% of the country's GDP; of this percentage, 68% is spent on ad hoc fuel subsidies, and 32% is spent on electricity. Because user consumption and government support are linked to urban growth and population size, these percentages will likely rise over time (Alshehry & Belloumi, 2015).

Riyadh's urban expansion has also been affected by the government subsidy for residential electricity, a fact that rings especially true when considering that many residential buildings benefit from government support. This utility subsidy encourages the building of larger homes in residential neighbourhoods instead of a reduction in house size. Larger homes for single families take up valuable land, leading to a demand for more plots zoned for neighbourhood construction in order to accommodate the city's housing needs. However, a lack of oversight, planning, and communication regarding energy consumption and energy needs in residential neighbourhoods has led to variation in the availability of utility services in residential areas. In many locations, the value of the land is greater than the revenue brought in by electricity, water, and gas utility bills. Also, because of the low operational cost of homes, the availability of residential grants for 400 m^2 to 900 m^2 plots was not affected when reducing the land covered.

Discourses on the relationship between residential neighbourhoods and energy are important since neighbourhoods require electricity to function. Once utility infrastructure is built for outlying neighbourhoods it encourages migration from the city centre because of the low cost of land there. Thus, the availability of infrastructure contributes to the changing city growth patterns.

According to data from The World Bank Group, fuel prices in Saudi Arabia are below the world average, and consumption is above it; this high level of energy consumption was caused by:

1. Increasing population size and high growth rates, estimated at 2.15% per year from 2004 to 2013 (GaStat, 2015);
2. Urban expansion doubling the urban area of the cities (Mandeli, 2008; Alshammari, 2011), leading to more dependence on private car use; and,
3. The low cost of transport energy.

It should be noted that, since urban expansion requires enough energy to meet the city's transportation needs, there is a reciprocal relationship between fuel consumption and urban growth. Also, low fuel costs have increased personal vehicle use and more daily trips within the city.

4.8 The Different Problems Associated with Growth

The poor growth management in Riyadh has caused multiple problems such as congestion, pollution, and social issues. Congestion is primarily due to an increase in personal vehicle ownership. In 2014, it was estimated there were around 18 million cars in Saudi Arabia. By contrast, the population in 2014 was estimated at 29 million people (GaStat, 2015). In Riyadh, there are an estimated 1.72 cars per household, suggesting families require multiple vehicles. In 2016, there were approximately two million registered vehicles in Riyadh, compared to 1.4 million in 2011. This is a 35.1% increase, averaging 7% annually (see Table 4.6). Comparatively, Riyadh's 2016 population was about 6.5 million people, illustrating an annual growth rate of 4% from 2010 to 2016. Thus, the number of registered vehicles per year increased at a higher rate than the population growth.

Table 4.6 The number of vehicles in Riyadh (2011 to 2016) (RDA, 2016)

Year	The number of vehicles (not including government vehicles)
2011	1,474,259
2012	1,511,288
2013	1,562,902
2014	1,612,542
2016	1,992,000

The dominance of cars in Saudi Arabia has been fostered by the development of high-quality highways and the migration of residents to the city outskirts. Saudi fuel prices are also some of the lowest globally, and there is no road tax, factors that encourage personal vehicle ownership. Saudi cities also have a decided lack of public transportation, which creates consumer demand for cars. A study undertaken by the RDA (2010) showed that Riyadh city is experiencing horizontal expansion, as proven by the fact that the average length of car trips has increased from 13 km to 17 km. Currently, movement around Riyadh is heavily dependent on private cars as the availability of public transportation is low. Additionally, the cost of owning and operating a car is relatively low, considering citizens' increased per capita income. All these factors contribute to the rise of private car ownership and the associated rise in city congestion.

All this traffic and congestion have an impact on the environment as well. Air pollution is caused by many factors, chief of which is vehicles' exhaust released into the atmosphere. In 1996 and according to the RDA (2004) report, Riyadh saw 4.5 million daily car trips; by 2010, this number had increased to six million trips (RDA, 2010). An RDA report on Riyadh's air

quality between 2014 and 2016 found that car exhaust (or rather, the nitrogen oxide particles contained in it) made up 70% of the air pollution contaminates.

But Saudi Arabia creates pollution in other ways beyond personal vehicles. The asphalt used in Riyadh's vast road expansion projects has contributed to global warming and increased the temperature. Riyadh factories located in the outskirts also engage in poor environmental practices, and households, shops, and workshops produce a high volume of waste.

Riyadh's rapid expansion and population growth have led to congestion and pollution, as discussed, but also to social problems. The continued influx of inhabitants places the city under tremendous pressure to provide utilities and services quickly, a task it cannot always accomplish. Incomplete neighbourhoods, therefore, often exhibit a lack of public services and facilities.

Furthermore, rapid growth creates pressure on water availability. At present, water in Riyadh comes from seawater desalination, yet there is no sea in Riyadh; the nearest maritime city is about 400 km away, making delivering water to the capital increasingly expensive. Despite this, the Riyadh region remains the largest consumer of drinking water in Saudi Arabia (consuming 33% of all drinkable water), with an estimated cost of five billion riyals during 2016 (Ministry of Environment, Water and Agriculture, 2016). Any expansion of Riyadh requires a more extensive water network to be established—an expensive and time-consuming operation. And yet, a 2016 study by the Ministry of Environment, Water and Agriculture indicated large amounts of wasted water, which may cause future issues with water demands. The average water consumption per capita is already estimated at 353 litres per day. This water waste and consumption will, in turn, affect the small and mid-sized cities nearby.

Another social problem resulting from Riyadh's urban growth is in terms of demographics. The RDA's 2016 study of the population of Riyadh found that native Saudis make up 64% of Riyadh's population while non-Saudis account for 36%. The study also showed that 48% of the households migrated to Riyadh from 13 different Saudi regions. These demographics contribute to the lack of social cohesion in the city of Riyadh. It breaks the city into different social groups based on ethnicity, society, or culture. Each group represents different urban patterns, educational levels, functional interests, and lifestyle tendencies. These differences make civil society a source of social disintegration.

4.9 Key Issues Facing Riyadh

The Ministry of Municipal and Rural Affairs in Saudi Arabia (MOMRA) and UN-Habitat delivered diagnostic urban analyses of key Saudi cities. In Riyadh, four main issues affecting sustainable urban development were identified (MOMRA & UN-Habitat, 2019). What is pertinent to this research are the later three issues, the way they will be investigated is discussed is in the next chapter.

4.9.1 Unbalanced Growth and Development Patterns (Sprawl)

This often happens when a city rapidly grows, presenting a widespread sprawl phenomenon and inharmoniously manifesting unbalanced developments across its territorial extension. As a result, dysfunctional urban management, both institutionally and experientially, is brought to light. The city showcases low-density and does not perform effectively, its services and facilities are not well-balanced in distribution and accessibility, and therefore citizens do not equally benefit from the advantages of urban life. This condition makes the provision and maintenance of essential services and transport infrastructure costly and challenging.

4.9.2 Divisions and Lack of Cohesion in City Structure (Fragmentation)

In cases of unbalanced growth, sprawl, and inharmonious development, forms of non-contiguous and non-cohesive city structures tend to co-exist without integration. As a result, pockets of leapfrog development are widespread. Undeveloped land, over-dimensioned infrastructures, and large extensions of monofunctional developments hinder the continuity of the city's fabric and, therefore, its social, economic, and ecological performance. As in cases of sprawl, this renders the equal provision of infrastructure and services to the entire city as difficult and costly. Additionally, the fragmentation phenomenon spatially affects the social dimension of sustainability, creating urban inequalities and segregation in areas far from the larger hubs and becoming isolated by a discontinuous urban landscape.

4.9.3 Monofunctional and Polarised Development (Spatial Inequality)

When a city showcases a predominance of extended monofunctional zones and lacks mixed-use areas, it implies a polarised development. This is particularly acute in cases where monofunctional developments are distantly scattered and isolated from the rest of the city. In Riyadh, the urban structure is characterised by monofunctional clusters of economic or social activity that amount to socio-spatial polarisation, creating inequality with highly variable access levels between different urban areas. Overall, various forms of polarised

development result in inequality within a city, the most obvious example of which can be characterised by socio-economic segregation. Examples include private compounds and gated developments with a high quantity and quality of services compared to the majority of the consolidated city.

4.9.4 Socio-Ecological and Economic Imbalance (Lack of Resilience)

Each city is formed by complex social, economic, and ecological systems. In a sustainable city, the balance between these three interrelated systems is maintained and enhanced over time. If anyone system is given continued preference over the others, over time, a structural imbalance will emerge that alters the sustainable trajectory of the city's growth and development. This misalignment generates an issue regarding water provision and food security, heavily impacting other socio-spatial aspects of the city's health. Segregation between agricultural lands and the urban fabric is a good example of this condition. The city does not interact with green space and is disconnected from farmlands by a strong boundary. A resilient city would integrate its natural and built elements, ensuring balanced coexistence.

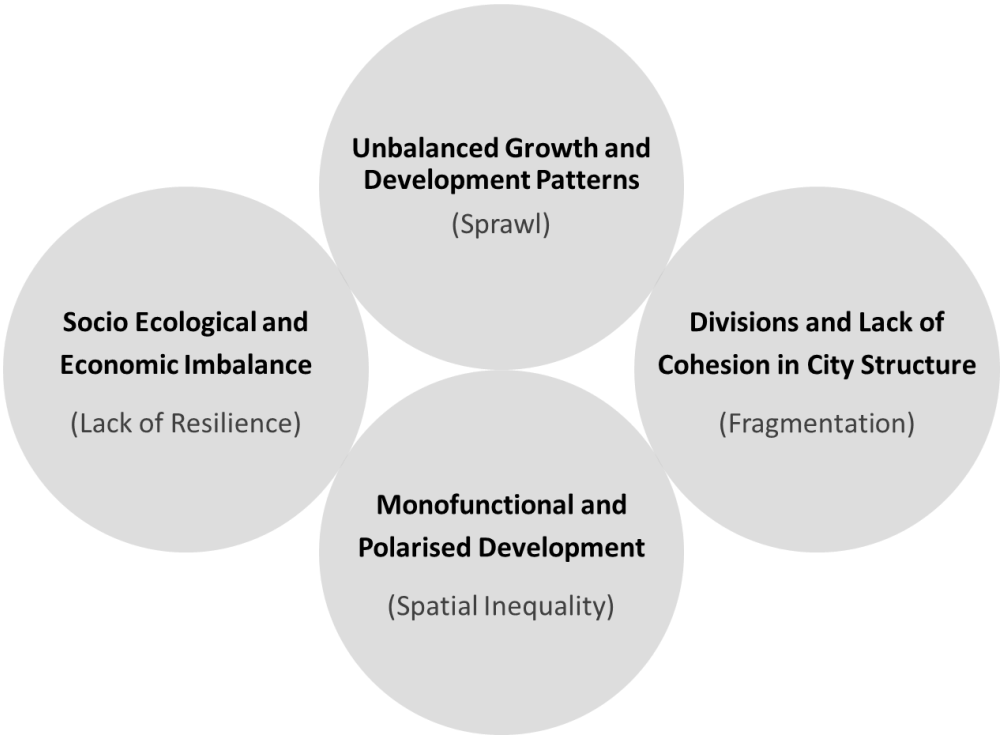


Figure 4.10 Key Issues Facing Riyadh

4.10 Conclusion

This chapter explained the context of urban growth in Riyadh. Beginning with the discovery of oil, Riyadh saw rapid growth beginning in the 1960s and '70s as people flocked to the city

to take advantage of the numerous job opportunities associated with that discovery. Overall, Riyadh city has experienced huge growth, transforming from a small town to a large city. The city's growth has caused many urban problems related to urban sprawl, the growing demand for housing, and pressure on services and facilities. The city's expansion is expected to continue, and the urban planning strategy will need to address the long-term challenges this raises.

The case study of Riyadh illustrates many of the issues that arise from rapid urban growth. Various phases of growth development plans were required to manage this growth, and the money generated by the discovery of oil provided the Saudi Arabian government the resources to fund this growth, but policies and government structures can erect barriers to good practice. Local governance in urban areas does not have the power to make decisions on behalf of their own contituents. This separation of power means that local governments do not have the necessary power to react to the emerging need for better transportation or education.

Land grants for citizens are another strategy used in the urban planning for Riyadh. However, this strategy actually promotes land development outside of the city outskirts and increases problems associated with urban sprawl. This is also the case with the Real Estate Development Fund that provides no-interest loans to citizens. Rapid growth has inherent problems such as congestion, pollution, and delivery of goods and services due to the proximity of Riyadh to an ocean port. This is particularly problematic when the population volume of Riyadh is considered given that the majority of the population lives in an area that is difficult to supply with goods and services.

Riyadh's case study illustrates an urgent need for an experimental study of the urban planning practices amid rapid urban growth. This means that the planning practices are at the centre of the structure that supports growth and planning in the urban city. Therefore, planning practices can be taken as a starting point to analyse the status of current urban growth to determine how to achieve sustainable growth.

Chapter 5: Methodology and Research Design: Towards A Multidimensional, Multi-Scale and Socio-Spatial Approach to Spatial Research

5.1 Introduction

This chapter is dedicated to discussing the approach adopted for data collection and analysis for this study. The chapter is structured according to three main sections. Section 1 relates the methodological approach adopted for the research and outlines the aim, objectives, and research questions for the study to determine the phases for empirical data collection. A mixed-methods exploratory design will be introduced as the methodological framework. In the second section, the reasoning behind choosing this particular method will be described followed by a description of the methodological approach. The research aim, questions, and objectives will be discussed before focusing on the methods for data collection, including methods for urban mapping, and survey coding. Next, this chapter will focus on survey methodology including expert surveys, resident surveys. Finally, Section 3 consists of a critical evaluation of the methodology, discussing the methodological choices and the use of mixed methods as part of the framework to ensure empirical rigour.

The relationship between urban fragmentation and gated developments has been increasingly discussed by built environment scholars since the turn of the new millennium (Alsayyad & Roy, 2006; Caldeira, 2000; Coutard, 2008; Coy, 2006; Kooy & Bakker, 2008; McFarlane, 2018). Studies have noted that, while the upsurge of gated urban archipelagos provides a sense of security to their users, this trend in urban development splinters the urban fabric and segregates populations (Borsdorf, Hidalgo, & Sánchez, 2007; Caldeira, 2000; Roitman, 2003). Though gated developments market themselves as inward-facing to shield users from the disruptions of the outside world, their effects are nonetheless felt outwardly by the city at large through the obstruction of mobility and circulation which alter the character of public spaces and impacts the ability for communities to participate in public life (Caldeira, 1996, 2009).

This research seeks to expand the understanding of urban fragmentation and its socio-spatial effects. To contribute to this discourse, the study has examined how urban fragmentation impacts the quality of life in contemporary cities through an empirical inquiry into the effect of gated developments on neighbouring communities in Riyadh.

5.2 The Methodological Framework: A Mixed Methods, Exploratory Design

The chapter will detail the methodological framework and empirical steps for data collection in relation to the study of urban fragmentation in Saudi cities. This methodology responded to the research aim of interrogating the effects of urban fragmentation on the socio-spatial structure of the city and, thus, to better appreciate the impact of gated developments on the quality of life in surrounding urban communities.

Five methodological phases serve to empirically deploy a research methodology. During phase 1, urban mapping and coding extensive analysis of satellite images and desk-based mapping resulted in recording 435 instances of gated developments in Riyadh. This phase makes it possible to determine the location and spread of fragmentary gated developments in Riyadh. Phase 2 resorts to survey questionnaires collecting the views and knowledge of 100 expert participants from built environment professions and highlighting the extent to which Riyadh may be seen as a fragmented city. Moreover, this phase facilitates conclusions on the spread of gated/fenced developments within its metropolitan area of Riyadh. Phase 3, meanwhile, consists of an urban network analysis uncovering how gated developments alter mobility patterns and, as a consequence, influence overall integration and connectivity of the urban fabric. This served to determine the collective impact of fragmentary building types on the wider urban context. In phase 4, which employs a strategy of cross-contextual comparative case study appraisals to ascertain how the perimeter design on gated/fenced developments impacts their immediate urban context. Here, a comparative, transnational approach is taken using cases in Saudi Arabia, the United Kingdom, and the United States of America. Overall, the combination of dispersed research methods thus serves to provide a broad yet sufficiently detailed picture of the contemporary consequences of Riyadh's ongoing condition of urban fragmentation. Finally, the methodology concludes with phase 5, the same format of survey questionnaires used in phase 2 will be conducted, collecting responses from 843 individuals from communities in and around gated developments to collate views on the impact of this urban typology of participants' social and spatial realities.

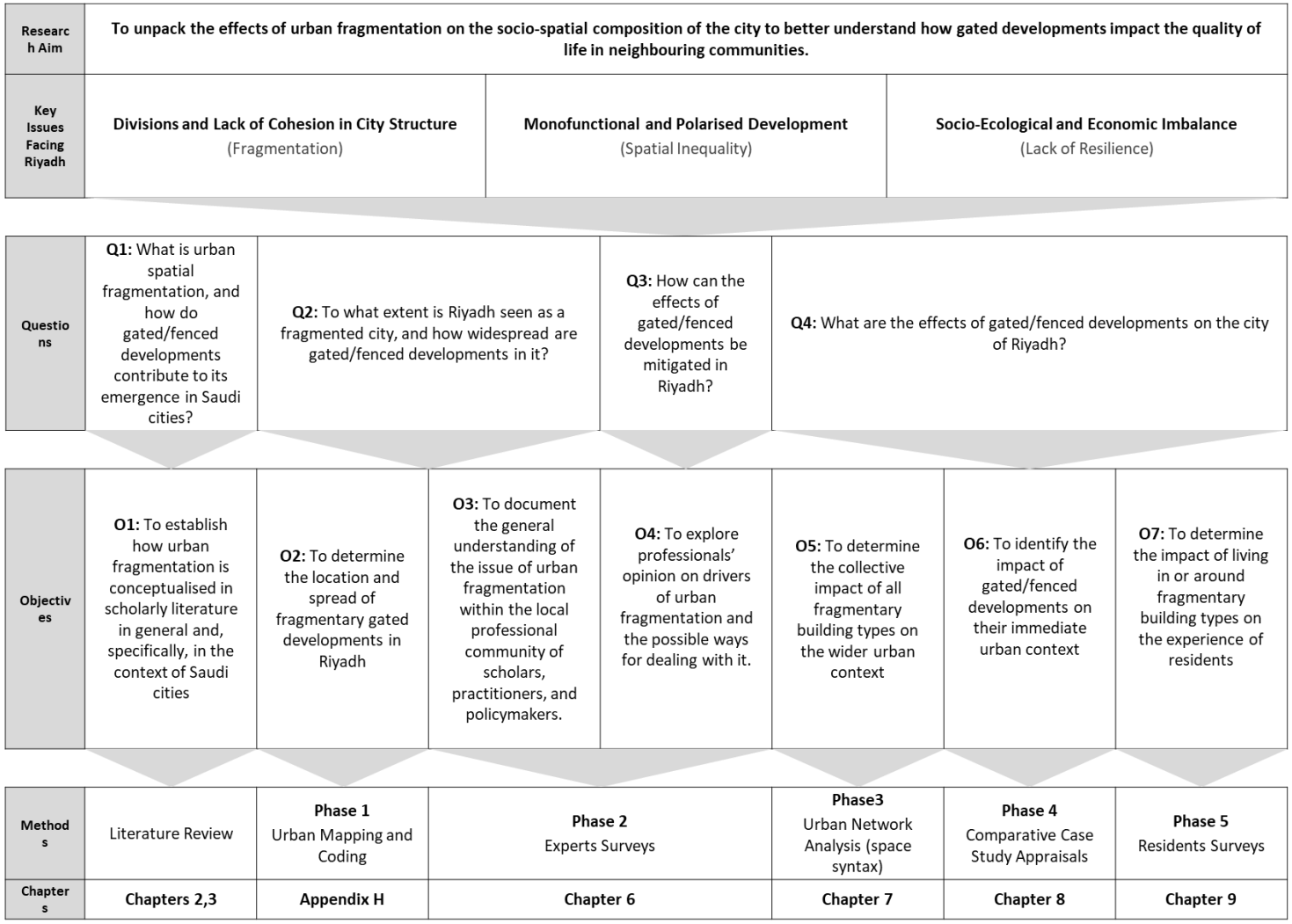
The combination of the five methodological phases corresponds to the mixed methods approach. Through a mix of methods, multiple perspectives on the issue of urban fragmentation are compiled, resulting in a more complete, embedded, and accurate understanding of the phenomenon (Denzin, 2009). Using such an approach likewise moderates weaknesses of individual methodological approaches and provides a better-rounded and contextually accurate portrayal of the urban phenomenon under scrutiny.

5.3 Methods for data collection

This section discusses how the methodological framework was applied using a mix of research methods. This process began with developing a theoretical framework through writing a literature review and included empirical data collection through urban mapping and coding, expert surveys, resident surveys, urban network analysis applying space syntax tools, and cross-contextual comparative case study appraisals.

In accordance with the approach adopted by Glasze and Alkhayyal (2002), a mix of data collection techniques and spatial mapping practices were used to collect and analyse the data for the present study. Glasze and Alkhayyal (2002) engaged key actors, mapped the spatial configuration of gated developments, and conducted desk-based research in order to explore life and space within gated developments in Lebanon and Saudi Arabia. In this research, a similar approach to data collection was adopted, combining testimonies from a wide pool of community participants and urban professionals alongside spatial analysis of gated developments' impact outside of the fences themselves. The methodological approach was designed to capture perspectives, positions and responses to fragmenting fenced development by different institutional, organisational, and community stakeholders as well as recording the material changes which these enclaves have upon mobility in the city.

The selected methods and the six tools for data collection used in the study are presented in this section. Each of these tools was defined in relation to the previously outlined research objectives and the key issues that face the city of Riyadh, as shown in Figure 5.1, Research Objective 1 guided the compilation of a conceptual framework for the study through a literature review. This framework is discussed in chapter 3. Therefore, this chapter will focus on the methodological tools derived from the remaining five research objectives (see Objectives 2-6 below).



5.1 The Methodological Framework

In the following sections, five phases of data collection are discussed in relation to these objectives.

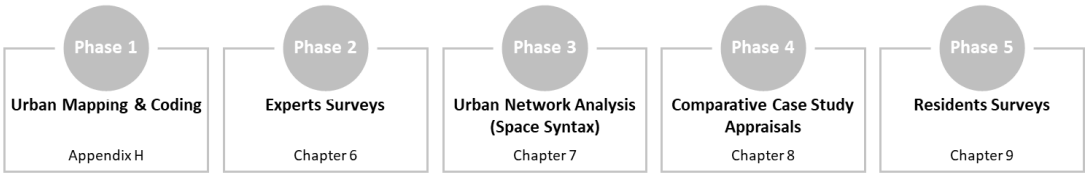


Figure 5.2 Phases of data collection

5.3.1 Phase 1: Urban Mapping and Coding Urban Surveys

To unpack the impact of gated urban developments on neighbouring communities in Riyadh, it was first necessary to define the studied phenomenon and chart its presence in the city. The methodology's urban mapping and coding phase sought to advance this purpose and determine the location and spread of fragmentary gated developments in Riyadh. To do so, the study relied on visual cues, extensive desk-based research, and coding using Google Earth. This software has seen ample usage within exploratory studies amongst spatial scholars. When mapping public and private spaces of urban agriculture in Chicago, for example, Taylor and Lovell (2012) manually classified aerial images from Google Earth to determine the spread of cases within the study area. Similarly, Spocter (2011) used Google Earth to map spatio-temporal aspects of gated residential estates in urbanised areas of South Africa. Following a similar methodological strategy, to these scholars, the present study identified and classified 435 gated developments in Riyadh.

To begin the mapping process, the research drew upon Kozak's (2008) work assessing typologies of urban fragmentation Buenos Aires. The first step consisted of outlining the empirical criteria by which gated developments were to be traced and plotted; these were:

1. Single use developments
2. Presence of any form of restriction on access (walls/gates/fences)
3. Occupying a city block or a large part of it.

Parting from these three parameters to define gated development, 14 distinct types of gated developments were mapped using satellite data of the city of Riyadh. In Table 5.1, below, describes the types of gated developments mapped during the study in Google Earth.

Table 5.1 Mapped Gated Developments

#	Type	#	Type
1	Commercial	8	Offices
2	Educational	9	Organisational
3	Governmental	10	Recreational
4	Industrial	11	Residential Gated Community
5	Residential Large Private Residence	12	Security
6	Medical	13	Self-Contained Large-Scale Urban Projects
7	Mixed-Use	14	Transportation

By applying these considerations to the process of data collection through manual aerial photography and satellite image interpretation on Google Earth, 435 instances of gated development were mapped in the city of Riyadh. The perimeter was recorded in the mapping process for each of these instances to facilitate area calculations for each development. Additionally, to assist with the interpretation of data, all mapped developments were subjected to a further round of coding. Qualitative data coding serves to clarify themes in the recorded data to bring out patterns of similar items, ideas, or phenomena (Baralt, 2012). For the present study, the data collected through urban mapping and coding was coded according to five parameters:

1. **Ownership**: whether the gated development was public, private, semi-public, or semi-private.
2. **Use:** whether the gated development was single-use or multi-use.
3. **Structures:** whether the gated development was single structure or multi-structure.
4. **Gating:** whether the gated development's perimeter was gated, non-gated, or used soft gating.
5. **Centrality:** whether the gated development was central, within the metro area, or in the urban periphery.

The collection and analysis of the urban mapping and coding provided a comprehensive picture of the fragmentary urban developments present in Riyadh at the time of study, charting their location in the city, the quantity and types of developments, as well as their individual attributes of use, ownership, gating, etcetera. In gathering this data, the focus was set on unpacking how fragmentation was perceived and problematised by professionals working in fields of architecture landscape, architecture urban planning, and design in Saudi cities, and accordingly deployed the next phase for data collection: the expert surveys.

5.3.2 Phase 2: Expert Surveys

The objective of conducting expert surveys was to document the general understanding of urban fragmentation within the local professional community. Building upon information acquired through the urban mapping and coding detailed in the previous section, as well as on desk-based research, a selection of experts with good knowledge of Saudi cities were invited to participate in the study. Professionals from government agencies, local authorities, and academic institutions were represented in the pool of invitees, in the hope that they would share their understandings on the underlying issues behind urban fragmentation, its drivers, and its impacts, as well as discuss how the negative effects of urban fragmentation might be mitigated.

To collect data from participants, a questionnaire survey was designed. Since the objective was to document a general understanding of urban fragmentation within local professional communities in Riyadh, this survey mode was decided on as the most appropriate choice. According to Driscoll (2011), “surveys are particularly useful to find small amounts of information from a wider selection of people in the hopes of making a general claim”. Moreover, the standardised set of structured questions which a questionnaire survey provides had the advantage of allowing more time for participant consideration and self-reflection compared to face-to-face interviews (Driscoll, 2011).

The sampling of participants in the expert surveys was conducted in two phases. Initially, participants were selected from built environment practice, urban governance bodies, and academia on the basis of `purposive' or `judgmental' sampling (Dixon, Otsuka, & Abe, 2011) to take part in an online questionnaire. To compile this opening register of key respondents with good knowledge of the subject of urban fragmentation and gated development, extensive desk-based research was conducted using institutional websites and personal social media accounts. Subsequently, personal invitations with information on the study and a link to the online survey were sent to each prospective participant, with options to respond in Arabic or English. As McLafferty (2010) points out, the advantage of using such internet-based tactics to recruit participants lies in that online surveys “provide access to geographically dispersed populations and they can be used to reach physically immobile groups” (p. 84). Thus, the use of online questionnaires increased the reach and scope of the survey. Moreover, as the research sought to survey the largest quantity of participants within urban professional networks, a snowballing sampling procedure was employed. Here, the

initial expert participants contacted to take part in the study were also requested to pass on the invitation to other possible participants from their professional network. In turn, this second wave of participants was also encouraged to send the invitation and questionnaire link on, and so forth, until the targeted community was saturated (Heckathorn, 1997). Consequently, an online chain-referral sampling strategy was implemented to encourage increased breadth of participation in the survey.

A questionnaire survey combining open-ended and fixed response questions was devised and circulated to record understandings of urban fragmentation and gated developments in Saudi cities. The questionnaire consisted of 20 questions divided into two sections. The first section, consisting of 14 questions, was dedicated to the topic of urban fragmentation and gated developments and combined fixed-response multiple-choice questions with open-ended questions allowing participants to answer in their own words. Meanwhile, the second section of the questionnaire consisted of 6 questions about the participant's experience and scientific and professional background, including their professional field within the built environment, level of education, and current occupation.

As McLafferty (2010) notes, open-ended questions have the advantage that respondents "can express in their own words the fullest possible range of attitudes, preferences and emotions. Respondents' 'true' viewpoints may thus be more comprehensively represented" (p. 79). She meanwhile advises that Fixed-response questions provide data that is easier to interpret, since multiple predefined responses are presented to the participants who proceed to select the answer that best reflects their stance, knowledge, or opinion (McLafferty, 2010). Such multiple-choice questionnaires provide the researcher with data that can efficiently be analysed through descriptive statistics and presented quantitatively when required. By combining open and fixed-response questions, the questionnaire survey was better equipped to comprehensively collect data on the subject of urban fragmentation and gated developments in Saudi cities in general, and Riyadh in particular (Flick, 2018; Johnson & Onwuegbuzie, 2004).

In total, 100 expert participants took part in the online survey. Of these, 79 people completed every section of the questionnaire. Combined with the coding and mapping already applied in the urban mapping and coding, the expert surveys provided both quantifiable survey responses to the fixed questions, which were suitable descriptive statistical analysis and, simultaneously, more detailed, "thick descriptions" gained from the

survey's open-ended questions (McLafferty, 2010; Reiter, 2013, 2017). With this data added to the study, the research documented how experts viewed the impact of urban fragmentation and how they thought any negative effects of the same might be mitigated. The next phase of the methodology sought to understand how the effects of urban fragmentation and gated developments were felt amongst urban communities.

5.3.3 Phase 3: Urban Network Analysis (Space Syntax)

Following data collection through urban mapping, expert surveys, the methodology next turned to use urban network analysis to record the spatial layout of gated developments and their consequences on human activity patterns. This form of analysis aimed to determine the collective impact of fragmentary building types in Riyadh upon the wider urban fabric. For this purpose, it was determined that Space Syntax techniques would be best suited. Space Syntax techniques conform to an analytical approach to architecture and urbanism grounded in a framework of social theory of space (Karimi, 2018).

As a methodology for urban analysis, Space Syntax first emerged in the 1970s and 1980s through the work of Bill Hillier and colleagues (Hillier, Hanson, & Graham, 1987; Hillier, Leaman, Stansall, & Bedford, 1976) at University College London (UCL) and has since been advanced and refined by later generations of architectural and urban scholars (Bafna, 2003; Netto, 2016; Önder & Gigi, 2010; Osman & Suliman, 1994). The purpose of Space Syntax, according to Hillier (2008), was to "look at the society–space relation 'space first' by examining the patterns of real space found in the built environment and asking in what sense these could be seen to be the outcome of social and economic processes". Thus, the foundational paradigm at the core of Space Syntax thinking explores the relationship between the configuration of a space and its social function (Penn, 2008). It is, therefore, of key consequence for design and planning practice (Karimi, 2018). In practice, the application of Space Syntax techniques to urban analysis involves representing the environment under scrutiny as a plan in which the longest sightlines are drawn. Thence, the plan is modelled into a graph format where each sightline is shown as a node, whilst intersections between lines are shown as links. The model resulting from this process shows the correlation between pedestrian and vehicular humans and the specific features of the urban landscape. As described by Penn and Turner (2002), the representation encapsulates "the geometry of the configuration of space in the environment […and] its ability to predict movement rates" (p.102). In capturing this relationship, Space Syntax analyses are positioned to interrogate

how movements within the built environment engender change to multifarious urban phenomena, from trade (Penn & Turner, 2002), to urban regeneration (Agirbas, 2020), to mobility (Hidayati, Yamu, Tan, & Holzhacker, 2021), and countless other spatial experiences.

In applying Space Syntax to the inquiry into urban fragmentation and its effects on neighbouring communities in the city of Riyadh, the present study sought to record the effects of gated developments on human movement in that city. To do so, two detailed models of the urban environment were set up, positing different scenarios of urban fragmentation:

1. **CLOSED**: the existing condition of the street network shows the gated developments in their present, isolated state, which is inaccessible to the wider public.
2. **OPEN**: a modified street network in which all entrances to gated developments were open, and any movement restrictions are removed, thus making the otherwise gated city blocks accessible to circulation from the public.

Each model combined layers of geospatial data, which consisted of street segment networks recorded through OpenStreetMap (OSM); distribution of gated urban developments mapped in Google Earth observations during Phase 1 of the study methodology; and the functional classification of gated developments based on information from both OSM and local authorities. Mapping and spatial analyses were performed with the use of either QGIS, depthmapX, or a combination of both these software as required (see Chapter 8). As a geographic information system (GIS) and cartographic software package, QGIS allowed for the mapping and analysis of geospatial patterns and statistics, as well as area calculations. Meanwhile, depthmapX – as a multi-platform software application for spatial network analyses developed specifically for the purpose at UCL – facilitated the application of Space Syntax analytical methods to better understand spatially embedded social processes (Al-Sayed, Turner, Hillier, Iida, & Penn, 2014).

Juxtaposing geospatial and social data for the open and closed models, levels of connectivity and integration for the city of Riyadh were recorded across the two scenarios. Within the discourse of Space Syntax analysis, ‘connectivity’ is understood in degrees as it “measures the number of immediate neighbours that are directly connected to a space” whereas

'integration' is a measurement that shows "how deep or shallow a space is in relation to all other spaces" (Al-Sayed, Turner, Hillier, Iida, & Penn, 2014 p. 15). Put differently, both of these parameters produce measures that express how segregated or amalgamated a space is in relation to the broader network of spaces around it. As measures of social behaviour in space, the exploration of connectivity and integration offered insight to the present research, as they allowed the collection of data on how gated developments impact the movement patterns and accessibility of the city. This served to identify configurational properties of the urban environment in Riyadh, outlining the spatial correlations for functional characteristics of gated developments and identifying a social impact of fragmentation on the city by contrasting two opposing scenarios.

As the socio-spatial portion of the urban network analysis concluded with these insights into the impact of gated developments in Riyadh, the research closes the empirical data collection with a final phase in which the qualitative/quantitative, socio-spatial data collected could be explored in more detail and, simultaneously, contrasted and contextualised.

5.3.4 Phase 4: Cross-contextual comparative case study appraisals

The fourth methodological stage deployed consisted of a trans-continental comparative case study analysis. taking an urban-wide approach when surveying Riyadh's gated developments, gathering data from professionals and communities on their experiences of urban fragmentation across the city, and analysing how gated developments impact connectivity and integration networks in Riyadh, this step allowed a smaller scale of study, merging into specific case studies. This phase on was designed to identify the impact of gated developments on their immediate urban context. Therefore, the comparative case study appraisal phase recorded data on the material expression of gated developments' perimeters and boundary treatments, seeking to unpack how these structures interacted (or not) with their immediate urban contexts. This analysis was performed on cases in Riyadh as well as in cities belonging to two additional national contexts. In doing so, Phase 5 of data collection simultaneously enhanced analytical detail and provided valuable insight into contextual idiosyncrasies impacting how the phenomenon of fragmenting gated developments presents in Riyadh versus two other international contexts.

As a research method, case studies are widely distended amongst scholars across diverse disciplines and subject areas and have become primarily associated with qualitative work

(Starman, 2013; Yin, 2003). Case studies are empirical inquiries that investigate a "contemporary phenomenon within its real-life context" (Kohlbacher, 2006 p.6) and are particularly useful in practice-oriented fields (Starman, 2013) such as architecture, urban design, and urban planning. Moreover, case studies facilitate exploratory research agendas, allowing investigators to "retain the holistic and meaningful characteristics of real-life events" (Yin, 2003 p. 4). Their use served the present investigation as a channel to unpack how specific gated developments sit within the urban fabric and interact with the adjacent spaces. To advance this purpose, the research applied a "building block" case study, a method of case study work dedicated to unpacking "particular types or subtypes of a phenomenon, that, when put together, contribute to a more comprehensive theory" (Starman, 2013 p. 34). Thus, by adding case studies to the data collection process of the current research, the theoretical contribution of the study to further define the notion of urban fragmentation through gated developments is further advanced.

In combination with the building block case study approach, a dual comparative advance has been adopted to analyse how gated developments impact their surrounding urban environments. Firstly, the perimeters of three cases of gated developments in Riyadh have been compared to record how the gates and fences themselves interact with the surrounding built environment. This approach, comparing distinct manifestations of the same phenomenon, is consistent with the building block study. Meanwhile, incorporating a comparative approach allows for increased criticality and systematisation during data collection and analysis (Kaarbo & Beasley, 1999). The selection of cases studies was guided by the urban mapping and coding and the Expert Surveys conducted at the outset of the methodology, which had provided an indication of the frequency of the phenomena across Riyadh, as well as an overview of the prevalence of certain types of gated development. From the 14 types of gated development surveyed in the urban mapping and coding, a university campus, a medical centre, and a sports stadium were selected as cases.

Secondly, the boundary appraisal of the three case studies in Riyadh was compared to a further six international cases. The use of international comparative analyses placed the material articulation of fragmentary boundaries in Riyadh into conversation with the same typology of space in other territories. In doing so, the methodology aligned itself with Robinson's (2016) assertion that "any act of urban theorization from somewhere is by necessity a comparative gesture […] putting a perspective informed by one context or

outcome into conversation with concepts invented and circulated elsewhere" (p. 5). International comparative analysis of case studies underwrites theoretical advances in urban studies by empirically juxtaposing the realities of diverse settings, thus clarifying the idiosyncrasies of each and the cross-contextual similitudes between locations (Kaarbo & Beasley, 1999; Lewis, 2015; Robinson, 2016). The cross-contextual comparative case study appraisals draw on analogous case data study data derived from empirical studies in Saudi Arabia and secondary data on the United Kingdom (UK) and the United States of America (USA). The approach contrasts the Gulf context represented by the city of Riyadh with disparate contexts to examine similarities and divergences. In addition to three case studies selected in Riyadh, a further six were identified as suitable for comparison: three in the United States of America and three in the United Kingdom. To maintain consistency and facilitate the comparative analysis, these international cases were selected from typologies of gated developments that matched those found in Riyadh.

The selection of the USA and the UK as the contexts for comparison was based on two key factors. The first of these revolved around urban mobility. Saudi Arabian cities respond to a typically car-centric urban configuration. Therefore, a comparison with a similar international context was selected to discern how the material articulation of gated development perimeters evolves in car-dependent cities. The car-dependent context selected in this instance was the USA. As a point of comparison, the UK was selected as the second context for comparison, as it presented an opportunity to explore how cities with integrated mass public transit (Briones & Gómez-Lobo, 2013) impact the design expression of gated developments boundary treatments. Beyond these mobility-focused advantages, the second benefit of using the USA and the UK as the contexts for comparison lay in the general familiarity of these contexts as international cultural referents, making them easily discernible. Finally, the ready availability of data sources to facilitate the remote desk-based work of appraising the perimeters of the chosen case studies likewise contributed to the selection of the USA and UK contexts.

Table 5.2 shows the indicators used in the study to record the responsiveness of nine transnational cases of gated development to their urban surroundings, the variable measured for each indicator, and the value used for each measurement

Indicator	Variable	Value [unit]
Physical interaction between buildings and sidewalks	Direct pedestrian access from sidewalk	Average distance between pedestrian entrances per block [m]
Visual interaction between buildings and sidewalks	Transparent windows and doors facing sidewalk	Ground-floor transparent windows or doors per block [%]
	Transparent fences facing sidewalk	Ground-floor transparent fences per block [%]
Permeability	Access to public spaces from sidewalks	Average distance between accesses to public spaces per block [m]
Geometry	Alignment to the prevailing geometry in the area	Buildings aligned to the prevailing geometry in the area [%]
	Plot size	Plot size average per block [m]
Land use grain	Variety of land uses	Description of land uses
Character of the borders	Border's materiality	Description of border's materiality

Having selected the nine cases of gated development for transnational comparative analysis, a contextual appraisal of the boundaries of each development followed. For the cases in Riyadh, this analysis relied on primary data and observation techniques, whereas the cases in the United States and the United Kingdom relied on desk-based research, satellite imagery, and Google Earth street view. As a methodological guide for the boundary appraisal of the nine selected transnational case studies, the research used analytical tools from the seminal urban design work 'Responsive environments. A manual for designers' by Bently et al. The central tenet in the work of Bently et al. holds that "the built environment should provide its users with an essentially democratic setting, enriching their opportunities by maximising the degree of choice available to them. We call such places responsive." (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985 p. 9). Drawing on the premise of the responsive places, the study explored the material articulation selected for the perimeters of the nine gated developments to assess how they interacted – or not – with adjacent developments and humans circulating in the area. The level of perimeter interactivity was measured by six indicators developed to record the responsiveness of each gated development and evidenced in Table 5.2 above.

The appraisal of boundary treatments across the nine transnational case studies provided the study with sufficient data to conclude the significance of material articulation and design

decisions on the impact of fenced developments on their immediate urban context. With this step, the data collection for the study was concluded and the methodology complete. The following section summarises the approach and briefly discusses the methodological choices made, the selection of methods.

5.3.5 Phase 5: Resident Surveys

The key purpose of the resident surveys in the study's methodology was to determine the impact of living in or around fragmentary building types on residents' experience. Having previously collected data on how built environment professionals view urban fragmentation in Saudi Arabia, the researcher added this to the findings on the geographical location and spread of gated developments in Riyadh. As such, the research sought next to better understand the impact of these phenomena on urban communities. For this purpose, the next phase of the research methodology consisted of an online residents' survey. Incorporating resident surveys into the study methodology reinforced the possibilities of making quantitative claims through descriptive statistics about the impact of urban fragmentation and gated development in Riyadh.

The process of recruiting participants for the resident surveys was once more initiated through online desk-based research in a similar approach previously adopted during the Expert Surveys in Phase 2 of the methodology. During this germinal approach, multiple online message boards were identified in which community exchanges between inhabitants of specific Riyadh neighbourhoods in the vicinity of gated developments could be seen as taking place. Using `purposive' or `judgmental' sampling once again (Dixon, Otsuka, & Abe, 2011), these forums were employed as the first point of communication to disseminate the online questionnaire link. An information sheet was provided, notifying potential participants of the purpose and motivation for the research, and inviting any household members over the age of 18 to participate in the survey. As with the expert surveys, an online chain-referral sampling strategy was used where participants were encouraged to pass on the invitation to other possible respondents. A total of 843 people took part in the survey, of which 399 completed all questions. The entirety of the questionnaire presented to the study participants has been included in Appendix B.

Like the expert survey, the resident survey questionnaire was predominantly comprised of multiple-choice questions featuring some open-ended questions allowing for text entry

answers. Here, too, the combination of question styles was designed to comprehensively record residents' experiences and opinions on the subject of urban fragmentation and gated developments in Saudi cities (Flick, 2018; Johnson & Onwuegbuzie, 2004; McLafferty, 2010). The resident survey questionnaire consisted of 31 questions organised into three sections. Section 1 contained questions regarding the participant's background (including such aspects as age, gender, income, household size and location, etc.). Section 2 was dedicated to the respondents' residential history and preferences. Here, the questions focused on the participants' current and previous residential choices and experiences, their reasoning for selecting their place of residence, their proximity to gated developments, and their experience of navigating the neighbourhood. Section 3 was developed with reference to the Place Standard Tool (PST) for assessing the quality of spaces (NHS Scotland, 2017).

The Place Standard Tool (PST) was developed in collaboration between NHS Health Scotland, the Scottish Government, Architecture and Design Scotland, and Glasgow City Council (NHS Scotland, 2017; Gjorgjev et al., 2020). In Section 3 of the questionnaire, the research presented a modified version of the original PST questions better suited to a Saudi context and theme of the study. Subsequently, through this PST-style approach, respondents were requested to evaluate their current neighbourhood based on their experience. Each question was structured into two parts. Firstly, participants were asked to rate an aspect of their neighbourhood between 1 and 5, where 1 indicated dissatisfaction and 5 indicated complete satisfaction. Each question was subsequently followed by two sets of positive and negative options, included to help participants justify their evaluation. Alternatively, respondents could choose to type in their own justification in a free text box. Following the collection of data from a participant, the PST framework allowed for plotting numerical responses onto the template of a diagram, which allowed the data to be visually accessible to the reader. This is done to "show, at a glance, the areas where a place is performing well and where there is room for improvement" (Scotland, n.d., p. 3). As Gjorgjev et al. (2020) have suggested, an advantage of using the PST lies in this tool's simplicity and its capacity to encourage the consideration of both physical and social aspects of a place (for example buildings, spaces, and transport links as well as community buoyancy or whether people feel they have a say in decision making). For the present study, this benefit of the PST meant that the questionnaire, while focused on the social experiences of participants, maintained a continual connection to the spatial dimensions of urban fragmentation. In the following

section discussing the use of Urban Network Analysis methods, the socio-spatial makings of the research data are further bolstered.

5.4 Pilot study

Pilot studies are the most suitable way of testing and refining the research methods and procedures before starting the study of a larger population and collecting data from the entire target group of samples (Creswell 2009). By finding the issues and challenges associated with the methods and procedures by applying them to a small group of samples, the researcher will have the chance to avoid critical mistakes while managing time and risks. Accordingly, a pilot study of the expert and residents survey element of data collection was carried out in this research before proceeding to the primary data collection stage.

Considering the previously discussed five methodological phases only those concerned with experts and residents were tested for the pilot study. The previously designed experts interview form, residents' surveys been tested in a real-life situation. A panel of 16 experts were invited to be interviewed individually and residents of a small residential block in the city of Jeddah were approached to be surveyed. The data was collected during a visit to Saudi Arabia early 2019. In addition to the data collection, a primary analysis of the data has been carried out in order to test the capability of the proposed research methodology in answering the research questions. The finding from the pilot study has been used to refine the data collection methods and logistic arrangements to maximise efficiency. Table 5.3 represents a brief summary of the lessons learnt and related rearrangements.

Table 5.3 Summary of lessons learnt from pilot study

Method	Lessons learnt	Re-arrangement
Expert Interviews	Interviewees digress in their answers, they rarely offer clear replies. Interviews turn out to be non-ending discussions.	To avoid both issues raised in the pilot study the decision was made to opt for a survey rather than an interview to achieve the main goal of this stage which is: To document the general understanding of the issue of urban fragmentation within the local professional community of scholars, practitioners, and policymakers.
	The availability of the researcher created engagements that were either confrontational or passive.	
Residents' Survey	In part 3 of the survey when residents were asked to evaluate aspects of their current neighbourhood, questions were found to be a bit confusing.	For clarification positive and negative circumstances were added as examples for each aspect of the resident's neighbourhood being evaluated .

Overall, the expert interviews were changed in favour of a survey following the same themes to ensure the clarity of the data collected, while a new version of the Residents' Survey has been made clearer and more precise.

5.5 Ethical Considerations

One of the basic requirements for the conduct of research is the need for informed consent, the right to privacy, and professional honesty. Research ethics relates to the appropriateness of behaviour and concerns the rights of subjects or those who may be affected by the research. In this study, the protection of the research subjects' privacy and confidentiality is part of the ethical responsibilities of the researcher. Hence, all sensitive information and identifiable data will be deleted when the research is complete. The ethical procedures for this research comply substantially with the University of Strathclyde's ethical policies on research involving human subjects. The researcher strictly adhered to the ethical principles to ensure that the informed consent of participants was sought in line with the policies. No invasion of privacy arose as all the participants involved in this study were given detailed information about its purpose before participating. Above all, the researcher ensured that there was no bias in the views and contributions of the participants in expert and residents surveys while their views did not in any way constitute a risk to them. In the process, all the participants filled out the consent form as evidence of their consent to participate and were informed of their right to withdraw at any stage, at which point all their data would be deleted. A copy of the signed ethical approval form is attached in Appendix I.

5.6 Conclusion

The present chapter has described the reasoning for the methodological strategy for data collection to study urban fragmentation. Using mixed methods and an exploratory research design, the relationship between the process of urban fragmentation and gated developments was critically reviewed and tested in the novel context of a Saudi city. This methodology included a variety of survey approaches, including expert surveys and resident surveys. Urban network analysis and cross-contextual comparative case study appraisals rounded out the mixed methods approach. In this way, the research has collected and analysed a comprehensive body of data that contributes novel considerations to scholarly and professional understandings of urban fragmentation, and the impact gated developments have on neighbouring communities.

An instance in which the rigor added by the mix of methods has served the present study is in the use of surveys to supplement any conceptual weaknesses in the urban network analysis. A common critique of the Space Syntax technique has suggested that it is difficult to infer cultural, political, or social norms that guide a society simply by using this method. In response, the addition of data from Expert and Resident surveys contributes to smoothing over this gap in the data, particularly since “surveys or polls describe the attitudes, beliefs, and behaviours of a population”. (Patten & Newhart, 2018 p. 19). Thus, Phases 2 and 3 of the methodology incorporated insights that would otherwise have been absent from the study had a pure Space Syntax analysis been used. Conversely, questionnaire surveys are prone to provide only superficial representations of a phenomenon, as multiple-choice questions fail to offer the scope for genuine subjective interpretations. In the study, this was remedied first by including open-ended questions as part of Survey Phases 2 and 5. Moreover, data from the urban mapping and coding and the cross-contextual comparative case study appraisals added detail and depth to the questionnaire responses through comprehensive recording and analysis of the environments under discussion. Likewise, the use of mixed methods allowed the data collection to record and evaluate different types of data. (Flick, 2018). In applying the research design to the present study, this variety in data sources includes both verbal accounts from the multitude of questionnaire surveys conducted and visual accounts through the various forms of mapping, collations of satellite images, and material appraisals.

Chapter 6: Urban Fragmentation in Riyadh: A Discursive Analysis and Discussion

6.1 Introduction

The survey was comprised of 66 questions and sub-questions (see Appendix A for a full list of survey questions) and collected data on the expert's professional expertise and experience, their views on urban fragmentation and the structural elements, policy frameworks, and development types that contribute to it. The experts were also asked for their opinion on a number of design guidelines. This research also utilised a mapping methodology to map gated developments across Riyadh to understand the relationship between gated developments, socio-economics, and development trends (see Appendix H for a further details). This chapter aims to understand expert opinions on fragmentary urban typologies and the impact on the built environment and residents of Saudi Arabian cities.

An underlying hypothesis of this research is that gated development amongst other fragmentary urban typologies might contribute to spatial fragmentation and social exclusion. By their nature, gated developments physically separate specific areas from the broader environment and create zones or pockets of restricted access within the urban fabric. The study finds majority support for this position, although there is some disagreement over the precise definition of urban fragmentation. There is a considerable amount of agreement between experts and residents on the issues facing Saudi cities in relation to the provision or services, facilities, and the public realm.

This chapter briefly outlines the methodology used to conduct the survey and analyse the gathered data. It then describes the professional backgrounds of the panel. After which, it analyses expert opinion on urban fragmentation, its causes and the impact on quality of life in the city, concluding with a discussion on potential design guidelines. It ends with a summary of the survey's findings.

6.2 Experts Survey Overview

An online survey of experts in the fields of urban design, urban planning, and architecture was conducted between February and July 2019. The investigation adopted a Respondent-Driven Sampling (RDS) method in which participants were encouraged to use their social and

professional networks to invite others to participate in the survey. The sampling process began with the researcher identifying a number of participants as seeds from their professional network of academics, practitioners, and policymakers. These seeds then recruited others. This process of existing sample members recruiting future sample members continued until the desired sample size was reached.

A total of 100 experts took part in the survey, however, not all respondents completed all questions, with the drop-out rate increasing throughout. A total of 79 experts completed the survey, including the background information. Due to the nature of the survey, all responses have been included provided that a respondent completed all questions relevant to a given research topic.

Online surveys have both advantages and limitations. One advantage is that it accords respondents with a degree of anonymity and has been shown to increase their willingness to openly express their views, to maximize the response rate, and to minimize response errors. Close-ended or multiple-choice questions were used wherever possible.

The survey comprised of 63 questions and sub-questions that collected data on the respondent's professional background, their views on urban fragmentation and its underlying causes, and their opinion on several design guidelines. The length of the survey and the detailed nature of the questions enabled detailed insights into specific issues relating fragmentary urban typologies, although the structure of the multiple-choice answers potentially limited the ability to fully analyse the diversity in opinion amongst the panel. A form of Likert scale may be more appropriate for further investigation.

The survey initially focused on the city of Riyadh, however, during the course of the study, it was decided to expand the scope to include experts located in other cities in Saudi Arabia. This did not fundamentally change the structure of the survey, and the two data sets were combined during the analysis presented in this chapter.

The General Authority for Statistics economic census in 2010 found there were approximately 31,000 architecture-related professionals in the country; the actual number is likely to be somewhat higher, especially if professionals in public policy and academics are included. Given the sample size of 100, this suggests that at a 95% confidence level the margin of error is 9.78%. This is relatively high; however, given the nature of the survey and

the broad range of professional backgrounds of the panel, it is believed that the study provides useful insights into the spectrum of expert opinion.

6.3 Professional Profile

The expert panel was composed of professionals and academics specializing in urban design and the built environment. A significant majority were either urban planners (49%) or urban designers (22%). Architects made up 19% of respondents, with a further 11% being made up of individuals from other specialties (landscape architecture, engineering, etc.)

The experts were sourced from the public sector (44%), academia , and (28%) private sector (19%). The respondents were well distributed across sectors and areas of expertise – for example, the 33% of architects were public sector employees, 47% were private sector employed or businesspeople, and 20% were academics. Urban designers followed a similar distribution across the public sector (41%), private sector (24%), and academia (29%).

The highest level of educational qualifications obtained by the survey respondents was reasonably well distributed, with almost 40% having a bachelor's degree, 36% with a master's degree, and just under a quarter holding a doctorate. Almost three-quarters of those with a doctorate worked in academia. Around 60% of respondents have studied exclusively in Saudi Arabia, including 94% of those with a bachelor's degree. Of the respondents that have studied fully or partially abroad, 58% had studied in North America, and 38% had studied in Europe.

The experience level of the panel was well-distributed, enabling the survey to capture the views of both older, more experienced professionals alongside those of younger members of the various professions – 30% had between 6-10 years of experience whilst 28% had more than 16 years' experience.

Less than a third of respondents stated their place of work; these were mostly public sector employees or those in academia. Figure 6.5 shows a word cloud of the institutions they represent.

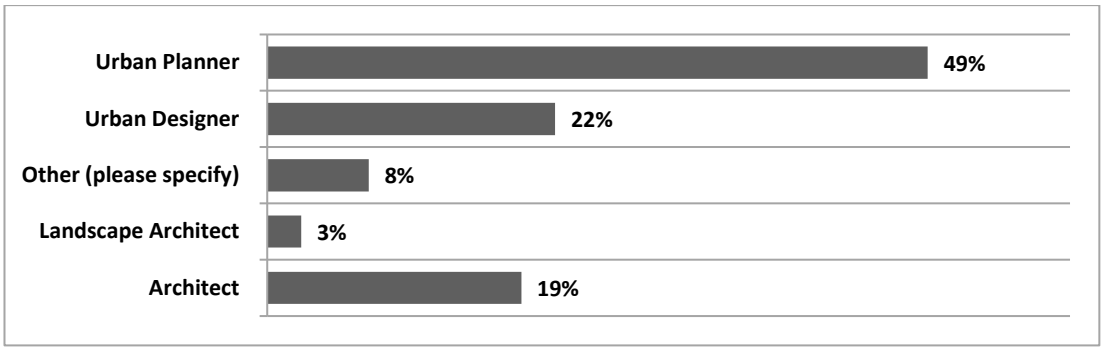


Figure 6.1 Area of expertise

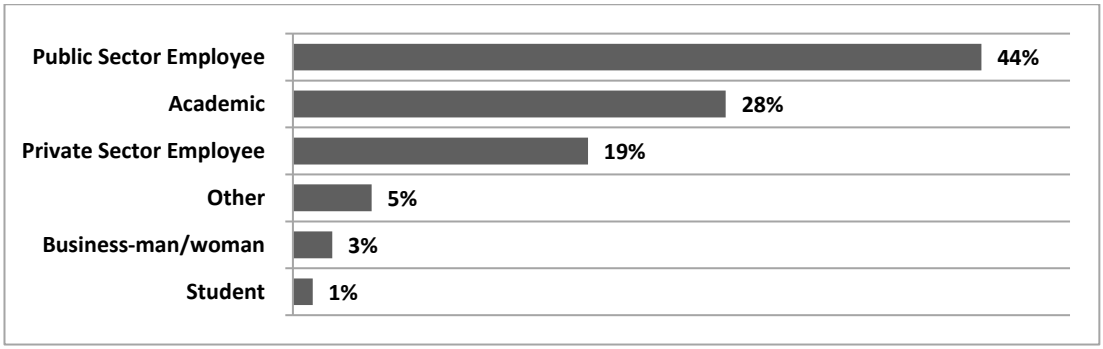


Figure 6.2 Work Sector

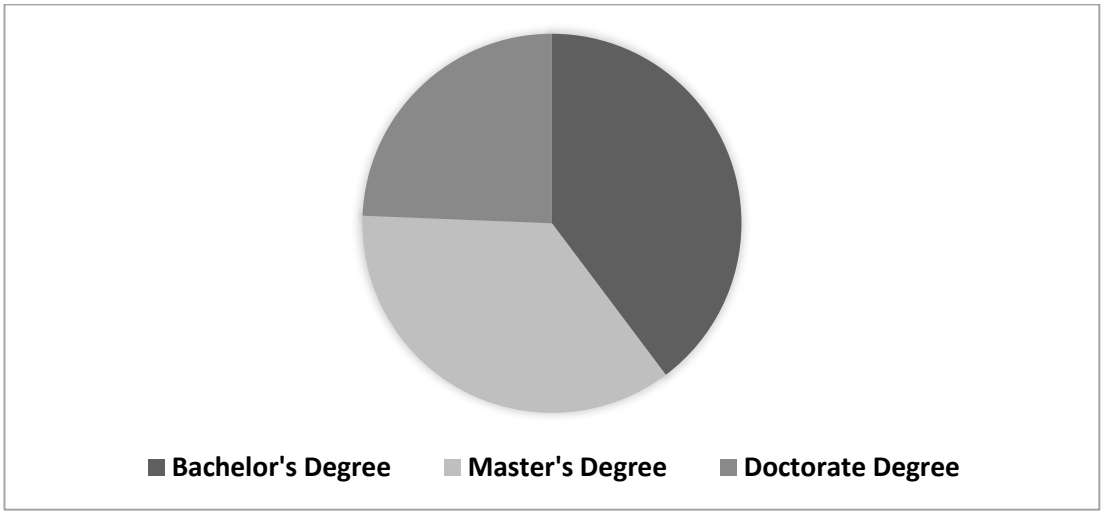


Figure 6.3 Education qualifications

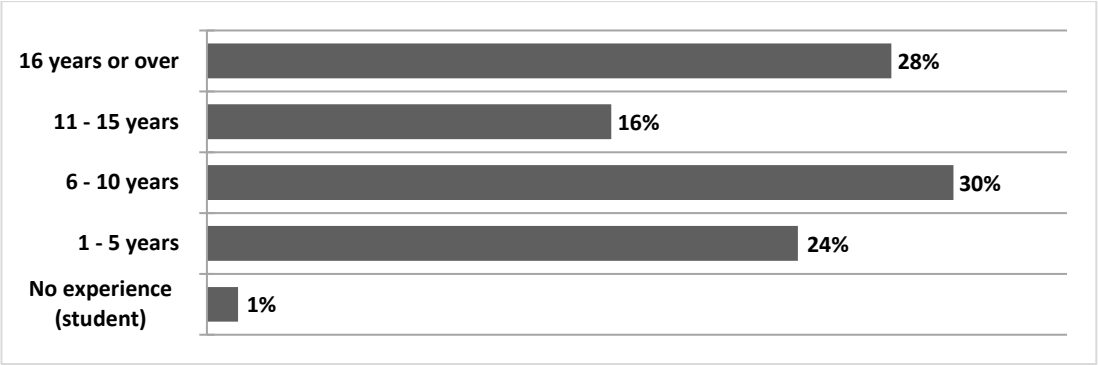


Figure 6.4 Years of experience

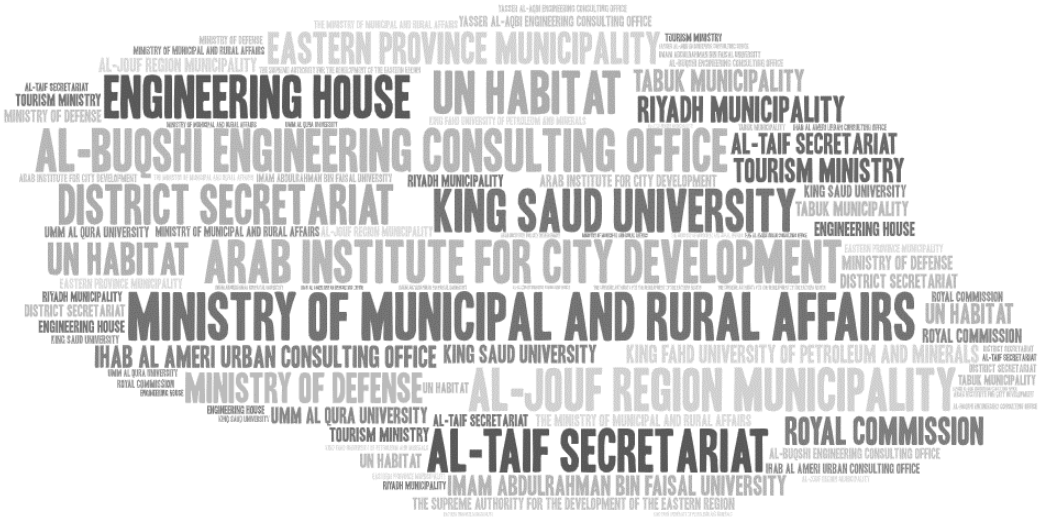


Figure 6.5 Institutions represented

6.4 Challenges of Urbanisation

A number of factors contribute to the development of a fragmented built environment and urban fabric, including urban planning policies, structural elements such as gates, walls, and other barriers and forms of urban development such as arterial highways, malls, industrial areas, and gated communities. This section looks at each of these factors, analysing expert opinion and assessing the impact on the built environment and the quality of life of city residents.

6.4.1 Urban Challenges

The survey asked the expert panel to assess the extent to which a variety of issues impact the built environment in their city - Figure 6.6 summarizes the results. The rate of population growth and urbanisation were the most common issues, with four out of five of the experts

surveyed deeming them to be a major challenge. This was particularly true in Riyadh, with 88% of experts from the city concerned by population growth and 96% concerned by the rate of urbanisation.

Whilst it is acknowledged that there are ongoing projects to develop public transportation in Riyadh, 77% of respondents identified the absence of public transport and consequent reliance on private vehicles as a major challenge facing cities in Saudi Arabia. In a related issue, 71% of respondents highlighted the 'absence of the human dimension in the design of the public domain'.

A number of governance and co-ordination issues were identified – almost three-quarters of the experts surveyed identified 'poor coordination between the different agencies dealing with urban issues' (74%) and 'limitations of the municipality system and urban decision making process' (72%) as major challenges impacting the built environment.

There was somewhat less consensus on whether the lack of a balanced distribution of land-uses, population densities, public services, and the variety of housing available is a major challenge, with between 50 – 60% of experts seeing this as a major challenge, 30-40% only seeing it as a minor challenge and around 5-10% unconcerned. The proliferation of informality in business activity and residential settlements was of least concern to the panel – 39% agreed that this was a major challenge, but over a quarter (26%) did not believe it was an issue applicable to their city.

The survey participants were asked to reflect on the quality of urban design and their city's built environment and identify neighbourhoods that exhibited both positive and negative characteristics. The largest group of experts is based in Riyadh – Al-Safarat or the Diplomatic Quarter, the neighbourhood most frequently cited as an example of high-quality urban design; it was mentioned by 30% of experts based in the city. This was followed by the Ministry of Foreign Affairs Housing District. In general, neighbourhoods in the north and northwest of the city were more likely to be mentioned. However, a number of comments suggested that there were few, if any neighbourhoods that were well designed. When asked to give examples of poorly designed neighbourhoods with low-quality built environments in need of improvement, the most common answer amongst Riyadh-based experts was 'all or most neighbourhoods'. This was followed by 'Southern' and 'Central' Riyadh.

There was little consensus amongst the 12 experts based in Jeddah. The neighbourhood of Muhammadiyah was mentioned by a quarter of respondents as an example of good design. Ghulail and Al-Bawadi were each mentioned by three respondents as areas in need of improvement.

In Dammam, the neighbourhoods of Doha, Dana, and housing projects for undergraduates were each mentioned by two out of six respondents as the best neighbourhoods in the city. Al-Dawasir was mentioned by half of the experts (3/6) based in the city as needing improvement.

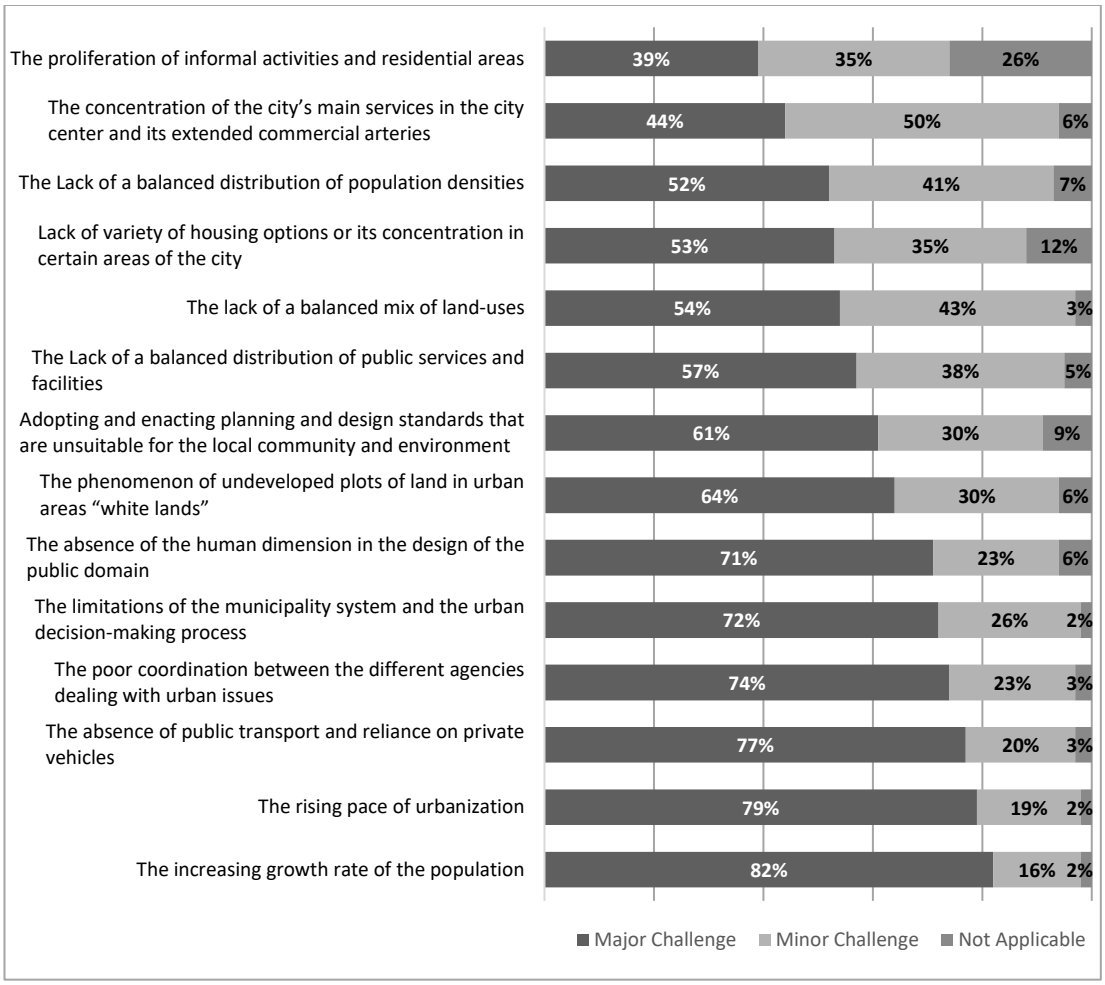


Figure 6.6 Many cities in the world today face multiple and overlapping challenges

6.4.2 Urban Fragmentation

The expert panel was asked to what extent they agree with the following definition of the concept of urban fragmentation:

> "Urban fragmentation is a spatial phenomenon in cities whose urban fabric is characterised by limited access and the emergence of areas that are largely isolated from the rest of the city, and where there is no coherence at the level of the urban fabric."

Just over half (51%) agreed, 47% somewhat agreed, and only 2% disagreed with the definition. Table 6.1 shows the percentage of experts who agree with the definition of urban fragmentation cross-tabulated with the percentage that believes urban fragmentation is a concept that is applicable to cities in Saudi Arabia.

Table 6.1 Urban fragmentation and Saudi Arabian cities

Concept applicable to Saudi Arabian cities				
Definition of Urban Fragmentation	**Applicable**	**Somewhat Applicable**	**Not Applicable**	Total
Agree	30%	21%	0%	51%
Somewhat Agree	15%	27%	5%	47%
Disagree	0%	1%	1%	2%
Total	45%	49%	6%	100%

Amongst the expert panel, 45% believed the concept was applicable to Saudi Arabian cities, of which two-thirds agreed with the definition. Just under half (49%) believed the concept was somewhat applicable, of whom 43% agreed with the definition. Only 6% of respondents (six individuals) do not believe that urban fragmentation is a concept that is applicable to Saudi Arabian cities.

Table 6.2 examines the relationship between an expert's view on whether the concept of urban fragmentation is applicable to Saudi cities and the extent to which they believe a variety of issues are challenges facing their city. The chart shows the percentage of experts who believe the concept to be appliable or somewhat applicable cross-tabulated against their view of the issue as a major challenge, minor challenge, or not applicable. Due to the small number of respondents who did not believe it was a relevant concept, those individuals have been excluded from the analysis.

Respondents who believed urban fragmentation to be an applicable concept were significantly more likely to view the issues as challenges facing the city. The largest difference in opinion (delta) was in views on "the lack of a balanced mix of land-uses" in which there was a 26.2 percentage point gap between those that "agreed" and "somewhat agreed" on whether this was a major challenge. Other significant differences in opinion were on the "phenomenon of undeveloped plots of land in urban areas 'white lands'" (16.4 percentage point gap), "the lack of a balanced distribution of public services and facilities" (13.2 percentage points), and "the absence of public transport and reliance on private vehicles"

(17.6 percentage points). However, in other areas, the views of the two groups were reasonably well aligned, such as in issues relating to the population growth rate and distribution of population densities.

In broad terms, respondents who believe the concept of urban fragmentation is a useful concept to apply to Saudi Arabian cities tend to be more concerned by issues relating to land-use and the provision of public services and facilities, including public transport.

Table 6.2 How do views on urban fragmentation in Saudi cities inform opinions on the challenges facing those

Adopting and enacting planning and design standards that are unsuitable for the local community and environment is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 64.3%	+ 23.8%	+ 11.9%
Somewhat applicable	+ 59.6%	+ 34.0%	+ 6.4%
Delta	**+ 4.7%**	**- 10.2%**	**+ 5.5%**
Lack of variety of housing options or its concentration in certain areas of the city is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 59.5%	+ 38.1%	+ 2.4%
Somewhat applicable	+ 46.8%	+ 31.9%	+ 21.3%
Delta	**+ 12.7%**	**+ 6.2%**	**- 18.9%**
The absence of public transport and reliance on private vehicles is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 88.1%	+ 9.5%	+ 2.4%
Somewhat applicable	+ 70.2%	+ 27.7%	+ 2.1%
Delta	**+ 17.9%**	**- 18.1%**	**+ 0.3%**
The absence of the human dimension in the design of the public domain is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 78.6%	+ 19.0%	+ 2.4%
Somewhat applicable	+ 66.0%	+ 25.5%	+ 8.5%
Delta	**+ 12.6%**	**- 6.5%**	**- 6.1%**
The increasing growth rate of the population is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 83.3%	+ 14.3%	+ 2.4%
Somewhat applicable	+ 85.1%	+ 14.9%	+ 0.0%
Delta	**- 1.8%**	**- 0.6%**	**+ 2.4%**
The Lack of a balanced distribution of population densities is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 54.8%	+ 38.1%	+ 7.1%
Somewhat applicable	+ 51.1%	+ 42.6%	+ 6.4%
Delta	**+ 3.7%**	**- 4.5%**	**+ 0.8%**
The Lack of a balanced distribution of public services and facilities is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 64.3%	+ 31.0%	+ 4.8%
Somewhat applicable	+ 51.1%	+ 44.7%	+ 4.3%
Delta	**+ 13.2%**	**- 13.7%**	**+ 0.5%**
The lack of a balanced mix of land-uses is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 66.7%	+ 28.6%	+ 4.8%
Somewhat applicable	+ 40.4%	+ 57.4%	+ 2.1%
Delta	**+ 26.2%**	**- 28.9%**	**+ 2.6%**
The limitations of the municipality system and the urban decision-making process is a ...			

The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 78.6%	+ 21.4%	+ 0.0%
Somewhat applicable	+ 66.0%	+ 29.8%	+ 4.3%
Delta	**+ 12.6%**	**- 8.4%**	**- 4.3%**
The phenomenon of undeveloped plots of land in urban areas 'white lands' is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 73.8%	+ 19.0%	+ 7.1%
Somewhat applicable	+ 57.4%	+ 36.2%	+ 6.4%
Delta	**+ 16.4%**	**- 17.1%**	**+ 0.8%**
The poor coordination between the different agencies dealing with urban issues is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 76.2%	+ 19.0%	+ 4.8%
Somewhat applicable	+ 70.2%	+ 27.7%	+ 2.1%
Delta	**+ 6.0%**	**- 8.6%**	**+ 2.6%**
The proliferation of informal activities and residential areas is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 38.1%	+ 42.9%	+ 19.0%
Somewhat applicable	+ 38.3%	+ 29.8%	+ 31.9%
Delta	**- 0.2%**	**+ 13.1%**	**- 12.9%**
The rising pace of urbanization is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 85.7%	+ 11.9%	+ 2.4%
Somewhat applicable	+ 76.6%	+ 23.4%	+ 0.0%
Delta	**+ 9.1%**	**- 11.5%**	**+ 2.4%**
The concentration of the city's main services in the city centre and its extended commercial arteries is a ...			
The concept of urban fragmentation is ... to Saudi cities.	Major Challenge	Minor Challenge	Not Applicable
Applicable	+ 40.5%	+ 54.8%	+ 4.8%
Somewhat applicable	+ 46.8%	+ 44.7%	+ 8.5%
Delta	**- 6.3%**	**+ 10.1%**	**- 3.7%**

6.4.3 Urban Planning Policies

Survey respondents were asked whether 'urban planning policies in Saudi cities generally and in your city, in particular, contribute to the creation of a fragmented built environment". More than three-quarters (76%) believed that they contribute to urban fragmentation, 12.5% believe they do not contribute, and 11.5% had no opinion. Public sector employees and those with expertise in architecture are less likely to believe that urban planning policies lead to urban fragmentation.

A number of respondents provided examples of policies that contribute to urban fragmentation in Saudi cities – their comments are summarised in Table 6.3. A number of themes are evident – several of the respondents mentioned the lack of planning around urban expansions, including allowing expansion into areas under-served by infrastructure or services. Several respondents mentioned issues relating to a lack of public transport provision and pedestrian-friendly streets. Poorly-designed neighbourhood centres lacking social and community spaces and infrastructure was also a recurring theme.

Table 6.3 Expert's views on urban policies which lead to urban fragmentation in Saudi Arabian cities

Themes and Comments
Physical Barriers, Built Environment and Zoning
Absence of varying housing densities
Any land above 5000 square meters is considered a private development, and this system, unfortunately, is not studied
Building heights
Commercial districts
Height of fences
Preventing mixing of uses within residential neighbourhoods
Preventing separate houses from rising more than one floor
Space lands and breaks within neighbourhoods
Systems of setbacks and plots of land, which are often old generalizations, not an urban code, which reflects urban confusion
The absence of humanization of cities and neighbourhood centres
The extension of commercial strips on land uses beside roads
The lack of an effective system against the spread of white lands
The lack of an effective system for residential neighbourhoods and the existence of centres for them,
The municipality systems built only two floors, which contributed to the expansion and disintegration and the excess of permissible growth control and the result is the urban disintegration of the city
The streets separate the uses from each other
Front setbacks of housing
Housing setbacks
Roads, Public Transport and Pedestrians
The lack of a clear transportation plan starting from the sidewalk to the arrival point
Absence of public transportation
Failure to separate traffic from pedestrians
Grid systems
Lack of respect for sidewalk dimensions for pedestrians
Not providing public transportation
Priority road network for vehicle movement
Promoting car traffic more than pedestrian traffic and planning has given priority to vehicles, especially private vehicles, more than to enhance the human, social and cultural aspects of the city.
Road network(arterial.)
Very wide streets in residential neighbourhoods
Social and Community Spaces
Absence of places of mixing and general acquaintance
Not to remove demolished buildings and turning them into squares that are considered a lung to breathe from, such as parks and parking lots to benefit from the rest of the good buildings, such as a home, restaurants or crafts activities
The absence of neighbourhood centres
Urban expansion and lack of infrastructure and service provision
Adding new neighbourhoods on the outskirts of cities
Issuing building permits in areas not served by infrastructure and public facilities
Planning at the level of services and urban expansion
Planning criteria and the limitations of vertical expansion based on the size of the infrastructure capacity
Urban scale system for cities based on horizontal expansion
Planning, Policy and Governance
Centralization in city planning or some projects, which results in a neighbourhood inconsistency with neighbouring neighbourhoods, there is no administration dedicated to managing the city with all its services
Certification procedures for schemes
Install the Saudi Building Code
Lack of consistency between systems and need
Land uses and requirements
Municipalities system, urban zone regulation, building regulations
The correct logic system for the city and its classification. And not to generalize the requirements to all parts of the city, let alone the tradition in the villages
The system of approving governmental and private plans
Unfortunately, there is essentially no urban planning system in the Kingdom. Rather, all that exists is the personal discretion of government agencies in immediate handling of its planning problems.
Urban legislation and building system

6.4.4 Structural Elements

The expert panel was asked whether the "overuse of the following structural elements has an effect in creating a fragmented built environment". The results, shown in Figure 6.7, show that opinion was divided with approximately half agreeing that structural elements that ensure "security" and "privacy" had an effect on creating a fragmented built environment, over 70% agreed that those that define property ownership have an effect.

More experienced respondents tended to believe that structural elements had less effect than younger, less experienced professionals. Of those with over 16 years' experience, 41% believed privacy-related elements impacted fragmentation, 32% for security-related elements, and 45% for elements that define property ownership.

Table 6.4 shows the relationship between views on the role of structural elements in creating a fragmented built environment and whether a respondent agreed with the definition of urban fragmentation. Those that did not agree have been excluded due to the small sample size.

The chart suggests that there is no clear link between respondent's understanding of the definition of urban fragmentation and their views on the extent to which structural elements contribute to it; indeed, those that "somewhat agreed" with the definition were more likely to agree that structural elements play a role for two out of three of the elements.

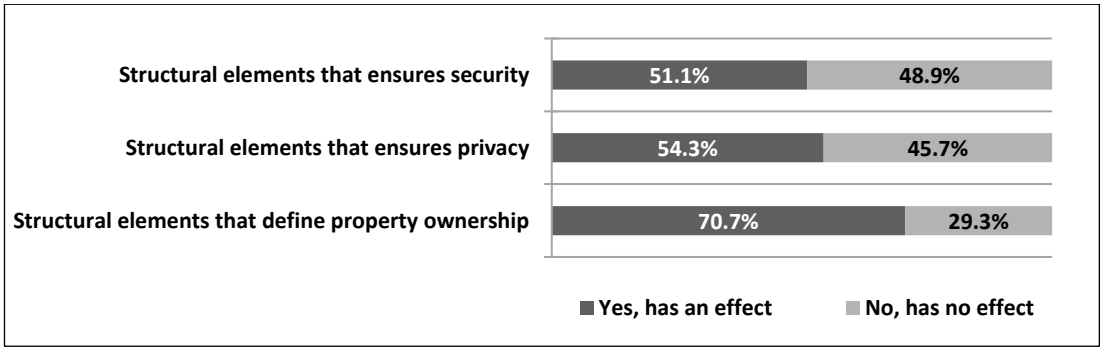


Figure 6.7 Impact of structural elements on creating a fragmented built environment

Table 6.4 Connection between understanding of urban fragmentation and perspective on the structural elements that contribute to it

	Agree	Somewhat Agree
Structural elements that define property ownership		
Yes, has an effect	71.11%	68.89%
No, has no effect	28.89%	31.11%
Structural elements that ensure privacy		
Yes, has an effect	46.67%	60.00%
No, has no effect	53.33%	40.00%
Structural elements that ensure security		
Yes, has an effect	40.00%	60.00%
No, has no effect	60.00%	40.00%

Table 6.5 examines the relationship between views on the impact of structural elements and the extent to which a variety of issues are a challenge for the city. The heat map shows the percentage of respondents who saw an issue as "major challenge", "minor challenge", or "not applicable", split by their view on the three types of structural elements. The chart shows that many of the differences are not particularly strong, although some larger gaps do exist.

The effect is strongest when considering the effect of elements that define property ownership. For example, 61% of respondents who believe that this has an effect also believe that the "lack of a balanced distribution of population densities" is a major challenge; the corresponding figure for those that do not believe that these have an effect is 26 percent. Similar patterns can be seen for "lack of a balanced distribution of public services and facilities" (63% s, 41%) and the "lack of a balanced mix of land-uses" (79% vs. 33%).

Table 6.5 Respondent's view's on structural elements and the challenges facing their city

Adopting and enacting planning and design standards that are unsuitable for the local community and environment is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+61.5%	+33.8%	+4.6%
No effect	+59.3%	+22.2%	+18.5%
Structural elements that ensure privacy			
Yes, has an effect	+64.0%	+32.0%	+4.0%
No effect	+57.1%	+28.6%	+14.3%
Structural elements that ensure security			
Yes, has an effect	+68.1%	+29.8%	+2.1%
No effect	+53.3%	+31.1%	+15.6%
Lack of variety of housing options or its concentration in certain areas of the city is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+60.0%	+32.3%	+7.7%
No effect	+33.3%	+44.4%	+22.2%
Structural elements that ensure privacy			
Yes, has an effect	+56.0%	+32.0%	+12.0%
No effect	+47.6%	+40.5%	+11.9%
Structural elements that ensure security			
Yes, has an effect	+59.6%	+31.9%	+8.5%
No effect	+44.4%	+40.0%	+15.6%
The absence of public transport and reliance on private vehicles is a …			

Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+76.9%	+18.5%	+4.6%
No effect	+77.8%	+22.2%	+0.0%
Structural elements that ensure privacy			
Yes, has an effect	+80.0%	+20.0%	+0.0%
No effect	+73.8%	+19.0%	+7.1%
Structural elements that ensure security			
Yes, has an effect	+72.3%	+25.5%	+2.1%
No effect	+82.2%	+13.3%	+4.4%
The absence of the human dimension in the design of the public domain is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+73.8%	+21.5%	+4.6%
No effect	+63.0%	+25.9%	+11.1%
Structural elements that ensure privacy			
Yes, has an effect	+74.0%	+18.0%	+8.0%
No effect	+66.7%	+28.6%	+4.8%
Structural elements that ensure security			
Yes, has an effect	+74.5%	+19.1%	+6.4%
No effect	+66.7%	+26.7%	+6.7%
The concentration of the city's main services in the city centre and its extended commercial arteries is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+46.2%	+47.7%	+6.2%
No effect	+40.7%	+51.9%	+7.4%
Structural elements that ensure privacy			
Yes, has an effect	+48.0%	+46.0%	+6.0%
No effect	+40.5%	+52.4%	+7.1%
Structural elements that ensure security			
Yes, has an effect	+42.6%	+51.1%	+6.4%
No effect	+46.7%	+46.7%	+6.7%
The increasing growth rate of the population is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+84.6%	+13.8%	+1.5%
No effect	+77.8%	+18.5%	+3.7%
Structural elements that ensure privacy			
Yes, has an effect	+84.0%	+16.0%	+0.0%
No effect	+81.0%	+14.3%	+4.8%
Structural elements that ensure security			
Yes, has an effect	+85.1%	+12.8%	+2.1%
No effect	+80.0%	+17.8%	+2.2%
The lack of a balanced distribution of population densities is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+61.5%	+32.3%	+6.2%
No effect	+25.9%	+63.0%	+11.1%
Structural elements that ensure privacy			
Yes, has an effect	+54.0%	+44.0%	+2.0%
No effect	+47.6%	+38.1%	+14.3%
Structural elements that ensure security			
Yes, has an effect	+61.7%	+38.3%	+0.0%
No effect	+40.0%	+44.4%	+15.6%
The lack of a balanced distribution of public services and facilities is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+63.1%	+32.3%	+4.6%
No effect	+40.7%	+51.9%	+7.4%
Structural elements that ensure privacy			
Yes, has an effect	+54.0%	+40.0%	+6.0%
No effect	+59.5%	+35.7%	+4.8%
Structural elements that ensure security			
Yes, has an effect	+61.7%	+36.2%	+2.1%
No effect	+51.1%	+40.0%	+8.9%
The lack of a balanced mix of land-uses is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable

Yes, has an effect	+58.5%	+38.5%	+3.1%
No effect	+33.3%	+63.0%	+3.7%
Structural elements that ensure privacy			
Yes, has an effect	+58.0%	+40.0%	+2.0%
No effect	+42.9%	+52.4%	+4.8%
Structural elements that ensure security			
Yes, has an effect	+59.6%	+38.3%	+2.1%
No effect	+42.2%	+53.3%	+4.4%
The limitations of the municipality system and the urban decision-making process is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+77.8%	+26.2%	+3.1%
No effect	+70.4%	+29.6%	+0.0%
Structural elements that ensure privacy			
Yes, has an effect	+66.0%	+30.0%	+4.0%
No effect	+76.2%	+23.8%	+0.0%
Structural elements that ensure security			
Yes, has an effect	+74.5%	+23.4%	+2.1%
No effect	+66.7%	+31.1%	+2.2%
The phenomenon of undeveloped plots of land in urban areas "white lands" is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+66.2%	+27.7%	+6.2%
No effect	+59.3%	+33.3%	+7.4%
Structural elements that ensure privacy			
Yes, has an effect	+66.0%	+28.0%	+6.0%
No effect	+61.9%	+31.0%	+7.1%
Structural elements that ensure security			
Yes, has an effect	+74.5%	+25.5%	+0.0%
No effect	+53.3%	+33.3%	+13.3%
The poor coordination between the different agencies dealing with urban issues is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+75.4%	+21.5%	+3.1%
No effect	+66.7%	+29.6%	+3.7%
Structural elements that ensure privacy			
Yes, has an effect	+72.0%	+24.0%	+4.0%
No effect	+73.8%	+23.8%	+2.4%
Structural elements that ensure security			
Yes, has an effect	+70.2%	+27.7%	+2.1%
No effect	+75.6%	+20.0%	+4.4%
The proliferation of informal activities and residential areas is a …			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+33.8%	+41.5%	+24.6%
No effect	+40.7%	+25.9%	+33.3%
Structural elements that ensure privacy			
Yes, has an effect	+34.0%	+42.0%	+24.0%
No effect	+38.1%	+31.0%	+31.0%
Structural elements that ensure security			
Yes, has an effect	+31.9%	+44.7%	+23.4%
No effect	+40.0%	+28.9%	+31.1%
The rising pace of urbanization is a ...			
Structural elements that define property ownership	Major Challenge	Minor Challenge	Not Applicable
Yes, has an effect	+78.5%	+20.0%	+1.5%
No effect	+81.5%	+14.8%	+3.7%
Structural elements that ensure privacy			
Yes, has an effect	+84.0%	+16.0%	+0.0%
No effect	+73.8%	+21.4%	+4.8%
Structural elements that ensure security			
Yes, has an effect	+87.2%	+10.6%	+2.1%
No effect	+71.1%	+26.7%	+2.2%

6.4.5 Forms of Urban Development

The panel was asked "to what degree do you see the following urban development types contributing to the emergence of a fragmented built environment?" (Figure 6.8). Infrastructure elements that divide urban areas such as inner-city highways and arterial roads, bridges, and floodwater streams were seen as a major contributing factor to urban fragmentation by two-thirds (64%) of the experts surveyed. This was followed by the presence of industrial zones located within the city limits, with 60% seeing this as a major factor, although 11% thought that they had no effect. Big shopping centres and malls were seen as having the least impact on creating a fragmented built environment – 39% thought they had a significant effect, while 17% thought they had no effect.

Several of the respondents suggested additional development types that contribute to a fragmented built environment, including "white lands" or "large open spaces", the development of "mega projects" and "economic cities", and "military areas within the urban cluster". At the human or neighbourhood level, experts mentioned the role that "house walls" play in disrupting the urban fabric, and several mentioned the lack of "safe, connected sidewalks" and the negative impact of "arterial roads" and "unconnected streets".

Table 6.6 shows the extent to which an expert's view on the definition of urban fragmentation influences their views on whether various forms of urban development lead to the development of a fragmented built environment. The table shows that for three of the urban development types, "big shopping centres and malls", "single-use business areas" and "infrastructure elements that divide urban areas", the views of experts that agree with the definition are significantly different from those that do only somewhat agree. Those who agree are on average 23 percentage points more likely to believe that these urban development types significantly impact urban fragmentation. However, there is little to no difference in views on the impact of "gated communities", "industrial zones", or "large gated urban areas", with 50-60% stating that they have a significant impact.

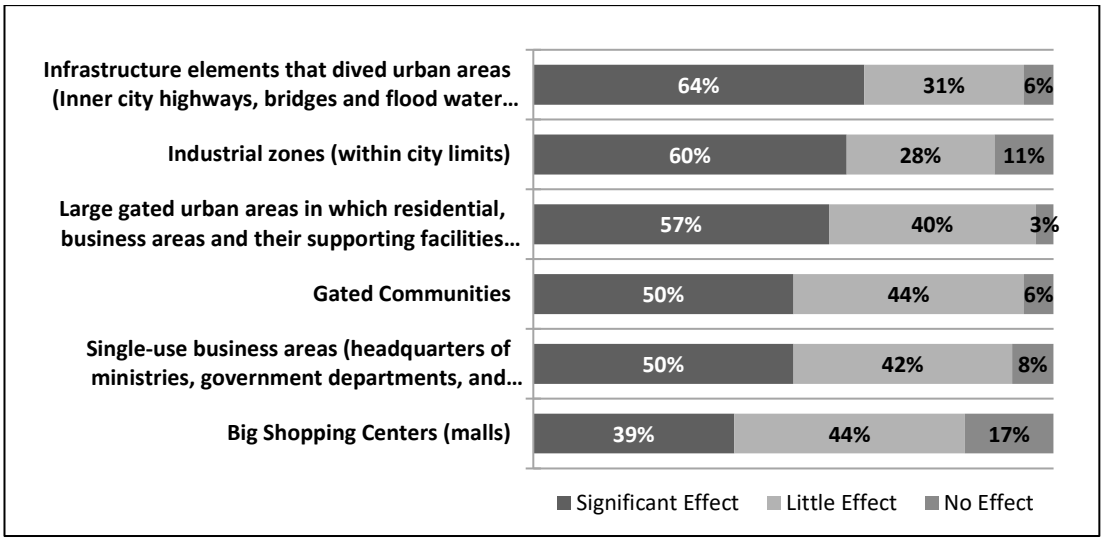


Figure 6.8 Impact of urban development types on creating a fragmented built environment

Table 6.6 Connection between understanding of urban fragmentation and perspective on the degree to which urban development types contribute to it

		Agree	Somewhat Agree	Delta
Big Shopping Centres (malls)	Significant Effect	48.8%	27.9%	20.9%
	Little Effect	37.2%	51.2%	-14.0%
	No Effect	14.0%	20.9%	-7.0%
Gated Communities	Significant Effect	51.2%	51.2%	0.0%
	Little Effect	44.2%	41.9%	2.3%
	No Effect	4.7%	7.0%	-2.3%
Industrial zones (within city limits)	Significant Effect	62.8%	58.1%	4.7%
	Little Effect	27.9%	27.9%	0.0%
	No Effect	9.3%	14.0%	-4.7%
Large gated urban areas (university campuses, medical centres)	Significant Effect	55.8%	55.8%	-
	Little Effect	39.5%	41.9%	-2.3%
	No Effect	4.7%	2.3%	2.3%
Single-use business areas (headquarters of ministries, government departments, and companies)	Significant Effect	65.1%	37.2%	27.9%
	Little Effect	27.9%	53.5%	-25.6%
	No Effect	7.0%	9.3%	-2.3%
Infrastructure elements (Inner city highways, bridges and flood water streams)	Significant Effect	74.4%	53.5%	20.9%
	Little Effect	18.6%	41.9%	-23.3%
	No Effect	7.0%	4.7%	2.3%

6.4.6 Impact on the quality of life of city residents

Experts were asked to evaluate the impact of a fragmented urban environment on various social and economic issues that impact the quality of life of city residents. The results, shown in Figure 6.9 , are reasonably consistent - roughly 60 and 70% of respondents believe that the listed forms of urban development types have a significant impact on the quality of life of nearby residents. The most frequently cited reasons were the availability of public services and facilities (73%) and the availability of parks and recreational spaces (71%). The area of

least concern was access to multiple transportation options such as taxis, Uber, Careem, and home delivery services. Less than 10% of respondents believed that these forms of urban development would have no effect on any of the quality of life indicators.

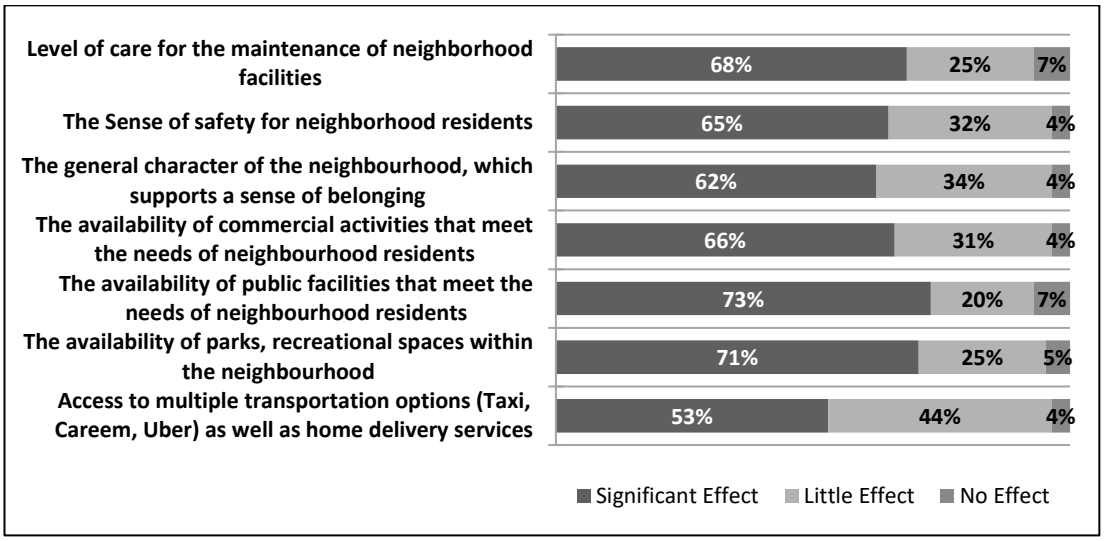


Figure 6.9 Impact of urban fragmentation on the quality of life of residents

Appendix C contains a series of charts showing the extent to which there is a relationship between respondents' views on the impact of urban development types on residents' quality of life and the challenges facing the city. Each chart shows a potential challenge facing the city and various factors which could impact the resident's quality of life. Taking those experts who believed a factor to have a significant, little or no effect, in turn, the chart shows the percentage of experts who believe the challenge to be a major challenge, minor challenge, or not applicable. Those who saw no effect have been excluded due to the small sample size.

The chart helps to identify a number of hotspots in which there is a large gap in opinion between the two groups. The challenges in which there are the largest gaps are "adopting and enacting planning and design standards that are unsuitable for the local community and environment", "the concentration of the city's main services in the city centre and its extended commercial arteries", "the absence of the human dimension in the design of the public domain", "the lack of a balanced distribution of public services and facilities", and "the poor coordination between the different agencies dealing with urban issues".

In terms of quality-of-life indicators, most of these hotspots, which average around 30 percentage points, relate to views on the availability of public facilities, parks, and

recreational spaces. There are also a number of gaps in relation to respondents' views on the general character of the area and the sense of belonging.

These results confirm earlier observations, namely, that the experts surveyed have different but consistent perspectives on the issues facing their cities. For example, one of the largest differences relates to the concentration of the services in the city centre, respondents who view this as a major challenge were also far more likely believe that the availability, or lack thereof, of parks, public facilities, and services at a neighbourhood level will impact the quality of life of residents. Another example is the hotspot associated with adopting and enacting planning and design standards that are unsuitable for the local community and environment. Respondents who viewed this as a major challenge also tended to believe that urban fragmentation impacts the general character of the neighbourhood, which is important in helping residents form a sense of belonging.

6.4.7 Design Guidelines

The expert panel was asked to evaluate the extent to which they agreed with a number of design guidelines. The design guidelines are split into four dimensions – functional, social, morphological, and temporal. Each dimension has two guidelines (A and B) which provide contrasting visions and perspectives on the built environment. Table 6.7 shows the extent to which the survey respondents agree with each guideline. The following section summarizes the findings and provides a brief analysis of how the background of respondents influences their views of the guidelines

6.4.7.1 Function Dimension

Eighty-six% of respondents agreed with the view that an urban area should be multi-functional (B1) with residential, retail, businesses, and green recreation spaces. Only 1% disagreed. However, 35% of respondents also agreed that an urban-area should be mono-functional (A1), with the area connected to the rest of the city by car.

There is a significant gap in support for guideline A1 between those with 6-10 years' experience in which only 29% agree with the guideline and over 50% disagree. In contrast, those with more than 16 years' experience are more like to agree (40%) and less likely to disagree (36%). However, this does not, translate into a broader correlation between experience and perspective. In terms of the impact of a respondent's sectoral background - there is a 19 point gap between the percentage of academics that agree with the guideline and private sector

employees. Around a third of academics disagreed with the guideline (32%) compared to two-thirds of those in the private sector. Public sector opinion was evenly split between "agree", "somewhat agree", and disagree".

Ninety-five% of urban designers agreed with the guideline B1 compared to 80% of architects. Those working in the private sector were more likely to support the guideline (100%), academics (86%), and public sector employees (83%). Experience also played a factor, with those with more than 16 years' experience less likely to agree (77%).

6.4.7.2 Social Dimension

Just under three-quarters (72.5%) of respondents agreed that an urban area should have a supply of housing types that meet the needs and are affordable to a cross-section of society alongside cultural focal points such as museums, movie theatres, and libraries (B2). However, 45% agree that urban areas should cater specifically to certain socio-economic groups' needs and that malls and shopping facilities act as cultural and social venues (A2), with only 26% disagreeing with the statement.

Architects are significantly less likely to disagree with guideline A2 (13%) than urban planners (26%) and urban designers (47%). However, urban planners were the most likely group to "agree" with the guideline, with 48% support. Only one in five (20%) private sector employees agreed with the guideline compared to those in the public sector (54%) and academics (45%).

Architects are somewhat less likely to agree with guideline B2 (60%) compared to urban planners and designers (76%). Each sectoral group had broadly similar numbers of people who disagreed (2.8 - 6.7%). There were some differences in the proportion who "agreed" and "somewhat agreed". Academics were more likely to agree, with 82% supporting the guideline. Experience had no clear impact on the respondents' views on either guideline.

6.4.7.3 Morphological Dimension

The results for the morphological are more balanced, with approximately 50% agreeing with each guideline. Guideline A3, to which 53% agreed, states that streets and buildings should be organised into "super-blocks" with architectural styles which contrasts with the traditional architecture of old buildings. Guideline B3, to which 48% agreed, proposes a grid-like network of small blocks enabling the creation of enclosed paces and squares. Architectural styles are in keeping with traditional buildings.

Almost two-thirds of urban planners agreed with guideline A3, significantly higher than the 40% of architects and 41% of urban designers. Urban designers were the most likely to disagree with the guideline - 18% compared to just 7% of architects. There is no particularly strong relationship between the sectoral background of respondents and support for the guideline.

Architects are somewhat more likely to disagree (20%) with guideline B3 than urban planners/designers (12-13%), although this difference is relatively small. A bigger difference exists between the views of public and private sector employees - two-thirds (67%) of private sector respondents agreed with the proposal compared to 37% of those in the public sector; however, the proportion who either "agreed" or "somewhat agreed" is fairly consistent. Academics were somewhat less likely to disagree than other groups (4.5%). Experience had no clear impact on the respondents' views on either guideline.

6.4.7.4 Temporal Dimension

A majority (65%) agreed that the design of new urban areas should integrate previously existing structures provided they are robust and have charm and character enough to justify their prolonged preservation (B4) and can be adapted to accommodate diverse uses. At the same time, 48% agreed with the guideline (A4) that stated that new urban developments should comprehensively replace pre-existing structures with modern buildings

The proportion who agree with guideline A4 is reasonably consistent (41 - 54%) although urban designers are somewhat more likely to disagree with the statement (18% vs. 7-8%). Three-quarters of urban designers agreed with guideline B4 compared to just over half of architects (53%); however, the proportion that "agree" or "somewhat agree" is reasonably consistent across the different professional groups. Experience and sectoral background played little role in shaping respondents' views on the subject.

Table 6.7 Evaluation of Design Guidelines

Guidelines	Disagree	Somewhat Agree	Agree
First: Functional Dimension			
The urban area is mono-functional, either residential, commercial or business-oriented ("office centre"),	41.25%	23.75%	35.00%
The urban area is multi-functional, with residences and retail, as well as businesses, green spaces for re	1.25%	12.50%	86.25%
Second: Social Dimension			
The supply of housing types, and prices in the urban area caters to either those of high-income or those with limited income. A modern shopping mall constitutes the community's social focus and meeting place. Cultural places - such as public libraries, art galleries, museums and movie theatres are easily	26.25%	28.75%	45.00%

accessible by car. Safety and security are ensured by means of specialized security systems (human and/or technological). The urban area's supply of housing types, and prices, accommodates a diverse community from all age and socio-economic groups. The area also has central cultural places - such as public libraries, art galleries, museums and movie theatres. With places that sustain high levels of activity at different times of the day helps ensure a better sense of safety and security.	3.75%	23.75%	72.50%
Third: Morphological Dimension The street system is hierarchical, which allows for buildings to be organised into "super-blocks" with internal service roads, surrounded by the main collector road that channels the main fluxes of traffic. Public space is the open space around buildings. The architecture of new buildings contrasts stylistically with the traditional architecture of old buildings.	10.00%	36.25%	53.75%
The urban area has a street system that is a grid-like network of interconnected streets, allowing alternative routes between places. Buildings in the area are organised into blocks of relatively small dimensions, shaping streets and squares, and promoting spatial enclosure. The architecture of new buildings respects local tradition.	15.00%	36.25%	48.75%
Fourth: Temporal (Evolutional) Dimension The urban project proposes a comprehensive replacement of all previous structures and former uses. The architecture of buildings is "generic", or relatively ordinary and unremarkable, facilitating their replacement in the short/medium term by other, more modern buildings.	8.75%	42.50%	48.75%
The design of the new urban area integrates previously existing structures with newer ones. Buildings are robust and have charm and character enough to justify their prolonged preservation and can be adapted to accommodate diverse uses in the future.	5.00%	30.00%	65.00%

6.5 Conclusion

The survey attempted to understand expert opinion in relation to a number of questions. Firstly, is the concept of urban fragmentation one in which there is a consensus definition and to what extent the concept is applicable to cities in Saudi Arabia. Opinion was roughly equally divided between those that fully agreed with the definition and those that somewhat agreed. Only a small group actively disagreed with the definition. Similar proportions believed the concept was useful in describing the structure and development of Saudi cities. Interestingly, a sizeable minority of those who somewhat agreed with the definition agreed that the concept was useful in a Saudi context, suggesting that support for the underlying concept may be higher than the results suggest and that an amended definition may have garnered more support.

The second question related to the causes of urban fragmentation. The study explores a number of different potential causes, including urban planning policy, urban design, and the physical structures that make up the built environment. In almost all cases, the majority position held that the various factors contributed to urban fragmentation, although the proportions varied. According to the expert panel, the least important factors tended to be

physical structures; these could be human-level structures that provide privacy and security or larger developments such as shopping malls or business districts. The highest levels of support were for the impact of urban planning policies as well as major infrastructures such as arterial roads and highways.

One of the underlying hypotheses of the study was that gated communities and other forms of segregated developments contribute significantly to urban fragmentation by disrupting the urban fabric and creating barriers to the movement of residents. While a slim majority agreed that these significantly affect residents, it was not highlighted as a major cause for concern relative to other issues. That said, the lack of walkable neighbourhoods and the provision of high-quality sidewalks and community spaces were mentioned repeatedly. It can be argued that these developments contribute to these issues.

Having analysed the causes of urban fragmentation, the survey asked the expert panel to estimate the impact of fragmentary urban typologies on the quality of life of city residents. A clear majority of the expert panel (60-70%) believe that urban fragmentation in its various, multifaceted forms impacts the quality of life in the city, be it through limiting access to certain services and facilities, poor maintenance of the built environment, or low-quality urban design that negatively impacts neighbourhood character.

Whilst the dividing lines are blurred, there appear to be two broadly distinct groups of perspectives. On the one hand, some experts tend to believe urban fragmentation is the result of urban planning and design that fails to take into account the human-dimension. This results in isolated developments, disconnected from the local neighbourhood and wider city, and a built environment containing structures and forms, such as high walls, discontinuous sidewalks, and gated developments, which limit access, mobility, and the development of community.

While acknowledging that these forms of structure and design in extremis can negatively impact residents, the other group is relatively less concerned. They are significantly less likely to believe that developments such as single-use business areas or shopping centres have a large, negative impact. They also tend to be less concerned by car-centric developments, be they in the city centre connected by arterial highways or on the periphery of the city, provided that these developments meet the needs of residents.

The final section of the survey asked the panel to provide their opinion on a number of design guidelines across four dimensions. Each dimension contained two contrasting visions of urban design and development, one which developed a more human-level vision and another which proceeded with current forms of development. The results here were mixed as, in a number of cases, experts indicated that they agreed with both proposals. One way to interpret these somewhat mixed results is that it suggests that a one-size-fits-all model of development is inappropriate for the diverse needs of a city of 7.7 million people. In certain city centre locations, single-use developments have their place, but in residential neighbourhoods, a greater level of focus needs to be placed on developing cohesive neighbourhood centres designed around the needs of residents.

Chapter 7: Urban Fragmentation in Riyadh: A Spatial Analysis and Discussion of The Macro-Metropolitan Scale

7.1 Introduction

The city of Riyadh is home to 283 gated developments occupying almost 25% of its total urbanised area. The largest gated developments are located closer to the city periphery, while smaller ones surround the old part of Riyadh. The former occupies land plots located along main traffic directions and have a lower density of street network within their borders with fewer connections to the outer grid. The latter is better integrated into the dense street network of the city centre and form compact clusters. Both types of gated developments in Riyadh disrupt the natural movement of pedestrians on the local scale and affect motorised transit in a city-wide context. This chapter's goal is to determine the collective impact of all the city's fragmentary building types on the wider urban context. It does so by answering the following questions:

- To what degree is the quality of the city's network in the vicinity of the mapped gated urban developments impacted by them?
- What is the level of improvement in the quality of the city's network if gated urban developments became permeable?
- Are there particular subtypes of gated urban developments that exacerbate the impact on the surrounding network?
- Is it possible to determine the maximum area, that when fenced or gated, would have the least impact on the quality of the surrounding network?

7.2 Gated urban developments in Space Syntax discourse

Due to the evolutionary, bottom-up process of urban development, the role circulation network in Muslim cities was reduced to a minimum (Bianca, 2000). Gated developments here have the same impact on the overall quality of urban space as in other locations: they obstruct free movement and reduce the permeability of street networks and accessibility of urban centres (Minton, 2002; Sun, Webster, & Chiaradia, 2017). Recent developments in Space Syntax theory allow to study urban space as a generator of movement and, therefore,

to assess parameters of the built environment which may either facilitate or constrain pedestrian transit (Hillier & Hanson, 1984; Hillier, 2007; Hillier, Penn, Hanson, Grajewski, & Xu, 1993). Studies of gated developments based on Space Syntax methodology include cases of urban areas around Europe, Asia and Middle East.

Issues of discontinuity and limited accessibility of urban cores due to the obstructions posed by gated industrial facilities are observed in many Chinese cities. Cheng (2019) evaluated the level of intelligibility of street space in the Chinese factory city Tangzha. Based on the morphology study of the town, he concludes there is a potentially limited understanding of urban configuration among residents due to the physical barriers posed by the location of gated town-forming factories. Residents have limited capacity to navigate through the city, which reduces the accessibility of a civic centre with schools, hospitals, and public parks. Kaushik (2019) applied the same methods of evaluating street network connectivity to examine gating in Gurugram, India. The study is based on the comparison of spatial arrangements within the three types of urban development, ranging from areas completely built up by private investors to the areas developed by the government planning department. Differences in the spatial configuration of these developments are striking, with much fewer connections of privately developed housing areas to the urban fabric outside. Consequently, these areas have lower connectivity and intelligibility values than those designed by public sector units.

Legeby (2010) assessed the aftermath of post-war residential development in Sweden. Inward-facing housing blocks criticised by Zako and Hanson (2009) for their disengagement from the economic and social life of the surrounding urban areas are widespread in the city of Södertälje. Being highly accessible on a city-wide scale, these developments showcase extremely low integration into the urban fabric on a local scale, i.e., their spatial arrangement is highly hierarchical, which negatively affects the continuity of pedestrian transit. Hillier (1988) noted that overlocalised design peculiar to the urban developments of the second half of the twentieth century disrupts the natural flow of people and, therefore, these areas become critically unattended. To sum up, properties of street network configuration within gated developments and around them significantly affect overall urban sustainability, security, and level of tensions between different social groups.

7.3 Macro spatial analysis

7.3.1 Timeframe and scale

The methodology for this phase was designed to answer the questions above in 7.1. The core research methods are mapping geospatial data with subsequent comparative statistical analysis and spatial analysis with the use of Space Syntax techniques to examine configurational properties of the urban environment in relation to its functional parameters (Hillier, 2007).

The city of Riyadh is studied based on its modern condition of urban development. Geospatial data used in the analysis corresponds to the present situation of 2020. Research is aimed at identifying relationships and discrepancies between spatial and functional parameters at the scale of the entire settlement. For that purpose, two detailed models of urban environment were built in the current borders of Riyadh. The first model reflects a real-life situation with all parts of the street network within gated developments being isolated from the civil infrastructures open to the public. The second model indicates a 'desirable' state of the street network with all gated developments being fully open and permeable. The models integrate several layers of geospatial data: street segment networks based on OpenStreetMap (OSM); distribution of gated urban developments mapped with Google Earth observations; and functional classification of gated developments based on the information from OpenStreetMap and from local authorities. Multidimensional analysis of these elements allows to identify configurational properties of Riyadh's urban environment and outline spatial correlations for functional characteristics of gated developments.

7.3.2 Measures and techniques of spatial analysis

Data from external sources and configurational analysis of spatial models were reviewed in parallel, compared, and critically analysed through deductive reasoning. Mapping and spatial analysis were performed with the use of QGIS and depthmapX software. QGIS is an open-source desktop cartographic software package, which allows for mapping and analysis of geospatial data. DepthmapX is a multi-platform software application to execute a range of spatial network analyses to understand social processes within built environments (Space Syntax, 2020). Measures of spatial analysis, data sources, and software applications are specified in Table 7.1.

Table 7.1 Spatial analysis measures, data sources and software

Measure	Data source	Software
Local integration radius 400, 1200 m	OSM	depthmapX, QGIS
Global integration radius 10000 m	OSM	depthmapX, QGIS
Local choice radius 400, 1200 m	OSM	depthmapX, QGIS
Global choice radius 10000 m	OSM	depthmapX, QGIS
Gated urban developments area (km^2)	OSM, Google Earth	QGIS

Space Syntax is one of the methods of spatial network analysis, which were evolving in the second half of the twentieth century (Garrison & Marble, 1962; Tabor, 1970; Batty, 1976; Hillier & Hanson, 1984). Studies in the field of configurational theory of architecture lie at the core of Space Syntax methodology. The theory argues that the configuration of urban space is a direct determinant of pedestrian flows distribution, other things being equal. Therefore, spatial analysis can bridge between configurational properties of space and behaviours of its users (Hillier, 2007; Karimi, 2012).

Analysis of urban street networks is performed at different scales, from the local scale of urban blocks and neighbourhoods to the global scale of the whole city or larger territory. Multi-scale study allows to identify the general structure of urban space and reveal local centres. According to Hillier (2009), these spatial centres directly relate to the environmental, economic, and socio-cultural properties of the city area. Measures of analysis, which allow for the identification of spatial properties, are based on assumptions about "natural movement" laws. It is assumed to be generated by the grid configuration — a set of relationships between parts of a spatial complex (Hillier, Penn, Hanson, Grajewski, & Xu, 1993). These relationships can be characterised as syntactic, i.e., they follow specific rules of order, structure, and combination between elements in the system.

The intensity of space usage is directly related to the configuration of street network elements. Therefore, based on the values of syntactic measures attributed to these elements, it is possible to judge the potential volumes of pedestrian flows. Configurational theory allows to study the role of urban elements in their broader context, or, in other words, identify their significance in the global structure of the area. Hillier (2009) defines this structure as a combination of foreground and background networks, where the former is the connector of centres of different scales, while the latter defines properties of residential space embedding these centres.

Measures of choice and integration are used to study the relationality of elements in the network. They are the formal interpretations of natural movement patterns, which allow estimating the intensity and distribution of pedestrian flows in the urban space (Hillier & Vaughan, 2007). Integration is a measure of centrality that shows how close a street segment is to all other segments in the network. Integration cores of the area are defined by high to-movement potential, i.e., they are destinations that attract a lot of movement. Choice characterises a through-movement potential of a street segment, i.e., it measures how likely an element would be walked through on all the shortest routes to all destinations (Hillier, Yang, & Turner, 2012). Integration and choice, being calculated at different radii, allow for statistical comparison of spatial structures of various scales.

7.4 Case Study

Gated developments in Riyadh are located along main highways revealing the city-wide orientation of urban development to motorised movement (Figure 7.1). Peripheral gated developments have the largest area; however, overall density of the street network decreases in direction to the city borders. Despite these differences, all gated developments in Riyadh share a high degree of enclosure and isolation from the surrounding urban context. Therefore, they all contribute to the fragmentation of the urban fabric partially based on a set of processes within Muslim society: tensions between various social networks, state and social control, and peculiar social hierarchy (Bagaeen and Uduku, 2010).

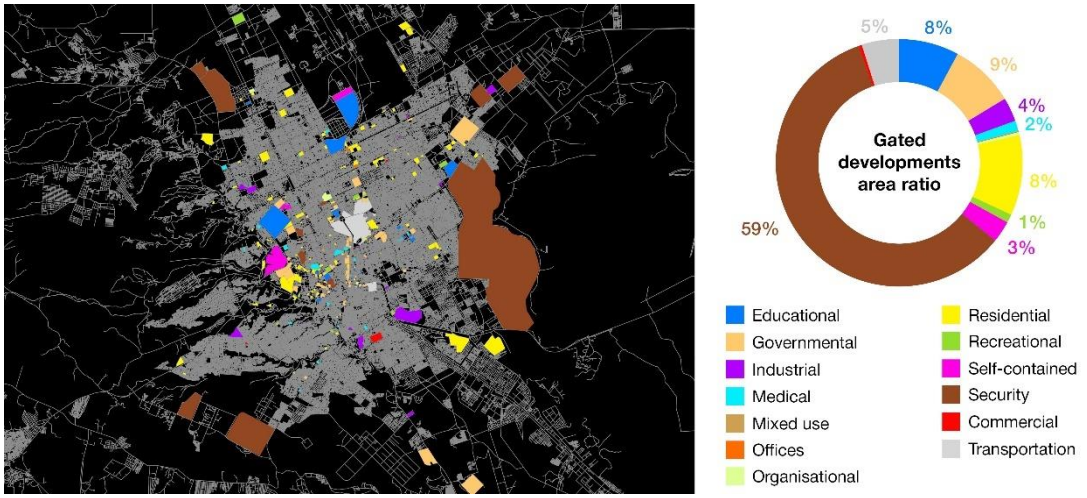


Figure 7.1 Gated urban developments in Riyadh

Table 7.2 specifies a classification of gated urban developments in Riyadh based on a city-wide survey of Google Earth satellite imagery. Thirteen types of gated developments include a total number of 283 land plots, with the most widespread types being Residential, Medical, and Governmental. The situation is different in terms of area occupied by each type, where Security plots cater for almost 60% of the total area of all gated developments in Riyadh, or more than 14% of the total urbanised area in the city. With only 12 land plots occupied, Security gated developments have the largest average area per plot and are located predominantly on the city's periphery. All in all, 283 gated urban developments in Riyadh occupy a significant share of almost 25% of the total urbanised area in the city. It is considered to be representative of wider social and economic divisions and issues in Riyadh (Atkinson and Blandy, 2013). The implications of spatial segregation posed by gated urban developments will be studied in the next section.

Table 7.2 Classification of gated urban developments in Riyadh

Type of gated urban development	Count	Area (sum of areas within one type), km²	% of total area of all gated developments	Average area (among developments within one type)	% of total urbanised area in Riyadh
Educational	20	21.45	7.87	107.23	1.91
Governmental	59	23.07	8.47	39.11	2.05
Industrial	15	8.55	3.13	57.01	0.76
Medical	22	3.75	1.37	17.06	0.33
Mixed	1	0.09	0.03	9.12	0.01
Offices	3	0.27	0.09	8.97	0.02
Organisational	4	1.09	0.39	27.17	0.09
Residential	125	28.59	10.49	22.87	2.55
Recreational	10	3.01	1.18	30.13	0.27
Self-contained	3	7.69	2.82	256.23	0.68
Security	12	160.32	58.86	1336.01	14.31
Commercial	3	1.16	0.42	38.58	0.11
Transportation	6	13.32	4.88	221.93	1.19
TOTAL	**283**	**272.36**	**100**		**24.28**

7.5 Analysis and Results

7.5.1 Spatial configuration

Configurational analysis of two street segment network models — gated, as it is today, and permeable — in Riyadh was conducted to reveal the city's spatial structure and identify relationships between spatial, functional, and morphological parameters. Syntactic measures of Choice and Integration were calculated at different scales, from local to global,

to investigate the potential intensity and distribution of movement patterns in the street networks (Hillier, 2007).

The Gated model of Riyadh's street network consists of 254735 segments with a total length of 25354.5 km. Mean segment angular connectivity is defined as the number of segments directly connected to the root segment (Turner, 2004). It is 2.26 among segments of the model with gated urban developments. Permeable model of Riyadh includes 287556 street network segments with a total length of 27641.4 km and has a mean segment angular connectivity of 2.31. There may potentially be a 12% increase in total street network length if gated developments of Riyadh become open to public transit. A slight improvement of 2% in the connectivity among segments can be reached, implying that Riyadh's residents would have more routing options for walking and driving.

Analysis of integration at radii 400 m and 1200 m allowed to identify local sub-centres situated around the city centre and in peripheral areas of Riyadh (Figures 7.2 - 7.5). Analysis results at local scale reveal urban centres which are highly accessible between 5 minutes (400 m) and 15 minutes (1200 m) walking. Most of the local centres are spread in the East-West direction with an active clustering in the old city area. This part of Riyadh has the highest density of the street network and, unlike other areas, showcases an organic pattern of urban grid, which is a complex historical product of accumulated small-scale changes to function and morphology (Hillier, 2007). Permeable model analysis revealed local sub-centres which emerge within the borders of urban developments that are gated today. Most of these centres are configured due to the higher density of street segments within particularly enclosed areas or due to their relative proximity to the outer urban areas.

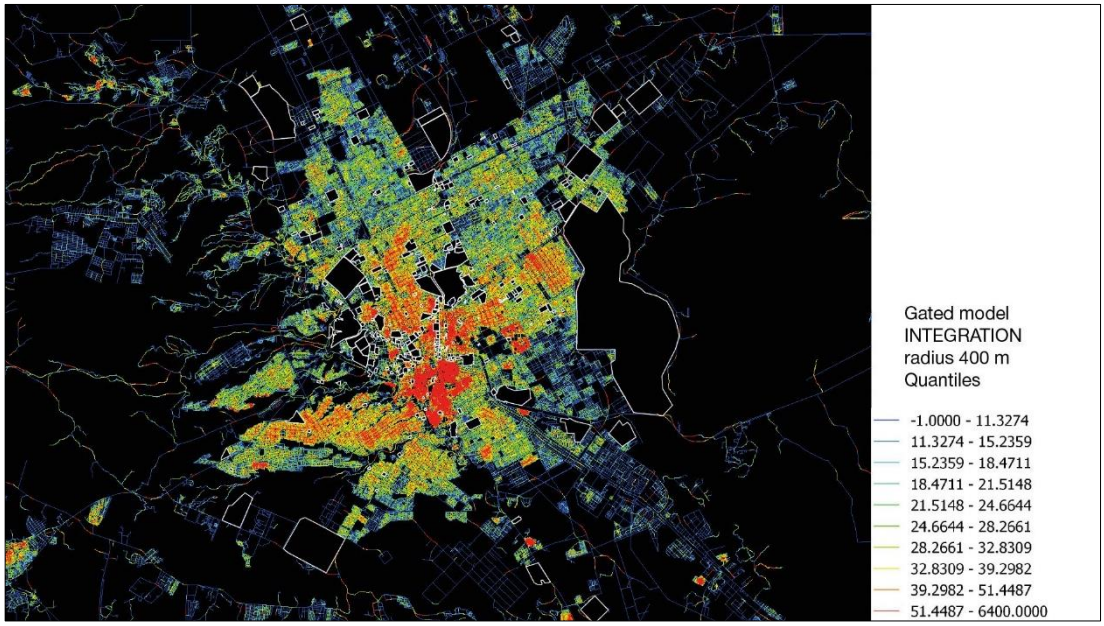


Figure 7.2 Integration radius 400 m. Gated model

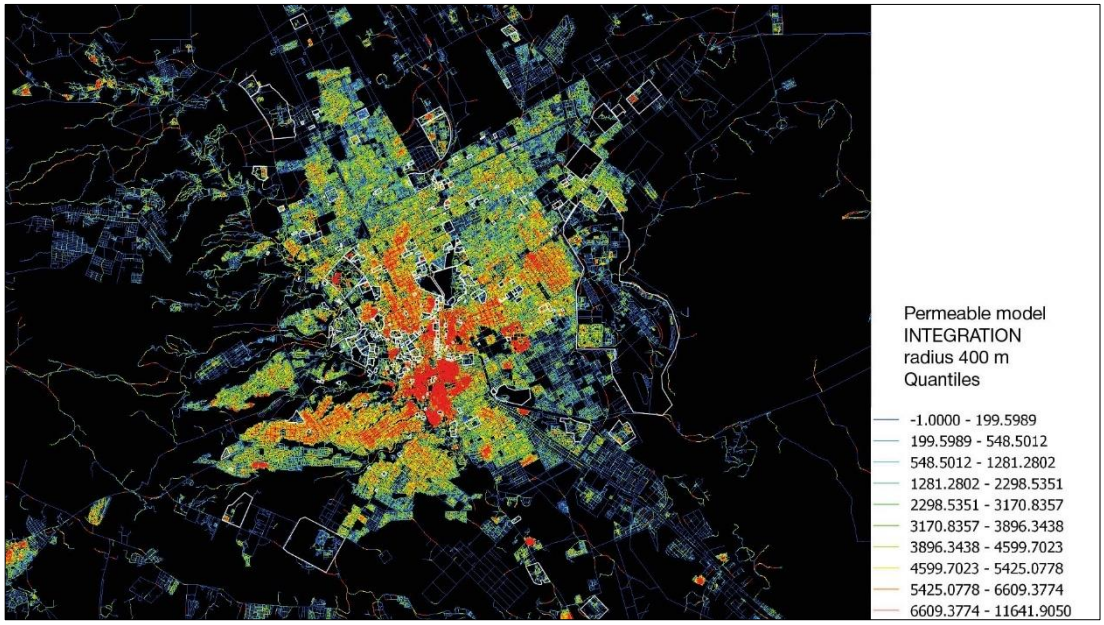


Figure 7.3 Integration radius 400 m. Permeable model

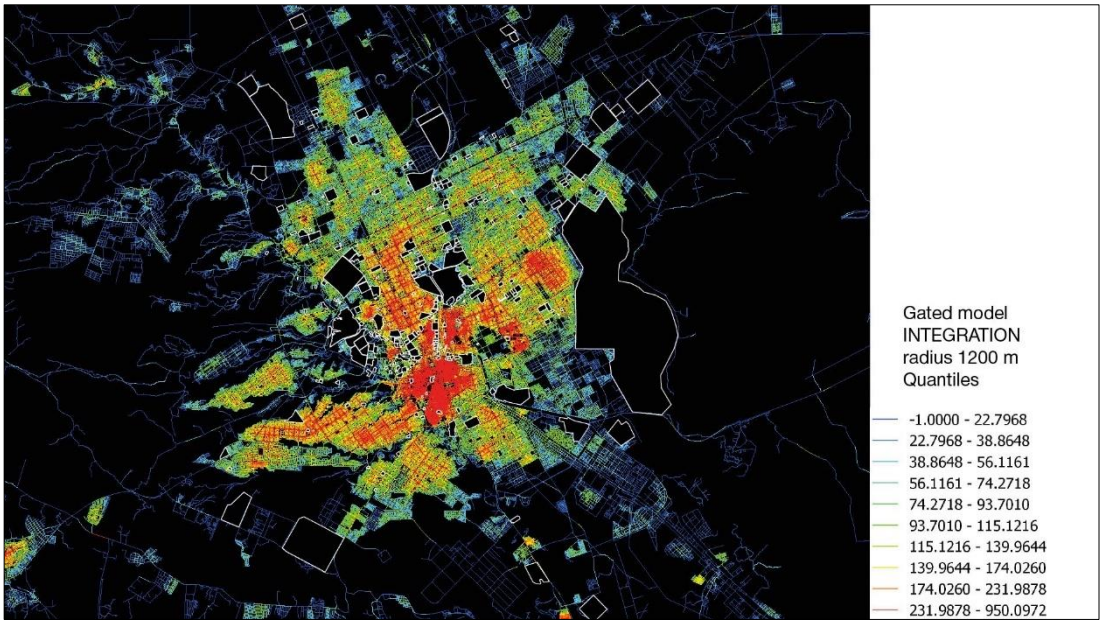


Figure 7.4 Integration radius 1200 m. Gated model

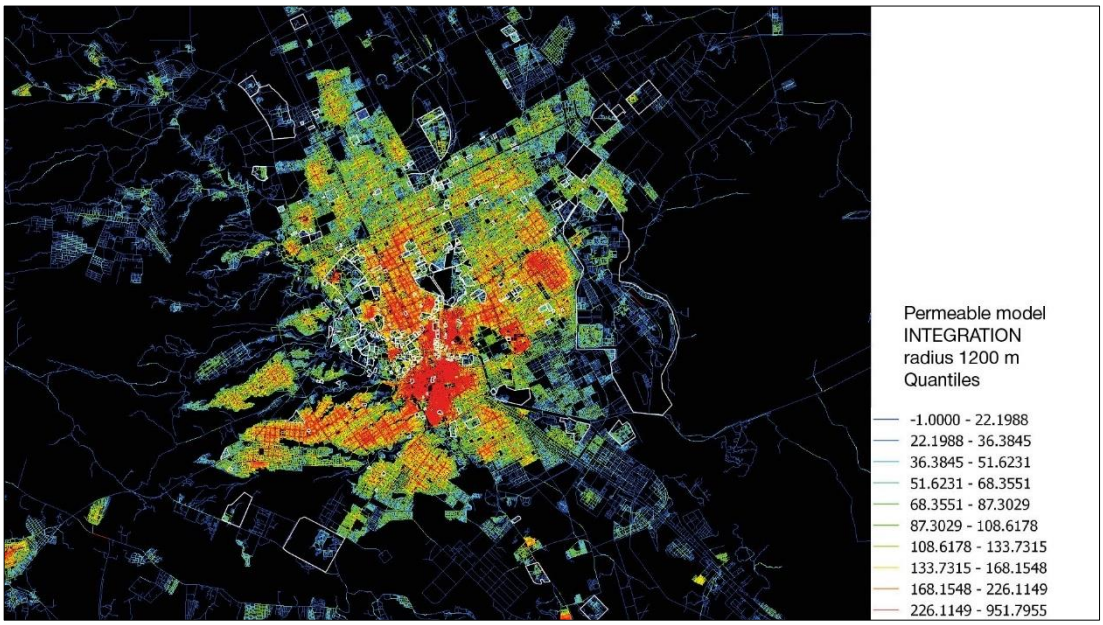


Figure 7.5 Integration radius 1200 m. Permeable model

Patterns of city-wide integration were studied at a radius of 10000 m to identify elements of the street network with the highest to-movement potential (Figures 7.6 and 7.7). Segments comprising the integration core of Riyadh (top 10% of the globally integrated segments) are located predominantly along main highways connecting peripheral areas to the city centre (Figures 7.8 and 7.9).

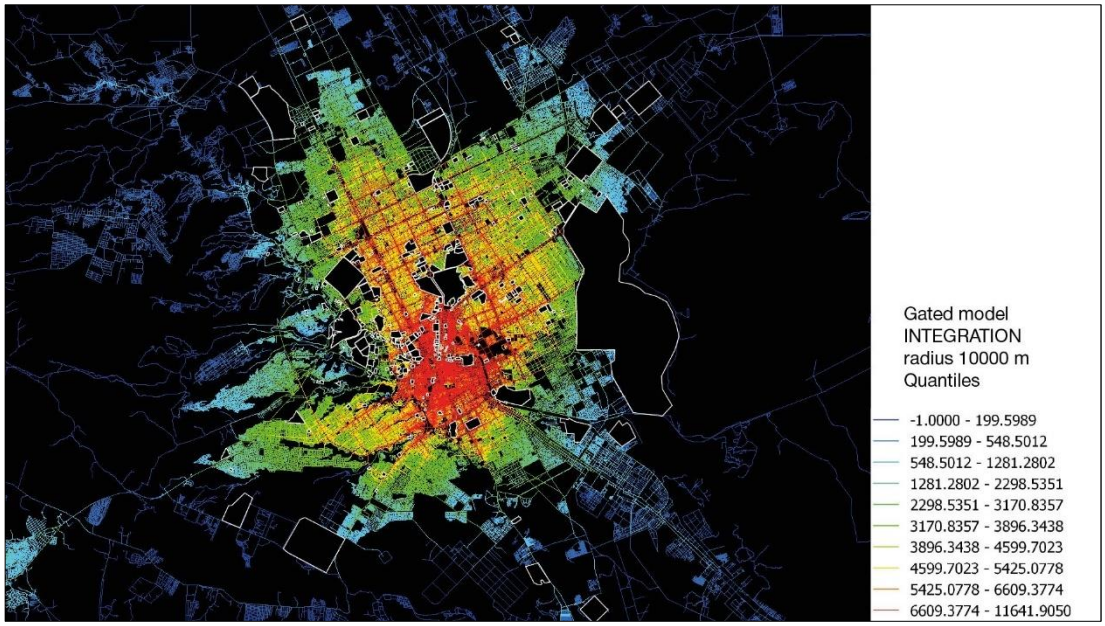


Figure 7.6 Integration radius 10000 m. Gated model

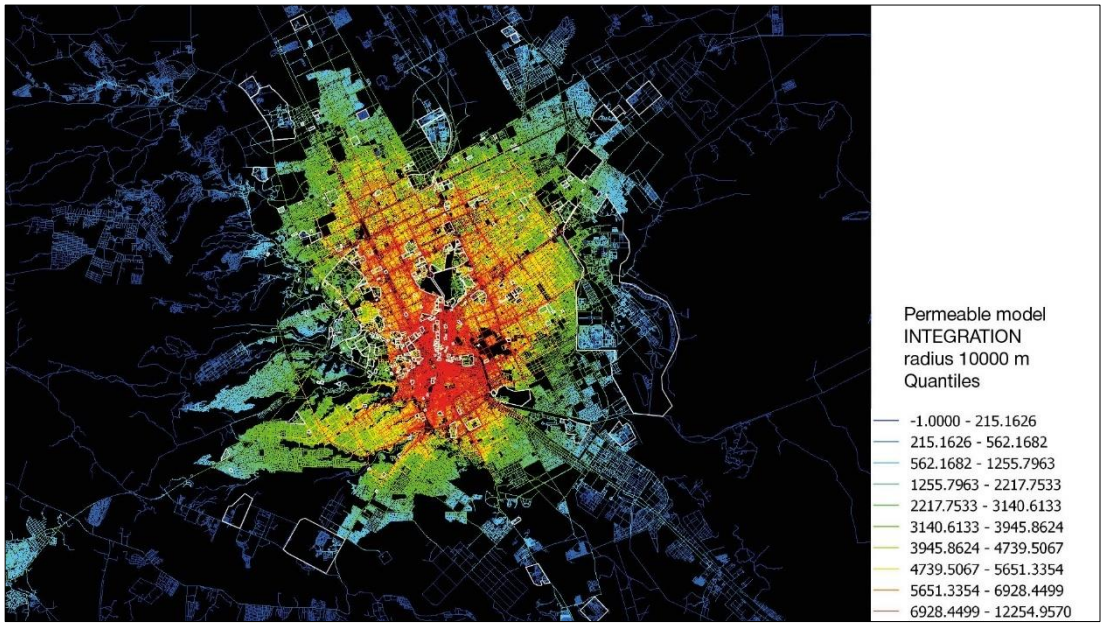


Figure 7.7 Integration radius 10000 m. Permeable model

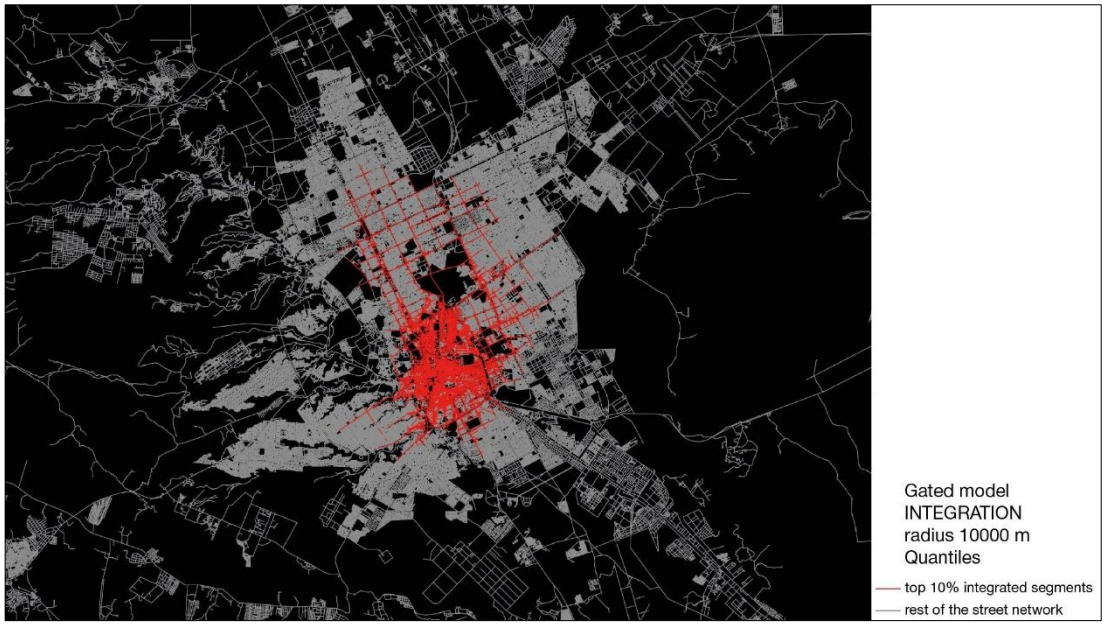


Figure 7.8 Integration core radius 10000 m. Gated model

Figure 7.9 Integration core radius 10000 m. Permeable model

The old part of the city showcases the highest integration values mainly being accessible for all residents. Integration core showcases the highest density of the street network, while later developed areas are located in the remote parts of the city. These areas have the lowest potential to attract activity at the city level (Hillier, Penn, Hanson, Grajewski, & Xu, 1993; Hillier, 2007). According to Hillier (2007, 2009), the intensification of an urban grid is a key

spatial feature of urban centres, which facilitates functional diversity and accessibility, as well as the frequency of encounters.

The urban centre is considered to be an area with a higher potential for attraction of non-residential activity (Hillier & Vaughan, 2007). Smaller gated urban developments in the old town of Riyadh showcase higher global integration values when opened. The street network in these areas has a strategic potential to attract residents from the urban periphery.

Hillier (2009) distinguishes two types of urban street networks that can be identified when analysed with choice measures at a city-wide scale (Figures 7.10 and 7.11). The foreground network comprises the street segments with the highest choice values calculated as the top 10% measure (Boonchaiyapruek, 2017). It connects sub-centres of the city and is characterised by the maximum length of elements and open angles between them, which allow for maximisation of movement and transit functions. The foreground network in Riyadh (Figure 7.12) links peripheral areas of the city to the civic centre. Most of the gated developments, except those on the periphery of Riyadh, are located along parts of the urban grid that comprise the foreground network. Analysis of the permeable model revealed that 28 gated developments might be penetrated with foreground network segments when opened (Figure 7.13). Therefore, allowing access to these areas may facilitate their potential for the through-movement of people and motorised transit. Background network structures movement and is defined with the lower values of choice at a city-wide scale. It reflects localised properties of the urban grid with predominantly residential character (Hillier, 2009; Hillier & Vaughan, 2007). In the permeable street network model, most gated urban developments retain their configurational properties, being located along important routes without overlapping the foreground network.

Figure 7.10 Choice radius 10000 m. Gated model

Figure 7.11 Choice radius 10000 m. Permeable model

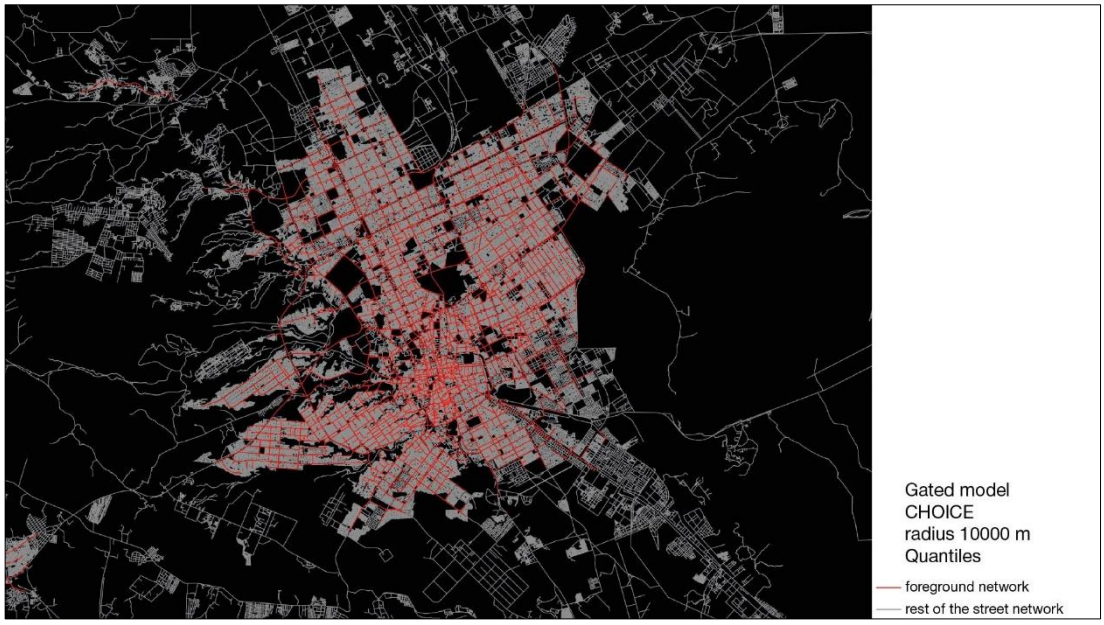


Figure 7.12 Foreground network radius 10000 m. Gated model

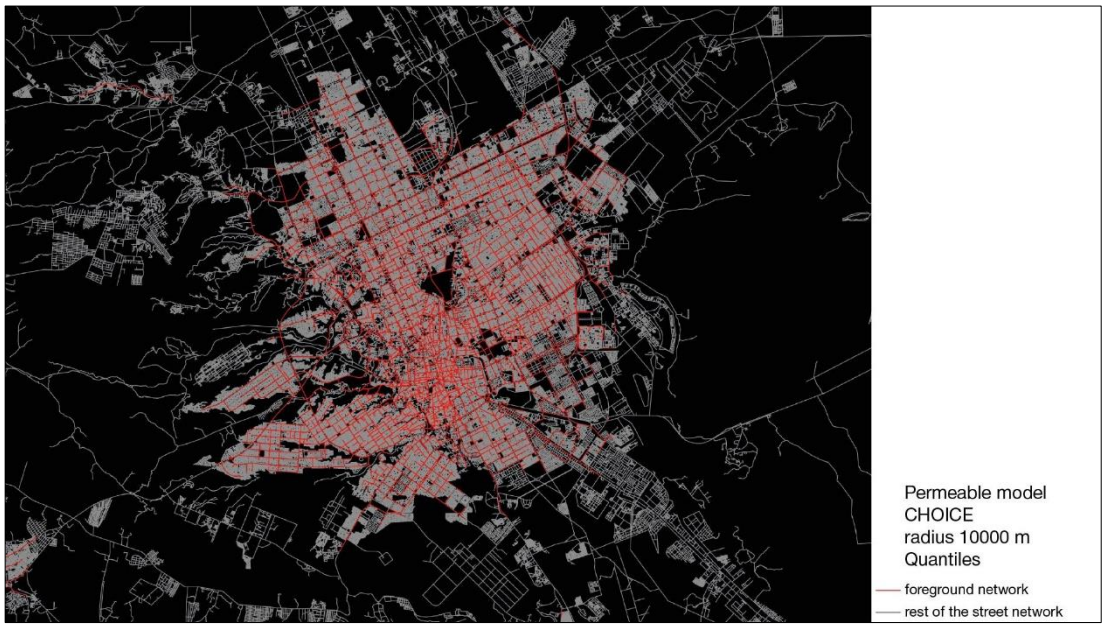


Figure 7.13 Foreground network radius 10000 m. Permeable model

7.5.2 Differences in measures between gated and permeable models

Changes in syntactic measures between the two street network models were studied based on examining values of choice and integration at radii 400 m, 1200 m and 10000 m. Table 7.3 specifies analysis results for each measure divided into quantiles and then correlated to identify the level of correspondence or discrepancy between gated and permeable models.

Analysis revealed strong relationships between integration values, up to 1.000 correlation coefficient for the 1st percentile of radius 1200 m integration measure. The high level of correlation illustrates that the hierarchy of urban spatial centres at all scales remains stable, with an overall pattern of accessibility of street segments being similar between gated and permeable models. The emergence of new centralities within the borders of gated developments does not change the general context of accessibility for the old city and the local centres.

Both models' choice values at local and city-wide scales match to a lesser degree, down to negative relationships between the bottom 20% of values at radii 1200 m and 10000 m. Both models' top 20% of values showcase a higher level of correspondence with Pearson's correlation coefficients 0.987 and higher. Analysis results reveal that street network segments where through-movement is less intense currently may potentially lose transit with the opening of the gated urban developments. At the same time, those street segments with higher potential for through-movement would supposedly gain even more transit after enhancing the permeability of gated developments. Figuratively speaking, choice measure differences between gated and permeable models of Riyadh street networks showcase the Matthew effect (Gladwell, 2008) in spatial terms, where elements of urban grid with higher potential for transit movement may gain even more pedestrian and motorised traffic with an increase in overall street network permeability.

Table 7.3 Pearson's correlation for choice and integration measures at radii 400, 1200 and 10000 m between gated and permeable models

CHOICE		INTEGRATION	
r 400 m	**Pearson's correlation coefficient**	**r 400 m**	**Pearson's correlation coefficient**
5th percentile	0.994	5th percentile	0.95
4th percentile	0.736	4th percentile	0.932
3rd percentile	0.541	3rd percentile	0.869
2nd percentile	0.56	2nd percentile	0.895
1st percentile	0.034	1st percentile	0.962
r 1200 m	**Pearson's correlation coefficient**	**r 1200 m**	**Pearson's correlation coefficient**
5th percentile	0.992	5th percentile	0.993
4th percentile	0.526	4th percentile	0.919
3rd percentile	0.434	3rd percentile	0.909
2nd percentile	0.387	2nd percentile	0.951
1st percentile	-0.001	1st percentile	1
r 10000 m	**Pearson's correlation coefficient**	**r 10000 m**	**Pearson's correlation coefficient**
5th percentile	0.987	5th percentile	0.981
4th percentile	0.254	4th percentile	0.882
3rd percentile	0.148	3rd percentile	0.919
2nd percentile	0.166	2nd percentile	0.976
1st percentile	-0.015	1st percentile	0.967

7.5.3 Where changes in street network quality are most significant

Removing spatial barriers which disrupt urban transit may have major political, social, and economic implications affecting the quality of life in the city in a positive way (Sun, Webster, & Chiaradia, 2017). Statistical comparison was conducted between integration and choice values for gated and permeable models. The analysis of changes in configurational properties of the street network after opening the gated urban developments allowed to identify areas of Riyadh with maximum potential for positive transformation.

Figures 7.14, 7.15, and 7.16 illustrate changes in integration values of street network segments at radii 400 m, 1200 m, and 10000 m, respectively. Analysis at the local scale revealed positive change mainly in the vicinity of smaller gated urban developments located closer to the old city of Riyadh (Figures 7.14 and 7.15). These areas would highly benefit from removing the gates in terms of local spatial accessibility for pedestrians. Positive alterations in integration values at a city-wide scale showcase the effects of clustering of gated developments (Figure 7.16). Two major areas mostly affected by removing the barriers are located to the North and the East of the old city. These areas may potentially become new sub-centres at a scale of the entire city, attracting visitors from different locations and are mostly accessible for motorised traffic.

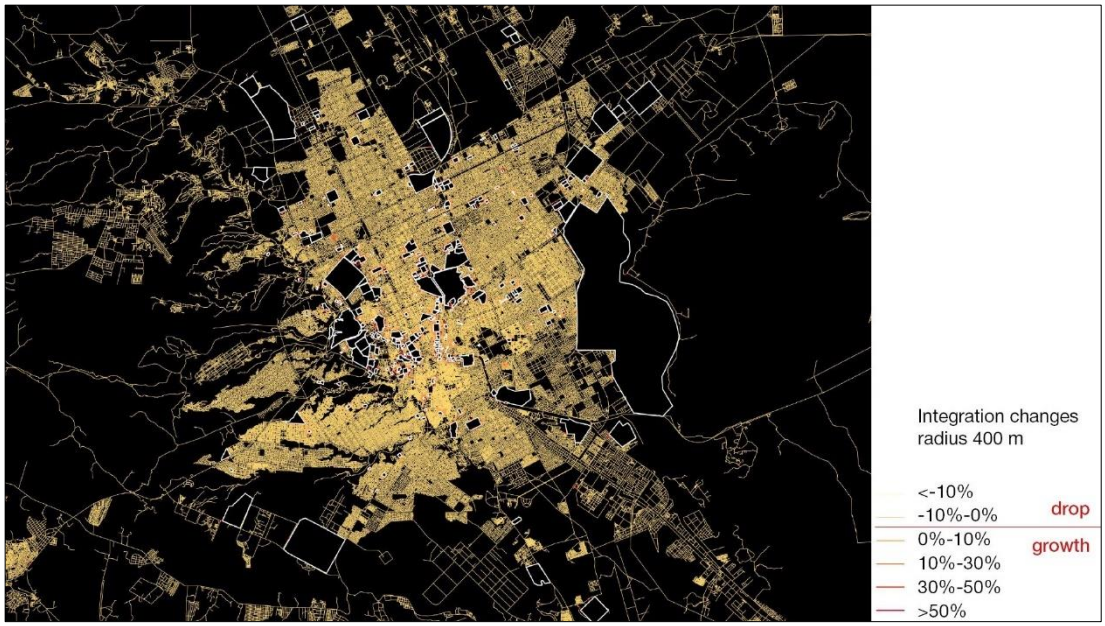


Figure 7.14 Changes in Integration radius 400 m between gated and permeable models

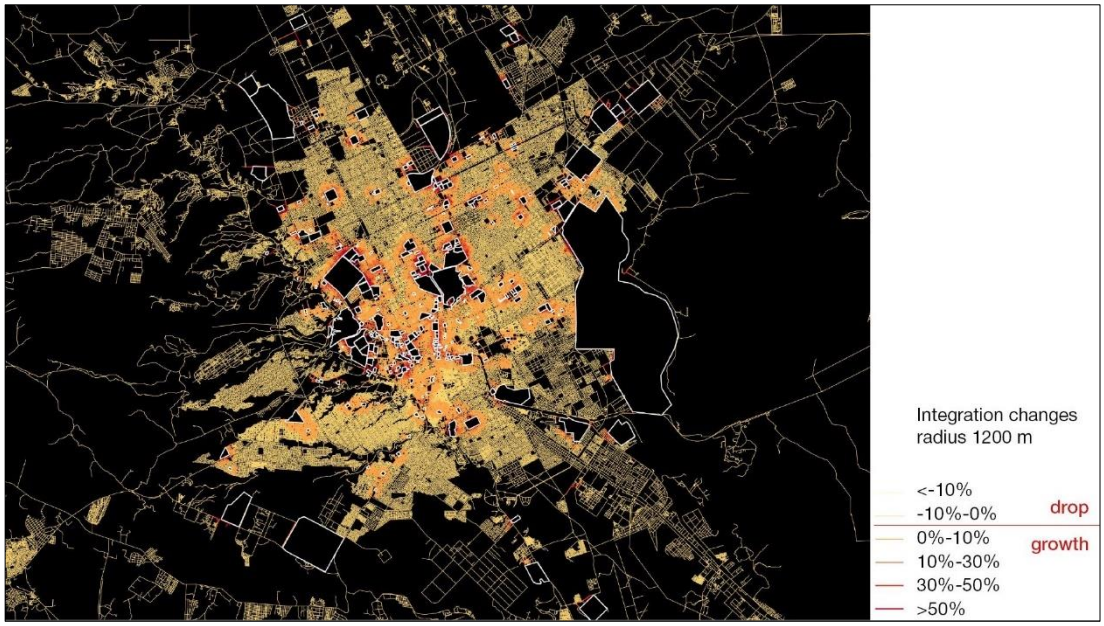


Figure 7.15 Changes in Integration radius 1200 m between gated and permeable models

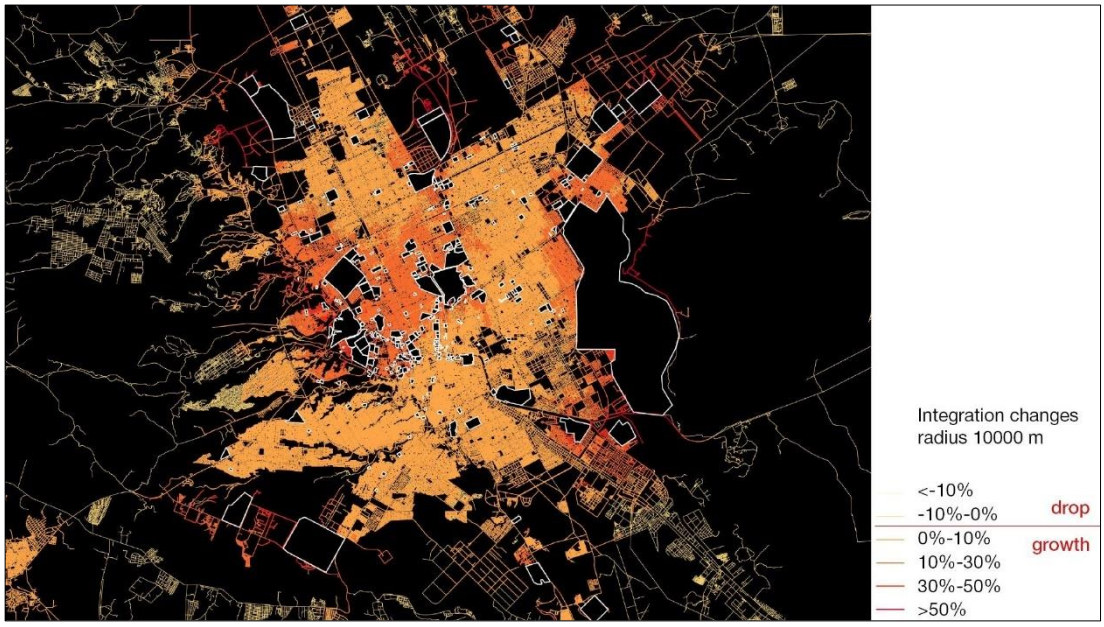


Figure 7.16 Changes in Integration radius 10000 m between gated and permeable models

Changes of choice values at radii 400 m, 1200 m, and 10000 m between gated and permeable models are more significant, with some of the street network segments showcasing a 200% increase and more. Most of the positive effect of opening the gates at the local scale is detected around clusters of smaller gated developments in the city centre, where the street network density is the highest (Figures 7.17 and 7.18). These areas may experience a major

increase in the through-movement of pedestrians. City-wide analysis revealed two spots of significant activity variation in the North and to the East from the old city (Figure 7.19). The results may be explained in the clustering of numerous communities in those areas, which may generate high volumes of traffic through adjoining districts when transformed into accessible and permeable parts of Riyadh.

Figure 7.17 Changes in Choice radius 400 m between gated and permeable models

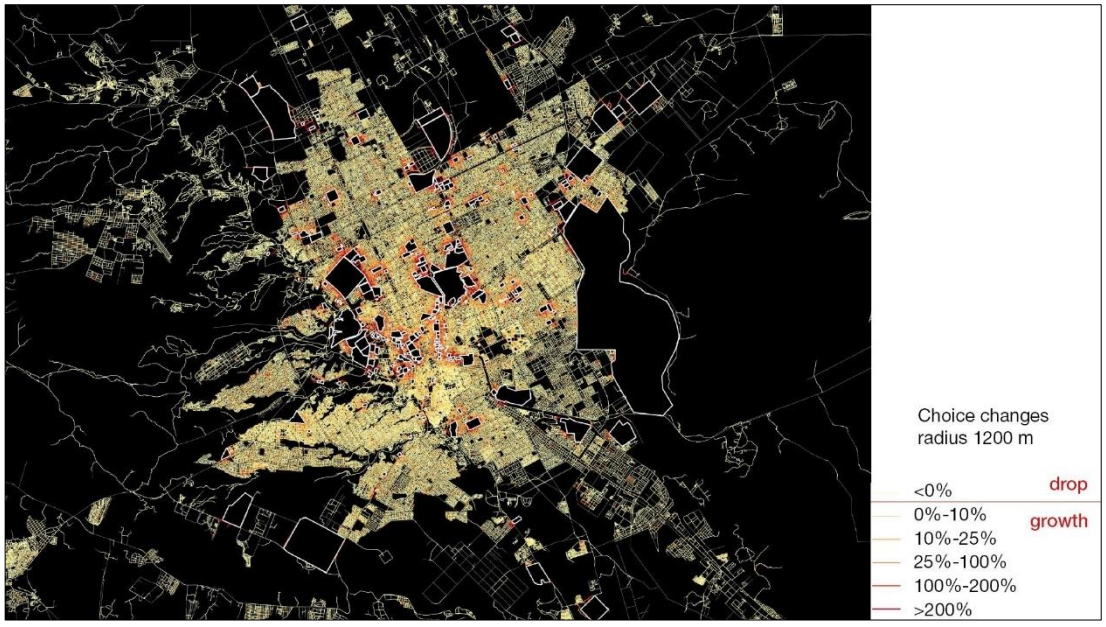


Figure 7.18 Changes in Choice radius 1200 m between gated and permeable models

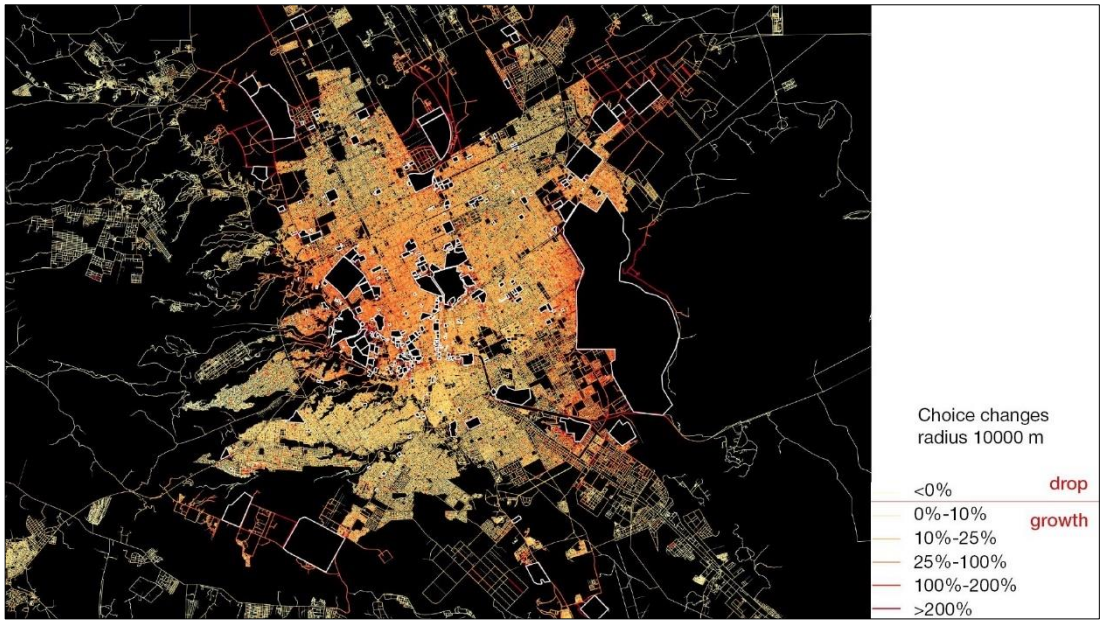


Figure 7.19 Changes in Choice radius 10000 m between gated and permeable models

7.5.4 Which gated developments have the most impact on street network quality

To quantify the relationships between the location of gated urban developments and syntactic properties of street networks, the average values of integration and choice at radii 400 m, 1200 m, and 10000 m were calculated for the segments adjacent to the perimeter of gated developments. This method allows assessing the influence each gated urban development has on the overall quality of the street network in Riyadh.

Integration analysis revealed that changes in the accessibility of street network segments at different scales are closely related to the location of gated urban developments. Areas located close to the old city of Riyadh have the most influence on the quality of street network at a local scale. The calculation of integration values at radius 400 m highlighted the compact cluster of predominantly small and medium urban developments with a relative increase in accessibility of 30% and more (Figure 7.20). These gated developments have the most positive impact on the quality of the urban grid in close proximity to them. Analysis of 15-minutes walking distance (1200 m) accessibility showcases the emergence of spatial centres in the areas surrounding the city centre as well as in sites located closer to the city's periphery (Figure 7.21). City-wide calculation allowed to identify gated urban developments which may have the most impact on the overall quality of the street network in Riyadh (Figure 7.22). These are mostly medium and large urban developments in peripheral areas of the

city. They contain a significant proportion of street network segments, differentiated from smaller gated areas in the city centre and may potentially attract visitors from other districts.

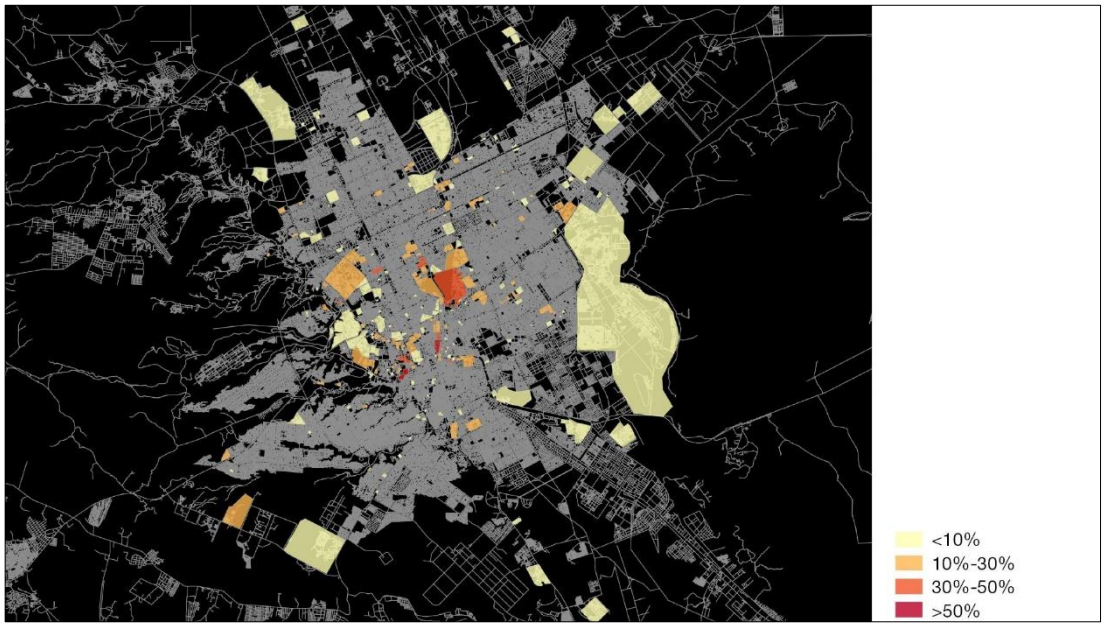


Figure 7.20 Increase in integration radius 400 m values among gated urban developments

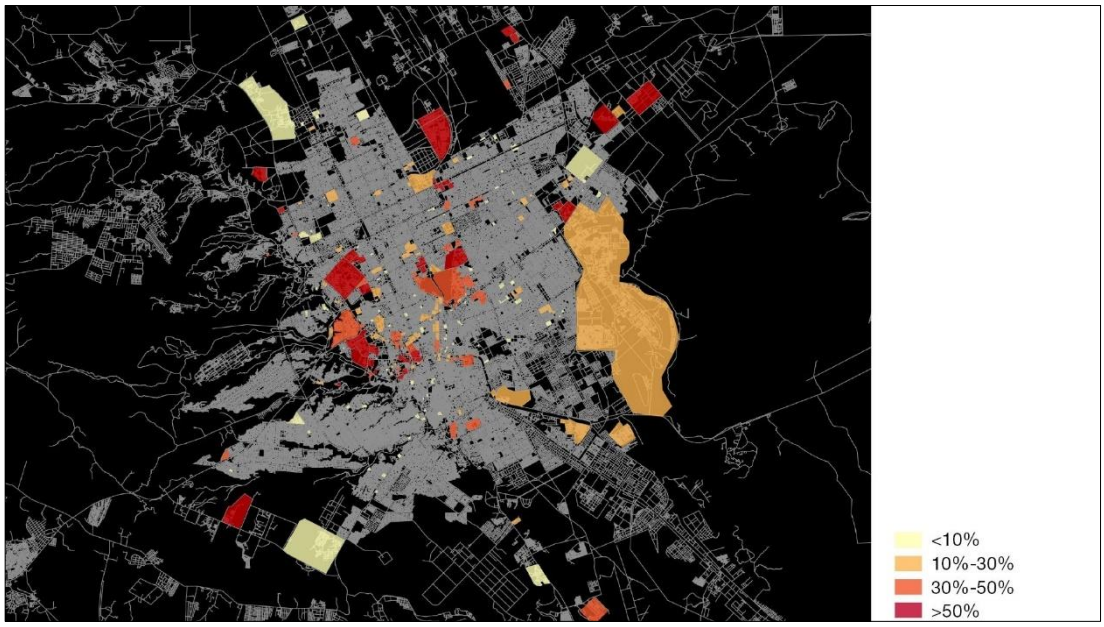


Figure 7.21 Increase in integration radius 1200 m values among gated urban developments

Figure 7.22 Increase in integration radius 10000 m values among gated urban developments

Choice values averaged for the street network segments adjacent to gated urban developments disclose a higher level of discrepancy among scales. Comparison of rates of potential through-movement in gated and permeable cases revealed a pattern of change at a local scale similar to the variation in integration values: centrally located gated developments produce major effects on local transit movement (Figure 7.23).

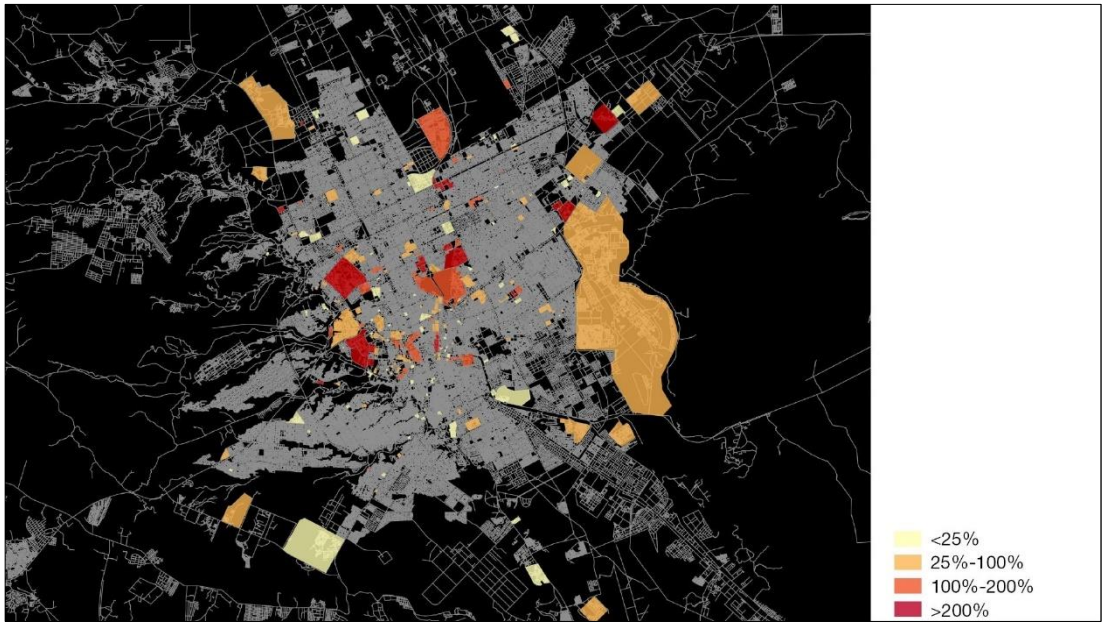


Figure 7.23 Increase in choice radius 400 m values among gated urban developments

Most of the positive effects can be observed within a 15-minutes walking radius (1200 m). A significant proportion of gated urban developments in Riyadh showcase average growth in potential transit movement of 100% and more (Figure 7.24). Finally, the city-wide analysis revealed no significant relationships between the location of gated developments and an increase in average values of choice among adjacent street segments (Figure 7.25). Some of the peripheral gated areas with a higher density of street network showcase major positive shifts in choice values of 200% and more.

Figure 7.24 Increase in choice radius 1200 m values among gated urban developments

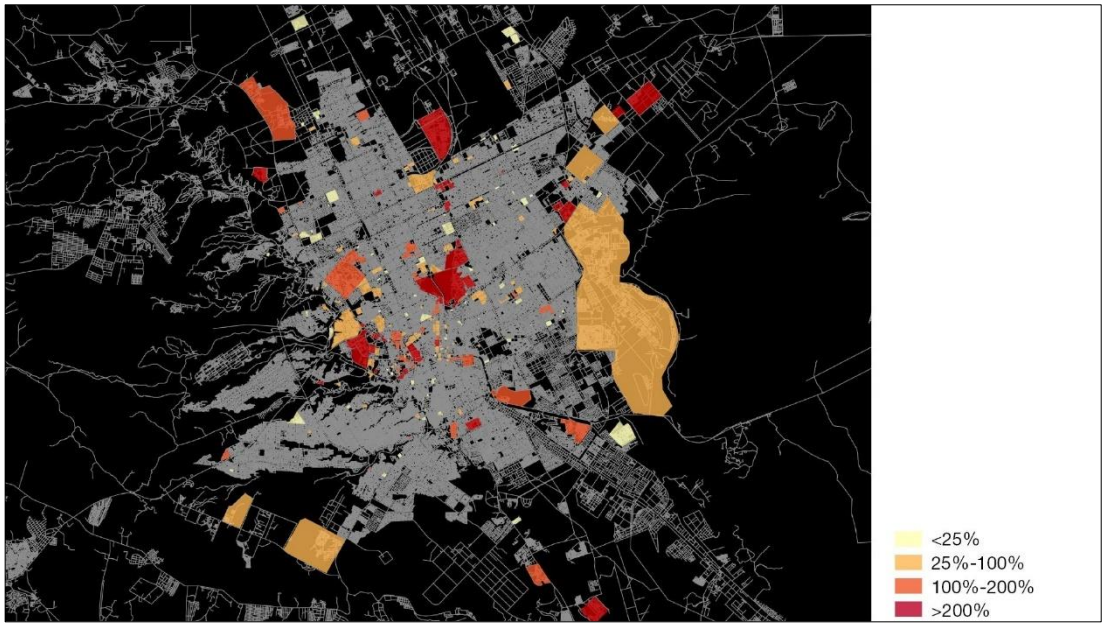


Figure 7.25 Increase in choice radius 10000 m values among gated urban developments

Table 7.4 specifies particular types of gated urban developments in Riyadh that have maximum effect on the quality of the street segment network when opened. The level of integration change characterises the potential for an increase in accessibility (i.e., to-movement) of an area from other areas in the radius studied. Educational, self-contained, and security developments demonstrate significant increases both at local and global scales. They may be considered as illustrations of a pervasive centrality — the quality of a spatial system to retain properties of an urban centre throughout scales (Hillier, 2009). The level of change of choice measure characterises potential for an increase in transit movement, i.e., number of shortest routes through the area. Educational, office, self-contained, and transportation developments demonstrate significant increases both at local and global scales. Both pedestrians and motorised traffic may choose their routes particularly through these areas, due to the beneficial spatial configuration of the urban grid within these communities.

Table 7.4 Average changes in choice and integration between gated and permeable models (times)

Type of gated urban development	Integration r 400 m	Integration r 1200 m	Integration r 10000 m	Choice r 400 m	Choice r 1200 m	Choice r 10000 m
Educational	1,11	1,39	1,34	3,58	4,69	4,34
Governmental	1,18	1,34	1,13	4,34	4,41	3,93
Industrial	1,04	1,08	1,07	1,28	1,67	2,59
Medical	1,06	1,18	1,09	2,93	3,41	2,71

Mixed use	1,04	1,01	1,11	1,17	1,06	1,22
Offices	1,09	1,81	1,12	6,28	7,33	6,15
Organisational	1,11	1,11	1,07	1,61	2,08	1,95
Residential	1,07	1,26	1,16	2,99	3,51	3,64
Recreational	1,11	1,28	1,08	3,49	3,32	3,24
Self-contained	0,78	1,95	1,65	3,04	11,21	7,78
Security	0,95	1,39	1,23	2,28	3,78	3,43
Commercial	1,11	1,16	1,03	1,75	2,51	2,94
Transportation	1,18	1,41	1,11	3,14	4,61	6,38

7.6 Discussion

Gated developments play an important role in the overall spatial development of Riyadh, comprising almost 25% of its total urbanised area. Argument on the negative social, economic and spatial effects of gated developments (Glasze et al., 2004; Sun, Webster, & Chiaradia, 2017; Blakely & Snyder, 1999) implies a necessity for their detailed investigation. Gated developments are generally described as walled or fenced urban areas with particular regulations of access and transit in relation to residents and non-residents (Atkinson & Blandy, 2006). Based on that, gated developments should be first studied as physical barriers that distort pedestrians and vehicles' natural movement in the city (Hillier, Penn, Hanson, Grajewski, & Xu, 1993). This study aimed to examine the level of improvement in street network quality when gated developments of Riyadh become open to the public.

The general effect of making gated areas permeable is a 9% increase in the total length of the street network and 12% increase in the average axial connectivity of street segments (Turner, 2004). Integration analysis revealed no significant shifts in the overall hierarchy of urban centres at all scales after opening the gates, i.e. the most accessible areas retain their central locations while the most segregated areas are still at the bottom of the centrality rank. Through-movement is different, with segments in the top 20% of choice rank remaining the most preferable routes, while there is a higher level of discrepancy among the bottom 80% of the street network.

Differences in configurational properties between gated and permeable models were mapped and described with statistical tools. Analysis at local scale revealed that most of the positive changes of integration and choice take place in the city's central area, in direct proximity to the old town of Riyadh. This is due to the high density of the street network in historic parts of the city and compact and solid clustering of gated developments in the city

centre. Spatial relationality of local centres potentially results in synergetic effects (Seamon, 2015). Opened permeable areas there may benefit from more dynamic pedestrian flows going through and attracted to the city centre. City-wide analysis revealed the emergence of two spots of high increase in choice and integration values to the North and to the East from the city centre. The former includes a cluster of numerous centrally located developments. The latter is formed by a few large peripheral gated developments that occupy a vast area and contain a significant proportion of the street network segments.

Each gated development in Riyadh was rated based on the level of positive impact on the quality of the street network it may produce when opened. The location of gated developments is highly connected to the scale of change their ungating would produce. Areas around the city centre mostly affect local movement patterns, while peripheral developments may significantly impact the intensity and directions of city-wide movement. Transformation of educational, office, self-contained, and transportation developments into permeable urban areas has a strategic potential. On average, they showcase higher positive changes in configurational values across all scales of analysis than other types of developments. Based on these findings, reconfiguration of gated urban developments in Riyadh can be considered to facilitate social justice, spatial sustainability, and economic viability of the city.

7.7 Conclusion

This study aimed to characterise the relationships between gated urban developments and the quality of the street network in Riyadh, primarily, how they restrict the movement and accessibility of urban centres. As a case study, we see Riyadh having 13 different types of gated developments. Spatial configurations differ between the old city that is mostly accessible for all residents when compared to new spatial configurations that are more focused on security and less accessible.

The spatial configuration of the city changed drastically after the 1950s, with the rapid multiplication of population resulting in urban sprawl. Sassen (2010) noted that the emergence of gated developments at the periphery of cities is usually the result of the uncontrolled growth of urbanised areas. Urban developments with restricted access are literally considered physical barriers for people's natural movement in the city, posing major social, economic, and political issues both at local and city-wide scales' network quality.

The gated developments that have the most positive impact on street network include those closest to the old city. These positive benefits are most prevalent within 15 minutes of the gated development. Gated developments play an important role in the spatial development of Riyadh.

The impact of gated urban developments on the quality of built environment can be assessed based on their location and configurational properties of the surrounding street network. Local pedestrian movement is highly dependent upon clusters of smaller gated developments surrounding the city centre. City-wide transit is mostly affected by the few large-scale urban developments with restricted access located in peripheral areas of Riyadh. Pervasive centrality — the quality of a spatial system to retain properties of an urban centre throughout scales (Hillier, 2009) — is present in the spatial configuration of educational, office, self-contained, and transportation developments. They have the most strategic potential for the positive transformation of Riyadh's street network.

This study is based on the data available from open sources, including OpenStreetMap and Google Earth. The provided conclusions may be specified further with a detailed field study of gated developments in Riyadh as well as of patterns of real pedestrian and motorised movement in the city. Furthermore, apart from studying only the spatial nature of impacts produced by gated developments on the quality of the street network, their socio-economic features may be added into modelling. Mapping and analysing existing commercial and civic facilities may provide valuable insights into the strategy of spatial reconfiguration. Finally, no strong relationships were found between the level of impact on the quality of the urban grid and the area of particular gated developments. It is assumed that the clustering of numerous communities, as well as the density of street networks within their borders, may be significant factors affecting the accessibility and permeability of urban areas at all scales. These parameters may be studied further in relation to syntactic measures and socio-economic parameters of the developments.

The research aimed to identify potentials for the transformation of the spatial configuration of gated urban developments in Riyadh. The application of Space Syntax analysis techniques allowed to specify opportunities and limitations posed by areas with restricted access. The issues of spatial sustainability discussed by Hillier (2009) are extremely relevant in modern Riyadh, where almost 25% of the urbanised area is occupied with gated developments.

Configurational analysis might be the key to approaching issues of limited urban movement and building effective strategies based on the studies of the local context.

Chapter 8: Urban Fragmentation in Riyadh: A Spatial Analysis and Discussion of The Micro-Urban Scale

8.1 Introduction

This chapter delivers the next level of spatial analysis at a micro-scale. It presents a comparative study of the urban impact of gating across three building types in three urban contexts. The chapter begins with a review of the urban fabric types in which all nine cases being examined are situated. The selection of sport stadiums, university campuses, and medical facilities is then rationalised through a review of their neighbourhood impact.

8.2 Urban Fabric Types

Urban fabric types can be categorised by their primary orientation in regard to transportation method: walking, transit, or automobile. By learning how to manage each fabric type effectively, urban planning efforts can make greater progress toward ending automobile dependence.

Named in respect to the work done by Italian physicist Cesare Marchetti (1994), "Marchetti's constant" describes the universal travel-time budget of each individual person. This budget consistently comes out to just over an hour. Exceeding this time budget tends to result in negative physical and psychological effects for the individual, and infrastructural dysfunction for cities (Van Wee et al., 2006). This creates a natural threshold for city shapes, as cities tend not to grow past a "one-hour wide" size (Kenworthy & Laube, 2001).

Managing a city's traversability in terms of time requires careful planning and a mixture of the three main urban fabric types: walking, transit, and automobile. However, modern urban planning has held a heavy bias toward automobile transportation, leading to this fabric emerging as the dominant one in many urban areas. In order for modern cities to mitigate the automobile dependence that has resulted, they must learn how to integrate walking and transit fabrics back into urban spaces.

8.2.1 Walking

The walking fabric is the oldest of all types, dating back to the beginning of human settlements. A lack of transport options beyond walking (for most people) required villages, towns, and cities to remain dense and highly walkable.

This bred intensive mixed-use development and narrow, intricate street systems, with the entire city span limited to what an average person could walk in an hour's time: no more than three to four kilometres across (2 km radius). Population densities were generally over 100 persons per hectare. Many of the world's oldest cities still retain their walking-oriented infrastructure. These include Barcelona, Ho Chi Minh City, Mumbai, Hong Kong, Kraków, and Venice.

8.2.2 Transit

The transit fabric experienced its emergence and popularity from 1850 to 1950. It was largely formed around train connections and eventually trams. This development allowed cities to spread out and become less dense in population (as low as 50 persons per hectare).

Expansion distance depended on whether trains or trams were the dominant mode of transportation in an area, with trams allowing for cities now 10 - 20 kilometres across (5 - 10 km radius), and trains pushing out to 20 - 40 kilometres across (10 - 20 km radius). The longer reach of these transit lines allowed for suburbs to develop.

The speed and distance relationships of trams and trains meant that trams could cover inner-city transit, while trains were typically used for outer-city networks. More modern additions to the tram-like fabric - subways and buses - have allowed for even more spread of inner-city zones. Because transit fabric was typically used to extend a city's walkable area, walking fabrics tended to crop up around transit routes, concentrating around stations and stops.

Many cities in Europe and Asia consist heavily of transit fabrics. The authors highlight cities such as Jakarta, Shenzhen, Singapore, and Tokyo.

8.2.3 Automobile (Car-Dependent)

Access to passenger vehicles became more commonplace around 1950, marking this as the launch-point for the automobile fabric's continued dominance in development. Cities could expand to a 40 km radius thanks to cars' rapid travel speeds. This extension led automobile-dependent suburbs to become the main urban fabric of many cities.

Such a sprawl caused densities in these areas to fall dramatically, to the point where they could no longer sustain supplemental transit fabrics when introduced. This has required many of these suburbs to build up density around transit stops and stations and make these connection points that are first driven to by suburb residents (Nilsson et al., 2014). The suburbs of European and Asian cities are more likely to successfully integrate transit fabrics through this method due to their higher densities than American and Australian suburbs.

8.3 The impact of Building Typologies

Neighbourhoods are complex urban organisms with intricate relationships between their economies and infrastructure. Different development types can have their own unique impacts on these elements as they become integrated into the urban landscape. In some cases, these impacts can be positive, contributing to the health and growth of a neighbourhood, and in others, they can be negative, causing neighbourhood quality and wealth to deteriorate.

This part reviews the available literature to analyse how stadiums, universities, and medical facilities specifically influence three key elements of urban function: housing tenure, transportation links, and economic activity and employment opportunities. This review determines in which circumstances these individual developments act as catalysts or suppressants of urban regeneration.

8.3.1 Housing Tenure

Housing tenure pertains to all legal forms of tenancy in residential properties. It includes rental from landlords, owner-occupancy of individual homes, and mixed forms of tenancy. This factor is commonly studied because of its strong relationship with a local economy's health and residents demographics. Each of the three types of developments assessed in this section has their own unique impacts on a community's housing tenure.

8.3.1.1 Sport Stadiums

When stadiums become a part of the neighbourhood fabric, a change in the rates and types of housing tenure can often be expected. Communities often expect negative impacts, explaining the commonality of NIMBY-type protests to stadium development.

It has been found that the construction of sports stadia in the UK typically results in an increase in local property values (Davies, 2005). However, whether or not an area will experience positive increases can vary depending on the specific locale.

One study found that in response to the mere announcement of a stadium being built for the Dallas Cowboys NFL team, a rise in property values was recorded in the city proper, but a decrease through the rest of the county (Dehring et al., 2007). When the stadium project was instead moved to Arlington, property values declined 1.5% relative to the surrounding area before stadium construction commenced. This decline was almost equal to the anticipated household sales tax burden. These findings suggest that the economic benefits of the stadium's amenities were negligible.

Contrast this to what occurred in Landover, Maryland: the construction of the FedEx Field for the Washington Football Team spurred an increase in property values (Tu, 2005). A similar positive effect was seen in Oklahoma City upon the arrival of a permanent new NBA team and accompanying arena (Chikish et al., 2018).

Stadium construction can have a negative impact on a neighbourhood's low-income housing options. In Atlanta, it was estimated that as many as 16,680 low-income residents were displaced as a result of facilities construction for the 1996 Olympics (Burbank et al., 2001). Promises of relocation assistance were not entirely fulfilled, with many of the displaced residents unable to qualify for new mixed-income housing units. Of one demolished public housing development, in particular, only 62% of residents were able to find replacement housing, and a substantial number of those went to Section 8 units - well known to offer less quality and stability than standard public housing.

This type of dynamic leads to a complex problem, as the typical employment opportunities generated by stadia are not high-wage positions. Employees of these facilities have limited housing options, and their population creates demand for expansion of affordable housing (Delaney & Eckstein, 2003.)

8.3.1.2 University Campuses

As covered in the section pertaining to economic activity and employment opportunities, the economic impacts of universities ripple into the housing market. It is common for property values near universities to decrease, especially in already low-income neighbourhoods (Maurrasse, 2002). Many universities take advantage of this effect, buying up more properties to add to the campus. This can cause substantial resident displacement, which is further exacerbated by resulting issues of gentrification.

Universities can cause a rise in housing rental prices as student demand increases (Ogur, 1973). Some communities can have difficulty absorbing the dramatic increase of student populations, and accommodation strategies often include the clustering of student housing in select areas of a neighbourhood (Allinson, 2006). This has been linked to rent spikes, resident displacement, as well as deterioration of neighbourhood quality, as student demographics tend to bring issues with noise, civil disturbances, litter, and lack of property maintenance (Cortes, 2004).

A typical impact is also for single-family dwellings to be converted into "houses in multiple occupation" (HMOs), where several students rent rooms in a single home (Sage et al., 2012). Therefore, it is common for an area's primary tenancy types to shift and residential properties to become higher in density as university students flock to a neighbourhood.

The studentification of an area is a documented catalyst for the exodus of families, resulting in a significant demographic shift. As student populations become larger and more original residents are displaced, local residency can become largely seasonal. This can create a "ghost-town" effect when there are breaks between university semesters.

Overall, the average home price and rent price is higher in ZIP codes with a university than those without, and highest in ZIP codes with a medium-sized university of 10,000–20,000 students (Rivas et al., 2019). Smaller areas typically exhibited more price volatility as student populations rose. The same research found that public universities tend to have more of a positive effect on housing prices than do private universities.

8.3.1.3 Medical Centres

Medical facilities are superficially regarded as a large benefit to community residents, given the rise in accessibility to healthcare. However, the impact of these facilities on housing tenure is complex. Analysis by Peng and Chiang (2015) has found that hospitals do provide value-raising amenities to residences, but only when they are in a certain "sweet spot". If housing is too close (0-500 m) or too far (over 2,000 m) in relation to a hospital facility, then property values drop.

Similarly, complex findings were recorded in a more recent study of hospital impacts on real estate markets (Rivas et al., 2019). Though the broader results generally confirm that larger, closer institutions yield higher value and rent prices, this correlation can be disrupted.

The study found that ZIP codes with larger hospitals have higher average home prices and rents than those with smaller hospitals, while ZIP codes with small and medium hospitals have lower home prices and rents than ZIP codes with no hospital. The authors theorised that this effect could be attributed to the fact that smaller hospitals tend to be in more remote areas with lower real estate prices. Expanding on the effects in smaller areas, it was found that price volatility grows as the number of doctors affiliated with the local hospital(s) grows.

The presence of medical facilities in a community can have an influence on migration patterns and the demographics of incoming residents. Research has found that where medical facilities exist, older individuals are more likely to move to, presumably as a result of their need for greater healthcare accessibility (Drobne & Bogataj, 2017).

8.3.2 Transportation Links

All three of these development types tend to require substantial land-space use. Through events, employment, and/or services, they can also be generators of massive commuter numbers. These factors make them highly-impactful figures in the transport network of the urban landscape.

8.3.2.1 Sport Stadiums

Overall, the events held at stadiums can be serious triggers for traffic congestion (Ghosh et al., 2019). This often puts a strain on city infrastructure and even increases demand for additional roadways or maintenance. In anticipation of the 2010 Asian Games, the city of Guangzhou had to invest in intelligent transport technology in order to accommodate the increased traffic strain on their transport infrastructure, which had little available capacity (Xiong et al., 2010).

In Australia, the placement of contemporary sports stadiums is planned to encourage visitor use of public transport and limit access by private vehicles (Burke & Evans, 2009). This generally results in sites with higher degrees of proximity to public transport stops and an orientation that achieves low-travel times for the highest number of residents.

Applying a transit-reliant approach can help stadiums elsewhere also avoid causing unsustainable surges in road traffic, but only with successful strategies. The Sleep Train Arena in Sacramento, California, serves as a suitable example. While analysis predicted that the stadium could bring as many as 7,000 private vehicles into the area during events, careful

selection of the site's location and traffic management was predicted to cut down that number (Larson, 2004). Yet, the already-congested downtown area experienced substantial strain on its roadways, especially nearby highway connections. The effect was large enough to elicit a petition to the Third District Court of Appeal that claimed the traffic study conducted by the stadium developers was insufficient (Manley, 2015). The stadium was eventually slated for reuse.

8.3.2.2 University Campuses

The insular nature of university campuses can sometimes affect public transport accessibility, especially for the student population. In China, where gated campuses are a commonality, serious inequities have been found in student access to public transportation from their campus grounds (C. Sun, Cheng, Lin, & Peng, 2018). The enclosed nature of Chinese universities has been established as a contributing factor to city traffic issues, as their land-space use prevents municipalities from constructing high-density road systems (Gu et al., 2019).

Even unenclosed university campuses can have a negative impact on local traffic systems. Their dense populations of students, faculty, and visitors generate a great deal of road traffic (Rotaris & Danielis, 2014). Campus proximity to ample bike lanes and public transportation stops is a strong determining factor in how many university users choose to commute via passenger vehicle (Akar et al., 2012).

It's important to note that the arrival of universities also commonly brings the arrival of sports stadiums. As school teams hold events, local areas can experience many traffic-related difficulties with other stadium developments.

8.3.2.3 Medical Centres

Not only are medical campuses typically large and placed in central locations to maximize their service range (Wang et al., 2019), they are also travelled to by significant numbers of patients and healthcare workers each day. This results in a large group of commuters travelling to one concentrated point. Unsurprisingly, local traffic congestion is a common side effect. Generally, hospitals placed near residential or employment zones are recorded as congestion contributors in both peak and off-peak hours (Song, Zhao, Zhong, Nielsen, & Prishchepov, 2019).

Analysis of Beijing traffic patterns shows that enhancing traffic flow via hospital relocation predictably results in compromised hospital accessibility. Medical developments that must maintain high accessibility rates must implement careful strategies to mitigate this effect. Urban planning must account for this dynamic in order to achieve an optimal arrangement, especially in areas with multiple hospitals. While distributing hospitals outside of central locations may increase overall system congestion, data indicates that this strategy so effectively relieves congestion in central areas that net traffic congestion rates are still reduced (Wang et al., 2019).

8.3.3 Economic Activity & Employment Opportunities

Proposals for these types of developments frequently seek communal support with promises of economic stimulus. However, the resulting economic effects of such developments can vary widely depending on the specific development type, as well as whether or not the project successfully deploys strategies to integrate with the community and meet the needs of the local economy.

8.3.3.1 Sport Stadiums

Coates and Humphreys (2000) have documented that, despite promises of significant economic incentives, sports stadiums built for city-based team franchises not only fail to raise city incomes but also often lower them - even with government funds subsidizing the cost of construction and/or renovation. More typically, it is a taxpayer burden. Comparable findings have been recorded by other researchers, including Noll and Zimbalist (1997), and Gunter (2011).

Event-specific sports stadia, such as those built for World Cup or Olympic games, are also often proposed as opportunities to uplift local economies. However, research has uncovered that these sites rarely induce long-term positive change. Ahlfeldt and Maennig (2010) found that sports stadia that implemented innovative, iconic architecture were more successful at inducing long-term stimulus.

The work of Noll and Zimbalist (1997) concludes that contrary to common predictions, the construction of stadiums usually diminishes local employment opportunities. Additional research has established that while these developments do yield a small positive effect on earnings per employee in the amusements and recreation sector, it is offset by decreases in both earnings and employment in other sectors (Coates & Humphreys, 2003).

These findings support the theory that “consumer spending on professional sports and spending in other sectors are substitutes”. (Coates & Humphreys, 2003 p. 175). Coates and Humphreys consider this an explanation for the overall negative economic effect found in similar research. More is illuminated by the fact that the jobs created by a stadium’s arrival are usually not high-paying (Delaney & Eckstein, 2003). This ties back to impact on housing tenure, as tenants employed by these venues or their satellites need lower-income housing options.

8.3.3.2 University Campuses

The permanence of university campuses can be a pillar of stability for low-income neighbourhoods nearby. Unable to easily change location due to their complex facility infrastructure, these institutions remain invested in their communities (Maurrasse, 2002). Community outreach efforts have grown as universities work to ensure that the quality of surrounding neighbourhoods contributes - rather than detracts from - the university’s appeal to prospective students, faculty, and investors.

Universities and/or their affiliated hospitals are the largest employers in one-third of America’s urban areas, making them a significant fixture for local income opportunities and economic health. However, some of the hiring practices common in universities can mitigate the economic uplift. A tendency to hire workers on a temporary basis with few benefits does provide low-skill jobs, but it contributes to income instability and suppresses the local community’s buying power. This can have a far-reaching effect on local economies, creating pressure that eventually causes business closures and housing devaluation.

Heavy immigration of student populations is known to cause a change in the local business landscape (Sage et al., 2012). Family-oriented services tend to be phased out in favour of those that appeal to the younger student demographic. And as seasonal fluctuations in population result from university breaks, so too do fluctuations in commercial activity.

8.3.3.3 Medical Centres

In at least 16 American states, hospital networks serve as the largest employers (Zuckerman & Pham, 2019). This status makes them pivotal figures in local economies. Overall, hospital systems contribute nearly $1.7 billion (or 6.6%) toward the $25 billion local economy (Rotarius et al., 2003).

A study of healthcare systems throughout Europe found that medical facilities were multiplying factors for employment (Boyce & Brown, 2019). For every new healthcare job created, total employment would grow by a factor of 1.3 or 1.7. There was also a positive relationship between healthcare spending and multiplied job creation in other sectors. The research used several locations as case studies for economic impact, including Lancashire, England, and Pomurje, Slovenia.

In Lancashire, the health and social care sector is the single biggest contributor to economic growth and employment. This was identified as creating a major impact on the area's business spending and induced spending. It was projected that Lancashire's health and social care sector will grow by 1900 jobs (1.7%) from 2014–2024. Pomurje shows similar traits of economic dependence, all the more significant given that the region has the country's highest unemployment rate. Of all regions in Slovenia, Pomurje has the highest healthcare employment percentage. Both case studies show that medical facilities are a key part of each area's economic infrastructure.

Research has established that medical facilities in rural communities play an especially important economic role (McDermott et al., 1991). It was found that hospitals contributed an average of $700,000 to $1 million to their communities. When analysing the effects of hospital closures in rural regions, calculated losses amounted to $40,103 per bed to $99,933 per bed. For a 70-bed facility, this would amount to an income loss of $3,780,000 per year on average.

In recent years, many hospital systems have rolled out community investment programs. For example, Kaiser Permanente has established the Thriving Communities Fund, which has planned $200 million in funding for efforts to reduce housing instability in the neighbourhoods of their hospitals. The healthcare brand has even made economic enhancement initiatives an integral part of their proposals for new hospital developments, referred to as "anchor institutions". One such instance is the recent opening of a new hospital in the Baldwin Hills-Crenshaw neighbourhood of Los Angeles. In addition to renovating the YMCA next door, the project also committed to hiring local and disadvantaged workers and businesses (Owens, 2017). A total of 48% of the project's construction workers were local, and 40% of construction contracts went to businesses owned by women, minorities, and/or veterans.

An in-depth study of anchor institutions found that, instead of urban socioeconomic context, hospital characteristics are the greatest predictors of a hospital's investment into communal economic development (Sherman & Doussard, 2019). Specifically, large, teaching-intensive hospitals have been identified as the biggest spenders in this domain.

8.4 The Comparative Analysis of Spatial Fragmentation

"[T]he idea that the built environment should provide its users with an essentially democratic setting, enriching their opportunities by maximizing the degree of choice available to them. We call such places responsive" (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985).

Cities are planned and designed differently. The contexts in which they are placed, the culture, activities, and users shape the city's urban fabric in many ways. However, the need for access, choices, and opportunities is unified. One thing that brings together all cities is the need to respond to their surrounding contexts, physically and visually. The importance of welcoming users by availing access and the variety of functions in a humane setting. The concept of 'Responsive Environments, first introduced by Ian Bentley et al. (1985), focuses on how the building form responds to the context based on a set of variables. The point in better understanding how developments respond to their contexts has a much bigger value for cities as a whole. It is important to analyse the urban fabric and how each of its components blends with their surroundings. We know that cities are much more liveable and accessible when they respond to their surroundings rather than form an enclave or a city within the bigger city. The coming sections thoroughly study nine different developments from around the globe. The developments are located in completely different contexts with different city planning ideologies that, in one way or another, entail how responsive those developments are to their contexts.

8.4.1 Micro spatial analysis

The study of the nine developments is based on a thorough analysis of the different sets of indicators taken from the works of Ian Bentley in Responsive Environments. Table 8.1 below shows the different sets of indicators and the variables on which the developments were assessed. The following sections address each characteristic separately with an analysis of the developments from two dimensions; the different continents and contexts in which they are placed, and the three different functions that they fall under. A comparison of the

different functions and contexts will be indicated for the different characteristics typically found in responsive environments.

The methodology to which each indicator was assessed will be included separately for each characteristic of responsive environments. The different variables were calculated based on a thorough virtual observational analysis of the nine sites as well as extensive desk research.

Table 8.1 List of Indicators used to assess the physical spatial fragmentation on a micro urban scale

Indicator	Variable	Value [unit]
Physical interaction between buildings and sidewalks	Direct pedestrian access from sidewalk	Average distance between pedestrian entrances per block [m]
Visual interaction between buildings and sidewalks	Transparent windows and doors facing sidewalk	Ground-floor transparent windows or doors per block [%]
	Transparent fences facing sidewalk	Ground-floor transparent fences per block [%]
Permeability	Access to public spaces from sidewalks	Average distance between accesses to public spaces per block [m]
Geometry	Alignment to the prevailing geometry in the area	Buildings aligned to the prevailing geometry in the area [%]
	Plot size	Plot size average per block [m]
Land use grain	Variety of land uses	Description of land uses
Character of the borders	Border's materiality	Description of border's materiality

8.4.2 Brief on the Nine Developments

The cross-contextual comparative case study appraisals draw on analogous case data study data derived from empirical studies in Saudi Arabia and secondary data on the United Kingdom (UK) and the United States of America (USA). The approach contrasts the Gulf context represented by the city of Riyadh with disparate contexts to examine similarities and divergences. In addition to three case studies selected in Riyadh, a further six were identified as suitable for comparison: three in the United States of America and three in the United Kingdom. To maintain consistency and facilitate the comparative analysis, these international cases were selected from typologies of gated developments that matched those found in Riyadh, as Table 8.2 shows below.

Table 8.2 Showing the key characteristics of the nine transnational case studies of gated development selected for perimeter appraisal.

	The Saudi City Car Dependent	The European City Transit	The American City Car Dependent
University Campus	**King Saud University, Riyadh**	**University of Leeds, Leeds**	**Ohio State University Main Campus, Columbus**

Number of Students	62,221 students	33,300 students	61,391 students
Area	91,10,000 m^2 7,310,000 m^2 (without student/faculty housing)	396,592 m^2	6,740,000 m^2
Medical Centre	**King Fahad Medical City, Riyadh**	**St. George's Hospital, London**	**Memorial Hermann Southwest Hospital, Houston**
Number of Beds	1,200 beds	1,300 beds	1,388 beds
Area	500,000 m^2 456,950 m^2 (without staff housing)	146,626 m^2	318,273 m^2
Sports Stadium	**King Fahd International Stadium, Riyadh**	**BT Murrayfield Stadium, Edinburgh**	**Lucas Oil Stadium, Indianapolis, Indiana**
Spectator Capacity	68,752 people	67,144 people	67,000 people
Area	502,473 m^2	212,642 m^2	144,670 m^2

8.4.3 Analysis: Physical Spatial Fragmentation on a Micro urban Scale

8.4.3.1 Physical Interaction between Buildings and Sidewalks

One of the main elements that define the responsiveness of a space is the physical interaction with its surrounding context. In some cities, the direct answer is creating gates and enclaves to separate the public from the private. However, apart from the obvious impact on the seclusion of the development from its surroundings, the gate usually also deters the pedestrians. This section aims to analyse the physical interaction of the nine different developments with their surroundings by assessing the direct pedestrian accesses from the sidewalk into the different complexes. The more the pedestrian access points from the sidewalks, the more responsive and accessible the development is.

Google Earth was used to accurately measure the distance between the different pedestrian accesses per block. The chart below (Figure 8.1) shows that the marked paths measure the estimated dimensions between the different access points within one block.

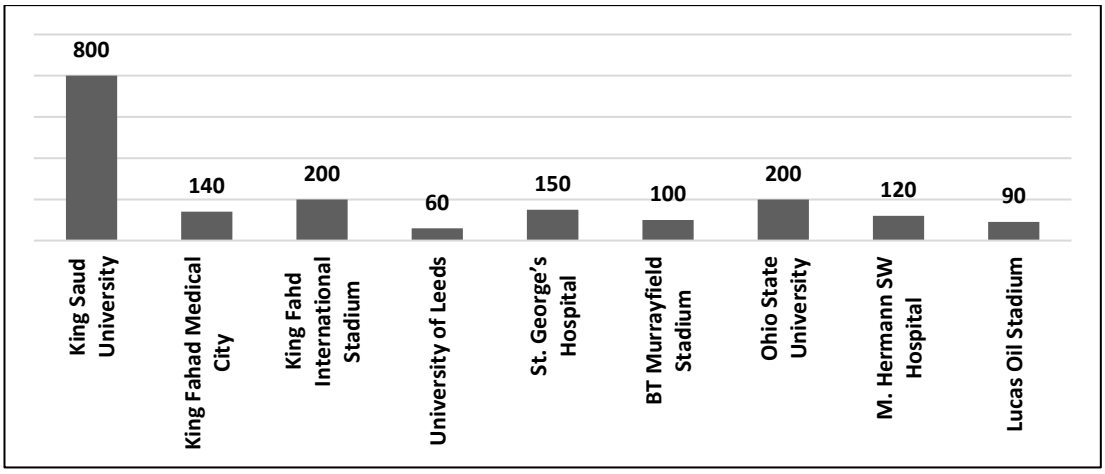


Figure 8.1 Average Distance between Pedestrian Entrances (meters)

8.4.3.1.1 The University Campuses

Figure 8.2 King Saud University Edge

Figure 8.3 Street View of University of Leeds's Edge - source (Google Earth)

Figure 8.4 Street view of Ohio State University's Edge - source (Google Earth)

The King Saud University campus is located in Riyadh, a car-oriented city, and is placed on a huge plot of land with an area of 9,110,000 $m^{2,}$ the largest in all of the nine developments analysed. The pedestrian accesses are almost unavailable, and the campus is completely surrounded by gates that are, in many instances, high concrete walls that deter physical and visual access. As a result, there are only seven main entrances to the campus where a few of them have a side door for pedestrians. The preliminary assessment indicates that the distance between pedestrian access could reach an average of 800 meters, the highest figure in all of the nine developments assessed. The challenge for pedestrians is that the area around the campus is not inviting for walking or cycling, nor are the pedestrian facilities in place. In addition, the campus seems to be concentrated in some zones only, which does not allow for mixed-use functions in all spaces around campus.

The University campuses are situated in very different contexts and environments. In the British context, the University of Leeds campus design reflects the pedestrian-oriented nature of the city. The campus is located amidst a high-density environment that blends with

the immediate context. As shown in the street view (figure 8.3), the campus is entirely accessible for pedestrians and completely merged with the city's urban fabric. The buildings in the campus lead directly onto the street sidewalks and have the same character and feel as the surrounding buildings. In the case of the University of Leeds, the assessment shows that the average distance is around 60 meters between clear pedestrian accesses per block. This is a very good figure when compared to the most pedestrian-oriented complexes. In fact, the pedestrian accesses are much more in reality, given the permeability and availability of multiple access points throughout the campus apart from the clear entryways that are marked for pedestrians.

In Columbus, Ohio, the context is significantly different from the British as the city is mostly car-oriented with minimal transit options. The planning is also different when it comes to density. Ohio University, in particular, is located on a vast plot of land, around 6,740,000 m^2, and split by a considerably wide highway crossing through the campus. This is also reflected in the pedestrian access points; since the city is mostly car-oriented, the campus is more inviting for cars. The analysis indicated the distance of 200 meters between pedestrian accesses per block on campus. This distance is on the higher end than the other developments, even though the campus includes well-designed sidewalks and pedestrian facilities that address accessibility and other features. It is also important to highlight that this figure is an average of the clear pedestrian access; the campus does not have gates around its buildings which helps avail more access at multiple points around campus other than the dedicated pedestrian gates. The presence of so many parking lots and cul-de-sacs indicates the clear direction of car-oriented campus planning. That said, it is still relatively inviting to pedestrians, given the accessibility options and the lack of gates in most areas around the campus. The availability of huge open space also made room for beautiful green spaces between the blocks on campus, which offered more public space for students and visitors alike.

8.4.3.1.2 The Medical Centres

Figure 8.5 King Fahad Medical Centre's Edge

Figure 8.6 St. George's Hospital's Edge - source (Google Earth)

Figure 8.7 Memorial Hermann Southwest Hospital's Edge - source (Google Earth)

King Fahad Medical City is located in a car-oriented city. Pedestrian access is minimal, given the fencing surrounding the complex. The assessment indicates an average of 140 meters as a distance between the different pedestrian access points in the complex.

St. George's hospital has better accessibility for pedestrians and transit even though most of it is physically separated from its immediate context. It also has to do with the density of the context and the available facilities in the area for pedestrians and transit. There are bus stops outside the building entrances within the medical centre complex. This enhances the accessibility of transit users and pedestrians into the medical centre as well as invites more foot traffic. That said, the average distance between pedestrian accesses per block is still quite high (around 150 meters), given the presence of a fence around the medical centre.

Memorial Hermann Southwest hospital is located in Houston, Texas, a city known for its huge roads and single use zoning. The city is mostly car-oriented with the exception of its downtown. The hospital is fenced off with metal fencing all around the complex except where the vehicle entrances are Thus, it is not accessible for pedestrians from many points. The assessment indicates that the average distance between pedestrian accesses is around 120 meters.

8.4.3.1.3 The Sports Stadiums

Figure 8.8 King Fahad International Stadium

Figure 8.9 BT Murrayfield Stadium - source (Google Earth)

Figure 8.10 Lucas Oil Stadium - source (Google Earth)

The King Fahad international stadium is an iconic feature in the city of Riyadh; its architectural design is quite unique and stands out amidst its context. A metal fence surrounds the stadium with multiple vehicle entrances where pedestrians can access. However, as explained in other developments in Riyadh, the area is very much car-oriented, thus pedestrian facilities are not given attention, and hence the accesses are mostly by car. The vehicle users may then leave the car in the stadium's huge parking lots and walk up to the arena. The assessment indicates that the average distance between pedestrian access per block is around 200 metres based on the average distance measured between the different entrances.

BT Murrayfield stadium has quite a different context and setup; the stadium is located in Edinburgh, Scotland, adjacent to a train track. While the context is pedestrian-oriented, the stadium is surrounded by a metal fence throughout that deters pedestrians from accessing the venue at multiple points. The average distance between pedestrian access points is 100 metres.

Lucas Oil Stadium is located in the heart of Indianapolis and completely blends with the context. As shown in the street view image above (figure 8.10), the accesses are multiple and there is no physical barrier that separates the stadium structure from its surrounding context. The assessment indicates that the pedestrian access per block is on average 90 metres.

8.4.3.2 Visual Interaction between Buildings and Sidewalks

The first impression of development comes from its visual outlook and clear access of the buildings from the public spaces. The visual interaction between the incoming user to the space is thus defined at this moment of perception. It is important for responsive designs to address the visual element and allow for some access vantage points where the users can feel welcomed and connected to the space. This also has to do with the edges of the development; one element that connects with the immediate context is the edge of the complex and its transparency. The coming section analyses the visual cues in the different developments by assessing the percentages of ground floor windows and doors and the overall gate/fencing around the development.

The percentages of ground floor windows and doors was assessed based on the google street view analysis. A number of street views per block were extracted and analyzed. The average of the solid versus void was then calculated accordingly.

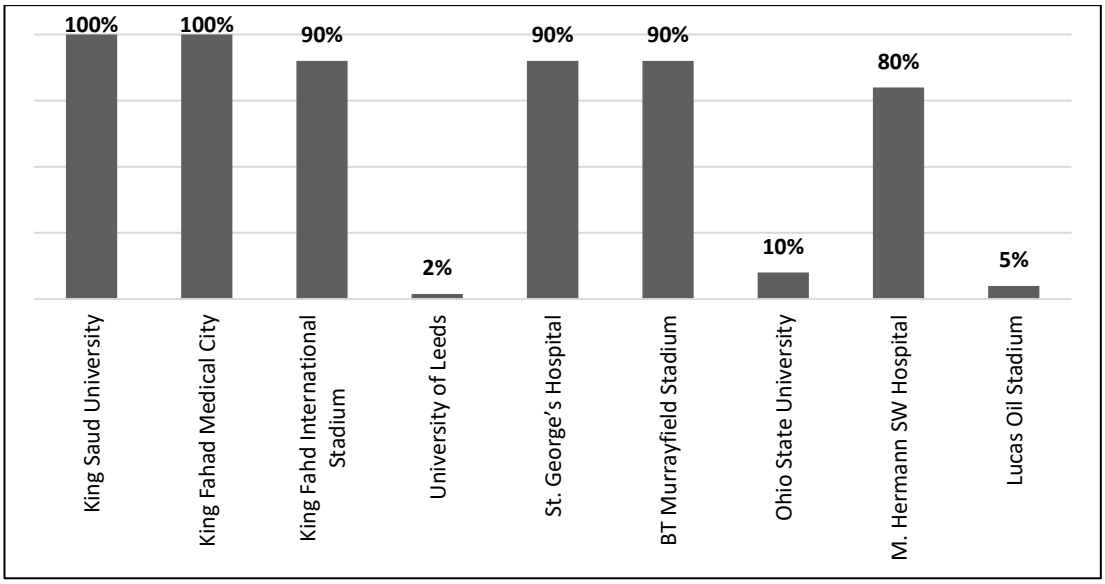


Figure 8.11 Ground Floor fencing per block (%)

8.4.3.2.1 The University Campuses

The visual interaction with the outer environment greatly varies in the university campuses around the three different contexts. King Saud University has 25% of ground floor windows and doors in its complex. The view of the actual buildings from outside is minimal since the buildings are placed farther away from the entrances to the campus. In addition to this, the campus is completely surrounded by fencing that also provides another layer of visual separation from the surrounding context. As shown in the chart above (figure 8.11), King Saud is completely surrounded by ground floor fences.

On the other hand, the University of Leeds is almost completely visually accessible from the outside. It has around 52% of ground floor windows and doors and almost no fences covering the complex (2%). This also goes back to the planning of the campus as part of the urban fabric in the city of Leeds.

With regards to the American city, Ohio State University has very good ground floor visual access with an estimate of 60% of ground floor windows and doors per block. Although spread out on a huge plot of land, the campus is accessible and inviting from different points across campus since the fencing is minimal, only around 10%.

8.4.3.2.2 The Medical Centres

In general, the three medical centres have high percentages of ground floor fences per block. The analysis of King Fahad medical city indicates a complete 100% enclosure with fences

around the complex. Along with 5% only of ground floor windows and doors per block. This entails a very poor visual interaction with the context.

The St. George hospital is also surrounded by many barriers (90%) all around the medical centre. However, the buildings in the medical centre have a high percentage of ground floor windows and doors, reaching an average of 70% per block. Finally, the Memorial Hermann has 55% ground floor windows and doors and 80% ground floor fencing.

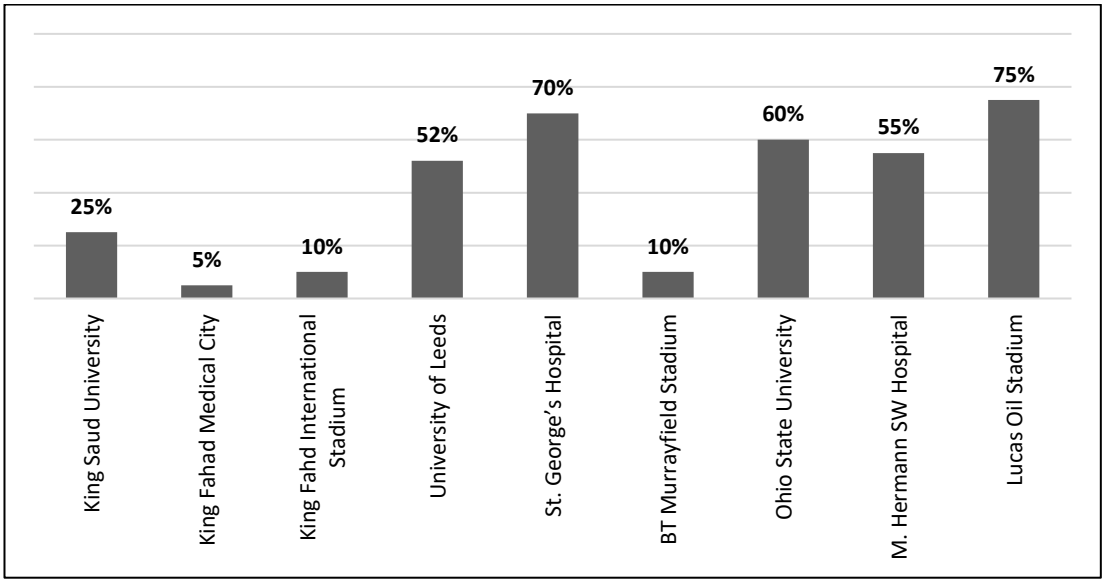


Figure 8.12 Ground floor doors and windows per block (%)

8.4.3.2.3 The Sports Stadiums

King Fahad international stadium and BT Murrayfield stadiums have the same figures for the visual interaction with the context. Both stadiums are 90% separated from their surroundings with metal fencing and also both have around 10% of ground floor visibility via windows and doors.

On the other hand, Lucas Oil Stadium is completely accessible with the surrounding context (5% of ground floor fences) and high visibility of the ground floor (75%), the highest of the nine different developments. Lucas Oil Stadium is actually one of the most visually accessible and interactive developments.

8.4.3.3 Permeability

Permeability is defined by a number of factors, one of which has to do with how the block layout is designed. Is it accessible from many points? Does it have open space? How often? Can one see through the activity? How interactive is its edge with the surroundings?

To better understand how permeable the nine developments are, one of the indicators assesses the access to public spaces per block. In an effort to compare realistically, the assessment is unified through all nine developments despite the different urban environments.

Google Earth was used to accurately measure the distance between the different public space accesses per block. The marked paths measure the estimated dimensions between the different public spaces within one block (when available). Sample aerial view from the St. George's Hospital Development are below.

8.4.3.3.1 The University Campuses

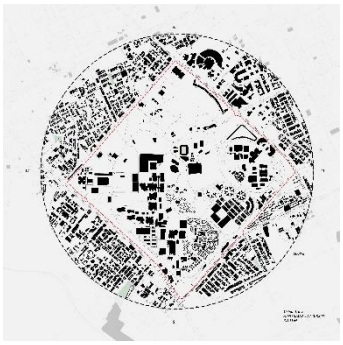


Figure 8.13 King Saud University Campus

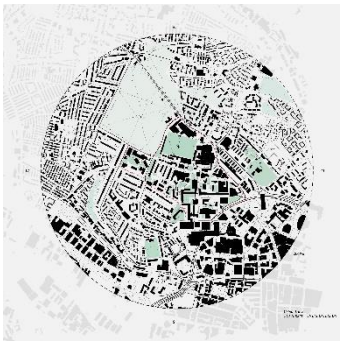


Figure 8.14 University of Leeds Campus

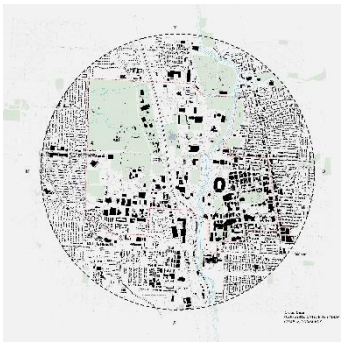


Figure 8.15 Ohio State University Campus

Access to public space in university campuses is integral; they make up a huge part of circulation from one school to the other. As is the case in the three university developments, the blocks are connected to each other through the public space in between, not necessarily physically connected. King Saud University is located on a huge, fenced plot of land. The buildings do have access to public space per block, but given the nature of the planning and design of the development, the average distance is high compared to other campuses. The access to public space per block is estimated at 150 meters on average.

The University of Leeds has a completely different nature to it; given that the campus buildings are submerged within its context without any boundaries, the public space is more accessible and quite frequent at an average of 10 meters. The blocks are also designed to

accommodate more public space internally the famous U-shaped blocks as shown in the ground figure above (figure 8.14). Ohio University is similar to King Saud in that they are both situated in a car-oriented city with low density. However, the campus in Ohio is designed to accommodate more open public space in between the buildings despite having a relatively big plot and block sizes. The estimated average distance between access to public space is 100 meters.

8.4.3.3.2 The Medical Centres

Figure 8.16 King Fahad Medical Center

Figure 8.17 St. George's Hospital

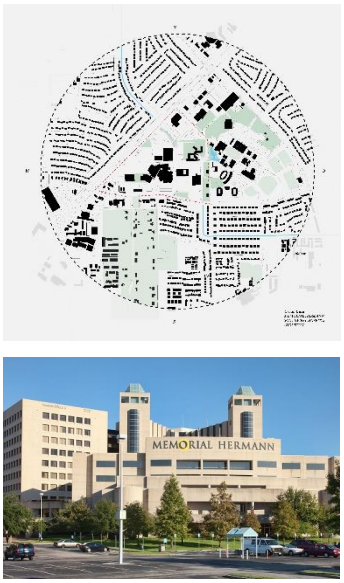


Figure 8.18 Memorial Hermann Southwest Hospital

Public space in the three medical centres is quite limited. The layouts are more utilised for the building's footprint or parking lots, as is the case in Riyadh and Houston developments.

In King Fahad Medical Center, the blocks include a few open spaces on the side, but the block size is quite big. This is similar to Memorial Hermann Southwest Hospital in Houston; in fact, both developments have an equal average of 80 meters as distance between access to public space.

St. George's Hospital, located in a pedestrian-oriented environment, is designed with more access to public space from within the buildings. This is visible through inspecting the layout of the hospital above (figure 8.17). Almost all blocks have an inner atrium/court with an open green space on the ground level; the distance between public space per block is around 50 m. In addition, the hospital has an active ground floor with outdoor seating/coffee shop outlets.

8.4.3.3.3 The Sports Stadiums

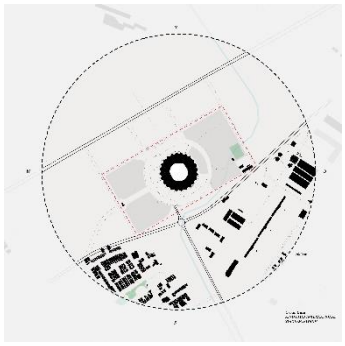
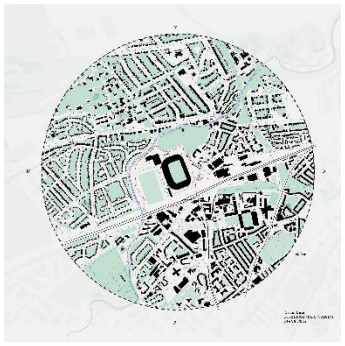


Figure 8.19 King Fahad International Stadium



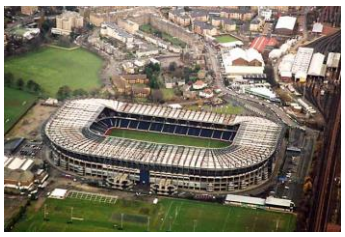


Figure 8.20 BT Murrayfield Stadium

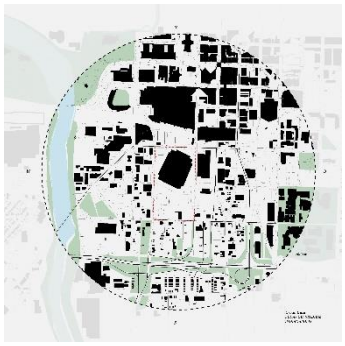


Figure 8.21 Lucas Oil Stadium

Stadiums have a very different nature of functions and thus special layout and block designs. The stadiums in the three different countries have one huge block: the stadium arena and have almost the same capacity of spectators. What differs is the outer façade of each and its access and visual appearance from the outer environment and their responsiveness to the context. In most cases, responsive blocks integrate open, public space within their form to allow access points. However, in the case of a stadium, this cannot be applied given the nature of its design. That said, the assessment of access to public space has taken quite a different approach here, where the average distance is taken from the stadium's pedestrian access and onto the public space surrounding it.

The three ground figure diagrams above (Figures 8.19, 8.20, 8.21) show the different layouts in which each stadium is located. The King Saud University is surrounded by parking from either side and very minimal density, however right outside the stadium within the development, there is some soft scape that is accessible from different points around the stadium arena. On another hand, the BT Murrayfield stadium is located in a mostly vegetated context with medium density and lots of open green space. That said, the space around the stadium is directly lacking any useable public space other than the entryway from the ticket booth by the entrance. Lastly, Lucas Oil Stadium, which is located in the heart of a relatively dense downtown, has multiple access points leading onto the outer environment; but, similar

to King Fahad International Stadium, is saturated with huge parking lots that are taking up all the open space available around the block. However, the Lucas Oil stadium is surrounded by open plazas with pedestrian entrances all around the development, as shown in the ground figure above (figure 8.21).

8.4.3.4 Geometry

The alignment of the different developments varies from one context to the other. It is important to mention that each city has its unique planning characteristics that define a lot of how those developments represent. When looking at the Saudi City, the alignment, in general, is very low compared to the British city, for example, where the developments blend more with their context and surroundings. The Saudi developments are more or less standing alone within their gated enclaves; thus, the alignment with the surrounding may not seem necessary. That said, King Fahad Medical City is partially aligned with the context reaching a high of 50% compared to the two other developments, King Saud University (15%) and King Fahad International Stadium (0%).

On the other hand, developments in the British cities are more aligned with the context. St. George's hospital has the highest alignment in geometry compared to the other 9 developments (90%) followed by the University of Leeds campus that is also physically merged with its surrounding (85%). And lastly, the BT Murrayfield Stadium is also 80% in alignment with its surrounding context.

The alignment was assessed through a grid tracing exercise of the area around the developments. The development's building main axis is extended to better assess the alignment with the surrounding axis of the area.

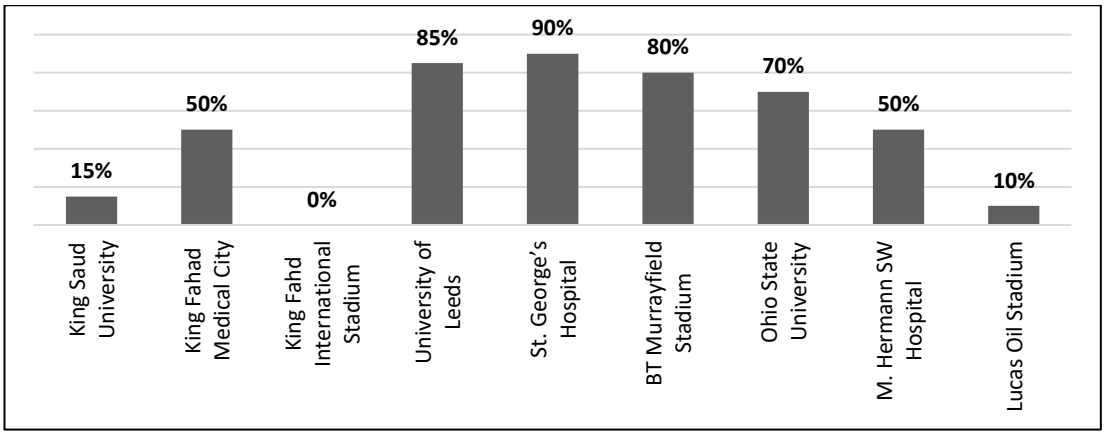


Figure 8.22 Average Building Alignment with Context (%)

The American city varies a bit more internally; Ohio state is pretty much aligned with its context despite crossing a major highway across its campus (70%), while the Houston Memorial Hermann is only 50% aligned with its surrounding context. On the other hand, Lucas Oil Stadium is not aligned with its context (only 10%) even though in terms of design and interaction, it's quite responsive to the context. However, the stadium structure is tilted diagonally and stands out in terms of alignment amidst the rest of the surrounding buildings.

In 'Responsive Environments', the authors stress the need for designing layouts with small blocks to enhance permeability and overall responsiveness of the complex:

> Smaller blocks give more physical permeability for a given investment in public space. They also increase visual permeability, improving people's awareness of the choice available: the smaller the block, the easier it is to see from one junction to the next in all directions (Bentley, Alcock, Murrain, McGlynn, & Smith, 1985 p. 12).

The plot sizes measured in the nine developments give a better idea of not only the geometry but also the permeability of each development from a pedestrian point of view. The smallest average plot size measured was that of the University of Leeds (15,000 m^2), while the highest was that of King Saud University (162,400 m^2).

As reflected in the average plot size bar graph below (figure 8.23), the University of Leeds is designed with smaller blocks in mind, thus creating a higher overall permeability on campus. On the other end of the spectrum, King Saud University has a much bigger block configuration and thus less permeability and accessibility on campus. The remaining developments' plot sizes vary but in total are within the average considering the overall area. Ohio University, for example, allocated on a huge plot of land (6,740,000 m^2) has a relatively large plot size of 154,000 m^2. This goes back to the city being mostly car-oriented; thus the layout is more focused on car access rather than pedestrian access. This is as a result of decreases in the development responsiveness.

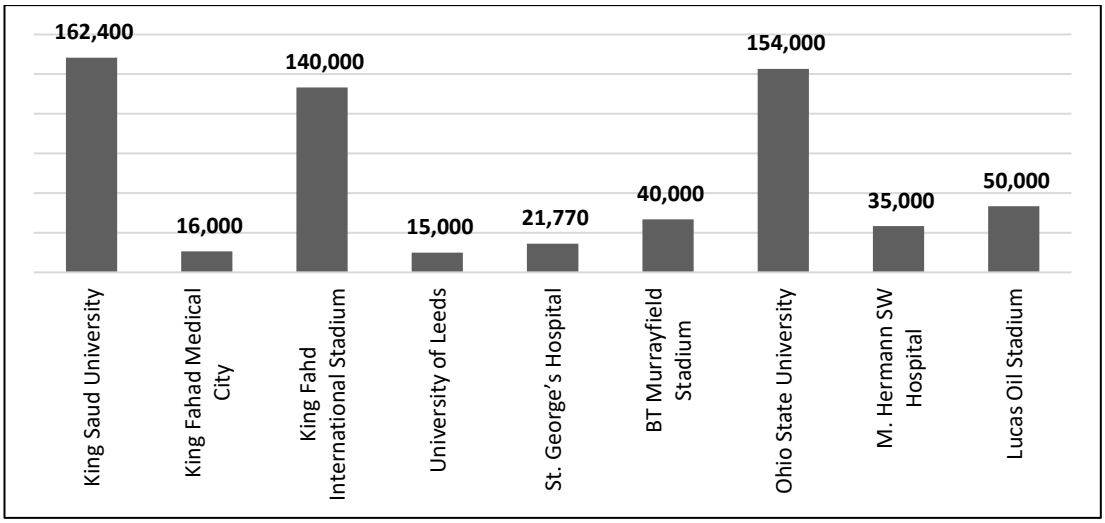


Figure 8.23 Average Plot Size per Block (m^2)

8.4.3.5 Land Use Grain

The developments' surrounding land use is critical in the livelihood and responsiveness of the area. There seems to be a pattern when it comes to the land use for the different developments. Saudi and American cities have a clear car-dependent orientation directly related to the functions allocated around the developments and the density of the urban fabric. The British city's land use is more diverse and mixed to promote pedestrian activity, focusing on the 15-minute neighbourhood design of cities. The 15-minute neighbourhood design concept is based on planning the different functions at proximity to each other in each neighbourhood so that everything is reachable by foot in 15 minutes or less. The different contexts' land use was acquired and analysed per city as described in the following paragraphs. Land use maps of each development area are in Appendix G.

8.4.3.5.1 The Saudi City Land Use Grain

Around King Saudi University, the immediate context is mostly residential with few mosques, governmental buildings, and few green parks. The area around the university is not central; thus quite abundant in desert space and has minimal active edges. The area around the King Fahd medical center is pretty much mixed use with a number of residential, commercial, and educational facilities surrounding the development. As for the King Fahad Stadium, the area surrounding is a mix of residential and recreational activities. In general, the land use in Riyadh is mostly based on low density, separate zoning where residential is separated from commercial and recreational; the planning also caters to vehicle users with multiple lane roads and vast highways with minimal pedestrian and cycling facilities.

8.4.3.5.2 The British Land Use Grain

The University of Leeds Campus is close to the city centre, making it a very lively place in general. The area around UL is a dense mixed-use neighbourhood with multiple services and destinations surrounding campus, such as residential, commercial, and educational facilities. Moving on to London, the area around St. George Hospital is a quiet neighbourhood with mostly one to two-story residential houses. There are a few parks and churches, also a huge cemetery. The main street, Totting High street, has more mixed-use functions along including bars and restaurants. The neighbourhood is pedestrian-friendly and is mostly accessible especially given the high presence of the elderly in the area. The area around the BT Murrayfield stadium is not very active, with mostly residential functions along with a couple of hotels/hostels and a few bars/restaurants, as shown in the land use map in Appendix G.

Overall, the land use grain in the British city is much denser and more pedestrian-oriented, thus having more active edges and being more permeable in most cases.

8.4.3.5.3 The American Land Use Grain

The area of Ohio State University has separate land-use zoning, for the most part, residential use is mostly surrounding the campus. There are two main streets (N HIGH and 5th) that are quite heavy on mixed recreational use. The campus is also divided by a major highway corridor (Olentangy Freeway), which requires vehicles to access the different parts of campus. There are also a considerable number of schools and churches in the neighbourhoods around campus.

Located in Houston, TX, Memorial Hermann hospital is located off Southwest freeway and is surrounded by mostly residential and some commercial services located along the highway. The area is quite spacious and vehicle-oriented, thus the spaces surrounding the complex are not pedestrian-friendly, and there is minimal transit coverage.

The Lucas Oil Stadium is located in the city centre. Its location and surrounding use are quite active and engaging from a pedestrian standpoint despite being located in the car-oriented city of Indianapolis. The stadium is surrounded by multiple mixed-use services in the area and is quite accessible by foot given the density of the center of the city.

8.4.3.6 Character of Borders

Responsive Environments talk extensively about the robustness of developments and how spaces can increase robustness through activating their edges. The edge between the

developments and the public space must be designed to avail a range of activities to coexist with outdoor public activities. The developments could still be able to maintain a semiprivate nature while availing an edge that is active, accessible, and visually and physically permeable for the users. In the analysis of the nine developments, there seems to be a clear distribution of border/edge characteristics as follows:

8.4.3.6.1 Active, Accessible, and Permeable Edges (No Gates or Surrounding Fence)

a. University of Leeds – Leeds, UK

The urban fabric of UL is mostly merged with the immediate context. There are only very few fenced blocks, and they're mostly transparent. The campus is completely submerged into the surrounding area, that it could sometimes be challenging to differentiate the university buildings from other ones with different services and functions in the neighbourhood. This has led to a very accessible campus connected to the city's transit and pedestrian network.

b. Lucas Oil Stadium - Indianapolis, USA

The stadium is not enclosed by a fence or gate and is quite open and connected with the immediate context. It is separated through differences in level and landscaping/greenery. This has increased the development's interaction with the built environment and enhanced its overall permeability.

8.4.3.6.2 Partially Accessible and Permeable Edges (Transparent Fencing or Low Physical Barriers)

a. King Fahad Medical City - Riyadh, SA

The medical city is physically fenced out from the surrounding context with a few vehicle-oriented entrances (1 main and 2 secondary). The borders are mostly metal fences or low concrete walls in some areas around the complex.

b. St, George's hospital - London, UK

St. George's Hospital is mostly surrounded by a fence around its perimeter. The fence is metal to maintain visibility, or in some instances where the services are, the barrier is a solid wall. There are also vegetated fences at a few points around the hospital. The access to the hospital is also gated for vehicles, but there are pedestrian scale entrances with accessible amenities for people to use.

c. BT Murrayfield Stadium - Edinburgh, UK

The stadium is physically separated from its surrounding with a fence that is either a metal fence or concrete wall.

d. Ohio State University - Ohio, USA

While there are a few physical barriers separating the complex from its surrounding, the entrance to the campus is quite spacious when it comes to pedestrian access. There are multiple layers a pedestrian has to pass through to get to the building entrance, including a highway, green buffer, huge parking lots, and others. While it may seem that the campus is part of the surrounding urban fabric, it is not pedestrian-oriented in most locations. With the exception of a few pedestrian entrances where secondary roads are, the campus is entirely dedicated to car access.

e. Memorial Hermann Southwest Hospital - Texas, USA

The hospital is surrounded by a steel rod fence all around. The gate is visually accessible where you can still see through the medical centre. The gates are followed mainly by huge parking lots at each block/plot. Entrance to gates is completely accessible without personnel or automated entryways.

8.4.3.6.3 Inaccessible and Impermeable Edges (Solid/Opaque Gate)

a. King Saud University - Riyadh, SA

Barriers physically separate the campus from the immediate context. It has seven main entrances that are all car-oriented. A street section around the university would show how the developments are surrounded by gates creating a vehicle-oriented environment. The actual buildings are located quite far away from the main entrance, which makes access by foot impossible.

b. King Fahad International Stadium - Riyadh, SA

King Fahad Stadium is enclosed by a metal fence. The gate is transparent, which allows for some visual access to the arena. That said, the structure is situated farther away from the boundary of the complex and access for pedestrians is strongly compromised.

8.5 Conclusion

The study conducted sheds light on the principles of design and planning in the various cities analysed. It's important to highlight how those findings come together to guide cities in

planning their developments as more accessible, permeable, and responsive to their outer environments.

The analysis indicated significant variance in how the different cities are planned; in the UK, the cities have a general pedestrian-oriented approach to design reflected on their street network, buildings, and general master planning. In the American and Saudi examples, we see a different approach of planning for cars rather than people. However, this is responded to differently in each country; in the USA, while the developments are clearly located in car-oriented contexts, the hierarchy of spaces and their designs are more integrated with the built environment than those in the Saudi context. The developments studied in Riyadh include multiple layers of barriers to accentuate each development's ownership and privacy outlook; this results in creating a city that is clearly detached from its surrounding context, thus unresponsive to its built environment. The below graph (Figure 8.24) highlights the rating for each development in terms of their overall design responsiveness as defined by Ian Bentley et al. (1985). The scoring system was based on the data gathered for each indicator, in which the lower the average distance between accesses to public space or between pedestrian entrances, the more responsive the development is. While the higher the ground floor windows and doors and the higher the percentage of alignment, the better scoring per development is.

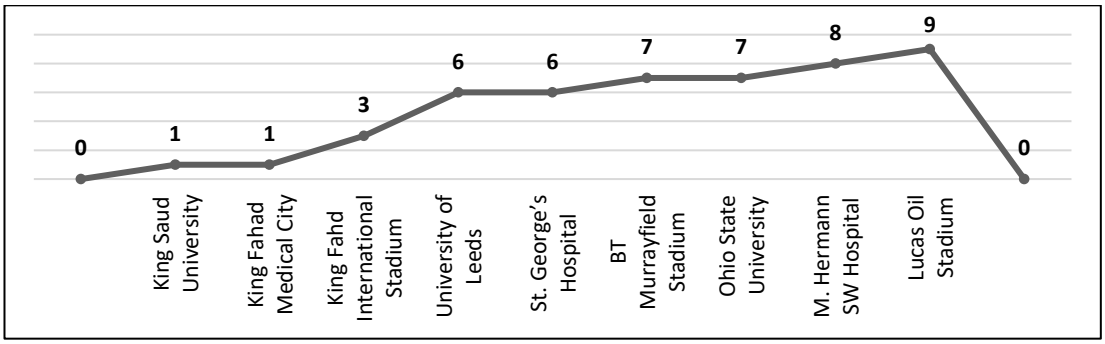


Figure 8.24 How responsive are the nine developments? (Scoring out of 10)

When building developments such as universities, hospitals, stadiums, shopping centres, schools, and others, cities must follow an approach that integrates the surrounding context physically, visually, and functionally. It is important to understand that especially those functions are highly attractive for the different user groups; thus, the design of the development's edge or border should be even more inviting and respond primarily to the users' needs. That said, car-oriented cities, in general, do need to change their outlook on

mobility and planning for people. We live in a time when public space and streets are becoming more and more of dire importance; people are looking for an open, safe, and healthy space to spend their time. With social distancing required to avoid getting infected with a global pandemic, governments are turning their cities into more pedestrian-oriented environments that allow for sufficient width of sidewalks, promoting non-motorised transport, availing public space amenities, and others. In some of the developments studied, especially those in the Gulf, there seems to be a need for really altering how the whole city is planned, not only how the developments fall within its surroundings. Responsive environments must respond, through their design, to the inner and outer environments they create.

Chapter 9: Urban Fragmentation in Riyadh: A Socio-Spatial Dimension Analyses and Discussion

9.1 Introduction

This chapter reports on the analysis of a survey on the impact of urban fragmentation on residents of Riyadh. It summarizes the results of the survey of residents, which gathered views on a variety of questions regarding their residential history and preferences, the built environment, and quality of life in their neighbourhood.

Gated developments (or fragmentary urban typologies) contribute to and have become, symbols of spatial fragmentation and social exclusion. By their nature, gated developments physically separate specific areas from the broader environment and create zones or pockets of restricted access within the urban fabric. The underlying assumption of this part of the research is that fragmentary typologies might negatively impact the lives of residents. The survey results partially challenge this assumption suggesting that residents prefer fragmentary developments, in part for the services and facilities they provide.

The chapter briefly outlines the methodology used to conduct the survey and analyse the gathered data. It then describes the socio-economic and demographic characteristics of the survey sample. After which, it analyses the residents' residential history and preferences, including the types of accommodation and forms occupancy favoured, the neighbourhood features most in-demand, and their awareness of the built environment. The final part of the chapter looks at residents' quality of life evaluations finding widespread dissatisfaction with multiple elements of the built environment and provision of urban services.

9.2 Residents Survey Overview

An online survey of Riyadh residents was conducted between June and August 2019. The project adopted a Respondent-Driven Sampling (RDS) method in which participants were encouraged to use their social networks to invite their friends and relatives to participate in a survey. The sampling process began with the researcher selecting a number of participants as seeds who were the first individuals to participate in the study. These seeds then recruited other participants. This process of existing sample members recruiting future sample

members continued until the desired sample size was reached. In the residents' survey, the first wave of participants was recruited through the principal investigator's personal network of individuals living in the city of Riyadh, in addition to related social media groups and accounts on Facebook and Twitter.

A total of 843 people took part in the survey, of which 399 completed all questions. A further 12 were excluded as they were missing responses on the demographic and socio-economic questions. To ensure the validity of the analysis, only fully completed surveys were analysed; thus, the analysis is based on 387 responses.

Online surveys have both advantages and limitations. One advantage is that it accords respondents with a degree of anonymity and has been shown to increase their willingness to openly express their views, to maximize the response rate, and to minimize response errors, close-ended or multiple-choice questions were used wherever possible.

However, there are inherent limitations with this approach. Online surveys tend to reach more technologically literate demographic groups and thus under-represent older populations and those with lower socioeconomic status - this appears to be the case in this survey. This leads to a non-random sample of the population and may lead to biases in the results. In addition, there is the potential for self-selection bias – however, in this case it is unclear in what direction, if any, this bias would occur, so no adjustment has been made to the response data.

The survey was comprised of 141 questions and sub-questions (see Appendix B for a full list of survey questions) and collected data on the respondent's demographic and socio-economic profile, their residential history and preferences, their perception of their neighbourhood's built environment, and asked them to evaluate the neighbourhood across a range of quality of life indicators. The length of the survey and detailed nature of the questions enabled detailed insights to be drawn into specific issues relating to the impact of fragmentary urban typologies on residents' quality of life. However, it is likely that this also contributed to the relatively high drop-out rate (52.6%). In addition, it appears that a sizeable minority of the respondents struggled to answer some of the questions – 31% rated the survey as "difficult" or "extremely difficult".

A final methodological concern relates to the sample size of the survey. The population of Riyadh is approximately 7.6 million; this means that the minimum sample size at a 95%

confidence level is 385. Thus, the survey meets the minimum requirements at a city-wide level. However, several of the questions analyse the characteristics of individual neighbourhoods, in these instances, the sample size at the neighbourhood level is too small to draw statistically significant conclusions. To address this concern, the neighbourhood level analysis groups neighbourhoods by average income, level of urban fragmentation, and the ratio of businesses to population (proxy for whether a neighbourhood is predominantly a residential or work/study neighbourhood. This information was drawn from an earlier Urban Mapping phase reported on in Appendix H, which catalogued fragmentary developments and data from the Royal Commission for Riyadh City.

9.3 Profile of Survey Respondents

9.3.1 Demographic and socio-economic features of survey population

A total of 387 respondents fully completed the survey. The following section outlines the socio-economic and demographic characteristics of the survey respondents. The median survey respondent is a male Saudi national earning above-average income. They are most likely to work in the public sector and live in a household with four other members.

Males are over-represented in the sample - 74% of respondents were male compared to just 26% female (Figure 9.1). This may lead to biases regarding the perception and relative significance of neighbourhood facilities and features of the built environment and quality of life.

Responses are reasonably well distributed across different age ranges. Figure 9.2 shows the distribution of responses by age group relative to the actual make-up of the Saudi working-age population. The age band 25-34 is somewhat over-represented, making up 38% of respondents but only 25% of the working-age population. However, the population of Riyadh is somewhat younger than the national average - 20-29-year-olds make up around 34% of the working-age population in the city, which suggests that the over-sample is relatively small. The over-representation of younger individuals is likely due to the survey being conducted online.

The respondents are overwhelmingly Saudi nationals – 94 percent. This represents a significant over-representation of the Saudi population. According to data from the Royal Commission for Riyadh City, Saudi's make up approximately two-thirds (66.5%) of the city's population. Of the non-Saudis the only significant group (13 people) were Yemenis.

Respondents tended to have above-average income (Figure 9.3), reflecting the difficulty in reaching lower-income households - 37% of respondents had a monthly income in excess of 15,000 SR (4,000 USD), with a further 21% having a monthly income over 10,000 SR (2,666 USD). This compares to the average monthly income in Riyadh of 7,833 SR. Around 19% of respondents earned less than 3,000 SR per month, this group was largely composed of students (55%), unemployed workers (18%), and homemakers (17%), and this does not necessarily reflect household income.

The over-representation of high-income individuals can be explained in part by both the high proportion of male respondents and the under-representation of non-Saudis. The average monthly income of Saudis is around 11,250 SR, compared to just 3,500 for non-Saudis. This also suggests that the non-Saudis who completed the survey are unrepresentative of the broader non-Saudi population, given the distribution of their incomes.

Around 70% of respondents were either employed in the public or private sector or self-employed businesspeople (Figure 9.4). The largest group were public sector employees, who made up 38% of respondents. Of the 30% who were not employed – half (14%) were students, with the remainder split between unemployed (4%), retired (5%), and homemakers (6%).

Just over 40% of respondents employ a full-time driver (Figure 9.5). This is broadly in line with the national average. In 2016/17, the latest period for which data is available, approximately half of households employed a private driver according to the General Authority for Statistics (GaStat), although this is likely to have fallen in recent years due to the increased use of ride-hailing apps such as Uber and Careem (a number of respondents mentioned this) and the expansion of female driving.

Over 30% of households have more than seven members, including the respondent (Figure 9.6). The median household has five members - this compares to the national average of 5.6. Around 7% of respondents live alone.

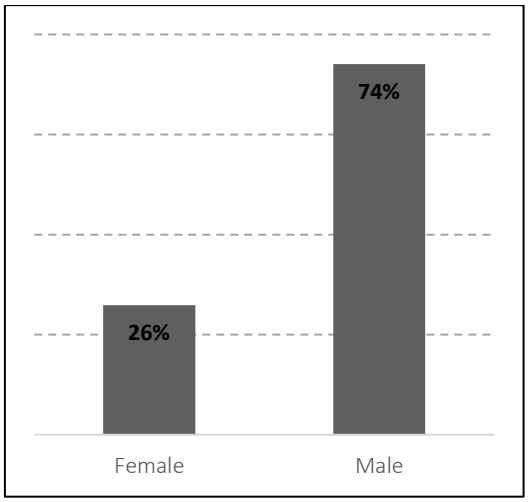


Figure 9.1 Gender

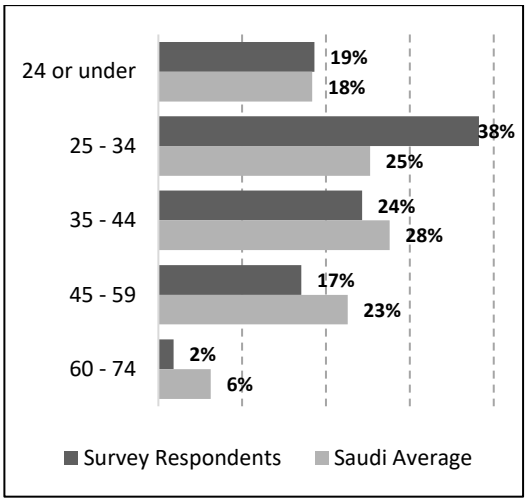


Figure 9.2 Age

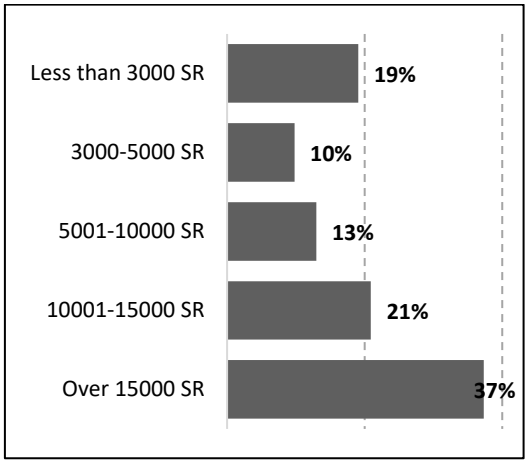


Figure 9.3 Monthly Income

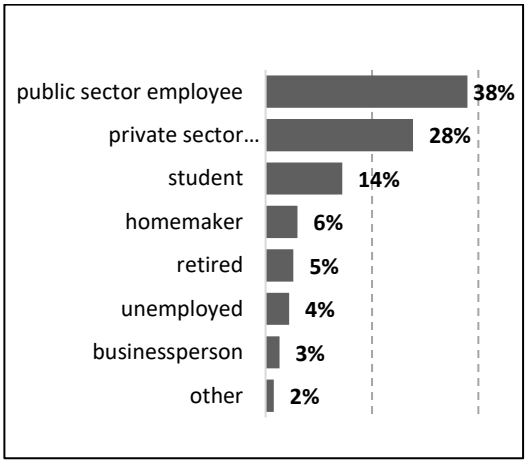


Figure 9.4 Employment Status

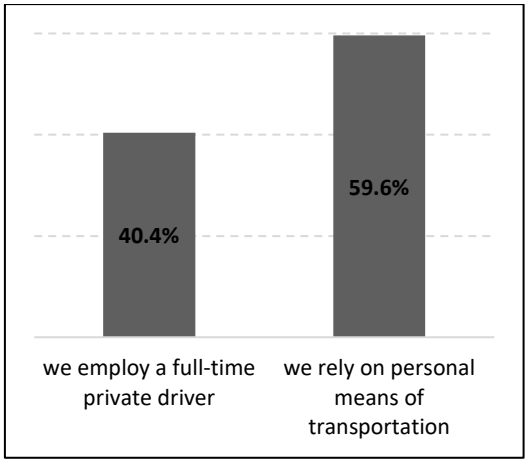


Figure 9.5 Employ a private driver

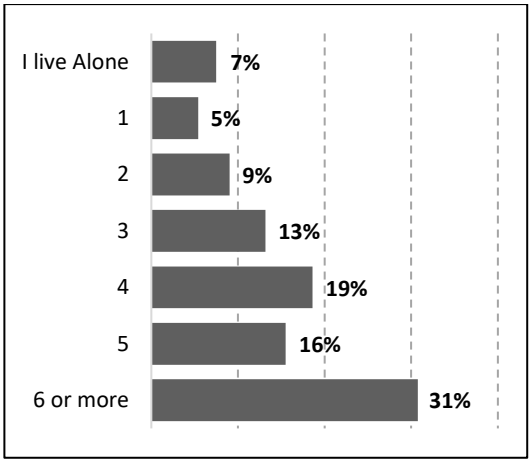


Figure 9.6 Household Size

9.3.2 Geographic distribution of survey respondents

Figure 9.7 shows the distribution of survey respondents based on their place of residence, this is compared to the actual population distribution of Riyadh by neighbourhood based on data from the Royal Commission for Riyadh City (Figure 9.8). Figure 9.7 shows higher numbers of responses in western neighbourhoods, mirroring the larger populations in those areas. However, it appears that eastern and southern neighbourhoods are under-represented. A number of central neighbourhoods lack any respondents; however, these generally have low populations. The city's northwest region appears to be somewhat over-represented, this likely due to the skew towards higher-income households.

Figure 9.9 shows the distribution of respondents by monthly income along with the average income by neighbourhood. Due to the small number of responses in each area, it is difficult to discern clear patterns; however, it does appear to broadly, if loosely, correspond to the average neighbourhood income shown in the blue-coloured heatmap. Respondents earning over 15,000 SR per month are concentrated in the north of the city, reflecting the actual distribution of high-income households in the city. There also appears to be a concentration of middle-income respondents in the western suburbs.

One way of understanding the city's structure is by looking at the geographic distribution of neighbourhoods by use. The survey asked respondents to specify the neighbourhood in which the household resides and the neighbourhood(s) in which household members work or study. This allows neighbourhoods to be classified into either work/study neighbourhoods or residential neighbourhoods.

Figure 9.10 shows the respondents' places of work/study alongside a chart showing the number of businesses per 1,000 head of population. The charts suggest that the south of the city is somewhat under-represented as a place of work amongst survey respondents. Figure 9.11 provides a side-by-side comparison of the respondents' neighbuorhoods and where they work/study. This shows that residential neighbourhoods tend to be on the periphery of the city, whereas work/study neighbourhoods tend to be closer to the centre. That said, there is considerable overlap between residential and work/study neighbourhoods, meaning that a clear distinction is between the two is not possible. The remainder of the analysis uses the proxy measure of businesses per 1,000 residents to determine if a neighbourhood’s primary function is residential or commercial.

Part of the reason for the lack of differentiation between residential and commercial neighbourhoods is that many residents live relatively close to their place of employment or study. The daily commute of each household member was calculated using the Open Route Service, an open-source route-finding tool, and Q-GIS. Assuming the route is traveled by car, the median commuting distance for household members is 14.6 km. The estimated median duration is 14 minutes and 40 seconds, although this does not consider traffic and congestion. The average distance for heads of households is essentially the same as for other household members, with a median journey distance of 15.3 km and an average commute time of 15 minutes. The distribution of commuting times and distances are shown in figures 9.12 and 9.13, respectively. The modal commuting distance was less than 4.5 km, accounting 17% of household members, 30% of household members had a commuting time of fewer than 10 minutes whilst 7.5% live and work in the same neighbourhood (excl. homemakers and the unemployed).

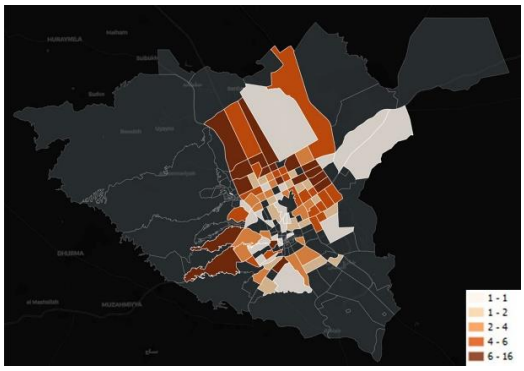


Figure 9.7 Geographic distribution of survey respondent's residences

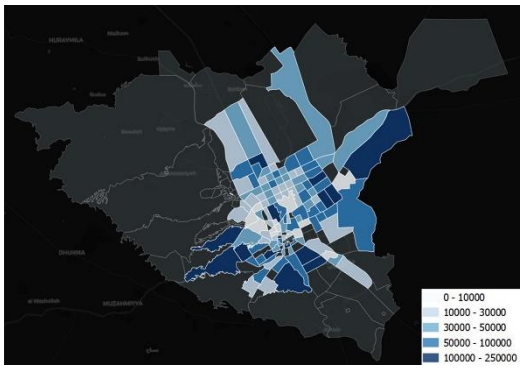
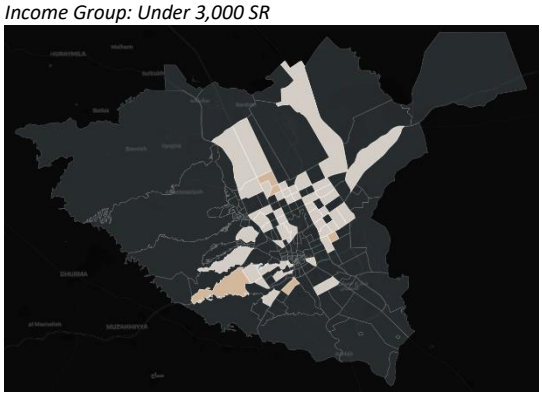
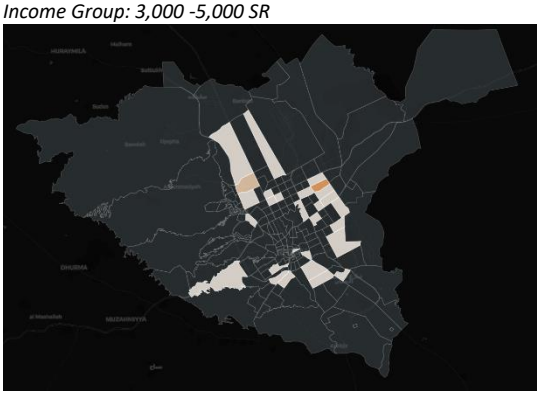


Figure 9.8 Population distribution of Riyadh

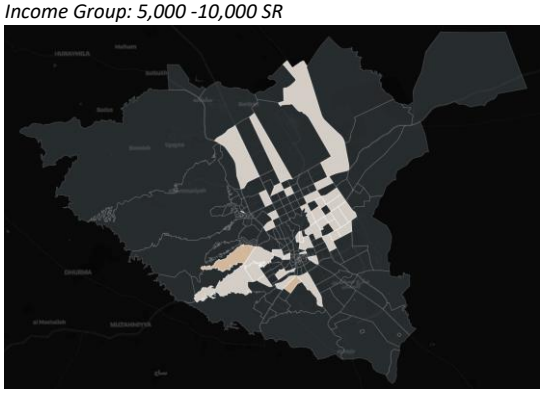
Income Group: Under 3,000 SR



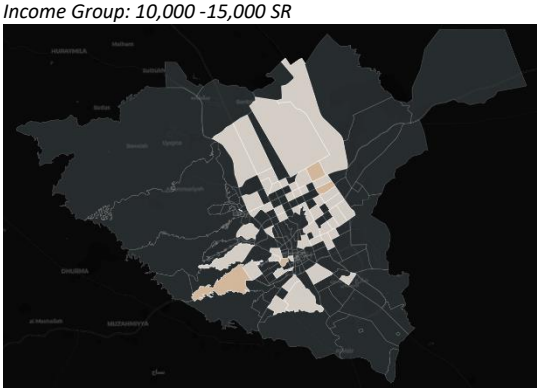
Income Group: 3,000 -5,000 SR



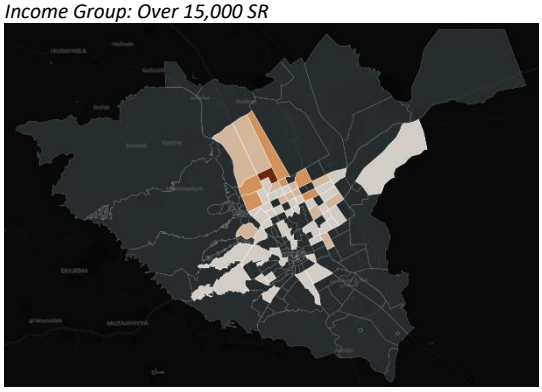
Income Group: 5,000 -10,000 SR



Income Group: 10,000 -15,000 SR



Income Group: Over 15,000 SR



Average income by neighbourhood

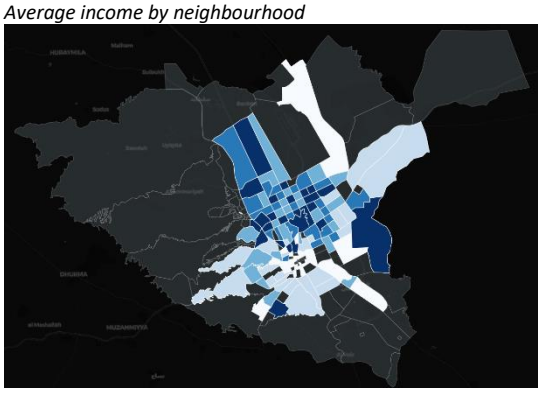
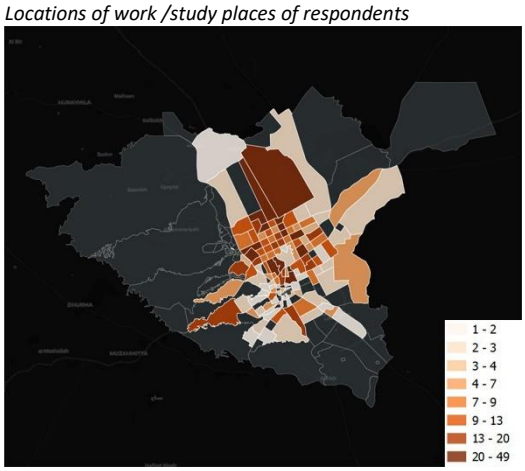


Figure 9.9 Geographic distribution of survey respondents by monthly income

Locations of work /study places of respondents



Businesses per thousand population

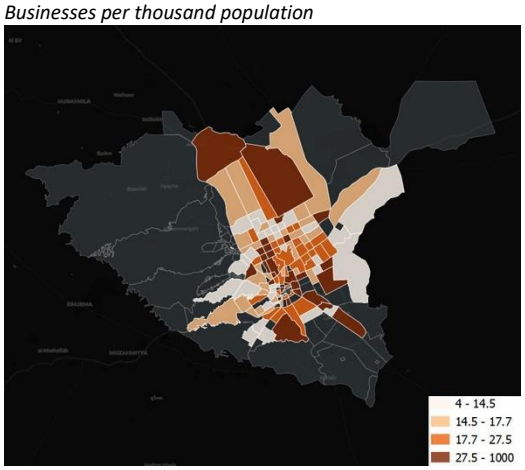
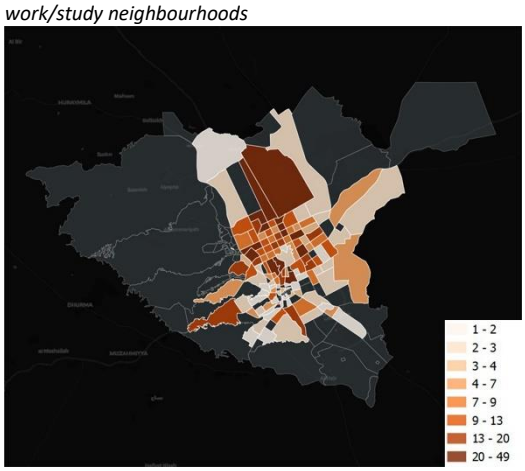


Figure 9.10 Geographic distribution of work neighbourhoods

work/study neighbourhoods



Residential neighbourhoods

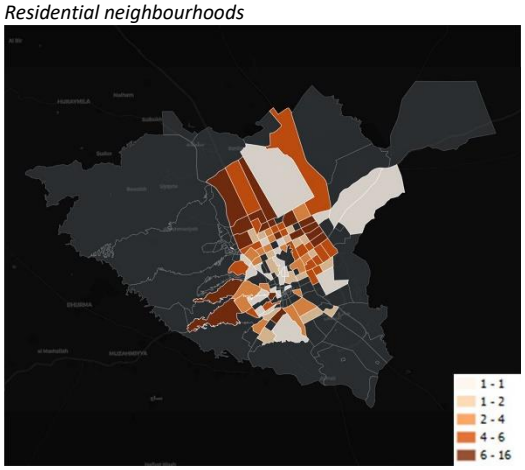


Figure 9.11 Geographic distribution of work/study & residential neighbourhoods

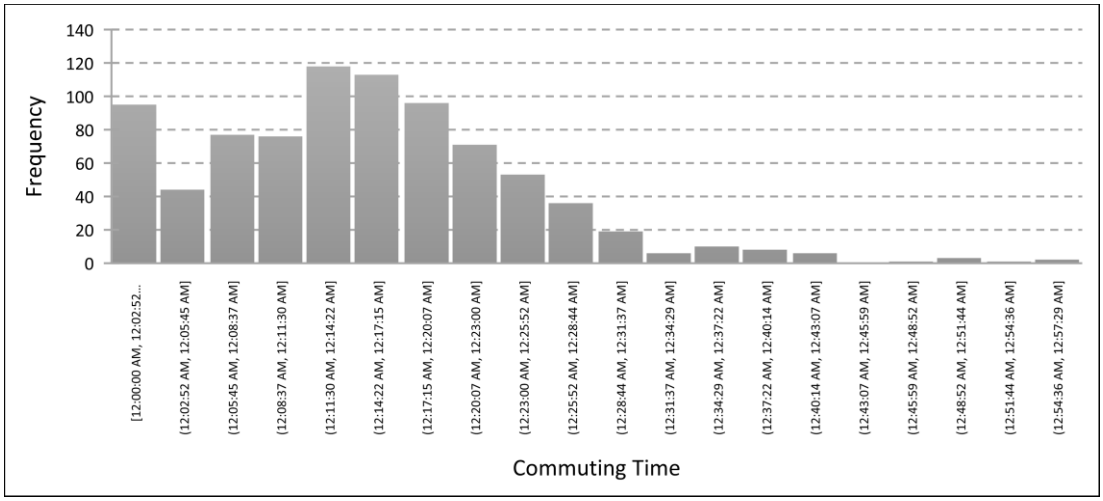


Figure 9.12 Distribution of daily commuting times

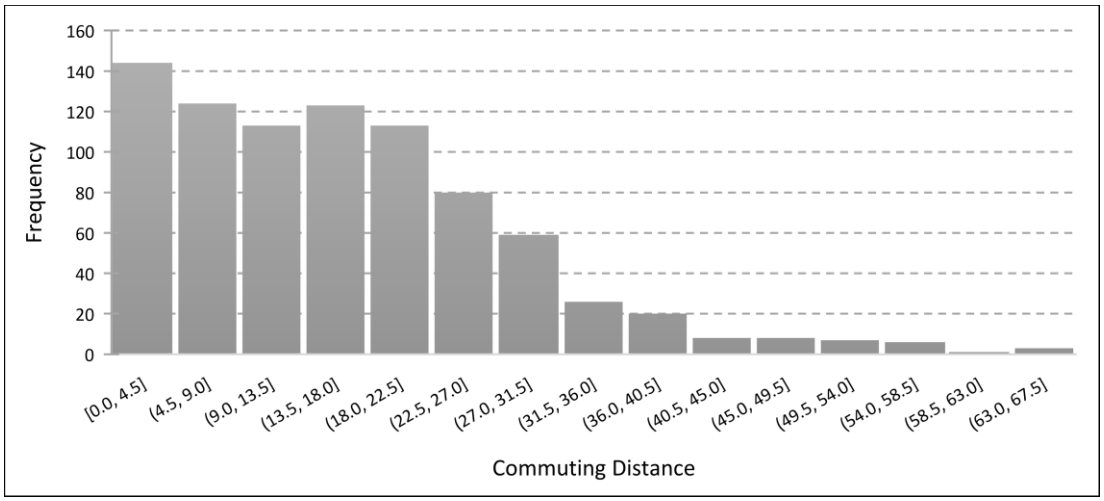


Figure 9.13 Distribution of daily commuting distances

9.4 Residential History and Preferences

This section examines the types of accommodation that respondents currently and have previously lived in, their reasons for choosing certain neighbourhoods and types of accommodation, their awareness of the built environment, and their future residential preferences.

9.4.1 Accommodation Choices and Occupancy Types

Respondents' previous residences are evenly split (Figure 9.14) between villas (45%) and apartments (49%); this includes households that occupy a floor of a villa or a duplex. A minority (5%) lived in a property that was part of a larger development or compound/gated community. The median respondent lived at their prior residence for more than five years (63% of all respondents). In contrast, only 16% lived in their previous residence for less than two years. Given the survey respondents' relatively young age profile, this suggests that mobility or switching between residences is relatively low.

A majority of respondents (60%) currently live in villas while 39% live in apartments, 1% of respondents live in other options such as traditional houses (Figure 9.15). Over half (56%) of respondents have lived in their current residence for five years or more. A quarter (24%) have lived in their current residence for two years or less (Figure 9.17).

The most common form of occupancy amongst the survey respondents is owner-occupancy making up 52% of respondents (Figure 9.18); this is broadly in line with the national average of 49.9 percent. Forty-one% of survey respondents live in rented accommodation, slightly above the national average of 38%. Around 4% of respondents live in employer-provided

housing. The form of occupancy varies considerably between the different accommodation types – 78% of those living in a villa are owner-occupiers. In contrast, 82% of apartment dwellers rent their accommodation.

As expected, monthly income plays a role in determining the type of accommodation people choose to live in. Among the survey respondents, those under 25 are the most likely group to live in a villa (69%). As discussed earlier, the reason for higher rates of villa dwelling amongst low-income respondents is because these individuals generally live with other family members. Three-quarters of those in the lowest income bracket who lived in a villa were aged under 25. A similar pattern (57%) applies to those earning 3000-5000 SR per month. Figure 9.19 shows the choice of accommodation split by monthly income, excluding those under 25. Villa dwelling increases with income, those earning over 15,000 SR per month are the most likely to live in a villa (62%), reflecting the societal preference for villas discussed below.

The number of non-Saudi nationals who completed the survey is too small and unrepresentative of the non-Saudi population to draw meaningful conclusions as only 16 of 387 respondents were non-Saudi. However, when looking at the available sample, they appear to be significantly more likely to live in apartments (78%) than Saudis (36%) (figure 9.20).

Only about 10% of respondents stated that their current residence was worse than their previous residence (Figure 9.21). These tend to be in lower-income areas - 23% of people currently living in low-income neighbourhoods deemed their current property to be worse than their previous residence. Only 5% of those living in high-income neighbourhoods made the same judgement. In contrast - those that saw their current property as better than the last were more likely to live in high-income neighbourhoods. They were also more likely to live in neighbourhoods that are primarily residential as measured by the number of businesses per capita. The level of urban fragmentation had no clear impact on how likely a respondent was to rate their current residence as better or worse than the one they lived in previously. The largest differences were based on the accommodation types that people moved from and to – 84% of people who moved from an apartment to a villa rated their current accommodation as better. In contrast, 48% of those moving from a villa to an apartment rated their current residence as worse than the one they moved from, and only 20% viewed it as a positive move.

Just over two-thirds (69%) of people want to move from their current residence (Figure 9.22) - of those, 89% (61% of all respondents) want to move to a villa compared to just 9% who want to move to an apartment. There is also a significant minority that prefers properties that are part of larger developments - 24% of those who expressed a desire to move to a villa that is part of a compound/gated community. Higher-income individuals (more than 15,000 SR per month) are much less likely to want to move than other income groups. These forms of development (see Expert's survey) are generally considered to contribute to urban fragmentation. However, the expressed preference of residents suggests that in the context of Riyadh, they provide residents with access to the services and facilities they desire.

This preference can be seen when looking at the satisfaction levels of those respondents who have lived in or currently live in gated communities (see Table 9.3). Around 14% have lived in development of this type, rising to a fifth of high-income earners; these residents overwhelmingly (85%) rated it as a positive experience.

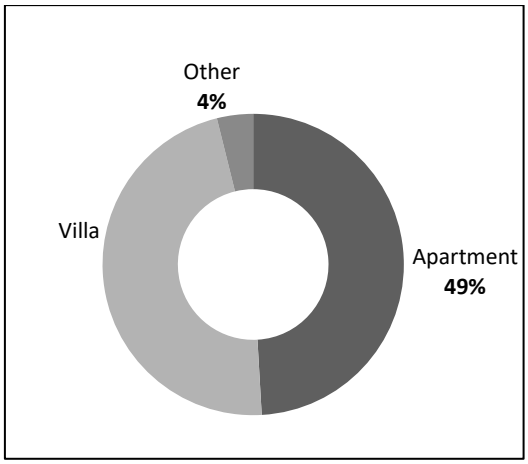


Figure 9.14 Previous Accommodation Type

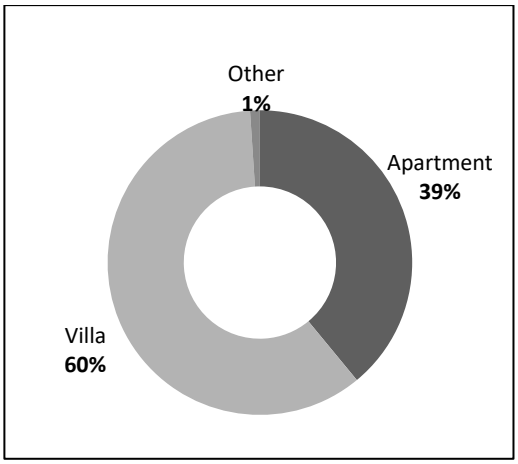


Figure 9.15 Current Residence

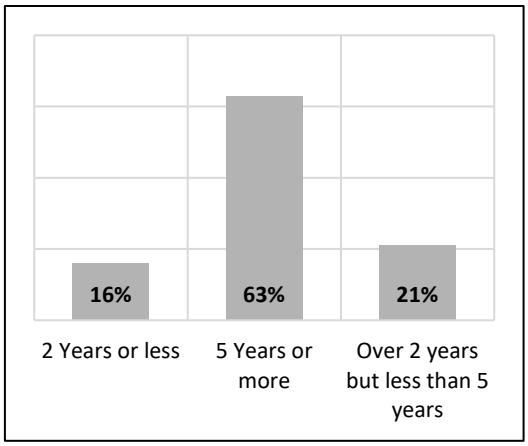


Figure 9.16 Time spent at previous residence

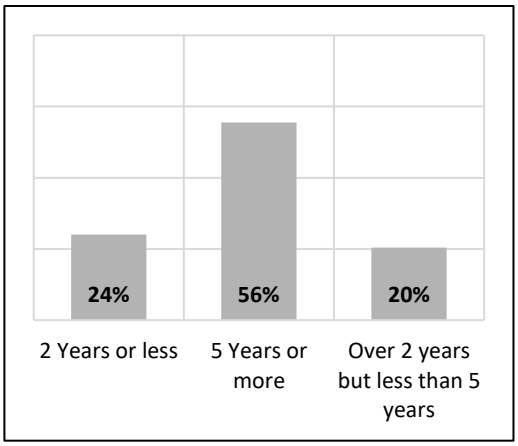


Figure 9.17 Time spent at current residence

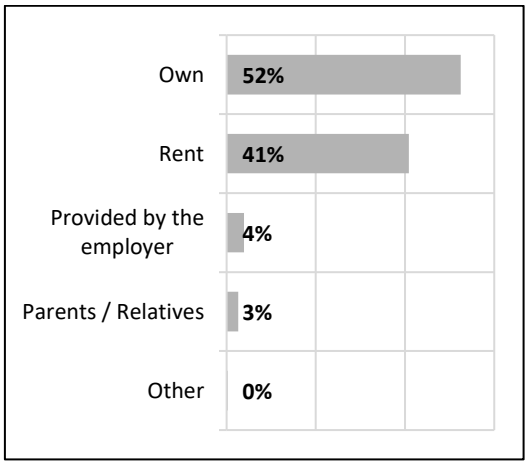


Figure 9.18 Occupancy Type

Figure 9.19 Accommodation choice by monthly income

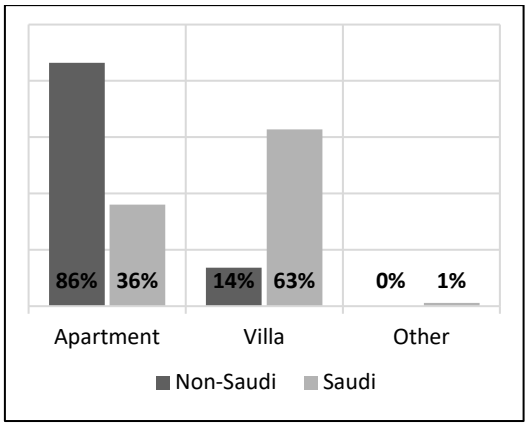


Figure 9.20 Impact of nationality on accommodation type

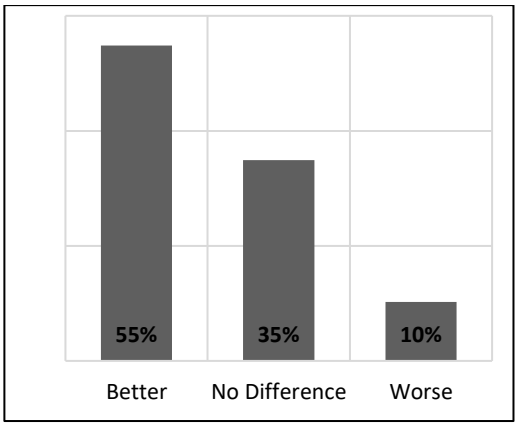


Figure 9.21 How does your current residence compare to your previous residence?

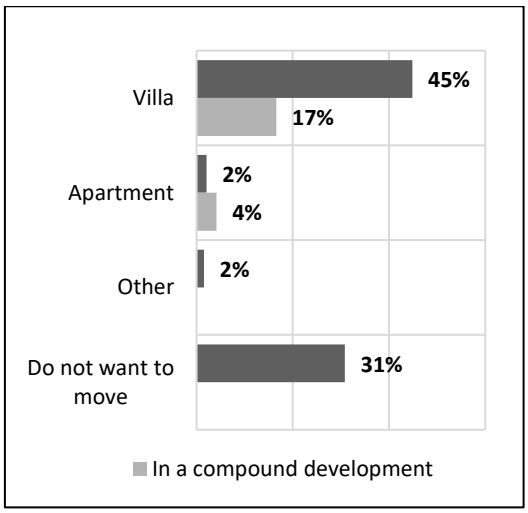


Figure 9.22 Where do people want to move?

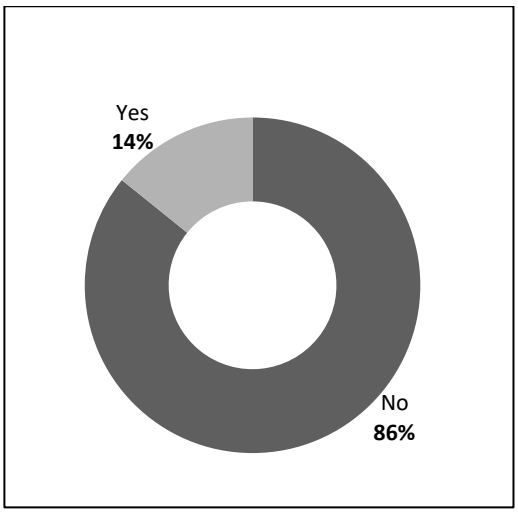


Figure 9.23 Proportion of resident that currently or have previously lived in a gated community

9.4.2 Neighbourhood Features

The survey asked respondents to select the neighbourhood features that were important factors in deciding where to live - Figure 9.24 shows the percentage of respondents who selected each neighbourhood feature. Proximity to friends and family was the most frequently cited reason for choosing a place of residence, with 39% of respondents selecting it as an important factor. This was followed by property value/rental price (34%) and proximity to a workplace or university (33%). A fifth of respondents (21%) selected neighbourhood design as an import factor.

The income of survey respondents determines the important factors in choosing a place of residence (see Table 9.1). Proximity to friends and relatives was significantly more important for those individuals earning less than 3,000 SR, with 44.5% citing it as a factor in choosing

their residence. This group is made up of students, homemakers, or unemployed who are likely to be more dependent on family members and social circles. Those employed on low incomes (3,000-5,000 SR) were the least likely to factor family and friends into their decision-making process; 21.6% selected it as a factor. Perhaps unsurprisingly, they were also the least likely to consider interior design when making a decision - just 2.7% selected it as a relevant factor.

Price/value for money was one of the most important factors for those earning less than 10,000 SR - it was an important factor for between 40 and 50% of those surveyed. In contrast, it was a much less significant factor for those earning between 10,000-15,000 SR (22.8%) and over 15,000 SR (29.1%). Those earning more than 15,000 SR tend to be more selective when choosing where to live - they were twice as likely to consider the quality of schools and the aesthetics and design of the apartment and neighbourhood than other income groups. They were also significantly more concerned by crime than lower income groups.

Approximately 14% of survey respondents either currently or have previously lived in a gated community; their preferences differ markedly from those that have not. They place greater value on safety (38% vs. 24%), interior design (42% vs. 14%), access to public services (35.5% vs. 17%), and proximity to a workplace of university (45.5% vs. 31%). This is unsurprising given the correlation between living in a gated community and income, but it underscores the difference in preferences across income groups.

The neighbourhood features that respondents, who are looking to move, value differ somewhat from those that were important in choosing their current residence (Figure 9.25). Neighbourhood design was the most common factor (41%), closely followed by “close to my workplace or university” (40%) and “safety from property crimes” (39%). This is in line with the overwhelming desire to move to villas and the sizeable minority who explicitly wish to move to a villa in a gated development or compound. Proximity to friends and relatives was a much less important factor, chosen by just 16% of respondents, compared to 39% who stated that it was an important factor in choosing their current residence.

Income affects future residential preferences in the same way it affects current choices – proximity to workplaces is a more important factor for middle and upper-middle-income households (5000 – 15000 SR), with just under half selecting it as an important factor. It is

less important for high-income households who were able to prioritize this factor in choosing their current residence. Lower-income households prioritize value for money.

Table 9.2 shows that there is no conclusive relationship between the degree of urban fragmentation at a neighbourhood level and the preferences of residents. Regression between the percentage of a neighbourhood's land area covered by fragmented urban developments and the desired neighbourhood features shows no statistically significant relationships.

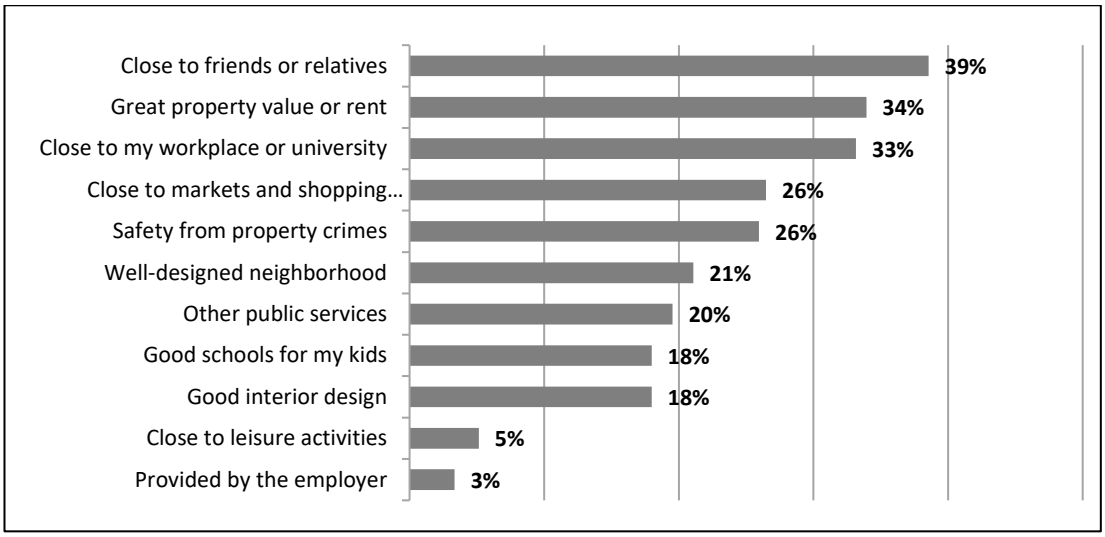


Figure 9.24 Neighbourhood features important when choosing a place of residence

Table 9.1 Neighbourhood features important when choosing a place of residence split by income bracket

Reason for choosing residence	Income Bracket				
	0 - 2999	3000 - 5000	5001 - 10000	10001 - 15000	15000+
Close to friends or relatives	44.4%	21.6%	36.7%	39.2%	39.0%
Close to markets and shopping destinations	26.4%	16.2%	26.5%	25.3%	31.2%
Close to my workplace or university	29.2%	32.4%	24.5%	39.2%	36.9%
Good interior design	15.3%	2.7%	10.2%	15.2%	29.1%
Good schools for my kids	18.1%	16.2%	14.3%	11.4%	24.1%
Great property value or rent	41.7%	45.9%	51.0%	22.8%	29.1%
Other public services	22.2%	16.2%	24.5%	15.2%	21.3%
Safety from property crimes	25.0%	16.2%	18.4%	27.8%	30.5%
Well-designed neighbourhood	**19**.4%	10.8%	22.4%	**19**.0%	26.2%

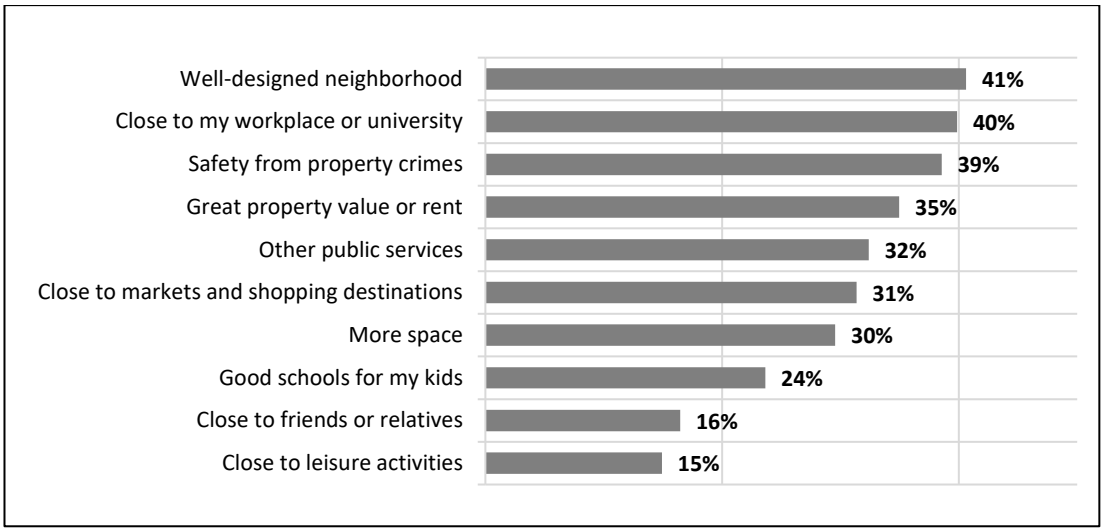


Figure 9.25 Neighbourhood features important when choosing a place of residence for those that want to move

Table 9.2 Impact of urban fragmentation on demand for neighbourhood features

Neighbourhood Features	Level of Urban Fragmentation			
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Well-designed neighbourhood	48%	36%	38%	42%
Close to my workplace or university	38%	42%	38%	44%
Safety from property crimes	40%	38%	37%	40%
Great property value or rent	38%	36%	28%	44%
Other public services	35%	33%	27%	36%
Close to markets and shopping destinations	36%	27%	30%	36%
More space	31%	27%	29%	33%
Good schools for my kids	26%	25%	20%	24%
Close to friends or relatives	16%	17%	17%	13%

9.4.3 Awareness of the Built Environment

Table 9.3 shows the proportion of residents positively identifying features and services in the built environment relative to the actual incidence of those features and services. Proxy measures are used to construct the chart using data from the Royal Commission for Riyadh City on the number of businesses in specific sectors for each neighbourhood. This is not a perfect measure as the sectoral definitions are not necessarily fully aligned to people's understanding of the question in the survey, for example, a neighbourhood could have a number of businesses providing ancillary health services but lack a hospital (see figure for list of sectors used for comparison). However, it does provide an indication of residents' awareness, or lack thereof, of the built environment. Using this measure, it appears that awareness of the built environment is relatively low – there are no clear relationships between the number of businesses in a sector and people's awareness. The only exception

to this is awareness of gated developments relative to the degree of urban fragmentation, which shows a clear positive relationship. Only 14% of residents of low fragmentation neighbourhoods positively identified gated developments in their neighbourhoods compared to 35.6% of residents of high fragmentation areas.

Awareness of the built environment is highly correlated to the average monthly income in a neighbourhood (see Table 9.4). This is likely due to the increased provision of services in high-income neighbourhoods. The most pronounced difference is in awareness of 'gated developments', which are much more prevalent in high-income neighbourhoods (38% identify them) compared with only 6% in low-income neighbourhoods. This reflects reality – fragmentary typologies are much more common in high-income neighbourhoods - 20% of high-income neighbourhoods (upper quartile) are also in the upper quartile of urban fragmentation, this compares to just 6% of low and lower-middle-income areas.

This pattern can be seen in the geographic distribution of residents positively identifying different aspects of the built environment (Figure 9.26) - note that caution should be used when interpreting the results due to the small sample size in many neighbourhoods. Higher-income neighbourhoods in the centre and north of the city tend to have greater numbers of observations. The neighbourhoods in the south and west seem to be relatively under-served and/or have residents that are less aware of the built environment.

Table 9.3 Awareness of the built environment relative to the actual incidence of relevant businesses

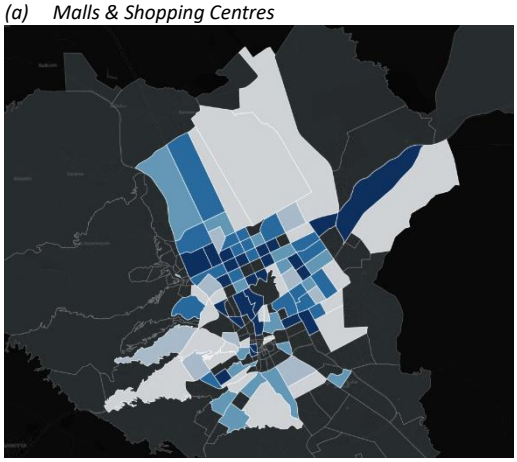
Built Environment	Business per neighbourhood by sector			
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Office Buildings (ministries and government departments)	20.7%	20.6%	20.0%	35.7%
Office Buildings (companies, office parks)	33.3%	25.0%	24.1%	16.7%
Malls / Shopping Centres	44.2%	61.3%	59.8%	46.6%
Hospitals or Medical Cities	29.0%	44.0%	35.7%	40.0%
Gated Communities (residential compound)	14.4%	26.4%	28.6%	35.6%
Educational Campuses (universities, institutes, schools)	43.8%	53.7%	49.5%	38.7%

Note: The proxy measures used are (Office Buildings (ministries and government departments) - Government Sector), (Office Buildings (companies, office parks) - Services & Business Sector), (Malls / Shopping Centres - Commercial Sector), (Hospitals or Medical Cities - Health Sector), (Educational Campuses (universities, institutes, schools) - Education Sector), (Gated Communities (residential compound) - Fragmentation Classification (** alternative measure)

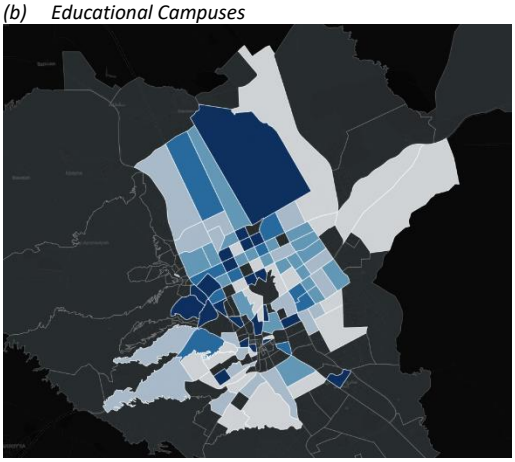
Table 9.4 Awareness of the built environment by average neighbourhood income

Built Environment	Business per neighbourhood by sector			
	1st Quartile	2nd Quartile	3rd Quartile	4th Quartile
Office Buildings (companies, office parks)	21%	16%	22%	36%
Malls / Shopping Centres	39%	42%	65%	62%
Hospitals or Medical Cities	30%	30%	37%	50%
Gated Communities (residential compound)	6%	16%	26%	38%
Educational Campuses (universities, institutes, schools)	32%	32%	51%	59%

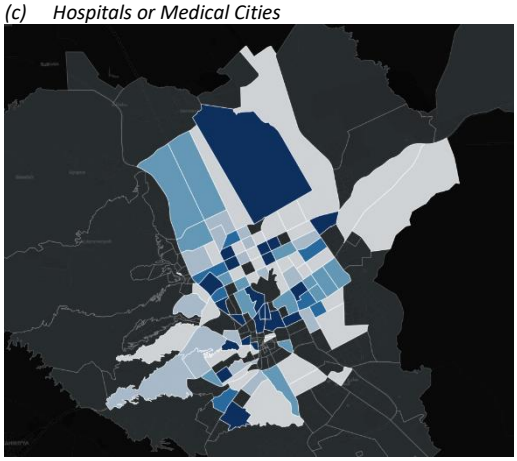
(a) Malls & Shopping Centres



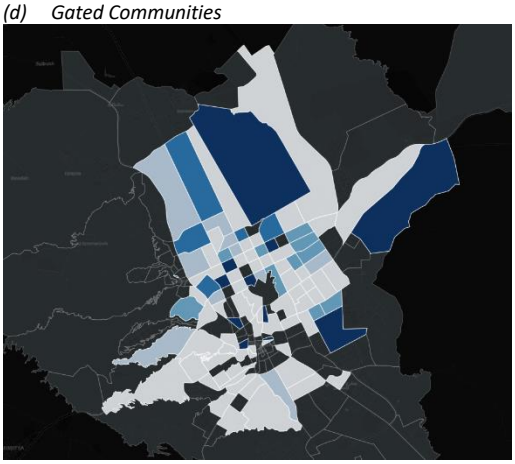
(b) Educational Campuses



(c) Hospitals or Medical Cities



(d) Gated Communities



(e) Office Buildings

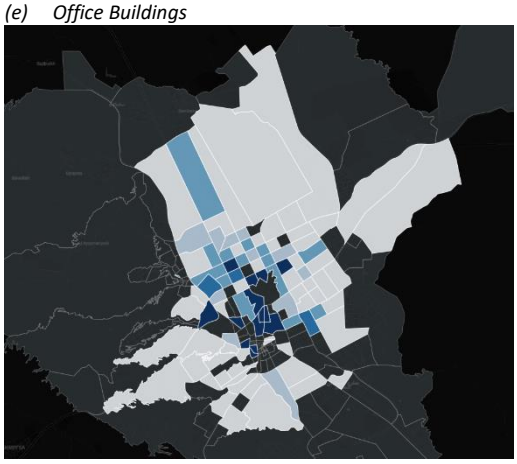


Figure 9.26 Percentage of residents identifying aspects of the built environment (a) (b) (c) (d) (e)

9.4.4 Residence Location

Connectivity can be thought of as capturing the extent to which a neighbourhood enables its residents to access employment, social networks (family and other personal obligations), and services. The survey asked respondents to evaluate the effect the location of their residence has on these three factors (Figure 9.27). The results are fairly evenly split between positive, negative, and no effect. Daily commuting to work is the category with the lowest levels of satisfaction, with 38% stating that the location of their residence negatively impacts their commute, but this compares to 35% who find a positive impact.

However, there are significant differences when cross-tabulating with a neighbourhood's average monthly income (see Table 9.5). Residents of high-income neighbourhoods are more than twice as likely to state that the location of their residence has a positive impact on the ability of services to reach them (58%) compared to just 26% of low-income households. A similar pattern is seen when looking at daily commutes (48% vs. 29%) and travelling to family and other personal obligations (46% vs. 27%).

One might hypothesise that residents that employ a private driver would have a more positive view of the impact the location of their residence has on their daily commute. This appears to be weakly true at lower monthly income levels, but the relationship is less strong as monthly income increases.

Figure 9.28 shows the geographic distribution of positive and negative responses to the question "does the location of your residence location affect the quality of your daily commute". Neighbourhoods in the south and south-west tend to have a greater number of negative

responses. This loosely correlates with the percentage of neighbourhood residents who express a desire to move (Figure 9.29).

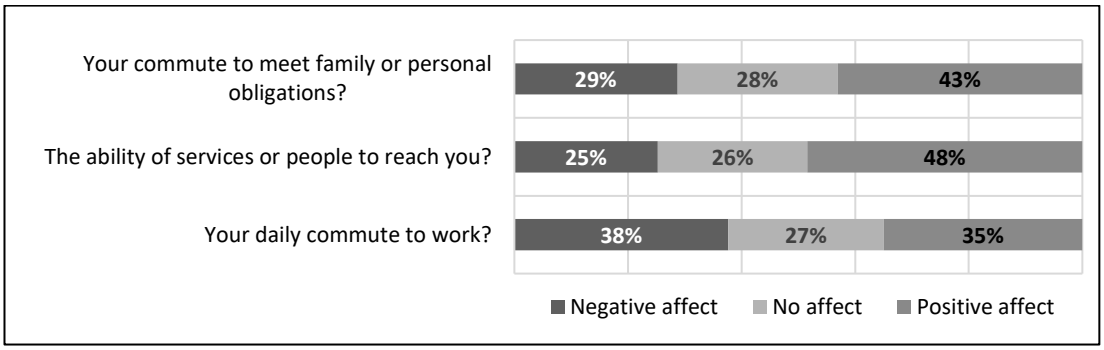
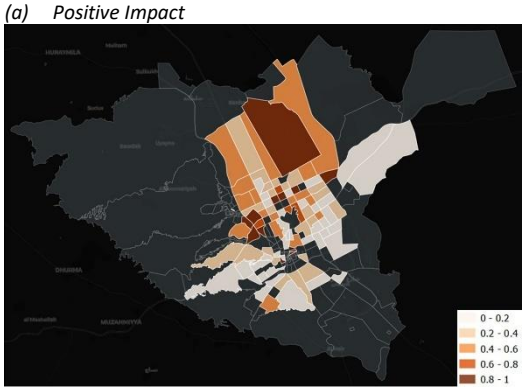


Figure 9.27 Does the location of your residence impact...

Table 9.5 Positive impact of residence location by income and employment of a driver

Monthly Income	Employ a full-time private driver	Rely on other forms of transport
0 – 2999	31%	28%
3000 – 5000	33%	17%
5001 – 10000	27%	21%
10001 – 15000	38%	36%
15000 +	46%	47%

(a) Positive Impact



(b) Negative Impact

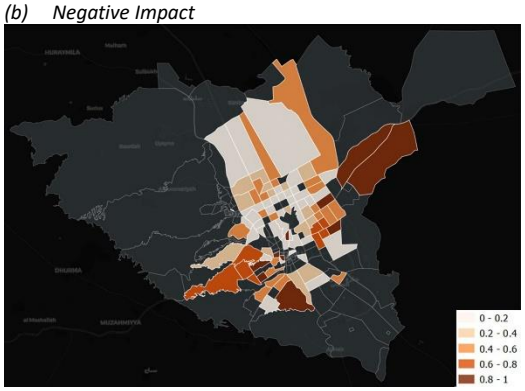


Figure 9.28 Impact of residence location on daily commute (a) (b)

Figure 9.29 Percentage of residents who wish to move

9.5 Place Standard and Quality of Life

The survey asked participants to rate their level of satisfaction across eight quality of life indicators on a 5-point Likert scale (1 = disagree, 2 – somewhat disagree, 3 – neutral, 4 – somewhat agree, 5 – agree). Figure 9.28 summarizes the results; ratings of 1 or 2 are aggregated and taken to indicate a negative response, 3 represent a neutral perspective, and 4 and 5 are taken to indicate a positive response. The average rate rating is also shown. The questions cover the attractiveness and design of the built environment, traffic and transport, play and recreation spaces, facilities and amenities, the local economy and employment, sense of place identity and belonging, crime and safety, and maintenance of buildings and public space.

As shown in Figure 9.28, respondents tend to have a somewhat more negative view of the quality of life in the city – this is particularly true in relation to indicators relating to the built environment and public space – 61% had a negative perception of the access to play and recreation spaces, 50% had a negative view of how buildings and public space are cared for and 43% disagreed that buildings, streets and public spaces are attractive and easy to navigate. The only area in which a majority (67%) held a positive view was in relation to safety and crime. Forty-five% agreed that there is an active local economy and access to quality work.

9.5.1 Issues relating to urban services, place, and the built environment that influence quality of life evaluations

Respondents were asked to indicate whether they were 'satisfied' or 'dissatisfied' with a range of specific issues related to each quality of life theme. The breakdown of the results is provided in Appendix D.

Do buildings, streets and public spaces create an attractive place that is easy to get around?

The average quality of life evaluation was 2.6 out of 5; 43% of respondents gave a negative rating compared to just 22% rating the attractiveness and ease of movement positively. The responses suggest that many neighbourhoods are designed around automobiles rather than pedestrians. Respondents have an overall positive view of neighbourhood access (72% satisfied) and that streets are well paved (55%). However, three-quarters are dissatisfied with the availability of continuous sidewalks for walking, and 83% are dissatisfied with the design and availability of open spaces and seating areas.

Do the neighbourhood traffic and parking arrangements allow people to move around safely and meet the community's needs and the utilisation of delivery and ride-hailing services (taxis, Uber, Careem)?

The average quality of life evaluation was 2.9 out of 5; ratings were reasonably evenly distributed across negative (36%), neutral (31%), and positive ratings (33%). Respondents are broadly satisfied with access and roads in their neighbourhoods (62-73% satisfied), although a majority are unsatisfied (61%) with traffic signage.

Can you access a range of spaces with opportunities for play and recreation?

The average quality of life evaluation was 2.3 out of 5, the indicator which performed the most poorly - 61% of respondents had a negative view on the provision of play and recreation spaces, only 16% provided a positive rating. Respondents are broadly unsatisfied with the range and quality of spaces for play and recreation. This includes the number (83% unsatisfied) and size of parks (60% unsatisfied), the provision of children's playgrounds (62% unsatisfied), and the availability of sports facilities (74% unsatisfied). Furthermore, 57% are unsatisfied with the number and quality of areas suitable for Eid prayers and other social gatherings. Only 13% are satisfied with the number and quality of open spaces and seating areas between buildings.

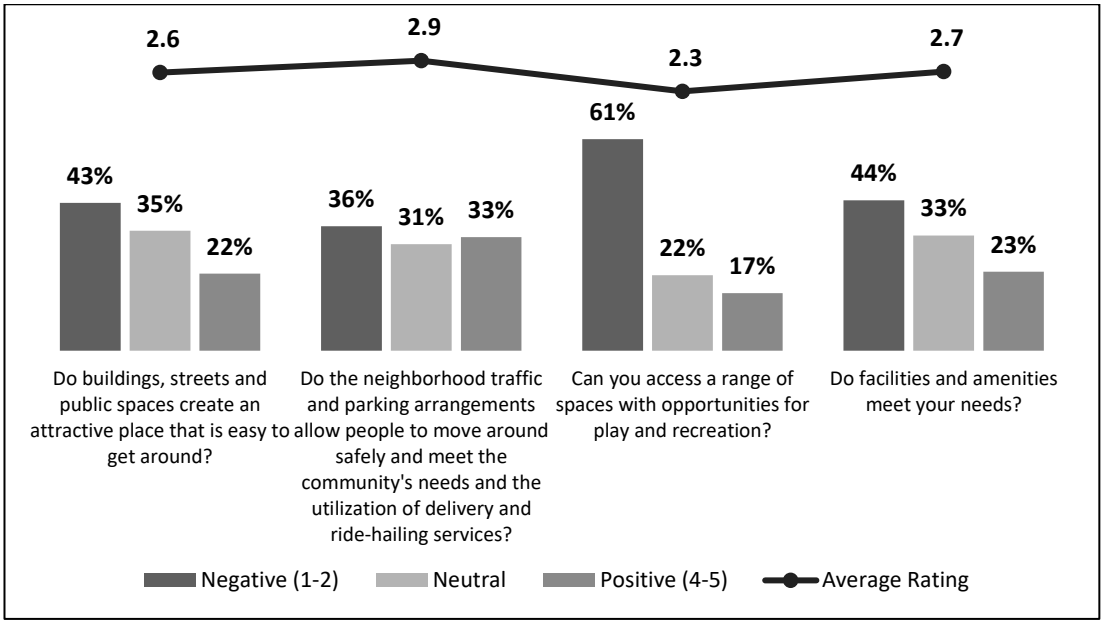


Figure 9.30 How does this city overall perform across a variety of quality of life indicators (a)

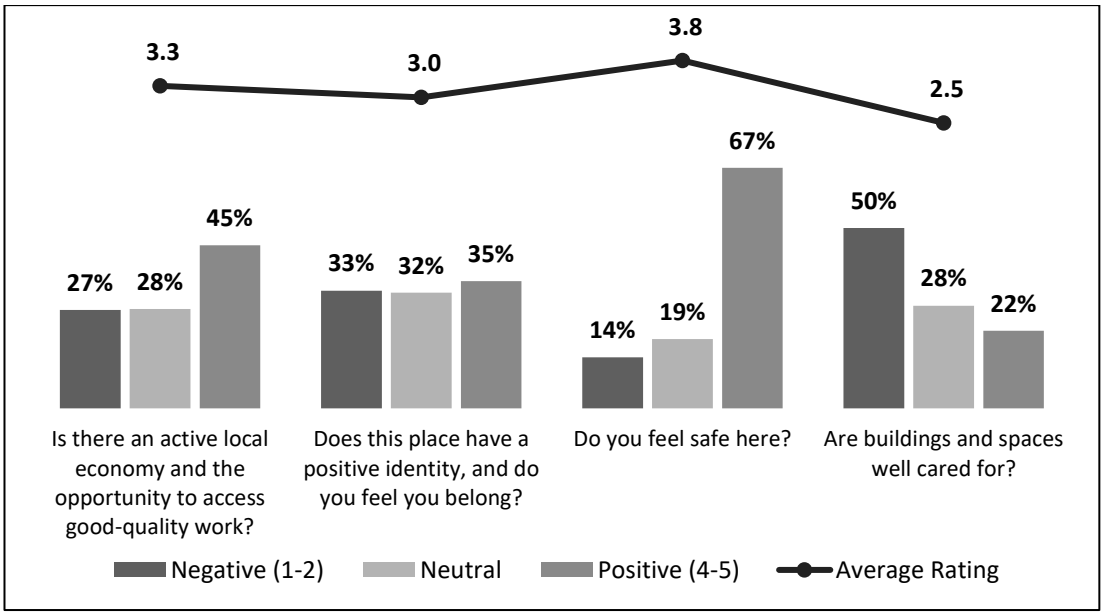


Figure 9.31 How does this city overall perform across a variety of quality of life indicators (b)

Do facilities and amenities meet your needs?

The average quality of life evaluation was 2.3 out of 5 with 44% rating their neighbourhood provision negatively (1 or 2 out of 5), compared to 23% providing a positive rating. A roughly equal number (48% satisfied, 52% unsatisfied) of respondents deemed the distribution of facilities and services to be proportionate to the neighbourhood's population. Respondents were broadly satisfied with the access to utilities such as waste bins (67%), internet (73%), sewage (83%), water supply (89%), and electricity (97%). Roughly half (56%) were satisfied with the provision of public schools in their neighbourhood.

Is there an active local economy and the opportunity to access good-quality work?

The city performed somewhat better in relation to the economy. The average rating was 3.3 out of 5; 45% rated the local economy and employment options positively, compared to 27% who rated it negatively. In the breakdown - 69% are satisfied that the number and diversity of businesses in the neighbourhood meet the needs of residents, with 77% agreeing that the neighbourhood has a great commercial street or area.

Does this place have a positive identity, and do you feel you belong?

The results suggest a level of ambivalence; the average rating was 3.0, the results were pretty evenly split between positive (33%), neutral (32%), and negative (35%). However, the breakdown of their views on specific issues suggests a somewhat higher level of dissatisfaction.

The mosque plays the most positive aspect of community and identity; however, only 49% agree that the neighbourhood mosque plays a big role in improving community ties and creating a sense of belonging. Forty-two% of respondents believe that residents are in harmony and that there are mechanisms to resolve disputes and disagreements. However, a clear majority believe that other forums for developing community cohesion are lacking - 74% are unsatisfied or disagree that there are regular community meetings. Eighty-nine% are unsatisfied with the availability of community centres that can support social activities, and 90% disagree that the neighbourhood has active community leaders that support community members.

Do you feel safe here?

The only area in which the city clearly performs well is safety - the average rating is 3.8, two-thirds (67%) rated it highly, with 29% rating it 5 out of 5. In contrast on 14% rated it negatively (feel unsafe). This is the result of the positive views of how the neighbourhood's design contributes to crime reduction, for example, that streets are wide enough and that there are no dead-end alleys or suspicious areas (70%) and that the streets are well lit (68%). Residents are also broadly satisfied with the provision and responsiveness of the police and civil defense services (73%). Seventy-three% also agree that their neighbourhood is generally safe, and there are few robberies and car break-ins. The only area in which a majority of residents express dissatisfaction (53%) is with the statement 'children are safe playing outside in this neighbourhood'.

Are buildings and spaces well cared for?

The results are broadly negative with an average quality of life evaluation of 2.5 out of 5; 50% of respondents provided a negative response. The breakdown of specific issues is somewhat mixed. Approximately half (56%) are satisfied that waste is collected and that pests are dealt with frequently. Half (50%) are satisfied that abandoned vehicles are removed promptly. Around two-thirds are satisfied that there are no encroachments on public property and open space. However, a majority are dissatisfied with the condition and maintenance of streets and sidewalks (63%), maintenance and irrigation of trees and green spaces (65%)) and the maintenance of park furniture and playgrounds (69%).

9.5.2 Factors influencing quality of life evaluations

A number of factors influence respondents' neighbourhood quality of life evaluations, including income, accommodation type, and the degree of urban fragmentation.

Lower-income individuals (3,000 – 5,000 SR per month) have a significantly more negative quality of life evaluations than other income groups – 58% disagreed that neighbourhood traffic and parking allows people to move safely and meets the community's needs compared to 30% of those earning over 15,000 SR. A similar pattern is seen in relation to the attractiveness and ease of movement in the neighbourhood (54% negative vs. 37%), access to facilities and amenities (58% vs. 40%), and the local economy (48% vs. 24%).

The relationship between income and quality of life is strengthened further when looking at the distribution of responses across high and low-income neighbourhoods, especially in terms of neighbourhood design, facilities, and maintenance. Eighty-six% of those living in low-income neighbourhoods rated the availability of play and recreation facilities poorly compared to 47% of those living in high-income neighbourhoods. Seventy% of respondents stated that facilities and amenities did not meet their needs compared to 34% in high-income areas.

The type of accommodation significantly impacts residents' quality of life perception (Figures 9.32 and 9.33). Those who live in villas are much more likely than those in apartments to have a positive perspective on their neighbourhood. This is true across all the factors considered in the study. However, a sizeable proportion of those who live in villas has negative views about the provisions of services, facilities and facilities, and built environment. The gap is most pronounced in relation to safety and crime, traffic and parking, and neighbourhood identity and belonging.

Whilst caution is required given the small sample size, there is a considerable gap between those that live in villas and those that live in villas in compounds or gated communities. The largest differences relate to the external built environment. Those living in gated communities are almost three times as likely to positively rate their access to facilities and amenities (75% vs. 25%). They are also more than twice as likely to highly rate both their access to spaces for play and recreation (43% vs. 17%) and the neighbourhood's attractiveness and travers ability (57% vs. 24%). The only area in which gated communities scored less well was on economic measures.

Looking specifically at how the level of urban fragmentation is linked to respondents' views on the various quality of life indicators, we see that higher levels of fragmentation are associated with a more positive quality of life scores.

There are a number of reasons why this may not be true. One potential explanation is that closed neighbourhoods are designed to meet the inhabitants' needs whilst excluding other members of the city. Consequently, measuring inhabitants' views fails to capture the wider impact of closed, fragmented developments on the city's social fabric. Alternatively, the nature of development in Riyadh may be a contributing factor. The city's population has more than doubled in just 20 years, from 3.5 million in 2000 to 7.2 million in 2020. This rapid growth coupled with an automobile-centric development model may have led to urban services and facilities becoming concentrated in specific fragmentary developments. The lack of systematic planning of services was a frequent concern amongst the experts surveyed. A final possible explanation is that these developments are high quality and more effective forms of development for the city.

Based on the survey responses, there are no significant differences between the quality of life scores of Saudis and non-Saudis. However, given the small and unrepresentative sample of non-Saudis in the survey, this is likely not representative of the city as a whole. People who employ a private driver tend to have marginally higher average scores across all quality of life scores. They also have fewer negative responses – for example, those employing a driver had 17 percentage points fewer negative responses regarding their neighbourhood's facilities and amenities. They were also more likely to positively view their neighbourhood traffic and parking (40% vs. 29%).

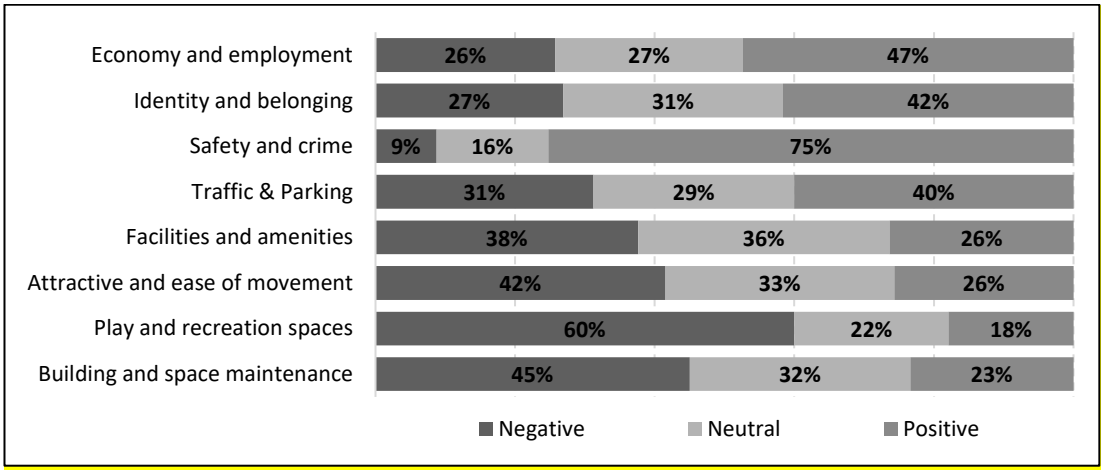


Figure 9.32 Quality of Life Evaluation – Villa

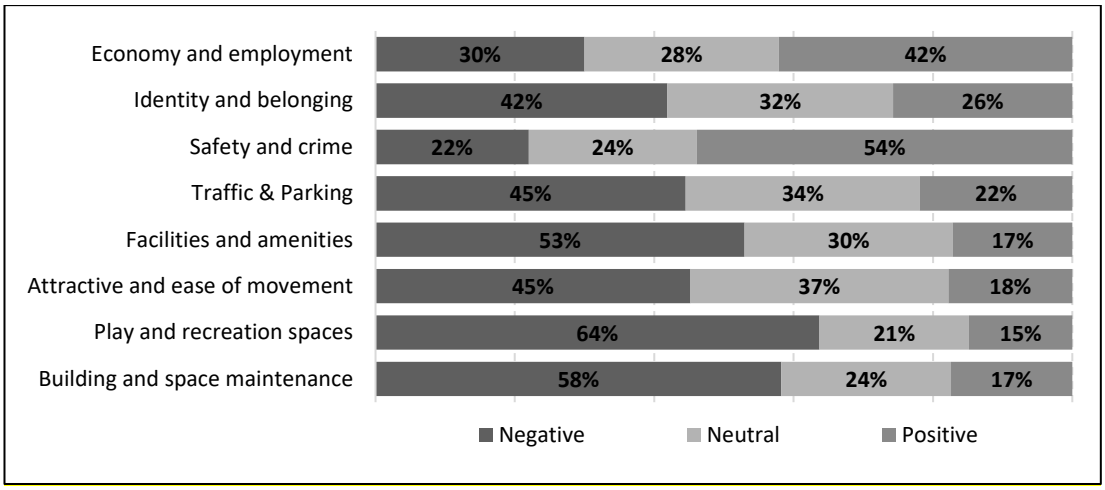


Figure 9.33 Quality of Life Evaluation – Apartment

9.5.3 Neighbourhood level quality of life evaluations

Appendix E shows a series of charts for each quality of life indicator showing the geographic distribution of positive (greens) and negative (reds) views. The results, discussed in detail below, conform to the patterns observed throughout the analysis. Residents of high-income neighbourhoods tend to provide a more positive quality of life evaluations than residents of low-income neighbourhoods. Residents of more central neighbourhoods tend to provide higher scores than those on the city's outskirts, suggesting support for the hypothesis for the link between the negative quality of life scores and poor infrastructure and service provision in poorly planned developments.

Do the neighbourhood traffic and parking arrangements allow people to move around safely and meet the community's needs and the utilisation of delivery and ride-hailing services (taxis, Uber, Careem)?

Whilst there is no clear pattern relating to the traffic, transport, and parking indicator, it does appear that neighbourhoods on the periphery have a higher percentage of negative scores than neighbourhoods in the central district and the northwest.

Do you feel safe here?

The "safety and crime" indicator is the only indicator for which a majority of neighbourhoods had a plurality of positive responses. These were distributed evenly across the city, although the outlying neighbourhoods of Al-Nadwa in the East and Badr in the South scored high negative scores, as did Tuwaig in the West.

Can you access a range of spaces with opportunities for play and recreation?

The “spaces for play and recreation” indicator received the most negative responses, as with other indicators, these tended to be in the area on the periphery, such as Tuwaiq and Dhahrat Laban in the West and An Nasim in the East. The only areas with positive scores are located near the city centre, such as Al-Aqqeek and Ash-Shuhada

Does this place have a positive identity, and do you feel you belong?

The “identify and belonging” indicator shows that neighbourhoods in the northwest and city centre have a stronger sense of identity. The neighbourhoods in the northeast around the airport and Princess Nourah Bint Abdul Rahman University have the lowest levels of belonging. These are predominantly commercial neighbourhoods.

Do facilities and amenities meet your needs?

The “facilities and amenities” indicator shows the same pattern on positive evaluations in the west and city centre and negative views further out. This is consistent with the argument that later developments lack sufficient access to urban services.

Is there an active local economy and the opportunity to access good-quality work?

The “local economy” indicator shows a high proportion of residents in city centre locations expressing positive views. These correspond to areas of the city with more commercial activity as opposed to the more residential neighbourhoods in the northwest. The south of the city is more mixed.

Are buildings and spaces well cared for?

The neighbourhoods in which a majority of respondents expressed negative views of the “building and space maintenance” indicator is distributed fairly evenly across the city, including a number of city centre locations. This also includes higher-income residential neighbourhoods in the northwest of the city.

Do buildings, streets and public spaces create an attractive place that is easy to get around?

The results suggest that neighbourhoods in the south of the city perform relatively poorly on the “attractiveness and ease of movement” indicator. The industrial areas to the east also have high levels of negative views. Only a small number of neighbourhoods in the west and centre score a high number of positive evaluations, such as Irqah and As Sulimaniyah.

Aggregated quality of life indicators

Appendix F shows a series of radar diagrams that show the average quality of life scores for each indicator across the six broad areas of Riyadh (Central, Eastern, Northern, Southern,

Western, and Ad-Dirayah). In addition, they show the percentage of the area covered by fragmentary developments as a normalised score of 0-5. There are considerable differences in the percentage of the land area covered by fragmentary developments. The southern, northern, and Ad-Dirayah areas of the city have less than 6% of their areas enclosed. This rises to 15% of western Riyadh. The central and eastern areas had 27 and 36% of their total areas covered by fragmentary developments. The results show that the Central area scored slightly below average in relation to 'Spaces for play and recreation', 'Traffic, transport and parking' and 'Building & space maintenance'. The east of the city was broadly in line with the overall city average. The northern and western areas scored above the city-wide average on all indicators with the largest gaps relating to access to facilities and amenities and the local economy, the western region also scored relatively well with respect to neighbourhood attractiveness and ease of movement. The southern area of the city performed poorly with below average scores on all indicators, with the exception of 'Identity & Belonging'. The largest gaps relate to 'Attractiveness & ease of movement' and 'Building & space maintenance'. Ad-Dirayah is an interesting case - the area performed poorly on indicators relating to the economy, identity and belonging, and access to facilities and amenities. However, it performed quite well relative to other areas on attractiveness, ease of movement, and the provision of spaces for play and recreation. These results support the conclusion that it is not fragmentary developments per se that negatively impact the quality of life scores, rather it is the nature of those developments and the extent to which they provide residents with access to services, facilities, and economic opportunities.

9.5.4 Factors influencing neighbourhood level quality of life evaluations

A number of factors influence, to a greater or lesser extent, the quality of life scores (QL scores) of neighbourhood residents, including average income, the level of urban fragmentation, and whether a neighbourhood is primarily residential or commercial in nature.

There is a reasonably strong relationship between the average QL scores for a neighbourhood and income. A simple linear regression was run between income and each QL score, Table 9.6 summarizes the key regression statistics. All factors are a positive relationship with average income; correlation coefficients range from 0.56 for "facilities and amenities" and 0.52 for "safety and crime" indicating moderate levels of correlation to "local economy" which has a correlation coefficient of just 0.17, indicating very low levels of correlation. When

looking at an aggregate level (average GL score across all indicators), the correlation coefficient is 0.49, average income explains just under a quarter of the variation in QL scores across neighbourhoods (R-squared = 0.245) significant at a 95% confidence level.

The level of urban fragmentation does not appear to have a similar effect. The correlation coefficient, using an aggregated QL score, was 0.007, indicating no correlation. The same pattern applies to each of the individual indicators with correlation coefficients of between 0.11 (“building and space maintenance”) and 0.006 (“facilities and amenities”). This suggests that the level of urban fragmentation has little impact on residents’ QL scores.

The extent to which a neighbourhood is primarily residential or commercial is determined using the proxy measure of the number of businesses per capita. Whilst it may be expected that this would have a significant impact on residents' quality of life evaluations, a simple regression against the average QL score shows no strong relationship with a correlation coefficient of 0.06 (no correlation). At the level of the individual indicators, the results range from 0.21 (“safety and crime”) to 0.02 (“building and space maintenance”).

One would expect neighbourhood QL scores to correlate with the percentage of residents who desire to move. A regression was run in the same manner as for the other indicators. There is a weekly positive relationship at an aggregate level - the correlation coefficient equals 0.27; however, the desire to move only explains 7% of the variation in the average QL score. There is some variation in the underlying indicators with correlation coefficients, ranging from 0.31 (“attractiveness and ease of movement”) to 0.02 (“spaces for play and recreation”), but all show a weak relationship.

A final factor that could influence residents’ QL scores is their awareness of the built environment. A regression was run between the average QL score and the percentage of residents identifying features of the built environment. This shows a weakly positive relationship with a correlation coefficient of 0.36. The extent to which residents are aware of the built environment explains 12% of the observed variation in QL scores. At the level of the individual features, there is some variation ranging from 0.34 (“Malls and shopping centres”), 0.28 (“Gated Communities) to 0.05 “Office Buildings”.

With the exception of income, all factors that may be expected to show high levels of correlation, in fact, display relatively weak relationships. There are a number of potential reasons for this. From a methodological perspective, the small number of observations at a neighbourhood level introduces noise - higher numbers of observations could be expected

to result in stronger relationships. However, it may well be the case that only limited relationships exist between neighbourhood-level features and the individual QL scores.

Table 9.6 Regression statistics: Relationship between average neighbourhood income and quality of life scores

Regression Statistics	Multiple R (correlation co-efficient)	R Square	Standard Error	F (Significance Level)
Play and recreation spaces	0.34	0.12	0.75	0.001
Traffic, transport and parking	0.33	0.11	0.74	0.002
Building and space maintenance	0.24	0.06	0.82	0.03
Safety and crime	0.52	0.27	0.68	0.0000003
Attractive and ease of movement	0.45	0.2	0.75	0.00002
Identity and Belonging	0.37	0.14	0.87	0.0005
Local economy	0.17	0.03	0.83	0.13
Facilities and amenities	0.56	0.31	0.67	0.00000003

9.6 Conclusion

There are a number of ways in which residents may express those preferences, including in their residential preferences, their choice of neighbourhood, or explicitly in terms of higher or lower quality of life scores.

The underlying hypothesis of the study was that higher levels of urban fragmentation would negatively impact the lives of residents, a view supported by expert opinion. This study does not find evidence to support that argument. Indeed there is some evidence to suggest that neighbourhoods with higher levels of urban fragmentation achieve higher quality of life scores. In addition, urban fragmentation also had no clear effect on the neighbourhood features desired by residents, nor did it influence whether respondents rated their current or previous residence more highly.

This suggests that fragmentary developments meet the needs of their inhabitants. Further research is required to determine the causes of this observation - for example, it could be that the rapid, poorly planned, automobile-centric model of development in Riyadh has resulted in urban services being concentrated in large planned developments. That respondents favour these developments, expressed by a sizeable minority of respondents, to move to a gated community or large-scale development. Eighty-six% of those that have or currently live in a gated community rated their experience positively.

The level of urban fragmentation, defined as the percentage of the neighbourhood's land area covered by fragmentary developments, played a limited role in determining QL scores. However, this does not suggest that city residents are satisfied with the built environment

and provision of services and facilities. Limited access to parks and recreation facilities such as community centres, seating areas, and sports grounds were identified as major issues by a significant majority of respondents. The lack of continuous sidewalks and well-designed open spaces were also highlighted as issues. There were some positives - a majority of respondents were satisfied with the quality of roads, transport connectivity, the economy, safety, and access to utilities.

The most important factor in shaping respondents' views and actions is income, both the average income in a neighbourhood and the average monthly income of the respondent. Neighbourhood income explains approximately 25% of the variation in QL scores. Income also plays an important role in shaping the preferences of respondents when considering the neighbourhood features that play a role in choosing where to live. Higher-income individuals were more likely to prioritise location in relation to work, family, and friends. They were also more likely to place greater importance on the aesthetics of both the property and neighbourhood. In contrast, low-income respondents prioritise value for money. Higher-income was related to higher levels of satisfaction with their current residence.

The survey revealed a clear societal preference for owner-occupation and villas over other forms of housing type. The percentage of households living in villas increased with income; most respondents living in apartments desired to move to villas, and those who have already done so overwhelmingly believe it to have been a positive move. This preference is likely to impact the city's development, encouraging larger, fragmented developments on the periphery of the city. as opposed to denser developments in the centre.

Chapter 10: Conclusions, Recommendations and Future Works

10.1 Introduction

Several factors drive the emergence of a fragmented urban fabric; this study focused on gated developments' role in that. On their part, the growth of different types of gated developments has been influenced by quite a few factors: these include crime, the fear of crime and insecurity, a search for a greater sense of community, identity, place and belonging in cities; a search for increased privacy and control, both economic and social; a specific lifestyle; status, prestige and elitism and a growing lack of trust and confidence in the performance of local institutions.

Essentially, gated developments spread across the world at the turn of the century because they became a useful approach to address a number of insecurities and needs, including personal needs and corporate agendas. Gated developments made possible the establishment of stable, controlled, and protected precincts, whether for residential, business, commercial or mixed-use. It has shown remarkable adaptability to the development rhetoric of the day, moving from small-scale interventions by a small group of residents to one of the most dominant types of development and, in many cities, the primary development type for new residential/mixed-use developments. It has also incorporated a shift towards the increased privatisation of infrastructure development and service delivery as a possible justification.

Gated developments occur in many countries worldwide through various manifestations, giving rise to many types and sub-types. They highlight the importance of a suitable typology and appropriate terminology of gated developments. This study has also indicated that one cannot view gated developments in isolation from their context, theoretically and in the immediate socio-spatial context. Many of the types were found to be specific to a country and directly linked to local conditions – for example, exceptionally high crime rates in Brazil, Kenya and Nigeria; conditions of war, for example in Lebanon, Israel and Russia; vast income disparities, for example in Brazil and Argentina or a heightened sense of privacy in Saudi Arabia.

The most significant aspect of the debate the research found was that there is no agreement on the meaning of fragmentation in urban studies. Perhaps the most significant aspect of the debate relates to the impact and implications of gated developments and their role in producing fragmentary urban environments. It was found that gated developments could positively and negatively impact, depending on the researchers' or commentators' perspective and criteria. It, therefore, became a question of being positive or negative for whom - for example, those inside enjoying additional benefits or those excluded on the outside, and secondly, who should be deciding on what should be allowed in the city. In this regard, there was no evidence of a single approach from various governments in considering and addressing gated development in various cities. It also became apparent that the impact of such developments varied and required a location-specific inquiry to assess the larger implications of gated developments.

It was important to investigate the specific nature and meaning of different gated developments in Saudi Arabian cities. Therefore, a detailed inquiry into the nature and future impact of new ways of subdividing the city was required. This study focused on Riyadh, Saudi Arabia, considering the rapid growth the city has seen and its socio-economic implications. It also considered the current planning trends and design concepts influencing planning and development in this country.

Very limited research on urban fragmentation and gated developments has been conducted from an urban design / architectural perspective or at a neighbourhood scale with a spatial focus. Another area of limited exploration concerns the relationships inherent in the physical design and manifestation of different gated developments, how these may differ between different types and how what happens at a neighbourhood level influences metropolitan planning and policy development. This thesis has sought to investigate urban fragmentation and the role of gating as a socio-spatial process at different scales. This chapter offers a conclusion regarding the main research questions. It furthermore highlights the relevance of the findings in terms of the main research objectives as outlined in Chapters 1 and 5 and proceeds to discuss their implications for future cities.

10.2 Urban fragmentation in Saudi Arabia

This thesis is concerned with Urban fragmentation in contemporary cities, specifically through gated developments. The study's main purpose was to explore urban transformation

in today's Saudi cities, focusing specifically on the relationship between gating and socio-spatial integration and its impact on urban transformation and development. To determine this, it set out to explore the relationships between the reasons for its development (causes), how this physically occurs (manifestation through different types of gated developments) and the likely impact and implications (effect). In this way, the study explored the multi-layered complexities of different types of gated developments within a broader framework that set out to understand the relationship between the built form and wider social processes.

10.2.1 Research objectives and findings

The study aimed to understand the multi-layered complexities of urban fragmentation in Saudi Arabia, focusing on seven major objectives. First, to establish how urban fragmentation is conceptualised in scholarly literature in general and, specifically, in the context of Saudi cities. Second, determine the location and spread of fragmentary gated developments in Riyadh. Third, to document the general understanding of urban fragmentation within the local professional community of scholars, practitioners, and policymakers. Fourth, determine the impact of living in or around fragmentary building types on residents' experience. Fifth, determine the collective impact of all fragmentary building types on the wider urban context. Sixth, identify the impact of gated/fenced developments on their immediate urban context. Finally, explore experts' ideas on the issue's drivers and its impact and discuss possible responses.

In synthesising the research findings, two important observations stand out. First, although the urban mapping revealed that 17% of the Riyadh developed area is fenced in some way or another, the space syntax analysis revealed that city-wide transit is mainly affected by large-scale urban developments with restricted access. In addition, the panel of experts the study surveyed thought that physical structures, i.e. (gated developments) are the least important factor in causing urban fragmentation. Second, whilst a clear majority of the expert panel (60-70%) believe that urban fragmentation in its various, multifaceted forms impacts the quality of life in the city, the residents' survey revealed that the level of urban fragmentation played a limited role in determining the quality-of-life scores in the experience of Riyadh surveyed residents.

10.2.1.1 The conceptualisation of urban fragmentation in scholarly literature

It isn't easy to discuss urban fragmentation in simple terms, particularly since the very definition is often open to interpretation. As such, researchers take many approaches to the study and understanding of urban fragmentation and its causes. Fragmentation can be looked at through a spatial lens or an economic one, studied through a social approach or a cultural methodology, or taken in terms of its political effects. Regardless of which approach a researcher takes, some standard trends about contemporary urban life will emerge. These include the rise of the fortress city and landscapes of power, which highlight the consumer desire for heightened security features in modern construction. In addition, modern city living is often privatised or militarised, creating both global and local enclaves, which serve as a vehicle for stronger fortification. And nowhere are these trends more obvious than in gated developments. This type of community focuses on safety for the gated community's residents and can seriously impact the surrounding area. Examples of gated developments include military developments, medical developments, academic developments, and commercial developments.

Though current research does not detail other non-residential types of gated developments, the general study of gated developments reveals that the varying types often have similar communal impacts. While certain types of gated developments may introduce specific problems or benefits to a community, many common effects come down to land use patterns typical of most gated developments, regardless of their individual purpose. Erecting barriers and restricting public access widely impacts the availability of public space, transportation efficiency, economic dynamics, and community cohesion. The impacts on the surrounding community include gentrification, where properties inside the gated community increase to the point that those outside can never afford to join the community. In addition, studies in China have shown that gated developments can increase environmental issues since the demand for property in naturally beautiful areas can lead to development that can negatively impact the natural environment. This can also reduce natural areas in urban areas. Urban planners must maintain awareness of these impacts to mitigate the negative effects and amplify those beneficial to the locales where gated developments are present.

10.2.1.2 The location and spread of fragmentary gated developments in Riyadh

Over the past couple of decades, gated development has continued to define much of development across the Saudi capital, driven through a confluence of factors including low

costs of fuel, preferences for suburban housing from Saudis, government land grants for Saudi citizens, newer services/amenities in northern/western suburbs, and security. Gated development across the Saudi capital accounted for 71% of the development area (of identified projects), although this figure is heavily skewered by ungated Industrial development. Excluding industrial development, 97.8% of development across Riyadh (322.61 km^2) was gated, with the only notable, sizable amount of either non-gated or soft-gated development attributed to Commercial development - shopping centres, which are heavily regulated public realms. Just 6.22 km^2 of non-Industrial projects across Riyadh were Soft/Non-Gated, a third of which in the Central District.

In the District's newest, most prestigious, affluent, and homogenous (Saudi) areas, the Northern and Western Districts, gated development accounts for 96% and 98% of land use, respectively. Conversely, the most non-gated areas are Riyadh's Southern and Eastern Districts, home to vast industrial zones that are generally ungated. Again, gating appears to follow a similar pattern to income, with higher income areas showing almost 100% gated development, except for neighbourhoods running along King Fahd Road, which are home to large quantities of commercial/business centres that typically have soft gating.

10.2.1.3 Professionals' understanding of urban fragmentation, their ideas on its drivers and possible ways of dealing with it.

The survey attempted to understand expert opinion concerning a number of issues. Firstly, is the concept of urban fragmentation, one in which there is a consensus definition and to what extent the concept applies to cities in Saudi Arabia. Opinion was roughly equally divided between those that fully agreed with the definition and those that somewhat agreed. Only a small group actively disagreed with the definition. Similar proportions believed the concept was useful in describing the structure and development of Saudi cities. Interestingly, a sizeable minority of those somewhat agreed with the definition agreed that the concept was useful in a Saudi context, suggesting that support for the underlying concept may be higher than the results suggest and that an amended definition may have garnered more support.

The study explores a number of different potential causes, including urban planning policy, urban design, and the physical structures that make up the built environment. In almost all cases, the majority held that the various factors contributed to urban fragmentation, although the proportions varied. According to the expert panel, the least important factors tended to be physical structures; these could be human-level structures that provide privacy

and security or larger developments such as shopping malls or business districts. The highest levels of support were for the impact of urban planning policies and major infrastructures such as arterial roads and highways.

One of the underlying hypotheses of the study was that gated communities and other forms of segregated developments contribute significantly to urban fragmentation by disrupting the urban fabric and creating barriers to the movement of residents. While a slim majority agreed that these significantly affect residents, it was not highlighted as a major cause for concern relative to other issues. That said, the lack of walkable neighbourhoods and the provision of high-quality sidewalks and community spaces were mentioned repeatedly. Therefore, it can be argued that these developments contribute to these issues.

Having analysed the causes of urban fragmentation, the survey asked the expert panel to estimate the impact of fragmentary urban typologies on the quality of life of city residents. A clear majority of the expert panel (60-70%) believe that urban fragmentation in its various, multifaceted forms impacts the quality of life in the city, be it through limiting access to certain services and facilities, poor maintenance of the built environment, or low-quality urban design that negatively impacts neighbourhood character.

Whilst the dividing lines are blurred, there appear to be two broadly distinct groups of perspectives. On the one hand, some experts tend to believe urban fragmentation is the result of urban planning and design that fails to consider the human dimension. This results in isolated developments, disconnected from the local neighbourhood and wider city, and a built environment containing structures and forms, such as high walls, discontinuous sidewalks, and gated developments, that limit access, mobility, and the development of a community.

While acknowledging that these forms of structure and design in extremis can negatively impact residents, the other group is less concerned. They are significantly less likely to believe that developments such as single-use business areas or shopping centres have a large, negative impact. They also tend to be less concerned by car-centric developments, be they in the city centre connected by arterial highways or on the periphery of the city, provided that these developments meet the needs of residents.

The final section of the survey asked the panel to provide their opinion on a number of design guidelines across four dimensions. Each dimension contained two contrasting visions of

urban design and development, one which developed a more human-level vision and another which proceeded with current forms of development. The results here were mixed as experts indicated that they agreed with both proposals in a number of cases. One way to interpret these somewhat mixed results is that it suggests that a one-size-fits-all model of development is inappropriate for the diverse needs of a city of 7.7 million people. In certain city-centre locations, single-use developments have their place, but in residential neighbourhoods, a greater level of focus needs to be placed on developing cohesive neighbourhood centres designed around the needs of residents.

10.2.1.4 The impact of living in or around fragmentary building types on the experience of residents

There are a number of ways in which residents may express those preferences, including in their residential preferences, their choice of neighbourhood, or explicitly in terms of higher or lower quality of life scores.

The underlying hypothesis of the study was that higher levels of urban fragmentation would negatively impact the lives of residents, a view supported by expert opinion. However, this study does not find evidence to support that argument. Indeed, there is some evidence to suggest that neighbourhoods with higher levels of urban fragmentation achieve a higher quality of life scores. In addition, urban fragmentation also had no clear effect on the neighbourhood features desired by residents, nor did it influence whether respondents rated their current or previous residence more highly.

This suggests that fragmentary developments meet the needs of their inhabitants. Further research is required to determine the causes of this observation - for example, it could be that the rapid, poorly planned, automobile-centric model of development in Riyadh has resulted in urban services being concentrated in large, planned developments. That respondents favour these developments, expressed by a sizeable minority of respondents, to move to a gated community or large-scale development. 86% of those that have or currently live in a gated community rated their experience positively.

The level of urban fragmentation, defined as the percentage of the neighbourhood's land area covered by fragmentary developments, played a limited role in determining QL scores. However, this does not suggest that city residents are satisfied with the built environment and the provision of services and facilities. For example, limited access to parks and recre-

ation facilities such as community centres, seating areas, and sports grounds were identified as major issues by a significant majority of respondents. The lack of continuous sidewalks and well-designed open spaces were also highlighted as issues. On the other hand, there were some positives - most respondents were satisfied with the quality of roads, transport connectivity, the economy, safety, and access to utilities.

The most important factor in shaping respondents' views and actions is income, both the average income in a neighbourhood and the average monthly income of the respondent. Neighbourhood income explains approximately 25% of the variation in QL scores. Income also plays an important role in shaping the preferences of respondents when considering the neighbourhood features that play a role in choosing where to live. Higher-income individuals were more likely to prioritise location in relation to work, family, and friends. They were also more likely to place greater importance on the property and neighbourhood aesthetics. In contrast, low-income respondents prioritise value for money. Higher-income was related to higher levels of satisfaction with their current residence.

The survey revealed a clear societal preference for owner-occupation and villas over other forms of housing type. The percentage of households living in villas increased with income; most respondents living in apartments desired to move to villas, and those who have already done so overwhelmingly believe it to have been a positive move. This preference is likely to impact the city's development, encouraging larger, fragmented developments on the periphery of the city instead of denser developments in the centre.

10.2.1.5 The collective impact of all fragmentary building types on the wider urban context

This study aimed to characterise the relationships between gated urban developments and the quality of the street network in Riyadh, primarily, how they restrict the movement and accessibility of urban centres. As a case study, we see Riyadh having 13 different types of gated developments. Spatial configurations differ between the old city that is mostly accessible for all residents compared to new spatial configurations that are more focused on security and less accessible.

The spatial configuration of the city changed drastically after the 1950s, with the rapid multiplication of population resulting in urban sprawl. Sassen (2010) noted that the emergence of gated developments at the periphery of cities is usually the result of the uncontrolled growth of urbanised areas. Urban developments with restricted access are

considered physical barriers for people's natural movement in the city, posing major social, economic, and political issues at local and city-wide scales' network quality.

The gated developments with the most positive impact on the street network include those closest to the old city. These positive benefits are most prevalent within 15 minutes of the gated development. These developments play an important role in the spatial development of Riyadh.

The impact of gated urban developments on the quality of the built environment can be assessed based on their location and configurational properties of the surrounding street network. Local pedestrian movement depends on clusters of smaller gated developments surrounding the city centre. City-wide transit is mostly affected by the few large-scale urban developments with restricted access located in peripheral areas of Riyadh. Pervasive centrality — the quality of a spatial system to retain properties of an urban centre throughout scales (Hillier, 2009) — is present in the spatial configuration of educational, office, self-contained, and transportation developments. They have the most strategic potential for the positive transformation of Riyadh's street network.

This study is based on the data available from open sources, including OpenStreetMap and Google Earth. The provided conclusions may be specified further with a detailed field study of gated developments in Riyadh and patterns of real pedestrian and motorised movement in the city. Furthermore, apart from studying only the spatial nature of impacts produced by gated developments on the quality of the street network, their socio-economic features may be added into modelling. Mapping and analysing existing commercial and civic facilities may provide valuable insights into the strategy of spatial reconfiguration. Finally, no strong relationships were found between the level of impact on the quality of the urban grid and the area of particular gated developments. It is assumed that the clustering of numerous communities and the density of street networks within their borders may be significant factors affecting the accessibility and permeability of urban areas at all scales. These parameters may be studied further in relation to the developments' syntactic measures and socio-economic parameters.

The research aimed to identify the potential for transforming the spatial configuration of gated urban developments in Riyadh. The application of Space Syntax analysis techniques allowed to specify opportunities and limitations posed by areas with restricted access. The

issues of spatial sustainability discussed by Hillier (2009) are extremely relevant in modern Riyadh, where almost 25% of the urbanised area is occupied with gated developments. Therefore, configurational analysis might be the key to approaching issues of limited urban movement and building effective strategies based on the studies of the local context.

10.2.1.6 The impact of gated/fenced developments on their immediate urban context

The study conducted sheds light on the principles of design and planning in the various cities analysed. It's important to highlight how those findings come together to guide cities in planning their developments as more accessible, permeable, and responsive to their outer environments.

The analysis indicated significant variance in how the different cities are planned; in the UK, the cities have a general pedestrian-oriented approach to design reflected on their street network, buildings, and general master planning. In the American and Saudi examples, we see a different approach to planning for cars rather than people. However, this is responded to differently in each country; in the USA, while the developments are located in car-oriented contexts, the hierarchy of spaces and their designs are more integrated with the built environment than those in the Saudi context. The developments studied in Riyadh include multiple layers of barriers to accentuate each development's ownership and privacy outlook; this creates a detached city from its surrounding context, thus unresponsive to its built environment. The scoring system was based on the data gathered for each indicator, in which the lower the average distance between accesses to public space or between pedestrian entrances, the more responsive the development is. While the higher the ground floor windows and doors and the higher the percentage of alignment, the better scoring per development is.

When building developments such as universities, hospitals, stadiums, shopping centres, schools, and others, cities must follow an approach that integrates the surrounding context physically, visually, and functionally. It is important to understand that especially those functions are highly attractive for the different user groups; thus, the development's edge or border design should be even more inviting and respond primarily to the users' needs. That said, car-oriented cities, in general, do need to change their outlook on mobility and planning for people. We live in a time when public space and streets are becoming more and more of dire importance; people are looking for an open, safe, and healthy space to spend their time. With social distancing required to avoid getting infected with a global pandemic,

governments are turning their cities into more pedestrian-oriented environments that allow for sufficient sidewalks, promote non-motorised transport, availing public space amenities, and others. In some of the developments studied, especially those in the Gulf, there seems to be a need for really altering how the whole city is planned, not only how the developments fall within its surroundings. Responsive environments must respond, through their design, to the inner and outer environments they create.

10.2.2 Significance of the findings for Saudi cities

The urban mapping and subsequent analysis confirmed that gated developments are a mechanism of change in the city of Riyadh, contributing to significant spatial transformation at a neighbourhood and metropolitan scale. In some cases, the spread and extent are of such a nature that significantly changes the urban landscape. Consequently, traffic and movement, as well as usage and behavioural patterns, are changed. This is often directly related to access control and the imposition of strict rules and regulations combined with physical closure through walls/fences, gates, and various additional security measures. In addition, the walls and fences are also changing the aesthetic nature of the built environment and atmosphere of the local roads. Following the research, the significance of the research findings can be summarised into three main issues.

(i) Complexities of spatial transformation: linking space, place and time

The rapid spatial transformation of the Saudi city has illustrated how the perceived reality of existing space unfolds within its local context, which in turn gives rise to the production of a new spatial order, and consequently, a variety of interpretations of an evolving new urban space. Emerging needs and ideas reformulate social intent, which in turn leads to the development or establishment of different types of gated developments. This leads to significant spatial transformation, which has a wide range of impacts and implications, which is reinterpreted from various perspectives, depending on the impact of the spatial changes and whether people are gaining benefits from these changes or are experiencing discomfort as a result of their implementation. Spatial change therefore also transforms the physical nature and character of places over time, which influences the use and management of these places and people's sense of place within and without.

This process of spatial transformation is also constantly influenced by many actors, development agencies, and tools present in a specific place at a particular time. In this way,

the production and management process of the city is also closely related to the meaning of the built form, as certain actors start to enforce or restrict behaviour through the modification and management of space. This highlights the multiple complexities of spatial transformation within the Saudi context. It also confirms that there are a variety of interpretations of space, spatial change and place, depending on the observer and observed within a particular urban context. Questioning the nature of existing space in a specific context at a particular point in time can therefore also lead to the redefinition of the nature and meaning of place by a particular group, which initiates a complex process of spatial change.

The thesis has introduced a conceptual framework (Chapter 3) that was appropriate to map the process of spatial change through gated developments. The framework serves as a valuable tool to identify the main (drivers and pressures) that influence spatial changes in the form of urban fortification and privatisation, how this generally occurs in cities (state), followed by the (impact) and implications of these changes and finally disciplinary (responses) for overcoming any resulting problems. It also highlighted the implications for the transformation of place and the conceptualisation of time within urban environments.

(ii) Influence of neighbourhood change on urban transformation

It has become clear how and to what extent changing neighbourhoods influence urban transformation in Saudi Arabia. Changes on a neighbourhood level had large-scale impacts and implications for the wider city, often due to the cumulative impact of these changes. This discussion raised four important issues: firstly, that gated developments cause various levels of problems on a metropolitan scale, physically, socially, environmentally and legally; secondly, their impacts are often different depending on the type and their nature and management, which makes it difficult to respond unilaterally; and finally, the neighbourhood transformation caused by gated developments gives rise to a variety of interpretations and responses from urban residents, which in turn pressurises local government to find solutions to respond to often opposing demands or goals. In this way, changes on a neighbourhood level severely influence the functioning and management of Saudi cities.

(iii) Contained neighbourhoods, but not self-sufficient

The prevalence of gated developments embodies the reality of the urban imbalance in Saudi Arabian cities. On the one hand, they provide safe and well-developed areas for those who

can afford to stay within them, offering access to a private outdoor space and a range of facilities and amenities, depending on the type. On the other hand, however, these areas are not self-sufficient, and users are therefore still dependent on the rest of the city for retail services, employment, entertainment, education, and a range of other services. Therefore, people will still need to travel outside the boundaries of the protected enclaves. Given this, it will be not only those outside gated developments that will be benefiting from an open and well-connected city but also those inside. In this regard, a more inclusive approach to the city is necessary to ensure a more sustainable approach and ultimately a more sustainable city for all the residents.

10.3 Gated developments and their meaning for future cities

10.3.1 Fortress cities and communities

As was pointed out, the multiplication of different types of fortress enclaves often leads to creating a fortress city. These fortress cities could lead to a system's total collapse in cities. This would make city governance fragmented and urban integration an impossible dream. It would also negate any attempts at greater urban cohesion or developing strong urban economies based on mobilising labour, skills and resources near cities. This will impede global competitiveness for larger cities or mere economic viability for medium cities and ultimately hinder the quality of life of everyone within these cities. Fortress cities, therefore, do not create the preconditions for more sustainable cities as they build barriers between communities and neighbourhoods instead of bridges.

10.3.2 Beyond the barriers

Urban design has to move beyond dualistic approaches that consider the city as different places, to rather consider it as a place for different people, to incorporate and accommodate differences within urban spaces, rather than resorting to the exclusion of some groups from certain places. Fortress enclaves are not self-sufficient unless they take the form of an independent city, of which there are very few examples worldwide - and even in some of these cases, residents are still dependent on nearby cities for employment or food. Given this, it, therefore, becomes important to consider their relation to the rest of the city. This thesis has indicated that spatial interventions are often the result of social needs and ideas, and therefore it would be necessary to consider the proliferation of gated enclaves as a socio-spatial process. This has implications for urban design. As alluded to in Chapters 6 and 8, there is a need for urban design to move away from anti-urbanism and micro-urbanism to

more integrative and interdependent urbanism that recognises coherence and co-dependence. Such integrated urbanism would focus more on integrating the different sub-systems to create an optimally functioning urban system rather than isolated development within a closed-cell. From an urban design point of view, it is necessary to look at the design of the neighbourhood edges as permeable, allowing integration between neighbourhoods and the use of public space by all. Integrated urbanism will therefore focus on the design and celebration of the seams and create a quilt made up of a variety of spaces connected through permeable boundaries and open and continuous public spaces. Given these, urban design responses making use of barriers to protect residents and separate communities are not appropriate to address crime but rather call for a holistic approach to crime prevention on a city scale and a focus on safer places for everyone.

10.4 Reflecting on the research

10.4.1 Attainment of research objectives

To a large extent, the study's objectives mentioned in Section 10.2 have been achieved. First, the study determined the local distribution of gated developments (location and extent) through the urban mapping effort. The mapping presented a good foundation and started, as it is the first of its kind, to understand the spread of gated developments in Riyadh (second objective). It also helped formulate the impact and implications of these developments on the experience of city residents and the wider urban context (fourth and fifth objectives). The mapping also confirmed the working typology and directed the research in the selection of cases for the comparative analysis of spatial fragmentation (sixth objective). The research followed a qualitative approach and involved a number of methods, namely, observation of the built environment, spatial analysis and surveys of both residents and experts. This provided a comprehensive overview of the motivation for nature and the impact and implications of gated developments in Riyadh. The multi-strategy approach (quantitative and qualitative) worked very well and further supported the multidimensional, dynamic and multi-scale approach to spatial research followed by the thesis.

The methodology was greatly assisted and guided by the development of a theoretical framework (Chapter 3) to explain spatial transformation to guide the specific research on urban fragmentation and gated developments. This structured the data analysis and presentation of the research findings within this document and offered a valuable mechanism for comparison. In addition, the theoretical framework offered a way to identify

the main themes involved in the process of urban fragmentation and a way to, firstly, understand the theoretical and local context in which urban fragmentation and gated developments are situated, and secondly, guide the research to achieve the first objective of this study.

10.4.2 Limitations of The Research and Scope for Further Study

Employing a mixed-method approach allowed for approaching the problem from different angles. However, a significant amount of time and resources have been used to collect and handle data, resulting in less time and consequently lower resolution in other parts of the research. For example, the data could be analysed in more detail using different spatial analysis methods. Future studies may consider focusing on one or two case studies to create the chance to include more details and to add more layers to the analysis.

Using self-completion surveys instead of systematic observation has added to the subjectivity of the data. Although this limitation has been addressed to some extent by putting extra effort into the design of the surveys, a complimentary systematic observation could increase the reliability of the data. Some of the limitations of this research concerning the sampling of the experts' survey and that of the residents' survey have been discussed in Chapters six and nine (sections 6.2 and 9.2). The resources of this study have not permitted a large-scale quantitative survey that would allow generalisation over the entire population of urban producers and shapers (Chapter 6) and that of the residents and visitors of Riyadh (Chapter 9); thus, the outcomes of these studies have been strictly used as a complement to the qualitative data produced through the other main methods, suggesting patterns and trends rather than establishing definitive results. The predominantly qualitative nature of this research and its focus on the spatial dimension has guided the selection of a limited number of key physical-spatial cases. Concentrating on this controlled selection has allowed a deeper examination of each case. Moreover, selecting a research approach that prioritises the physical-spatial analysis has restricted the room in this thesis to discuss other types of examples associated with urban fragmentation. The analysis of the concept of fragmentation conducted in the second chapter showed a complex concept linked to various urban manifestations. There are numerous alternative ways to demonstrate that urban fragmentation exists in Saudi Arabian cities.

Following the line of research introduced by Graham and Marvin (2001), future studies on urban fragmentation in Saudi Arabia could measure the extent of divergence of infrastructure, including the emergence of premium services. A comparison between the distribution pattern of infrastructure networks before and after the wide-scale process of privatisation and gating could provide particularly interesting insights into this subject. In addition, other manifestations associated with urban fragmentation could be researched, for example, in the dissimilar increase and devaluation of land value or in the availability and patterns of use of public transport that is when those currently under construction projects are completed.

In sum, the study of urban fragmentation in contemporary metropolises, particularly in Saudi Arabian cities, appears to be now open to several lines of research. These studies could benefit from this thesis and amplify its scope, providing further conceptualisations and insights to this current and significant subject.

10.5 Recommendations For Practice and Policy

The findings from this research provide empirical evidence about 'how' urban fragmentation affects the socio-spatial composition of the city and how gated developments impact the quality of life in neighbouring communities. Overall, the following recommendations can be made based on the results of this research.

Spatial Recommendations

For a compact city, a more compact city is structured along a well-established public transportation system. In Riyadh, densification along public transport corridors could be supported by a hierarchical system of urban centres, fostering high-density and mixed-use development. Alongside it, densification of existing built-up areas and incremental development of vacant land within the city's footprint should be heavily promoted, and most importantly, the expansion of the urban area must be restricted. To realise this goal, the city needs to establish planning tools and frameworks that support phased growth based on actual spatial requirements, promoting overall densification, compaction, and mixed-use.

For a connected city, the coordination and integration of more than one mode of transport, creating a connected and compact city with broad and easy access to most of its functional cores and areas, is vital for the sustainable development of Riyadh. Along these lines, the foreseen intermodal public transport system plays a central role in supporting compactness

and granting connectivity across the city. A well-established public transportation network and feeder system would support the densification of the urban fabric and increase accessibility and walkability within the revitalised central areas. Implementing such a system further provides the opportunity to prepare by investing in the provision of higher capacity technical infrastructure to serve the future needs of the higher densities developments along the public transportation corridors and the tod stations, reducing posterior expenditures.

For an inclusive city, a densified and connected city pertains to higher levels of efficiency and equitability. Extending access to services, facilities, and job opportunities to a wider population and fostering economic prosperity increase citizens' living standards. The soon-to-be-implemented public transport system linked to the proposed major urban centres and secondary sub-subcentres would be necessary in changing the city's socio-economic landscape, offering diverse and mixed-use areas with work, leisure, and commercial activities with a more even distribution across the city. Integrating the open space networks within the public transportation system would be crucial to have a significant spin-off effect on the city's socio-economic development.

For a resilient city, the city-wide open space network needs to be extended and improved, enhancing even distribution and connectivity within the green network and to the blue network. Suitable inner city vacant land should be utilised to develop open spaces and create a hierarchical network of green, open spaces at different scales, from the regional to the city, and neighbourhood scale, linking to major existing public spaces within the city and the system of urban centres. Punctual interventions should be promoted to establish a well-connected and well-balanced network, including a tree planting strategy on streetscapes to improve overall walkability and its experience by citizens. By incrementally greening the city whilst re-establishing a healthy and functioning relationship between the built and natural environment, Riyadh can enhance and rebalance its fabric's ecological, social, and economic dimensions, providing a healthy and productive urban environment for its inhabitants. Efforts to restore ecological balance could help combat climate change and ensure a healthy environment for future generations. Initiatives like (Green Riyadh) and (the Sports Boulevard) are a good start.

10.6 Research Contribution

The theoretical framework for this study outlines a broader view of the existing and current research and debates on social, political, economic, cultural, and spatial aspects of gating and spatial fragmentation on an urban scale, framing, at the same time, disciplinary responses for overcoming this challenge. In drawing from different fields, including urban planning, architecture, geography, sociology, psychology, anthropology, ethnography, political economy, and philosophy, this framework provided a multi-disciplinary perspective of both historical and current scholarship on the phenomenon and is one of the contributions of the thesis.

The methodological approach adopted in this thesis is also one of its contributions. One cannot consider only physical characteristics when researching spatial phenomena in cities since spaces embody a social meaning as places. This thesis showed that the social dynamics are intrinsically related to the spatial organisation and form and the interpretation thereof by users of the urban space or specific places in cities. One of the difficulties of doing spatial research is that one cannot understand it only from a single dimension or perspective. This thesis showed that through a mix of methods, multiple perspectives on the issue of urban fragmentation were compiled, resulting in a more complete, embedded, and accurate understanding of the phenomenon.

The thesis also contributed to the urban planning and design fields in countries of the south. Moreover, it provided a new case study, giving new information about gated developments and urban fragmentation in a major saudi city and contributing to the scholarly knowledge on the subject. Finally, by looking at gated developments, the thesis contributed to incorporating new topics into the urban and social development agendas.

10.7 Concluding remarks

This study started with an awareness that what seemed to be an important and especially contemporary urban concept was recurrently used vaguely in different realms of the urban discourse. The study has investigated whether there is a relationship between different types of gated developments as a contributor to urban fragmentation and the socio-spatial composition of Saudi Arabian cities the case of Riyadh as an example - and, if so, what this relationship is and what impact it is having on the quality of life in their neighbouring communities. Increased fortification and privatisation undermine attempts towards greater

integration. The lack of which is physically expressed through various elements in the built environment and various controls. Fortress enclaves or gated developments, therefore, manifest new ways of subdividing cities and embody a new mechanism of segregation on a neighbourhood and city scale. The study has indicated that the impact differs according to different types of gated developments in different locations and that the implications of these developments also vary. Therefore, the study has pointed out the need for context and type-specific approaches to deal with the shorter- and longer-term impact of gated developments on urban residents and the implications for urban design, planning and governance in Saudi Arabia and abroad.

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Appendix A Experts Survey

The Socio-Economic Implications of the Urban Fabric of Saudi Cities Riyadh As A Case Study

Hello,

I would like to invite you to participate in a research project titled (Urban Continuity and Fragmentation of Major Cities in The Arab Stats of The Gulf: Riyadh As A Case Study). The aim of this research is to develop adequate responses to the resulting challenges of spatial fragmentation. by reaching a clear understanding of the concept of urban fragmentation and identify the urban policies and practices that contribute to its emergence in the Saudi context. This research is the basis for the PhD degree that I am undertaking at the University of Strathclyde, the United Kingdom.

This survey is part of the qualitative component of this research project, and aims to documents the opinions of academics, practitioners and decision makers in areas of architecture and urban planning and design. Your participation will be greatly appreciated. The survey is divided into two parts and all questions can be answered through a selection from multiple options. Its first part is composed of 14 key questions revolving around the main topic of research, while the second part of the survey consists of 6 questions about the participant's experience and scientific and professional background. Answering all questions will take around 10 to 14 minutes and can be completed in Arabic or English according to your preference.

Finally, to enrich the results of this research, please send the survey's link to those you know who are specialize in urban fields.

Please do not hesitate to contact me if you require any further information about the study or your involvement.

Kind Regards,

Mohammad Almahdi
PhD Candidate, Department of Architecture, University of Strathclyde
email. mohammad.almahdi@strath.ac.uk

* I would like to note that you might find it easier to answer the survey on a computer rather than a mobile phone to avoid any errors or visual discomfort.

Part 1 | About the city's urbanization and its challenges

Please choose the right answer from the available options

Please choose the city you live in

☐ Makkah ☐ Medina ☐ Riyadh ☐ Jeddah ☐ Dammam ☐ Other City

please enter your city

Many cities in the world today face multiple and overlapping challenges. Which of the following issues do you think is a challenge that your city is facing, and how would you asses their impact on the quality of the built environment for the city?

	Not Applicable	Minor Challenge	Major Challenge
The increasing growth rate of the population	☐	☐	☐
The rising pace of urbanization	☐	☐	☐
The proliferation of informal activities and residential areas	☐	☐	☐
The absence of public transport and reliance on private vehicles Until the publication of this survey, work on the public transport project in Riyadh is continuing but it is difficult to dismiss the impact of its absence over the past decades in shaping the city's built environment	☐	☐	☐
The concentration of the city's main services in the city center and its extended commercial arteries	☐	☐	☐
Lack of variety of housing options or its concentration in certain areas of the city	☐	☐	☐
The lack of a balanced mix of land-uses	☐	☐	☐
The absence of the human dimension in the design of the public domain	☐	☐	☐
The limitations of the municipality system and the urban decision-making process	☐	☐	☐
The phenomenon of undeveloped plots of land in urban areas "white lands"	☐	☐	☐
The Lack of a balanced distribution of population densities	☐	☐	☐
The Lack of a balanced distribution of public services and facilities	☐	☐	☐
Adopting and enacting planning and design standards that are unsuitable for the local community and environment	☐	☐	☐
The poor coordination between the different agencies dealing with urban issues	☐	☐	☐

Would you like to comment on your previous answers?

Which of your city's neighborhoods do you consider the best and which of them do you see is in need for significant improvement in terms of the quality of their built environment?

The neighborhood that I see is one of the best in my city (you can mention more than one neighborhood)

The neighborhood that I believe requires major improvement (you can mention more than one neighborhood)

Do you agree with the following definition of the concept of urban fragmentation?

Urban Fragmentation is a spatial phenomenon in cities whose urban fabric is characterized by limited access and the emergence of areas that are largely isolated from the rest of the city, and where there is no coherence at the level of the urban fabric.

☐ Agree ☐ Somewhat Agree ☐ Disagree

I disagree with the previous definition of urban fragmentation, and I suggest the following definition:

Based on your understanding of the concept of Urban Fragmentation, do you consider the concept applicable to Saudi cities in general and your city in particular?

☐ Applicable ☐ Somewhat Applicable ☐ Not Applicable

Would you like to comment on your answer

Do you think that the urban planning policies in Saudi cities generally and in your city, in particular, contribute to the creation of a fragmented built environment?

☐ Contribute ☐ Doesn't Contribute ☐ No Opinion

Please give an example of these policies here

Do you think that building regulations and requirements in Saudi cities generally and in your city, in particular, contribute to the creation of a fragmented built environment?

☐ Contribute ☐ Doesn't Contribute ☐ No Opinion

Please give an example of these regulations here

Do you think that the overuse of the following structural elements has an effect in creating a fragmented built environment?

Structural elements that define property ownership

☐ Big Effect ☐ No Effect

Structural elements that ensures privacy

☐ Big Effect ☐ No Effect

Structural elements that ensures security

☐ Big Effect ☐ No Effect

To what degree do you see the following urban development types contributing to the emergence of a fragmented built environment.

Big Shopping Centers (malls)

☐ Significant Effect ☐ Little Effect ☐ No Effect

Industrial zones (within city limits)

☐ Significant Effect ☐ Little Effect ☐ No Effect

Single-use business areas (headquarters of ministries, government departments, and companies)

☐ Significant Effect ☐ Little Effect ☐ No Effect

Gated Communities

☐ Significant Effect ☐ Little Effect ☐ No Effect

Large gated urban areas the coexistence of residential and business areas and their supporting facilities as one urban entity (university campuses, medical centers)

☐ Significant Effect ☐ Little Effect ☐ No Effect

Infrastructure elements that dived urban areas (Inner city highways, bridges and flood water streams)

☐ Significant Effect ☐ Little Effect ☐ No Effect

Are there any development types or patterns that you see contributing to a fragmented built environment and you would like to add? (optional)

In researching the social and economic effects of the built environment on the quality of life of the city's residents, how would you evaluate the impact of urban development types mentioned previously in question no. 14 on the quality of the following issues in of their nearby neighborhoods

1. **Big Shopping Centers (malls)**

2. Industrial zones (within city limits)
3. Single-use business areas (headquarters of ministries, government departments, and companies)
4. Gated Communities
5. Large gated urban areas the coexistence of residential and business areas and their supporting facilities as one urban entity (university campuses, medical centers)
6. Infrastructure elements that dived urban areas (Inner city highways, bridges and flood water streams)

Ease of access to and movement around the neighbourhood

☐ Significant Effect ☐ Little Effect ☐ No Effect

Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services

☐ Significant Effect ☐ Little Effect ☐ No Effect

The availability of parks, recreational spaces within the neighbourhood

☐ Significant Effect ☐ Little Effect ☐ No Effect

The availability of public facilities that meet the needs of neighbourhood residents

☐ Significant Effect ☐ Little Effect ☐ No Effect

The availability of commercial activities that meet the needs of neighbourhood residents

☐ Significant Effect ☐ Little Effect ☐ No Effect

The general character of the neighbourhood, which supports a sense of belonging

☐ Significant Effect ☐ Little Effect ☐ No Effect

The Sense of safety for neighborhood residents

☐ Significant Effect ☐ Little Effect ☐ No Effect

Level of care for the maintenance of neighborhood facilities

☐ Significant Effect ☐ Little Effect ☐ No Effect

When evaluating any plan to develop a new urban area, how would you evaluate the following criteria

First, Functional Dimension

The urban area is multi-functional, with residences and retail, as well as businesses, green spaces for recreation, and public services/buildings. The area has a denser center with focal activities, within walking distance of most dwellings. The area's public spaces include small parks, squares and plazas that are also easily accessible by foot.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

The urban area is mono-functional, either residential, commercial or business-oriented ("office center"), and other urban activities are easily accessible by car. With a uniform building density. A large park, easily accessible by car service the area.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

You can add the design guideline you see fit in the following space

Second, Social Dimension

The urban area's supply of housing types, and prices, accommodates a diverse community from all age and socio-economic groups. The area also has central cultural places - such as public libraries, art galleries, museums and movie theatres. With places that sustain high levels of activity at different times of the day helps ensure a better sense of safety and security.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

The supply of housing types, and prices in the urban area caters to either those of high-income or those with limited income. A modern shopping mall constitutes the community's social focus and meeting place. Cultural places - such as public libraries, art galleries, museums and movie theatres are easily accessible by car. Safety and security are ensured by means of specialized security systems (human and/or technological).

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

You can add the design guideline you see fit in the following space

Third, Morphological Dimension

The urban area has a street system that is a grid-like network of interconnected streets, allowing alternative routes between places. Buildings in the area are organised into blocks of relatively small dimensions, shaping streets and squares, and promoting spatial enclosure. The architecture of new buildings respects local tradition.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

The street system is hierarchical, which allows for buildings to be organised into "super-blocks" with internal service roads, surrounded by the main collector road that channels the main fluxes of traffic. Public space is the open space around buildings. The architecture of new buildings contrasts stylistically with the traditional architecture of old buildings.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

You can add the design guideline you see fit in the following space

Fourth, Temporal (Evolutional) Dimension

The design of the new urban area integrates previously existing structures with newer ones. Buildings are robust and have charm and character enough to justify their prolonged preservation and can be adapted to accommodate diverse uses in the future.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

The urban project proposes a comprehensive replacement of all previous structures and former uses. The architecture of buildings is "generic", or relatively ordinary and unremarkable, facilitating their replacement in the short/medium term by other, more modern buildings.

☐ Agree ☐ Somewhat Agree ☐ Disagree ☐ No Opinion

You can add the design guideline you see fit in the following space

Part 2 | Basic information about the participant

Please choose the right answer from the available options

What is your area of expertise?

☐ Architect ☐ Landscape Architect ☐ Urban Planner
☐ Urbanist ☐ Realtor ☐ Other (please specify)

What sector do you work in?

☐ Academic ☐ Public Sector Employee ☐ Private Sector Employee
☐ Business-man/woman ☐ Retired ☐ student
☐ Other (Please Specify)

What is the highest educational qualification you have received?

☐ Diploma and below ☐ Bachelor's degree ☐ Master ☐ Doctorate

Please indicate where you received your educational qualifications. You may tick more than one box.

☐ Saudi Arabia ☐ Middle East and North Africa ☐ Europe ☐ USA or Canada
☐ Other (Please Specify)

How many years of experience do you have?

☐ 1 - 5 years ☐ 6 - 10 years ☐ 11 - 15 years ☐ 16 years or over
☐ No experience

Place of work (optional)

Thank you for your participation,

to enrich the results of this research, please send the survey's link to those you know who are specialize in urban fields

https://stratheng.eu.qualtrics.com/jfe/form/SV_cYKco0yDwl9mjk1?Q

Appendix B Residents Survey

The Socio-Economic Implications of the Urban Fabric of Saudi Cities Riyadh As A Case Study

Hello,

This survey is part of a PhD research investigating the social and economic Implications of urban design policies and practices. It intends to explore your views and experiences through questions about your residential preferences and your evaluation of a range of issues about your neighborhood.

This study is part of a PhD research at the University of Strathclyde, Department of Architecture. The results of this study will contribute to my dissertation, in partial fulfilment of a doctorate degree. Your participation is voluntary. All the information you provide will remain confidential and will be used anonymously and for the purpose of this research only. Any interested person aged 18 or above in the household is welcome to participate in this study by completing this questionnaire, and one survey per household will be sufficient.

Thank you for your participation,

Mohammad Almahdi
PhD Candidate, Department of Architecture, University of Strathclyde
email. mohammad.almahdi@strath.ac.uk

* I would like to note that you might find it easier to answer the questionnaire on a computer rather than a mobile phone to avoid any errors or visual discomfort.

Part One | Background Information

First, we would like to ask you some questions about yourself.

Please select the appropriate answer

1. Name of the neighborhood (area) where you live

(dropdown list)

2. What is your gender?

☐ Female ☐ Male

3. Which of the following best describes your age?

☐ 24 or under ☐ 25 – 34 ☐ 35 – 44

☐ 45 – 59 ☐ 60 - 74 ☐ 75 or over

4. What is your nationality?

☐ Saudi ☐ non-Saudi

(please specify) _____

5. What is your monthly income? in Saudi Riyal

☐ under 3000 SR ☐ 3000 - 5000 SR

☐ 5001-10000 SR ☐ 10001 - 15000 SR

☐ over 15000 SR

6. What is your employment status?

☐ public sector employee ☐ homemaker

☐ private sector employee ☐ retired

☐ businessman / businesswoman ☐ student

☐ unemployed ☐ other

(please specify) _____

7. Name of the neighborhood (area) where you work or study (dropdown list)

8. Does your household employ a private driver?

☐ we employ a full-time private driver

☐ we rely on personal means of transportation

☐ other (please specify) _____

9. Other than you, how many people live with you in your current residence?

☐ I live Alone

☐ 1 ☐ 2 ☐ 3

☐ 4 ☐ 5 ☐ 6 or more

10. Name of the neighborhood (area) where other members of the household work or study

(dropdown list)

Part Two | Residential History and Preferences

In this part, we would like to ask you about your current and previous residential choices and experiences.

Please tick (✓) one box in answering the questions of this part

11. What type of accommodation did you live in before moving to your current residence?

☐ Villa (not in a compound) ☐ Villa (in a compound)
☐ Apartment (in a single standalone building) ☐ Apartment (part of a larger development)
☐ Other (please specify) ...

12. How long did you live there?

☐ 2 Years or less ☐ Over 2 years but less than 5 years ☐ 5 Years or more

13. What type of accommodation do you live in now?

☐ Villa (not in a compound) ☐ Villa (in a compound)
☐ Apartment (in a single standalone building) ☐ Apartment (part of a larger development)
☐ Other (please specify) ...

14. How long have you lived at your current residence?

☐ 2 years or less ☐ over 2 years but less than 5 years ☐ 5 years or more

15. In which way do you occupy your current residence?

☐ Own ☐ Provided by the employer ☐ Rent
☐ Other (please specify) ...

16. What were the most important reasons you chose your current residence for? Please select all that apply

☐ Close to my workplace or university ☐ Safety from property crimes
☐ Good schools for my kids ☐ Well-designed neighborhood
☐ Close to friends or relatives ☐ Great property value or rent
☐ Close to markets and shopping destinations ☐ Provided by the employer
☐ Close to leisure activities ☐ Good interior design
☐ Other public services ☐ Other (please specify) ...

17. How does your current residence compare to where you lived before?

☐ Better ☐ Worse ☐ No Difference
(please explain) ...

18. If you want to move out, to what type of housing do you plan to move?

☐ My current residence is great, and I don't want to move out now (go to question 20)
☐ Villa (not in a compound) ☐ Villa (in a compound)
☐ Apartment (in a single standalone building) ☐ Apartment (part of a larger development)
☐ Other (please specify) ...

19. What are the things you would look for in your new neighborhood?

☐ Close to my workplace or university
☐ Good schools for my kids
☐ Close to friends or relatives
☐ Close to markets and shopping destinations
☐ Close to leisure activities
☐ Other (please specify) ...
☐ Safety from property crimes
☐ Well-designed neighborhood
☐ Great property value or rent
☐ more space
☐ Other public services

20. Is your current residence located in close proximity to any of the following

Educational Campuses (universities, institutes, schools)	☐ yes	☐ no	☐ don't know
Office Buildings (ministries and government departments, companies, office parks)	☐ yes	☐ no	☐ don't know
Gated Communities (residential compound)	☐ yes	☐ no	☐ don't know
Hospitals or Medical Cities	☐ yes	☐ no	☐ don't know
Malls / Shopping Centers	☐ yes	☐ no	☐ don't know

21. Does the location of your current residence affect the quality of .....

Your daily commute to work?	☐ Positive affect (please explain) ...	☐ Negative affect	☐ No affect
Your commute to meet family or personal obligations?	☐ Positive affect (please explain) ...	☐ Negative affect	☐ No affect
The ability of services or people to reach you?	☐ Positive affect (please explain) ...	☐ Negative affect	☐ No affect

22. Have you lived in a gated community before? (if NO go to question 24)

☐ Yes ☐ No

23. How would you evaluate the experience of living in a gated community?

☐ Good experience (Please explain) ...
☐ Bad experience

Part Three | Place Standard

In this part, based on your experience we would like you to evaluate the following aspect of your current neighborhood.

Please rate the place on a scale from 1 to 5, where 1 indicates your dissatisfaction and that there is a lot of room for improvement and 7 indicates your complete satisfaction with the neighborhood and that there is very little room for improvement. Each question is followed by two sets of positive and negative options that are there to help you justify your evaluation. Alternatively, you can type in your justification in the appropriate box.

---

24. Do buildings, streets and public spaces create an attractive place that is easy to get around?

|1 2 3 4 5|

lot of room for improvement

1. The neighborhood entrances and exits are limited and unclear
2. Some of the neighborhood streets remain unpaved
3. Sidewalks are either absence, not connected or vary in height making them unsuitable for use
4. The neighborhood streets are narrow and parking availability is insufficient, causing congestion
5. encroachments on public property and open spaces are common
6. The neighborhood suffers from clashes in design styles and colors and poorly designed building extensions.

very little room for improvement

1. The neighborhood has clear and multiple entrances and exits
2. The neighborhood streets are well paved
3. The neighborhood has continuous sidewalks appropriate for walking
4. There are enough parking spaces for all residents
5. There are well designed open spaces and seating areas between buildings
6. There is harmony in the design of the neighborhood buildings and of the population density

(please specify the reason of your assessment) ...

---

25. Do the neighborhood traffic and parking arrangements allow people to move around safely and meet the community's needs and the utilization of delivery and ride-hailing services (taxis, Uber, Careem?

|1 2 3 4 5|

lot of room for improvement

1. The neighborhood entrances and exits are limited and unclear
2. Neighborhood intersections lack appropriate traffic signs
3. The neighborhood is full of improvised speed bumps
4. Sidewalks are either absence, not connected or vary in height making them unsuitable for use
5. The neighborhood streets are narrow and parking availability is insufficient, causing congestion
6. Home delivery and taxi service providers have reservations on servicing the neighborhood
7. The neighborhood is closed and access to it is restricted
8. It is difficult to move around the neighborhood, building numbers and street names are not visible
9. The neighborhood streets are very narrow and don't allow for parking or loading and unloading

very little room for improvement

1. The neighborhood has clear and multiple entrances and exits
2. Neighborhood intersections have the appropriate traffic signs
3. The neighborhood streets are well paved
4. The neighborhood has continuous sidewalks appropriate for walking
5. There are enough parking spaces for all residents
6. Home delivery and taxi service providers have no reservations in servicing the neighborhood
7. The neighborhood is open and there are no restrictions on access
8. The neighborhood's buildings are clearly numbered, and street names are visible
9. Streets' widths allow for parking, and for loading and unloading

(please specify the reason of your assessment) ...

---

26. Can you access a range of spaces with opportunities for play and recreation?

|1 2 3 4 5|

lot of room for improvement

1. There are no parks in the neighborhood
2. The neighborhood lacks areas suitable for sport activities
3. Neighborhood parks lack playground for children or aren't family friendly
4. There are no areas in the neighborhood suitable for any kind of social gathering
5. The neighborhood lacks any kind of landscaping or greenery
6. The inability to reach the local parks without driving because they are either too far away or walking conditions are poor
7. The number of parks exceeds the needs of the neighborhood, and they are frequented by other neighborhood residents creating congestion

very little room for improvement

1. There is a large park or several small parks
2. There are areas suitable for sport activities
3. Neighborhood parks have playground for children and family friendly
4. There are areas in the neighborhood suitable for Eid prayer or other social gatherings
5. There are well designed open spaces and seating areas between buildings
6. The neighborhood park is accessible on foot without driving
7. The number of parks in the neighborhood is proportional to its population

(please specify the reason of your assessment) ...

---

27. Do facilities and amenities meet your needs?

|1 | 2 | 3 | 4 | 5|

lot of room for improvement

1. The neighborhood lacks the adequate number of public schools
2. The neighborhood suffers from inadequate electricity services
3. The neighborhood suffers from inadequate water supply
4. The neighborhood isn't connected to the city's sewage network or the connection is incomplete
5. The neighborhood isn't connected to landline or high-speed internet services
6. The neighborhood lacks the adequate number of waste bins or waste isn't collected regularly
7. The number and distribution of facilities and services isn't in proportionate with the neighborhood's population
8. The number of facilities exceeds the needs of the neighborhood, so they are frequented by other neighborhood residents creating congestion

very little room for improvement

1. The neighborhood is serviced by adequate number of public schools for boys and girls of all levels
2. The neighborhood has adequate electricity services
3. The neighborhood has adequate water supply
4. The neighborhood is connected to the city's sewage network
5. The neighborhood is connected to landline or high-speed internet services
6. The neighborhood has an adequate number of waste bins
7. The number and distribution of facilities and services are proportionate with the neighborhood's population

(please specify the reason of your assessment) ...

---

28. Is there an active local economy and the opportunity to access good-quality work?

|1 | 2 | 3 | 4 | 5|

lot of room for improvement

1. The neighborhood Lacks basic commercial activities
2. The distribution of commercial activities is very poor so there is excess in activities and a scarcity of other

very little room for improvement

1. The neighborhood has a great commercial street or area
2. The business available in the neighborhood are diverse and meet the needs of the residents

(please specify the reason of your assessment) ...

---

29. Does this place have a positive identity, and do you feel you belong?

|1 | 2 | 3 | 4 | 5|

lot of room for improvement

1. There are no community leaders in the neighborhood that support community members
2. There is a lack of harmony between the neighborhood residents and many problems among neighbors remain unresolved
3. There aren't any regular meetings between neighborhood residents
4. The neighborhood mosque has no role in improving community ties or sense of belonging
5. There aren't any community centers in the neighborhood

very little room for improvement

1. The neighborhood has active community leaders that support community members
2. Residents of the neighborhood are in harmony, and there is a mechanism to resolve any differences that might occur among them
3. There are regular meetings for neighborhood residents that improve community ties
4. The neighborhood mosque plays a big role in improving community ties and sense of belonging
5. There are community centers in the neighborhood for both men and women that supports various social activities

(please specify the reason of your assessment) ...

---

30. Do you feel safe here?

|1 | 2 | 3 | 4 | 5|

lot of room for improvement

1. There are no community leaders in the neighborhood that support community members
2. There is a lack of harmony between the neighborhood residents and many problems among neighbors remain unresolved
3. The neighborhood suffers from inadequate access to security police or civil-defense services
4. Home robberies or car break-ins occur every now and then
5. Children aren't safe playing outside the house in this neighborhood
6. Neighborhood streets are poorly lit and don't feel safe at night
7. Streets are narrow and there is several dead-end alleys or suspicious areas in the neighborhood

very little room for improvement

1. The neighborhood has active community leaders that support community members
2. Residents of the neighborhood are in harmony, and there is a mechanism to resolve any differences that might occur among them
3. The neighborhood has access to good and responsiveness of security police or civil-defense services
4. The neighborhood is safe and Home robberies or car break-ins are scarce
5. Children are safe playing outside the house in this neighborhood
6. Neighborhood streets are well lit at night and feel safe
7. Streets are wide and there are no dead-end alleys or suspicious areas in the neighborhood

(please specify the reason of your assessment) ...

31. Are buildings and spaces well cared for?

1	2	3	4	5

lot of room for improvement

1. The neighborhood streets and sidewalks are in bad condition and are poorly maintained
2. encroachments on public property and open spaces are common
3. Park trees and green spaces are neglected and poorly cared for
4. Playgrounds and park furniture are neglected and poorly maintained
5. Abandoned or damaged vehicles are Widespread in the neighborhood and rarely removed
6. Waste collection is poor, and rodents are widespread in the neighborhood

very little room for improvement

1. The neighborhood streets and sidewalks of are in good condition and are regularly maintained
2. There are no encroachments on public property and open spaces, and they are immediately dealt with if they occur
3. Park trees and green spaces are regularly irrigated and cared for
4. Playgrounds and park furniture are regularly maintained
5. There are no abandoned or damaged vehicles in the neighborhood, or they are removed immediately
6. Waste is collected regularly, and pest control teams operate often

(please specify the reason of your assessment) ...

Thank you for your participation, please tell us how easy you found answering the survey questions

☐ Easy ☐ Difficult ☐ Extremely Difficult

Thank You,

Appendix C City challenges and factors that impact quality of life

Adopting and enacting planning and design standards that are unsuitable for the local community and environment is a …			
The availability of commercial activities that meet the needs of neighbourhood residents has ...	**Major Challenge**	**Minor Challenge**	**Not Applicable**
Significant Effect	66%	25%	9%
Little Effect	54%	38%	8%
No Effect	33%	33%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	60%	36%	4%
Little Effect	68%	22%	11%
No Effect	0%	33%	67%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	67%	28%	5%
Little Effect	50%	33%	17%
No Effect	0%	33%	67%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	67%	24%	9%
Little Effect	48%	38%	14%
No Effect	50%	50%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	63%	28%	8%
Little Effect	62%	33%	5%
No Effect	25%	25%	50%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	68%	24%	8%
Little Effect	53%	41%	6%
No Effect	17%	50%	33%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	74%	17%	9%
Little Effect	38%	52%	10%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	67%	22%	11%
Little Effect	52%	41%	7%
No Effect	33%	67%	0%
Lack of variety of housing options or its concentration in certain areas of the city is a …			
The availability of commercial activities that meet the needs of neighbourhood residents has ...	**Major Challenge**	**Minor Challenge**	**Not Applicable**
Significant Effect	61%	27%	13%
Little Effect	46%	42%	12%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	56%	29%	16%
Little Effect	57%	35%	8%
No Effect	33%	67%	0%
Ease of access to and movement around the neighbourhood has ...			

Significant Effect	58%	30%	13%
Little Effect	50%	39%	11%
No Effect	33%	67%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	55%	31%	14%
Little Effect	57%	38%	5%
No Effect	50%	33%	17%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	58%	30%	12%
Little Effect	48%	38%	14%
No Effect	50%	50%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	58%	31%	11%
Little Effect	47%	41%	12%
No Effect	50%	33%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	58%	28%	13%
Little Effect	48%	41%	10%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	64%	25%	11%
Little Effect	41%	48%	11%
No Effect	33%	33%	33%

The absence of public transport and reliance on private vehicles is a …			
The availability of commercial activities that meet the needs of neighbourhood residents has ...	**Major Challenge**	**Minor Challenge**	**Not Applicable**
Significant Effect	79%	16%	5%
Little Effect	85%	15%	0%
No Effect	0%	100%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	78%	20%	2%
Little Effect	81%	14%	5%
No Effect	33%	67%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	81%	16%	3%
Little Effect	72%	22%	6%
No Effect	33%	67%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	81%	14%	5%
Little Effect	67%	33%	0%
No Effect	83%	17%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	82%	13%	5%
Little Effect	71%	29%	0%
No Effect	50%	50%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	77%	19%	3%

Little Effect	82%	12%	6%
No Effect	67%	33%	0%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	81%	15%	4%
Little Effect	76%	21%	3%
No Effect	33%	67%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	82%	13%	5%
Little Effect	70%	30%	0%
No Effect	67%	33%	0%

The absence of the human dimension in the design of the public domain is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	82%	13%	5%
Little Effect	54%	38%	8%
No Effect	33%	33%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	73%	20%	7%
Little Effect	76%	22%	3%
No Effect	0%	33%	67%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	77%	19%	5%
Little Effect	67%	28%	6%
No Effect	0%	33%	67%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	81%	16%	3%
Little Effect	48%	33%	19%
No Effect	67%	33%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	80%	17%	3%
Little Effect	57%	33%	10%
No Effect	25%	25%	50%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	79%	15%	6%
Little Effect	59%	41%	0%
No Effect	33%	33%	33%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	81%	13%	6%
Little Effect	59%	31%	10%
No Effect	33%	67%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	76%	18%	5%
Little Effect	63%	26%	11%
No Effect	67%	33%	0%

The concentration of the city's main services in the city center and its extended commercial arteries is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	54%	39%	7%
Little Effect	31%	65%	4%
No Effect	0%	100%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	56%	36%	9%
Little Effect	35%	62%	3%
No Effect	0%	100%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	52%	44%	5%
Little Effect	28%	61%	11%
No Effect	0%	100%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	53%	41%	5%
Little Effect	29%	67%	5%
No Effect	17%	67%	17%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	55%	38%	7%
Little Effect	24%	76%	0%
No Effect	0%	75%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	55%	39%	6%
Little Effect	24%	76%	0%
No Effect	0%	83%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	57%	38%	6%
Little Effect	24%	69%	7%
No Effect	33%	67%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	53%	42%	5%
Little Effect	33%	59%	7%
No Effect	0%	100%	0%
The increasing growth rate of the population is a …			
The availability of commercial activities that meet the needs of neighbourhood residents has ...	**Major Challenge**	**Minor Challenge**	**Not Applicable**
Significant Effect	89%	9%	2%
Little Effect	69%	31%	0%
No Effect	67%	0%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	91%	9%	0%
Little Effect	76%	22%	3%
No Effect	33%	33%	33%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	86%	14%	0%
Little Effect	78%	17%	6%
No Effect	33%	33%	33%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	86%	12%	2%

Little Effect	71%	29%	0%
No Effect	83%	0%	17%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	85%	13%	2%
Little Effect	81%	19%	0%
No Effect	50%	25%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	87%	11%	2%
Little Effect	71%	29%	0%
No Effect	67%	17%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	83%	15%	2%
Little Effect	83%	17%	0%
No Effect	67%	0%	33%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	89%	9%	2%
Little Effect	70%	30%	0%
No Effect	67%	0%	33%

The lack of a balanced distribution of population densities is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	57%	38%	5%
Little Effect	42%	46%	12%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	49%	44%	7%
Little Effect	59%	35%	5%
No Effect	0%	67%	33%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	56%	38%	6%
Little Effect	44%	50%	6%
No Effect	0%	67%	33%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	59%	34%	7%
Little Effect	43%	52%	5%
No Effect	17%	67%	17%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	53%	38%	8%
Little Effect	57%	43%	0%
No Effect	0%	75%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	56%	37%	6%
Little Effect	41%	53%	6%
No Effect	33%	50%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	57%	36%	8%
Little Effect	41%	52%	7%
No Effect	67%	33%	0%

The Sense of safety for neighbourhood residents has ...			
Significant Effect	60%	33%	7%
Little Effect	37%	56%	7%
No Effect	33%	67%	0%

The lack of a balanced distribution of public services and facilities is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	64%	30%	5%
Little Effect	42%	54%	4%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	60%	33%	7%
Little Effect	57%	41%	3%
No Effect	0%	100%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	61%	34%	5%
Little Effect	50%	44%	6%
No Effect	0%	100%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	64%	31%	5%
Little Effect	43%	52%	5%
No Effect	33%	67%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	57%	38%	5%
Little Effect	67%	29%	5%
No Effect	0%	100%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	65%	32%	3%
Little Effect	41%	47%	12%
No Effect	17%	83%	0%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	70%	26%	4%
Little Effect	31%	62%	7%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	60%	36%	4%
Little Effect	52%	41%	7%
No Effect	33%	67%	0%

The lack of a balanced mix of land-uses is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	55%	41%	4%
Little Effect	46%	50%	4%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	53%	40%	7%
Little Effect	54%	46%	0%
No Effect	0%	100%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	56%	39%	5%

Little Effect	44%	56%	0%
No Effect	0%	100%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	59%	36%	5%
Little Effect	38%	62%	0%
No Effect	33%	67%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	55%	42%	3%
Little Effect	48%	48%	5%
No Effect	25%	75%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	56%	39%	5%
Little Effect	35%	65%	0%
No Effect	50%	50%	0%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	62%	36%	2%
Little Effect	31%	62%	7%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	53%	44%	4%
Little Effect	52%	44%	4%
No Effect	33%	67%	0%

The limitations of the municipality system and the urban decision-making process is a ...

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	73%	25%	2%
Little Effect	73%	23%	4%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	71%	24%	4%
Little Effect	76%	24%	0%
No Effect	33%	67%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	75%	22%	3%
Little Effect	67%	33%	0%
No Effect	33%	67%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	72%	24%	3%
Little Effect	67%	33%	0%
No Effect	83%	17%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	70%	28%	2%
Little Effect	81%	14%	5%
No Effect	50%	50%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	74%	24%	2%
Little Effect	71%	29%	0%
No Effect	50%	33%	17%

The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	75%	21%	4%
Little Effect	66%	34%	0%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	71%	25%	4%
Little Effect	78%	22%	0%
No Effect	33%	67%	0%

The phenomenon of undeveloped plots of land in urban areas "white lands" is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	71%	23%	5%
Little Effect	54%	38%	8%
No Effect	33%	67%	0%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	69%	24%	7%
Little Effect	62%	32%	5%
No Effect	33%	67%	0%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	69%	27%	5%
Little Effect	56%	33%	11%
No Effect	33%	67%	0%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	67%	26%	7%
Little Effect	62%	33%	5%
No Effect	50%	50%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	65%	28%	7%
Little Effect	71%	24%	5%
No Effect	25%	75%	0%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	68%	26%	6%
Little Effect	65%	29%	6%
No Effect	33%	67%	0%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	70%	26%	4%
Little Effect	55%	34%	10%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	73%	24%	4%
Little Effect	48%	41%	11%
No Effect	67%	33%	0%

The poor coordination between the different agencies dealing with urban issues is a …

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	82%	16%	2%
Little Effect	54%	42%	4%
No Effect	33%	33%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			

Significant Effect	78%	20%	2%
Little Effect	70%	27%	3%
No Effect	0%	67%	33%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	78%	19%	3%
Little Effect	61%	39%	0%
No Effect	0%	67%	33%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	79%	17%	3%
Little Effect	57%	38%	5%
No Effect	50%	50%	0%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	77%	20%	3%
Little Effect	67%	33%	0%
No Effect	25%	50%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	82%	16%	2%
Little Effect	47%	47%	6%
No Effect	33%	50%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	85%	13%	2%
Little Effect	48%	45%	7%
No Effect	67%	33%	0%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	78%	18%	4%
Little Effect	63%	33%	4%
No Effect	33%	67%	0%

The proliferation of informal activities and residential areas is a …			
The availability of commercial activities that meet the needs of neighbourhood residents has ...	**Major Challenge**	**Minor Challenge**	**Not Applicable**
Significant Effect	41%	29%	30%
Little Effect	23%	54%	23%
No Effect	33%	33%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	44%	29%	27%
Little Effect	24%	46%	30%
No Effect	33%	33%	33%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	38%	36%	27%
Little Effect	28%	39%	33%
No Effect	33%	33%	33%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	29%	40%	31%
Little Effect	52%	38%	10%
No Effect	33%	0%	67%
The availability of parks, recreational spaces within the neighbourhood has ...			

Significant Effect	40%	30%	30%
Little Effect	19%	57%	24%
No Effect	50%	25%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	39%	32%	29%
Little Effect	24%	53%	24%
No Effect	33%	33%	33%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	38%	32%	30%
Little Effect	31%	48%	21%
No Effect	33%	0%	67%
The Sense of safety for neighbourhood residents has ...			
Significant Effect	35%	36%	29%
Little Effect	37%	41%	22%
No Effect	33%	0%	67%

The rising pace of urbanization is a ...

The availability of commercial activities that meet the needs of neighbourhood residents has ...	Major Challenge	Minor Challenge	Not Applicable
Significant Effect	86%	13%	2%
Little Effect	69%	31%	0%
No Effect	67%	0%	33%
Access to multiple transportation options (Taxi, Careem, Uber) as well as home delivery services has ...			
Significant Effect	84%	16%	0%
Little Effect	78%	19%	3%
No Effect	33%	33%	33%
Ease of access to and movement around the neighbourhood has ...			
Significant Effect	81%	19%	0%
Little Effect	83%	11%	6%
No Effect	33%	33%	33%
Level of care for the maintenance of neighbourhood facilities has ...			
Significant Effect	81%	17%	2%
Little Effect	81%	19%	0%
No Effect	67%	17%	17%
The availability of parks, recreational spaces within the neighbourhood has ...			
Significant Effect	83%	15%	2%
Little Effect	76%	24%	0%
No Effect	50%	25%	25%
The availability of public facilities that meet the needs of neighbourhood residents has ...			
Significant Effect	81%	18%	2%
Little Effect	82%	18%	0%
No Effect	67%	17%	17%
The general character of the neighbourhood, which supports a sense of belonging has ...			
Significant Effect	83%	15%	2%
Little Effect	76%	24%	0%
No Effect	67%	0%	33%
The Sense of safety for neighbourhood residents has ...			

Significant Effect	84%	15%	2%
Little Effect	74%	26%	0%
No Effect	67%	0%	33%

Appendix D Quality of Life Breakdown

The following table shows the percentage of respondents who are satisfied / unsatisfied elements of the built environment and provision of urban services and facilities.

Quality of Life Theme	Reason	Satisfied	Unsatisfied
Do buildings, streets and public spaces create an attractive place that is easy to get around?	The neighbourhood has clear and multiple entrances and exits	72%	28%
	The neighbourhood streets are well paved	55%	45%
	The neighbourhood has continuous sidewalks appropriate for walking	25%	75%
	There are enough parking spaces for all residents	46%	54%
	There are well designed open spaces and seating areas between buildings	17%	83%
	There is harmony in the design of the neighbourhood buildings and of the population density	39%	61%
Do the neighbourhood traffic and parking arrangements allow people to move around safely and meet the community's needs and the utilization of delivery and ride-hailing services (taxis, Uber, Careem)?	The neighbourhood has clear and multiple entrances and exits	70%	30%
	Neighbourhood intersections have the appropriate traffic signs	39%	61%
	The neighbourhood streets are well paved	49%	51%
	The neighbourhood has continuous sidewalks appropriate for walking	24%	76%
	There are enough parking spaces for all residents	42%	58%
	Home delivery and taxi service providers have no reservations in servicing the neighbourhood	72%	28%
	The neighbourhood is open and there are no restrictions on access	73%	27%
	The neighbourhood buildings are clearly numbered, and street names are visible	62%	38%
	Street widths allow for parking, and for loading and unloading	64%	36%
Can you access a range of spaces with opportunities for play and recreation?	There is a large park or several small parks	40%	60%
	There are areas suitable for sport activities	26%	74%
	Neighbourhood parks have playground for children and family friendly	38%	62%
	There are areas in the neighbourhood suitable for Eid prayer or other social gatherings	43%	57%
	There are well designed open spaces and seating areas between buildings	13%	87%
	The neighbourhood park is accessible on foot without driving	28%	72%
	The number of parks in the neighbourhood is proportional to its population	17%	83%

Do facilities and amenities meet your needs?	The neighbourhood is serviced by adequate number of public schools for boys and girls of all levels	56%	44%
	The neighbourhood has adequate electricity services	97%	3%
	The neighbourhood has adequate water supply	89%	11%
	The neighbourhood is connected to the city's sewage network	83%	17%
	The neighbourhood is connected to landline or high-speed internet services	73%	27%
	The neighbourhood has an adequate number of waste bins	67%	33%
	The number and distribution of facilities and services are proportionate with the neighbourhood's population	48%	52%
	The number of facilities exceeds the needs of the neighbourhood, so they are frequented by other neighbourhood residents creating congestion	42%	58%
Is there an active local economy and the opportunity to access good-quality work?	The neighbourhood has a great commercial street or area	77%	23%
	The business available in the neighbourhood are diverse and meet the needs of the residents	69%	31%
Does this place have a positive identity, and do you feel you belong?	The neighbourhood has active community leaders that support community members	10%	90%
	Residents of the neighbourhood are in harmony, and there is a mechanism to resolve any differences that might occur among them	42%	58%
	There are regular meetings for neighbourhood residents that improve community ties	26%	74%
	The neighbourhood mosque plays a big role in improving community ties and sense of belonging	49%	51%
	There are community centers in the neighbourhood for both men and women that supports various social activities	11%	89%
Do you feel safe here?	The neighbourhood has active community leaders that support community members	12%	88%
	Residents of the neighbourhood are in harmony, and there is a mechanism to resolve any differences that might occur among them	41%	59%
	The neighbourhood has access to good and responsiveness of security police or civil-defense services	73%	27%
	The neighbourhood is safe and Home robberies or car break-ins are scarce	73%	27%
	Children are safe playing outside the house in this neighbourhood	47%	53%
	Neighbourhood streets are well lit at night and feel safe	68%	32%

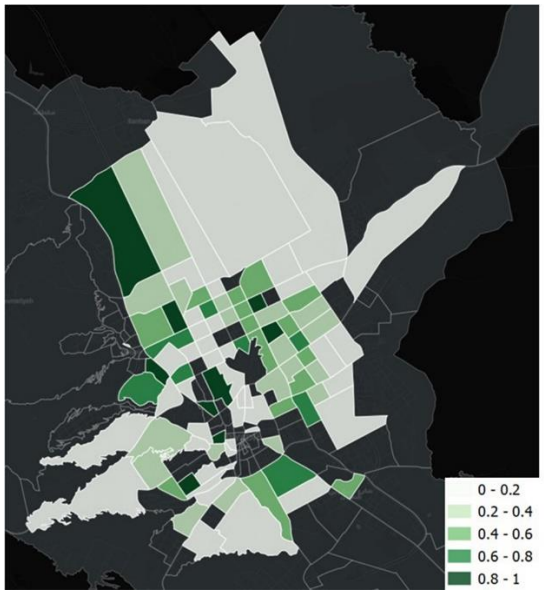
	Streets are wide and there are no dead-end alleys or suspicious areas in the neighbourhood	70%	30%
Are buildings and spaces well cared for?	The neighbourhood streets and sidewalks of are in good condition and are regularly maintained	37%	63%
	There are no encroachments on public property and open spaces, and they are immediately dealt with if they occur	62%	38%
	Park trees and green spaces are regularly irrigated and cared for	35%	65%
	Playgrounds and park furniture are regularly maintained	31%	69%
	There are no abandoned or damaged vehicles in the neighbourhood, or they are removed immediately	50%	50%
	Waste is collected regularly, and pest control teams operate often	56%	44%

Appendix E Quality of Life Indicators by Neighbourhood

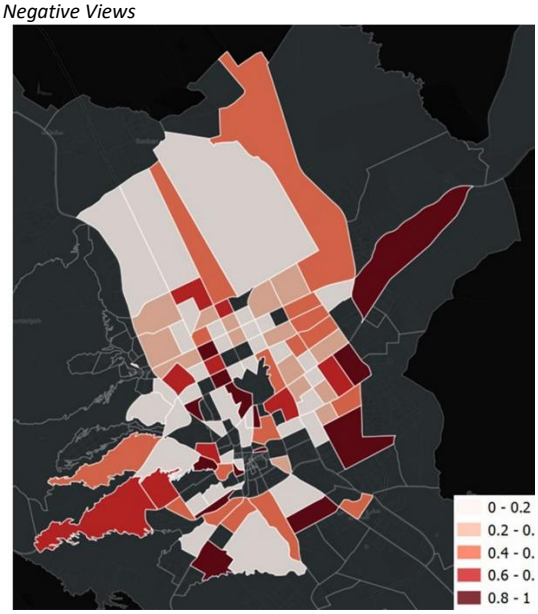
The following charts shows the percentage of respondent's expressing positive (4 or 5) and negative views (1 or 2) across the 8 quality of life indicators.

E.1: Quality of Life Evaluation - Traffic, Transport & Parking

Positive views

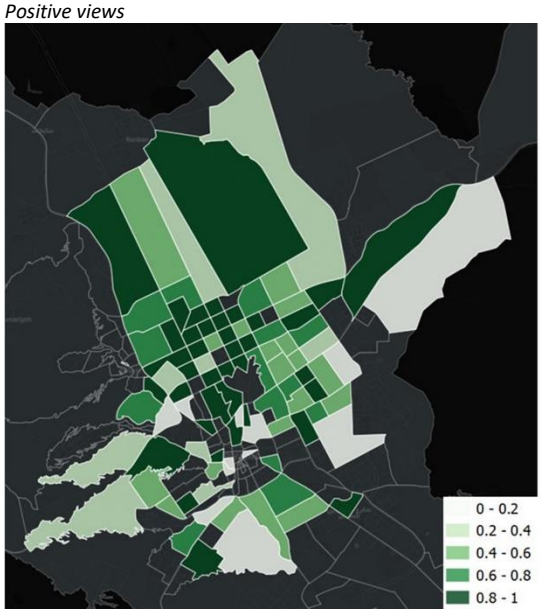


Negative Views

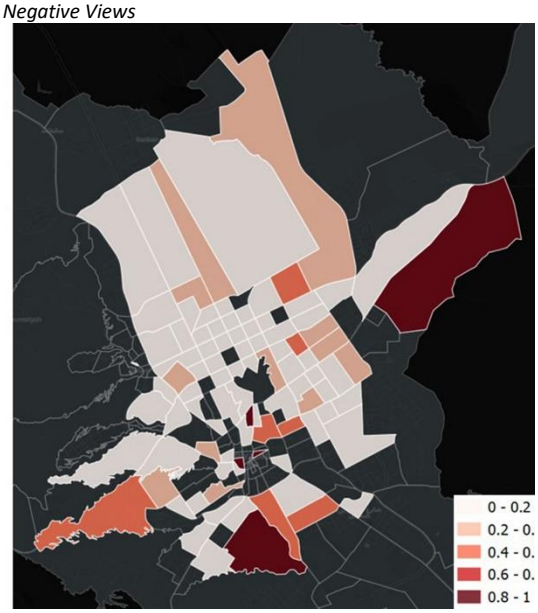


E.2: Quality of Life Evaluation - Safety & Crime

Positive views

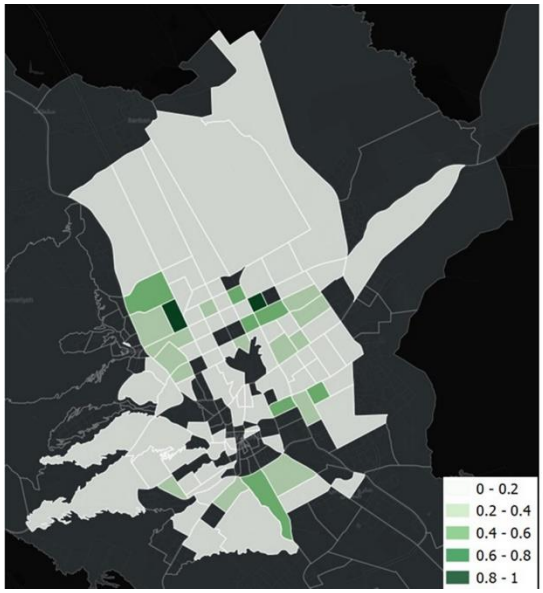


Negative Views

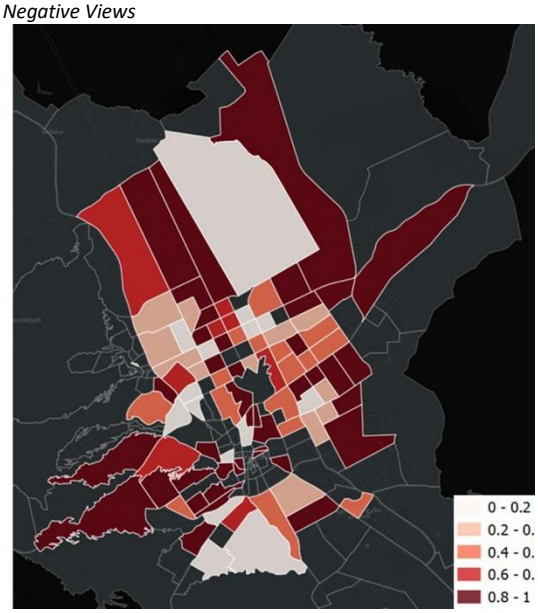


E.3: Quality of Life Evaluation - Spaces for Play & Recreation

Positive views

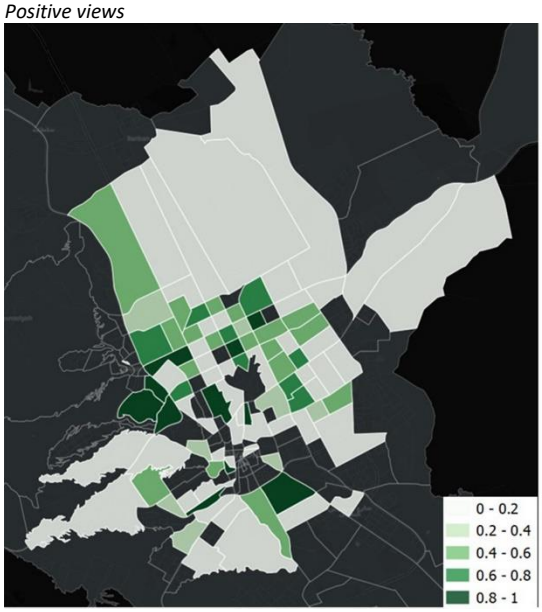


Negative Views

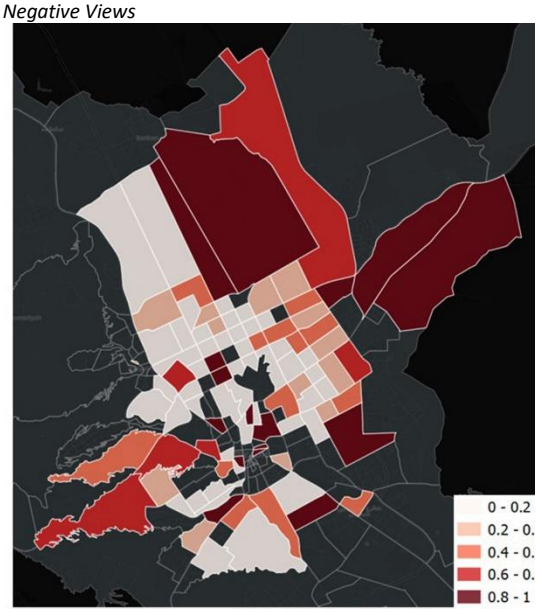


E.4: Quality of Life Evaluation - Identity & Belonging

Positive views

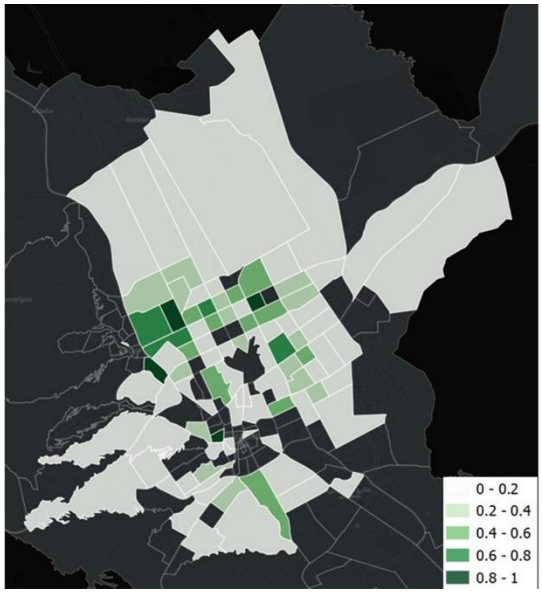


Negative Views

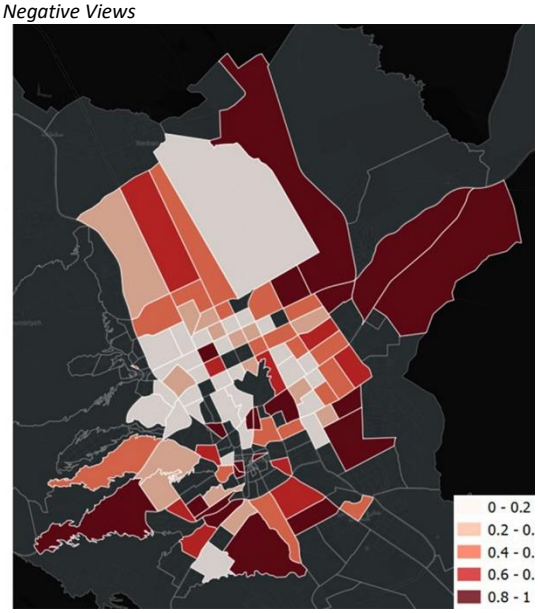


E.5: Quality of Life Evaluation - Facilities & Amenities

Positive views

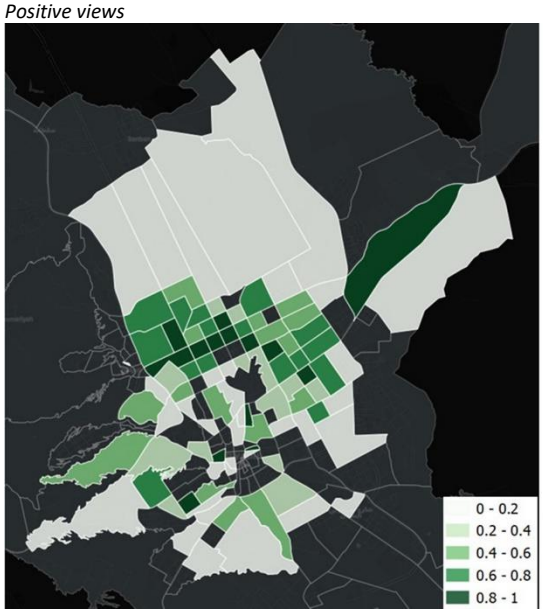


Negative Views

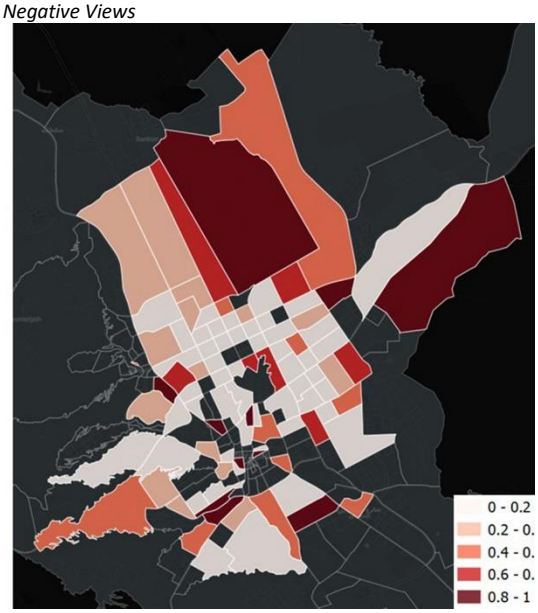


E.6: Quality of Life Evaluation - Local Economy

Positive views

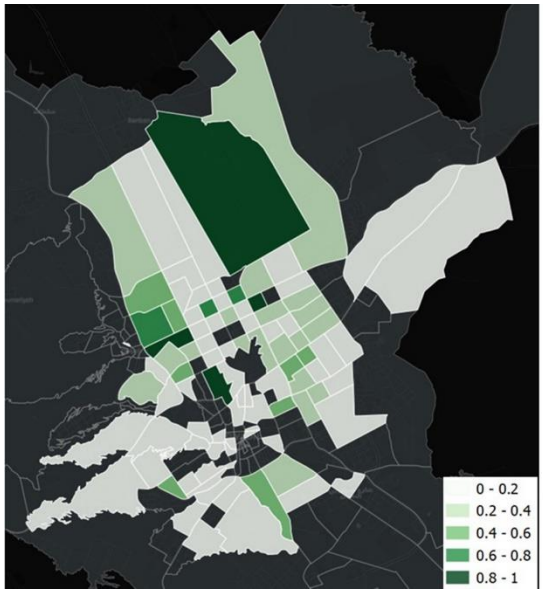


Negative Views

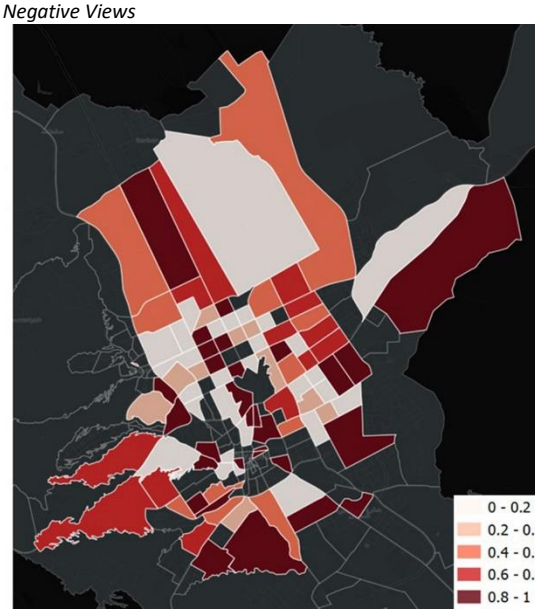


E.7: Quality of Life Evaluation - Building & Space Maintenance

Positive views

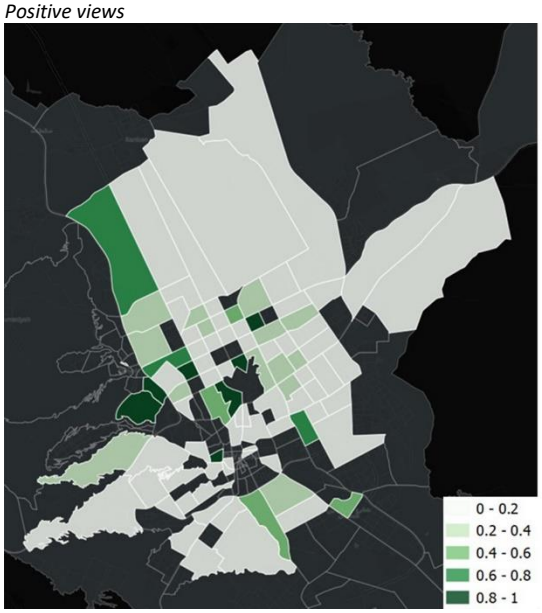


Negative Views

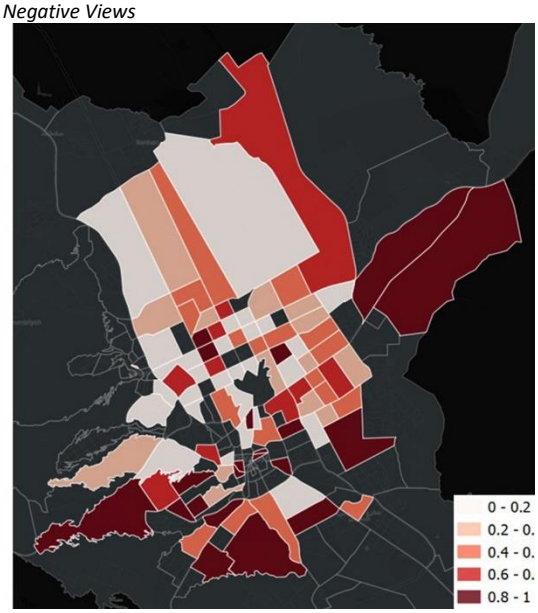


E.8: Quality of Life Evaluation - Attractive & Ease of Movement

Positive views

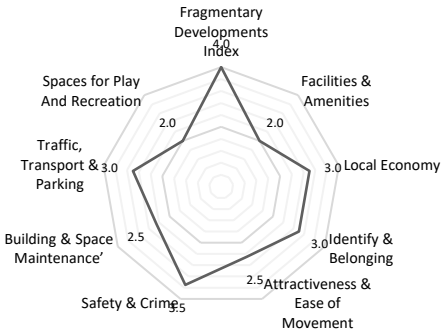


Negative Views

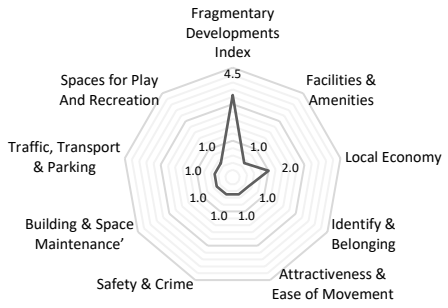


Appendix F Quality of Life Indicators by Area

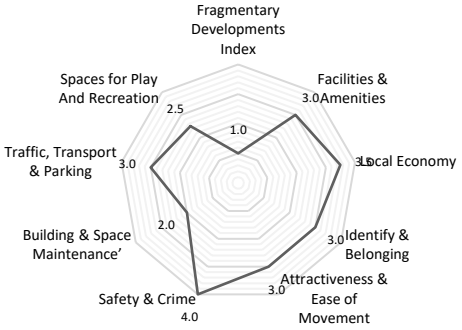
Central Riyadh



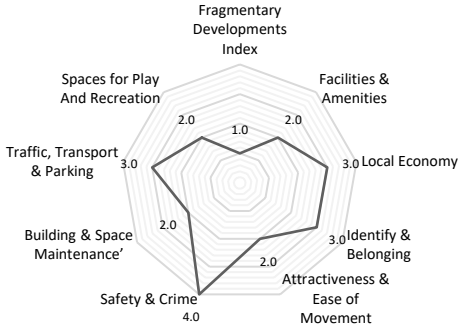
Eastern Riyadh



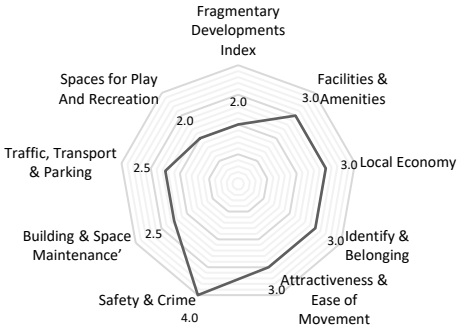
Northern Riyadh



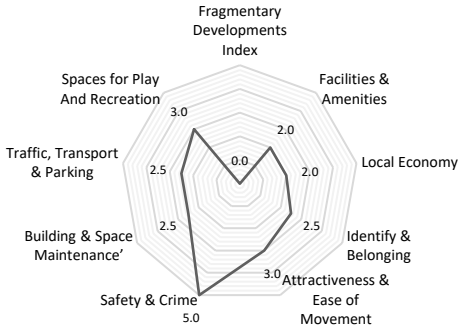
Southern Riyadh



Western Riyadh



Ad-Dirayah

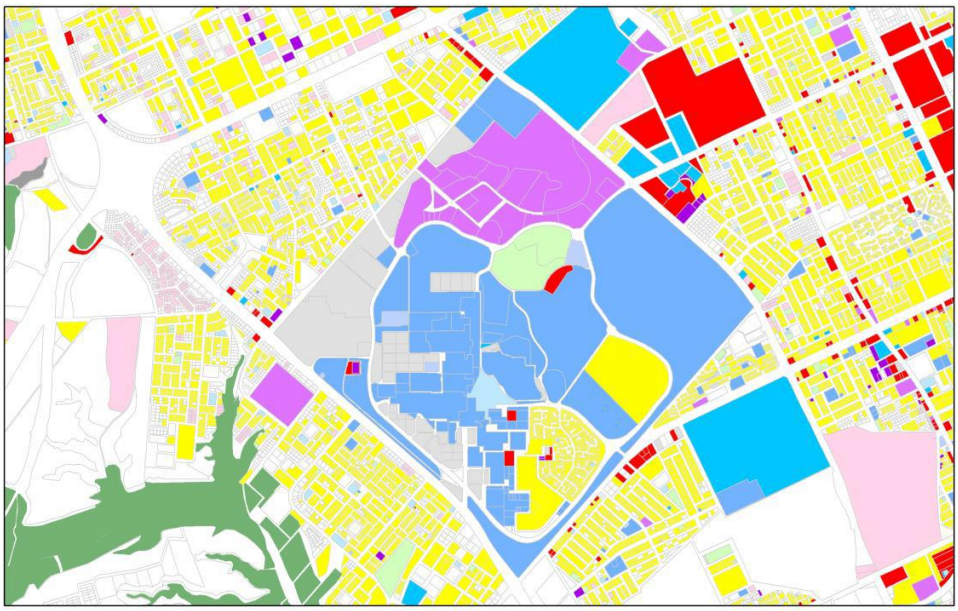


Appendix G Land Use Maps for the micro analysis

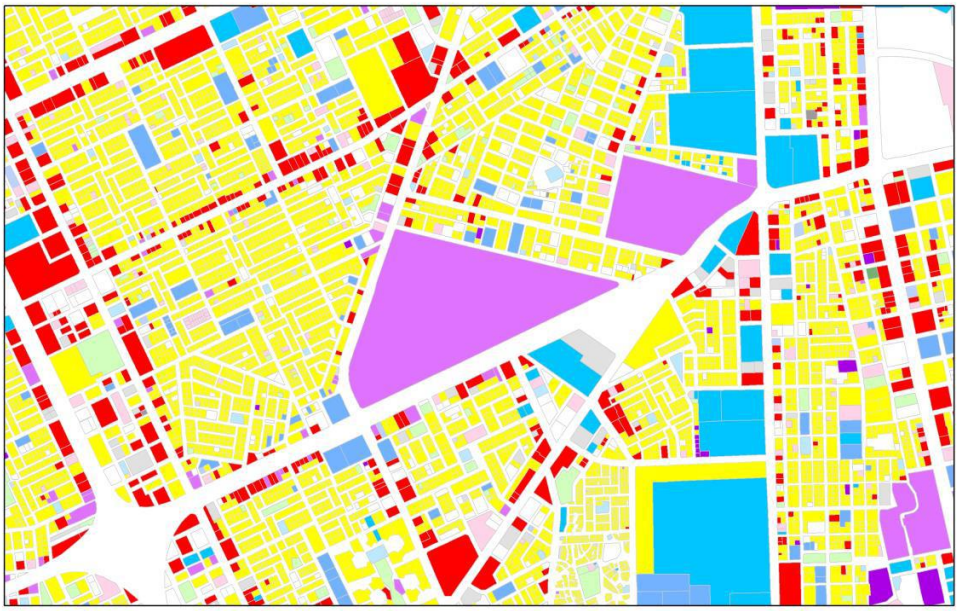
Land Use Maps Per Development

The Saudi City

King Saud University - Riyadh, Saudi Arabia



King Fahad Medical City - Riyadh, Saudi Arabia



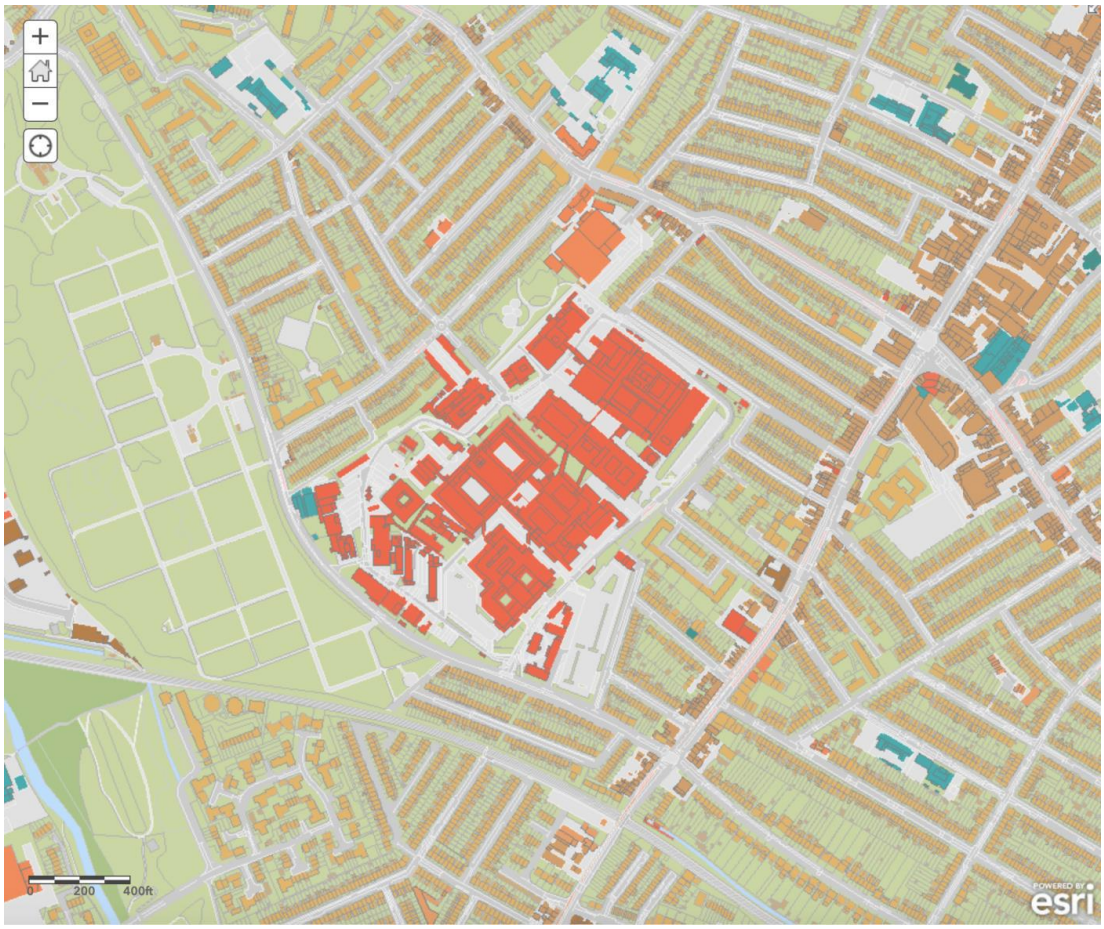
King Fahad International Stadium - Riyadh, Saudi Arabia

Land Use Key

Vacant	Community services	Commercial
Recreation and open spaces	Transportation	Agriculture
Residential	Industrial	Educational
Institutional	Religion	Cemeteries
Unknown		

The British City

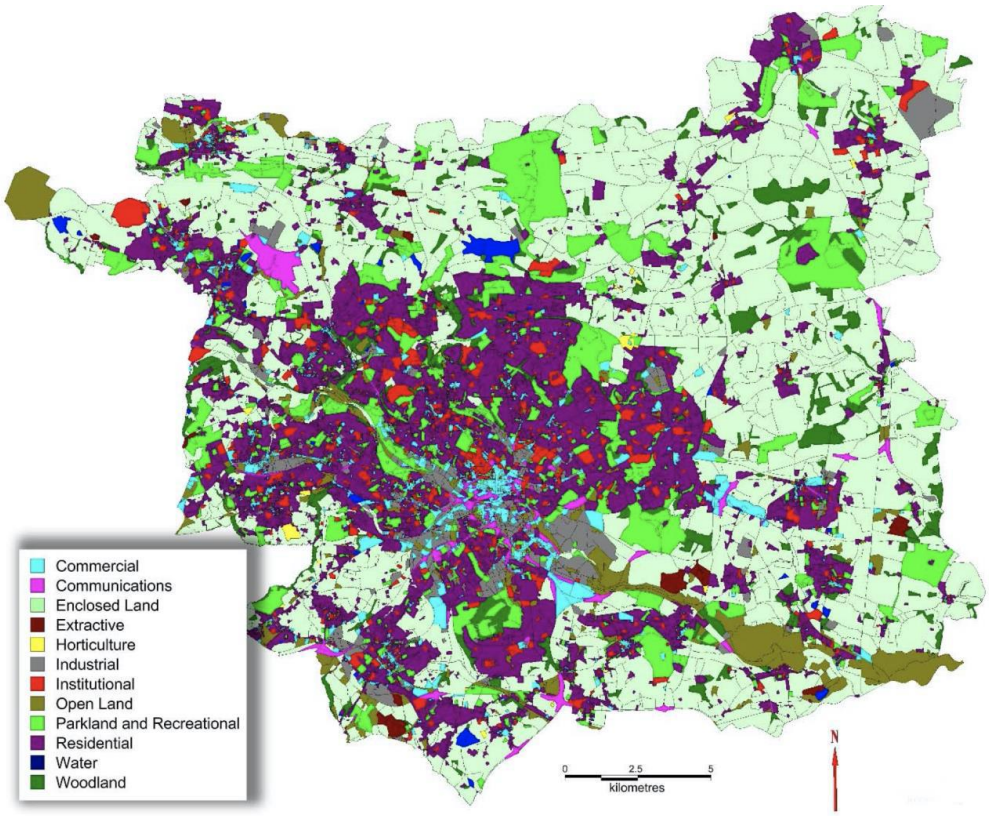
St. George's Hospital London, UK



Source:

https://www.arcgis.com/home/webmap/viewer.html?basemapUrl=https%3A%2F%2Fmaps.london.gov.uk%2Fgla%2Frest%2Fservices%2FIMA%2FIMA_context_information_landuse%2FMapServer&source=sd

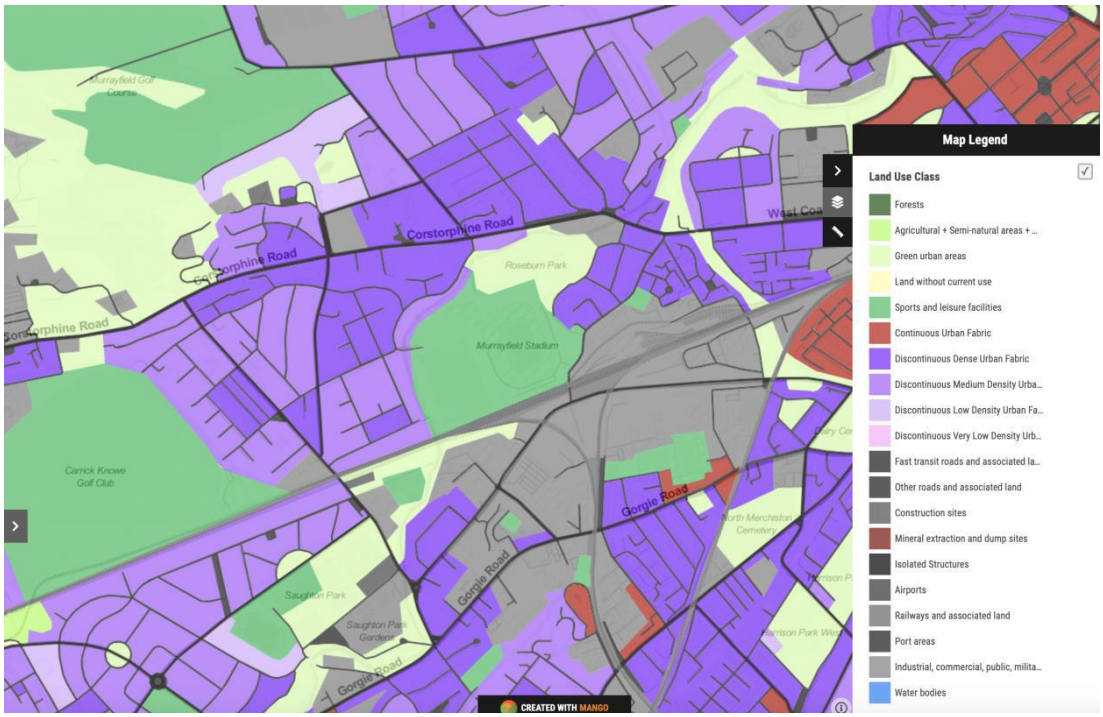
University of Leeds - Leeds, UK



Source:

https://www.wyjs.org.uk/media/69833/leeds-historic-landscape-characterisation-project-report.pdf

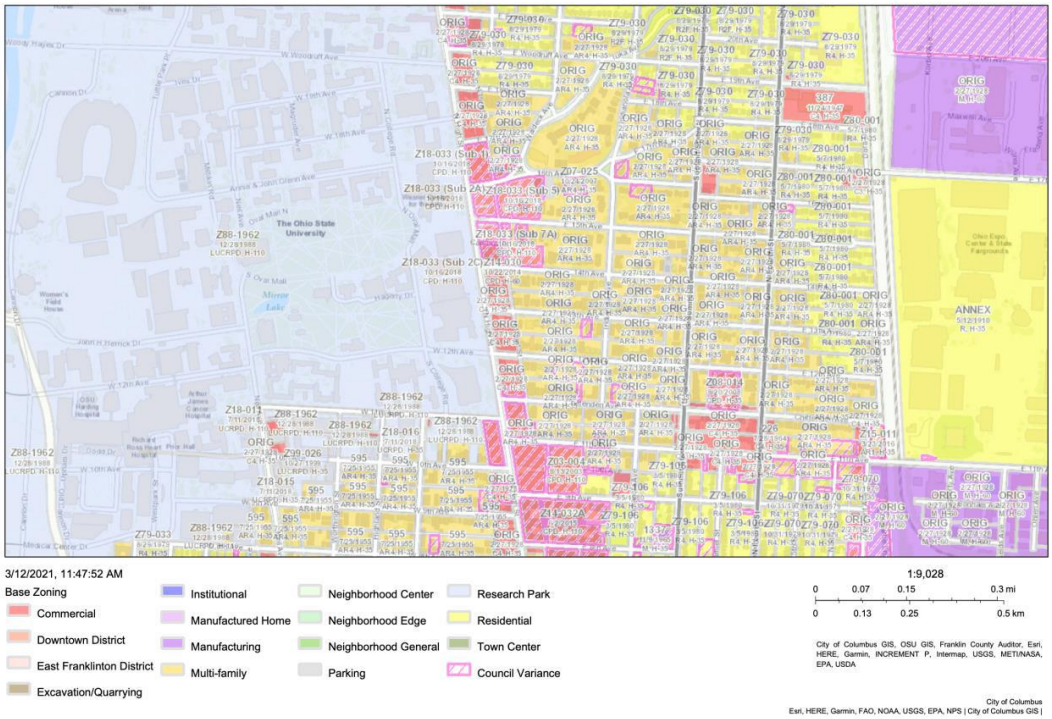
BT Murrayfield Stadium - Edinburgh, UK



Source:

https://mangomap.com/pgager/maps/21484/Edinburgh-Land-Use-Map-2010#

Ohio State University - Colombus, Ohio, USA



Source:

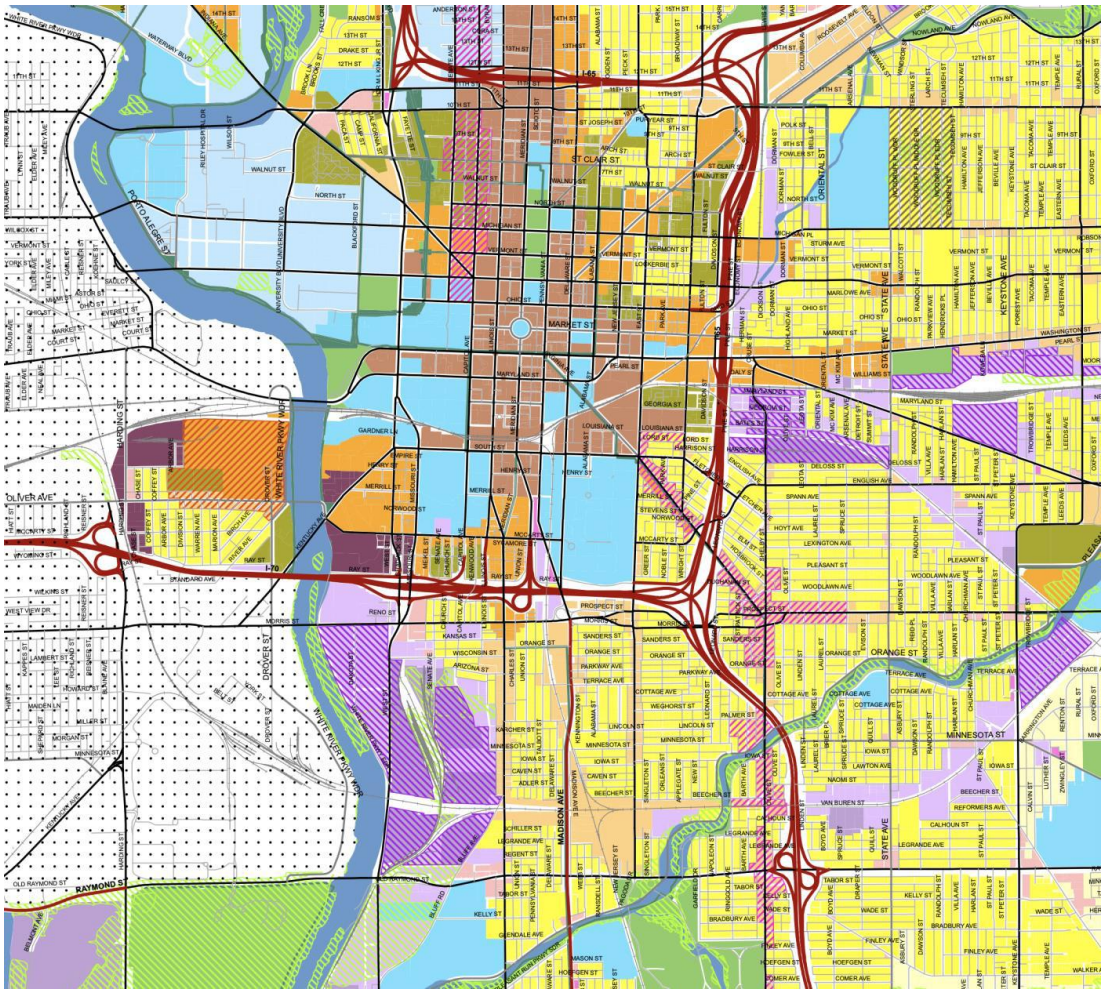
https://gis.columbus.gov/zoning/

Memorial Hermann Southwest Hospital Houston, Texas, USA

Source:

https://www.arcgis.com/home/webmap/viewer.html?webmap=2de14869e49f495799a19651b2ff7d22

Lucas Oil Stadium - Indianapolis, USA



Source:

https://indygis.maps.arcgis.com/apps/CrowdsourceReporter/index.html?appid=9db564b5120844f588a49ec67706ea3d

Appendix H Mapping Urban Fragmentation: The Extent, Location and Characteristics of Building Types Associated with The Phenomenon and Their City-Wide Impact

Introduction

Similar to many nations across the Gulf, Saudi Arabia has been transformed from a largely subsistence economy in the early twentieth century to one of the world's top twenty economies driven almost entirely through the nation's vast oil reserves. Saudi Arabia's dramatic economic growth has driven rapid urbanization of many of its major cities, particularly Jeddah, and the Capital and focus of this study, Riyadh.

Since the 1930s Riyadh has evolved from a small, historic walled settlement that housed around 27,000 ("Riyadh Population Growth," n.d.) people to an expansive, bustling modern metropolis with over five million residents. Development across Riyadh has focused on the automobile since the 1950s, with vast tracts of the old town being torn down to accommodate wider streets + boulevards (Aldalbahi & Walker, 2016). Riyadh's expansion and urban development have been fuelled by a confluence of factors including the importation of 1950s / 1960s modern American planning ideals that focus on Euclidean or single-use zoning, automobile access (Al-Hathloul & Anis-ur-Rahmaan, 1985), freeway creation, and superblocks, as well as the Capital's extreme desert climate, affluent Saudi families that could afford private vehicles, government initiatives to house Saudi nationals with land grants, a preference for suburban living, and some of the world's cheapest gasoline ("Gas Prices in Saudi Arabia," n.d.).

Largely constrained to the west by the Wadi Hanifa (a rugged valley subject to intermittent flooding), Riyadh's urban growth originally tracked in concentric circles until the 1970s onwards when massive tracts of land to the west and north of the city were zoned for subdivisions (Al-Hathloul, 2017). Rapid urbanisation from Saudi nationals ("Urban Population of Saudi Arabia - World Bank," n.d.) and an influx of Non-Saudi skilled workers in sectors such as finance + oil lead to high levels of immigration from low-income countries such as India, Pakistan, and Egypt, many of which finding accommodation within the older, higher density housing stock (e.g. mid-rise apartments) in and around the centre of Riyadh.

As Riyadh's suburbs began expanding outwards, affluent Saudis were attracted to the suburbs with the promise of larger homes and gardens, often within Gated Communities -

large fenced compounds with limited access (e.g., residents and guests). Gated Communities are not a phenomenon limited to Saudi Arabia and are found across the United States, and often in countries with high inequality and crime rates such as Brazil and South Africa (Silva de Araujo & Pereira de Queiroz, 2018).

Gated Communities are designed to restrict access and aim to decrease crime and anxiety surrounding crime for inhabitants (Landman & Badenhorst, 2012); however, they have been criticized for increasing inequality, reducing interaction between sections of society, and negatively impacting sustainability as they restrict pedestrian movement and are usually built and designed around the automobile, requiring a car for even the shortest of journeys. Gated Communities generally focus on the gating of residential developments, but across the Saudi Capital, all development types, including commercial, office, and even mixed-use development are subject to gating, which results in the ability to control/restrict access. Across Riyadh, gating is almost entirely designed to facilitate automobile movement which can often inhibit pedestrian movement - for example, two developments on neighbouring lots might not have direct/easy pedestrian access between entrances, requiring a long detour for pedestrians and promoting personal car use.

Gated developments have a long history across modern Saudi Arabia since the 1930s, beginning with Aramco's construction of the Dhahran compound, built to house Western oil workers. These compounds were designed to achieve two key goals - security of Western employees and to keep Saudi nationals shielded from Western culture (Glasze & Alkhayyal, 2002). As compounds evolved and grew in scale and amenities, they began to be developed by private developers across Jeddah and Riyadh, and remain popular often due to relaxed cultural restrictions on-site, so popular in fact that a 2001 study estimated that private gated compound development commanded rents double those of their ungated counterparts Glasze & Alkhayyal, 2002). A series of small terrorist attacks targeting Westerners across Riyadh and in Al-Khobar that combined killed 66 and injured 307 in 2003 and 2004 reinforced the desirability of security.

The purpose of this study is to understand the proliferation of Gated Communities and developments across Riyadh and explore the relationship between development, gated communities, and demographics of Riyadh.

Mapping Methodology

The purpose of this phase is to map gated development across Riyadh to gain insights and understanding of the relationship between gated developments, socio-economics, and development trends. Key objectives for this phase are:

- Determine the distribution of gated developments across Riyadh.
- Identify the scale of gated developments across Riyadh; and,
- Explore the relationship between socio-economic data, amenity accessibility, and other development trends across Riyadh.

Geographical Boundaries

The geographical units discussed within this appendix, except for the "Districts", which were developed for the sole purpose of facilitating the mapping process, are official geographical areas designated by Riyadh's municipality and used to collect official statistics such as Census data.

Study Area

The Study Area refers to the geographical extent of this research piece. The Saudi capital is officially divided into 21 sub-municipalities that comprise 193 neighbourhoods. Collectively these 21 sub-municipalities cover 5,961.70 km^2.

Districts

For research purposes and simplification of the city's expansive sub-municipalities and neighbourhoods Riyadh has been divided into six “Districts” - Central, Northern, Eastern, Southern, Western, and Ad-Dirayah.

Sub-municipalities

For administrative purposes, the City of Riyadh is divided into 21 sub-municipalities that range in area from less than 10 km^2 to over 1,000 km^2. These administrative districts are used by the Royal Commission for Riyadh, the entity responsible for the urban, economic, social, and cultural development of the Saudi capital.

Neighbourhoods

Each sub-municipality comprises between one and twenty neighbourhoods, with 193 neighbourhoods in total. These are also used by the Royal Commission for Riyadh and used to collect census data, including population counts.

Research Phase Strategy

This appendix focuses predominantly on a quantitative research strategy, through collecting and processing vast amounts of demographic and development related data obtained from a variety of sources which are outlined by research categorization (e.g. primary vs. secondary) on the following page and expanded on with visuals in the subsequent methodology.

Data Collection - Primary Research

Primary research was generated using manual interpretation of satellite imagery of every neighbourhood. While newer methods of image interpretation (digital processing / AI processing) are available and commonly used in areas such as forestry, high-level urbanisation, and environmental purposes, manual interpretation continues to be used to allow researchers to search for complicated, intricate details that are easily picked out by the human eye, for example identifying a university in satellite imagery compared to a shopping centre.

Projects: Project data refers to the 571 identified completed or under construction developments across the Study Area. In addition to the project area, other attributes include Land Use (Education, Government, Industrial, Commercial, Medical, Mixed-Use, Office, Organization, Residential Gated Community, Royal Private Residences, Recreation, Security, Self Contained Urban Project, and Transport), Ownership (Public, Private, Semi-Public, and Semi-Private), Accessibility (Open, Restricted), Usage (Single Use, Multi-Use), Structure (No Structure, Single Structure, Multi Structure), and Gating (Gated, Soft Gated, and Non-Gated).

Data Collection - Secondary Research

Data was obtained and cleaned from the Saudi government census on the below variables:

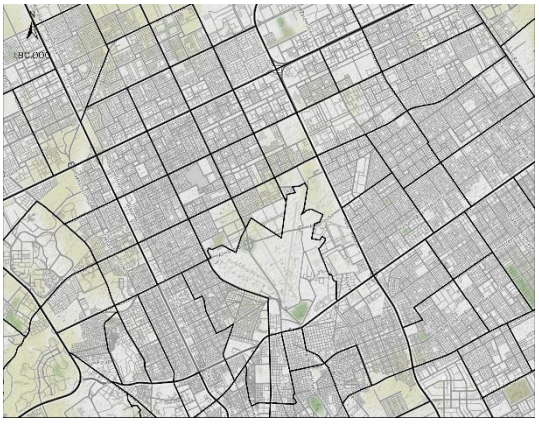
Land Use: Collected by the Royal Commission for Riyadh (formerly known as the Riyadh Development Authority), Land Use data published provides estimates on land coverage within each of Riyadh's neighbourhoods. Data available includes total neighbourhood area and land use coverage including developed land, undeveloped land, and street network coverage.

Amenities: Collected by the Saudi authorities, Amenity data refers to the 145,000+ individual amenities across Riyadh thought to be generated through operational licenses such as business permits etc. This data is available at a neighbourhood level and is divided into 12 categories (Service, Commercial, Entertainment, Religious, Agricultural, Education, Government, Communication, Industrial, Transport, Health, and Cultural). By comparing this data against socioeconomic data, the relationship between demographics (e.g., income and population density) and access to amenities such as healthcare and education facilities can be explored). While twelve categories of data are provided for the purposes of this study only essential, predominantly government amenities are used - Religious, Education, Government, Health, and Culture.

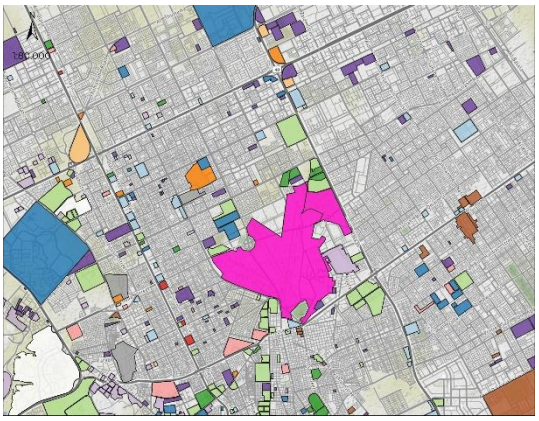
Socioeconomic: Obtained from the Saudi authorities, this research uses official population statistics which include population, population by citizenship (Saudi, non-Saudi), and income (Saudi/Non-Saudi). This data was typically available at a neighbourhood level. A blended income figure was created from these official datasets to reflect average income by neighbourhood. It should be noted that while population data was available for every neighbourhood, demographic data was not always available, which describes occasional discrepancies in data - for example, the City's total population is 5,304,887 although Citizenship data was available for 5,253,926 residents, leaving around 1% of the population's Citizenship unknown.

Methodology - ArcGIS Data Analysis

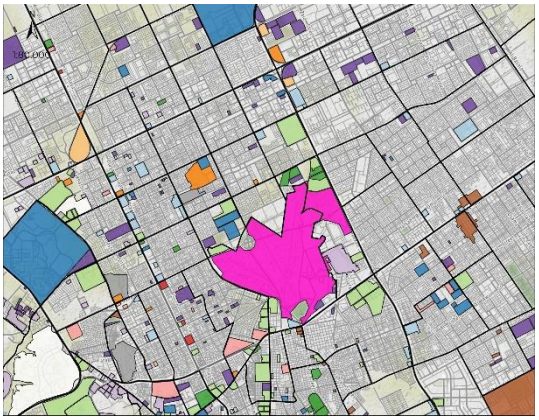
Step 1: Obtaining + Cleaning Government Data Government sourced shapefiles were joined with cleaned + processed Government Excel Census data to assign population, demographics, and information on amenities to each neighbourhood across the Capital.



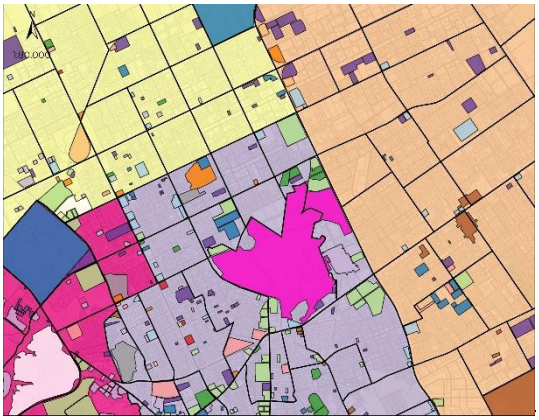
Step 2: Project Data Using manual interpretation researchers combed over the built landscape of Riyadh to identify 571 large scale/master-planned developments that range in scale from 0.004 km^2 (0.4 hectares) to 110.26 km^2. Occasionally developments overlapped neighbourhood boundaries, and under these circumstances developments were divided using neighbourhood extents, dividing the projects into two or more areas, so that each neighbourhood is assigned the exact amount of development taking place within its boundaries.



Step 3: Spatial Join After both Government Data was secured and Project Data generated the two data sets were joined together using a “spatial join” in ArcGIS. This type of join assigned each of the 571 Projects with the name and ID of the neighbourhood it occupies. This data is then exported for processing in Excel to sum development by type (e.g. Government, Industrial) and other attributes such as whether it was gated by neighbourhood, which is then reimported into ArcGIS.



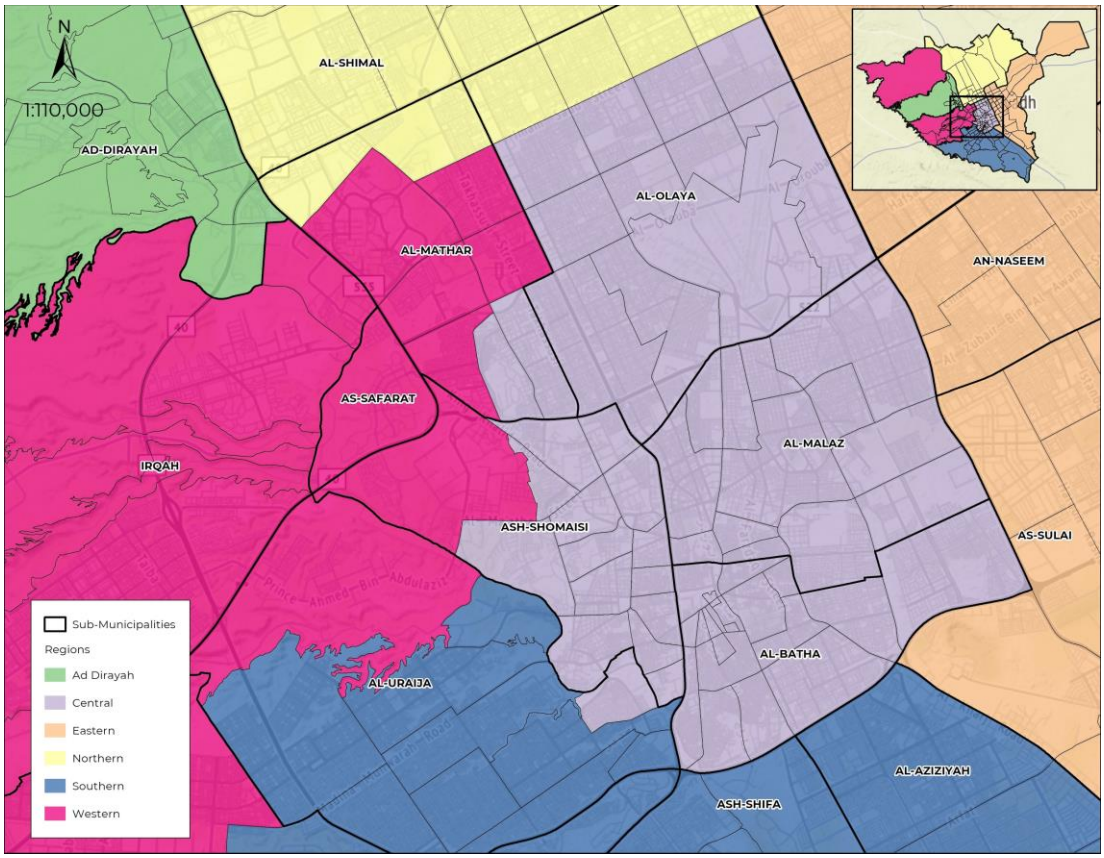
Step 4: Spatial Join 2 Following Step 3 a further ID was added to each of the neighbourhoods across the City to enhance simplicity rather than work with the 21 sub-municipalities. Data throughout this appendix is generally referred to at the District level, which sums all development / population / demographics of the neighbourhoods contained with the District.



Central District

Central District - Summary and Context

Located at the centre of Riyadh, the Central District contains the entire sub-municipalities of Al-Batha and Al-Malaz, as well as the majority of Ash-Shomaisi and Al-Olaya, as well as pockets of southern Al-Mathar and eastern Al-Uraija. Just 12% of the land within the 203.87 km^2 District is undeveloped (24.61 km^2), making it by far the most developed in the Capital. The Central District contains many of the Capital's most important financial, government, cultural, and commercial developments including the Kingdom Centre and Al-Faisaliah Centre two of Saudi Arabia's tallest and most iconic buildings. Within the Central District, 20% of all land was occupied by gated projects, making it the most gated District by percentage terms.



Map 01 Central District - Context and Summary

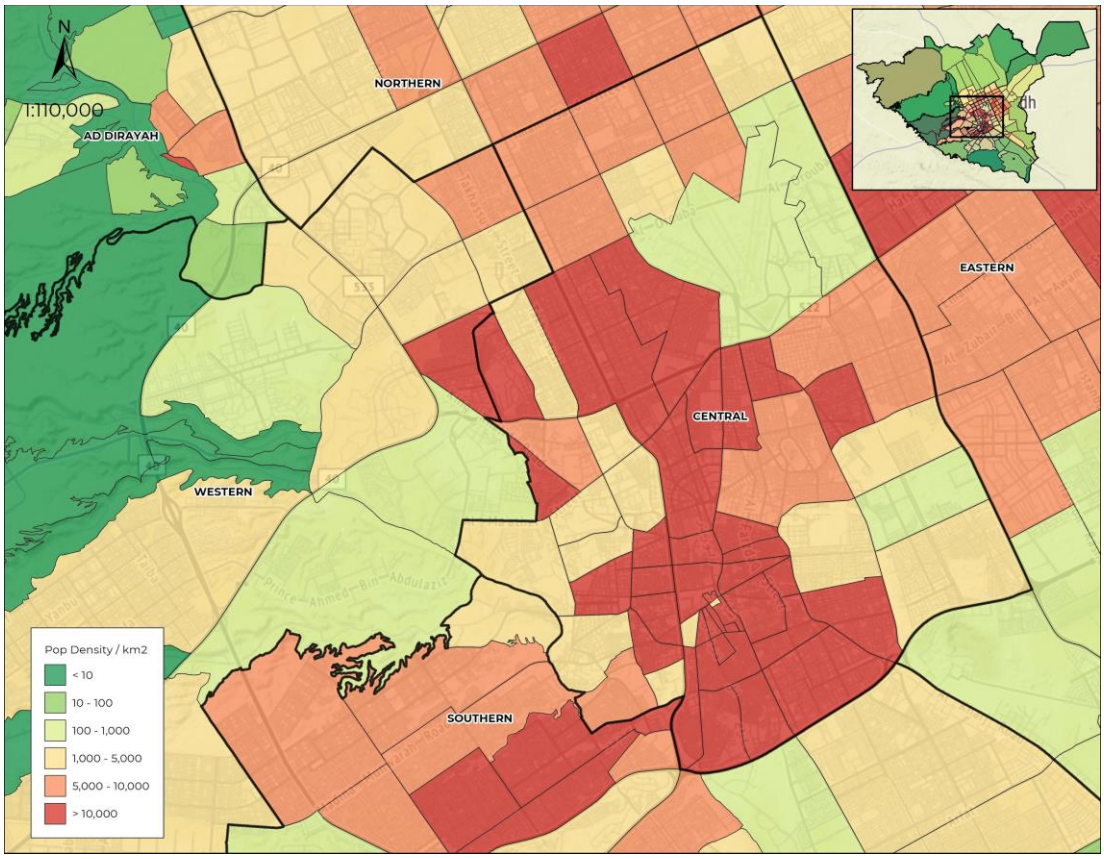
Table 1 Central District - Context and Summary (km²)

	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
Central District	**Al-Batha**	8.84	24%	0.76	2%	37.17	19.28	5.30	12.59
	Al-Malaz	11.97	22%	6.46	12%	53.65	27.39	9.64	16.61
	Al-Mathar	1.68	24%	1.41	20%	6.96	4.32	0.66	1.98
	Al-Olaya	26.45	37%	24.43	34%	72.43	50.93	4.86	18.12
	Al-Uraija	-	0%	0.00	0%	2.89	1.81	0.32	0.76
	Ash-Shomaisi	6.86	22%	6.71	22%	30.77	19.23	3.83	7.72
	Total	**55.79**	**27%**	**39.77**	**20%**	**203.87**	**122.96**	**24.61**	**57.78**

Central District - Population Density

Despite covering just 203.9 km² or 3% of Riyadh's total land area, the Central District is home to 1.93 million residents equivalent to 9,455 residents per km², making it ten times as dense as the Citywide average. Population densities are particularly high within the Al-Batha sub-municipality, with most of its neighbourhoods containing over 10,000 residents per km² making it the most densely populated area in the City. Generally, the further from the centre of the District, densities begin to lower, particularly to the north and east of the District. Just over 14.5 km² of the Central District's land coverage (7%) is dedicated to Riyadh's former

international airport, now used as a military base with plans for conversion under the Saudi 2030 Vision into an expansive park.



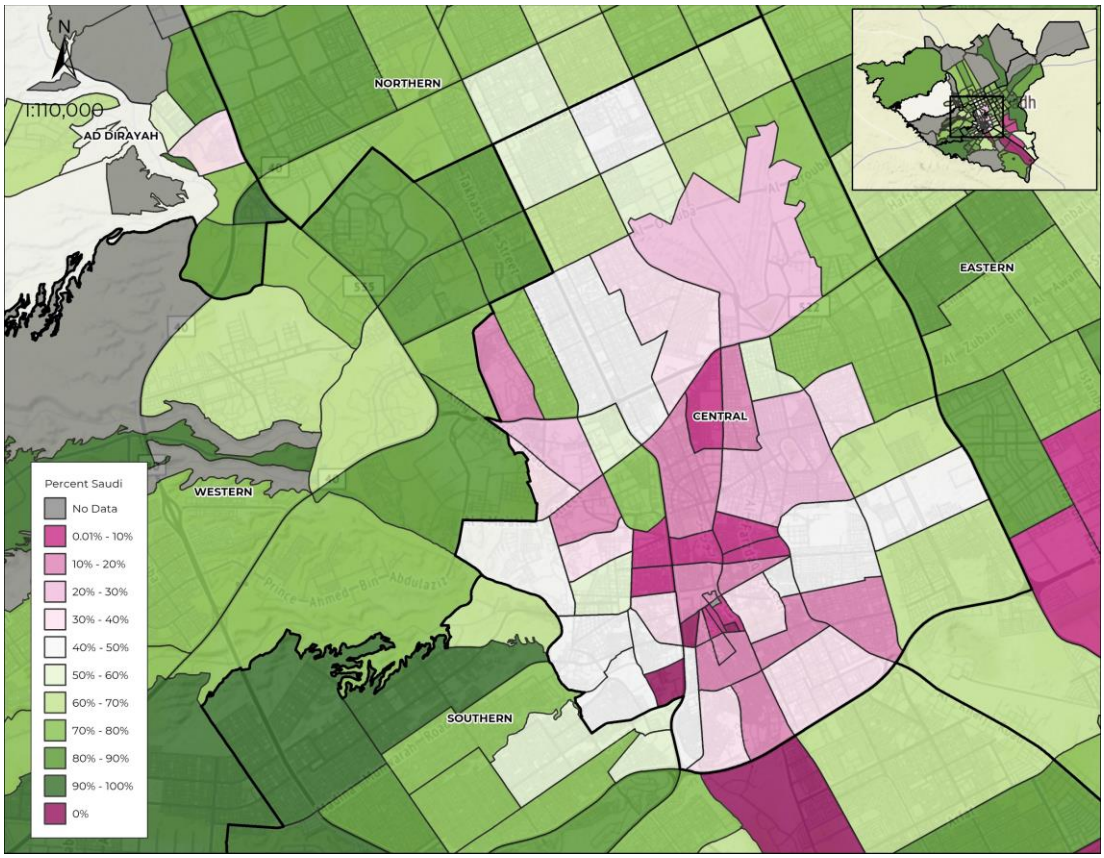
Map 2 Central District - Population Density

Table 2 Central District - Population Density

	Sub-Municipality	Area (km²)	Pop	per km²
Central District	**Al-Batha**	37.17	663,126	17,842
	Al-Malaz	53.65	499,674	9,313
	Al-Mathar	6.96	46,638	6,700
	Al-Olaya	72.43	428,928	5,922
	Al-Uraija	2.89	28,050	9,699
	Ash-Shomaisi	30.77	261,414	8,496
	Total	**203.87**	**1,927,830**	**9,456**

Central District - Citizenship Status

The Central District of Riyadh is by far the most diverse in the City, with 68% of residents Non-Saudi (1,315,581). Non-Saudi residents are concentrated into the City's older, central neighbourhoods, many of which home to apartment blocks - over half the city's entire Non-Saudi population lives within the sub-municipalities of Al-Batha, Al-Malaz, and the Central District's portion of Al-Olaya. Towards the outskirts of the Central District, the percentage of Saudi residents generally increases, particularly to the east and the north of the District.



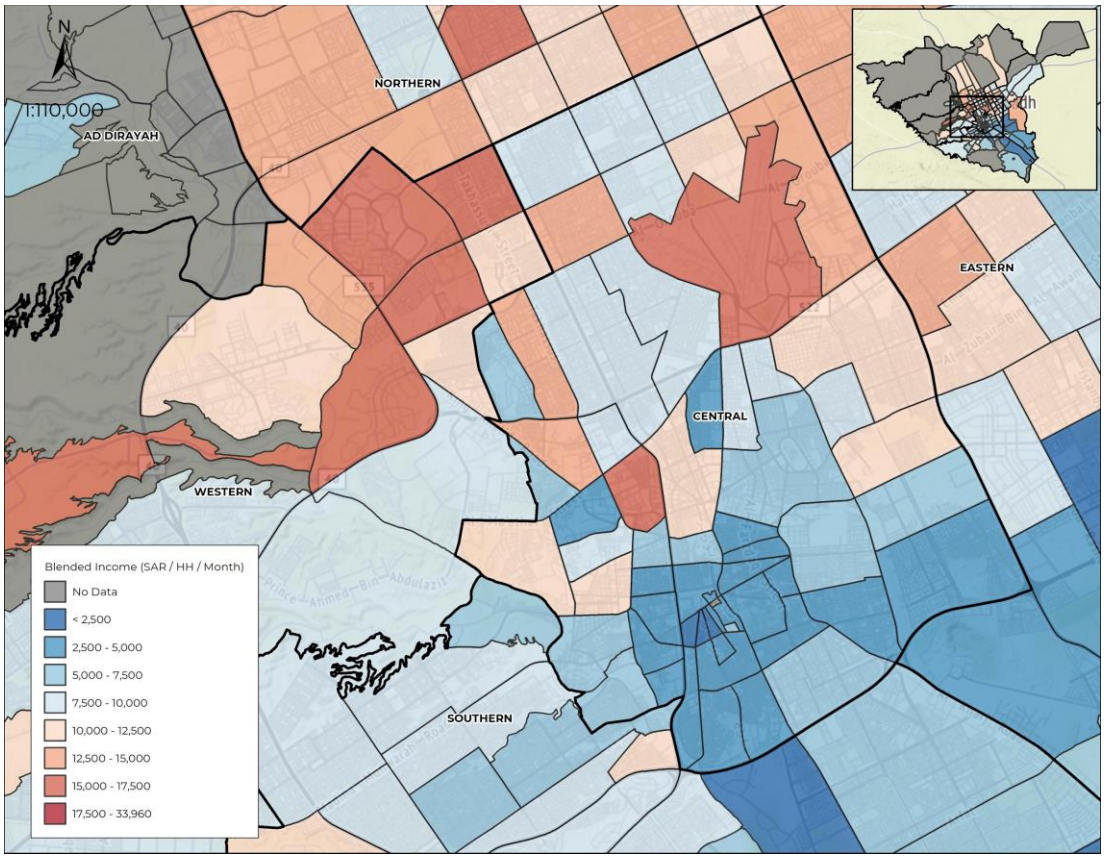
Map 3 Central District - Citizenship Status

Table 3 Central District - Citizenship Status

	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
Central District	**Al-Batha**	168,080	25%	494,848	75%	**662,928**
	Al-Malaz	124,099	25%	375,576	75%	**499,675**
	Al-Mathar	16,010	34%	30,628	66%	**46,638**
	Al-Olaya	198,905	46%	230,023	54%	**428,928**
	Al-Uraija	13,745	49%	14,306	51%	**28,051**
	Ash-Shomaisi	91,214	35%	170,200	65%	**261,414**
	Total	**612,053**	**32%**	**1,315,581**	**68%**	**1,927,634**

Central District - Income Distribution

In addition to being Riyadh's most densely populated district, the Central District is also the Capital's poorest, with blended monthly household incomes of SAR 6,521, 78% of the Citywide average. There is a clear divide between the north and south of the Central District, with the southern portion containing densely populated Non-Saudi neighbourhoods, particularly within the sub-municipalities of Al-Batha and Ash-Shomaisi. Al-Batha was the District's poorest neighbourhood with incomes of just SAR 3,778, 45% of the Citywide average.



Map 4 Central District - Income Distribution

Table 4 Central District - Income Distribution (Household / Monthly / SAR)

	Sub-Municipality	Saudi	Non-Saudi	Blended
Central District	**Al-Batha**	6,709	2,783	**3,778**
	Al-Malaz	13,195	5,066	**7,085**
	Al-Mathar	17,613	3,292	**8,208**
	Al-Olaya	14,871	5,721	**9,964**
	Al-Uraija	12,109	2,669	**7,295**
	Ash-Shomaisi	11,290	3,726	**6,365**
	Total	**11,766**	**4,081**	**6,521**

Central District - Amenity Distribution

Compared to the Citywide average residents of the Central District had access to the lowest amount of amenities (per 1,000 residents), although the area was home to the highest amount of amenities at 3,406. Unsurprisingly the Central District is home to the highest number of Government (608), Cultural (45), Health (461), and Education (1,051) amenities. Due to the significance of many of these central amenities such as national government offices, headquarters of institutions, and large education institutions facilities in the Central District are likely used by residents from across the City.

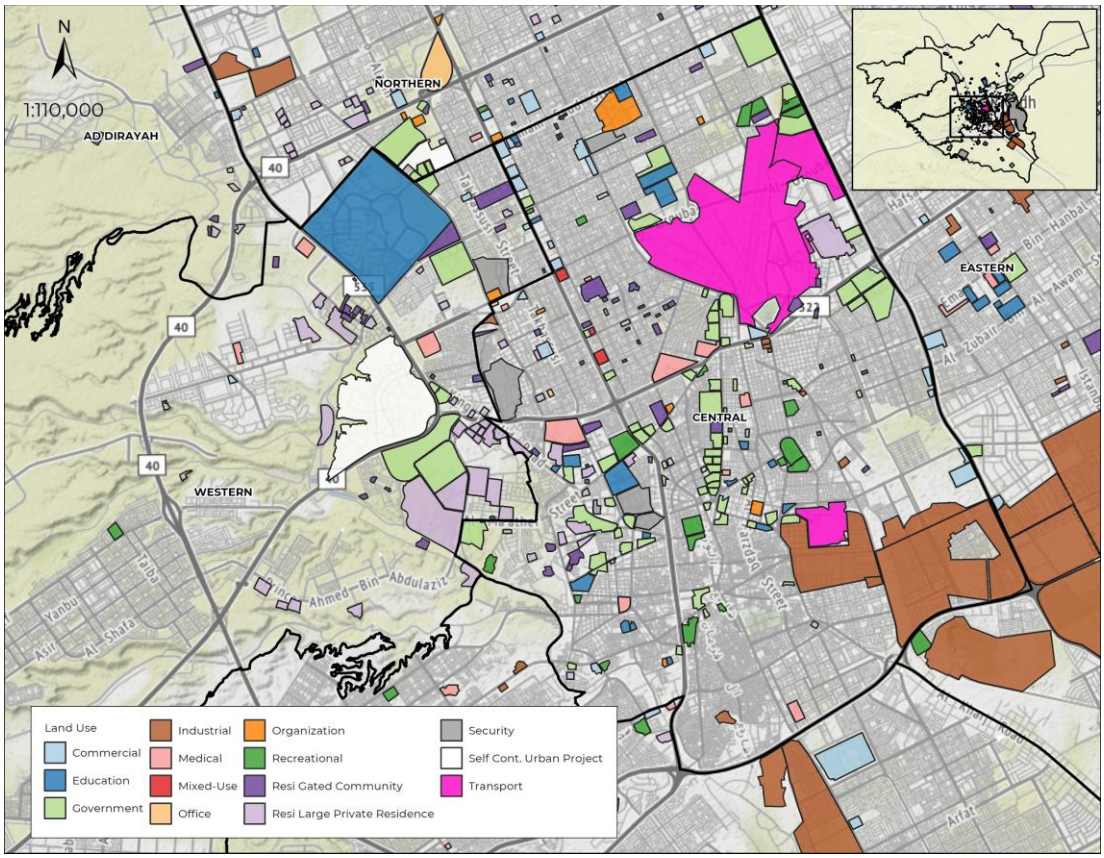
Table 5 Central District - Amenity Distribution

	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Central District	Al-Batha	663,126	10	251	101	72	423	**857**
			(0.02)	(0.379)	(0.152)	(0.109)	(0.64)	**(1.29)**
	Al-Malaz	499,674	11	248	174	82	277	**792**
			(0.02)	(0.496)	(0.348)	(0.164)	(0.554)	**(1.59)**
	Al-Mathar	46,638	1	18	14	13	33	**79**
			(0.02)	(0.386)	(0.3)	(0.279)	(0.708)	**(1.69)**
	Al-Olaya	428,928	16	342	195	247	236	**1036**
			(0.04)	(0.797)	(0.455)	(0.576)	(0.55)	**(2.42)**
	Al-Uraija	28,050	0	20	3	3	27	**53**
			(0)	(0.713)	(0.107)	(0.107)	(0.963)	**(1.89)**
	Ash-Shomaisi	261,414	7	172	121	44	245	**589**
			(0.03)	(0.658)	(0.463)	(0.168)	(0.937)	**(2.25)**
	Total	**1,927,830**	**45**	**1,051**	**608**	**461**	**1,241**	**3,406**
			(0.02)	**(0.55)**	**(0.32)**	**(0.24)**	**(0.64)**	**(1.77)**

Central District - Developments by Land Use

With 55.79 km^2 of development identified within the Central District, the area contains around 10% of the Capital's development land area, although much of this development is at far higher densities than suburban projects and includes landmark structures such as the Kingdom Centre and the Al-Faisaliah Centre. Notably, the Central District contains the highest amount of Government development (8.96 km^2), Commercial (1.79 km^2), Mixed-Use (0.22 km^2), and Organization (1.15 km^2). The Central District is also home to almost half of the City's entire developments identified as Recreation at 2.57 km^2 including King Abdullah and Al-Salam Parks.

Much of the development identified across the Central District is concentrated towards the north of the Central District, with a notable absence of development in the City's older more mature, denser, Non-Saudi occupied districts of Al-Batha and Ash-Shomaisi. While this is likely due to lack of both greenfield land and attractive infill sites this lack of investment within some of the Capital's densest areas is interesting.



Map 5 Central District - Development by Land Use

Table 6 Central District - Development by Land Use (km²)

Central District							
Sub-Municipality	**Al-Batha**	**Al-Malaz**	**Al-Mathar**	**Al-Olaya**	**Al-Uraija**	**Ash-Shomaisi**	**Total**
Education	0	0.25	0	0.96	0	1.1	**2.31**
Government	0.22	3.47	0	3.39	0	1.88	**8.96**
Industrial	8.18	4.97	0.06	0	0	0	**13.21**
Commercial	0.03	0.51	0.18	1.01	0	0.06	**1.79**
Medical	0.16	0.15	0.03	0.74	0	0.79	**1.87**
Mixed-Use	0	0	0	0.22	0	0	**0.22**
Office	0	0	0.05	0	0	0	**0.05**
Organization	0	0.11	0	1.01	0	0.03	**1.15**
Gated Community	0	0.18	0.07	1.39	0	0.53	**2.17**
Royal Residence	0	0.02	0.12	1.05	0	0.95	**2.14**
Recreational	0.26	1.05	0	0.67	0	0.59	**2.57**
Security	0	0	1.17	0.35	0	0.93	**2.45**
Self Cont. Urban Development	0	0	0	0	0	0	**0**
Transport	0	1.25	0	15.65	0	0	**16.9**
Total	**8.84**	**11.97**	**1.68**	**26.45**	**0**	**6.86**	**55.79**

Al-Batha

There are currently ten developments under construction within Al-Batha covering 8.84 km², equivalent to 46% of land area in this densely + built out area (19.28 km²). Much of this development (92%) can be contributed to an expansive industrial development in the east of the sub-municipality that borders Al-Malaz and As-Sulai. 91% of development under

construction in Al-Batha is non-gated, ranking it as one of the most ungated areas of development across Riyadh. Al-Salam Park that draws 780,000 visitors per year.

Al-Malaz

Al-Malaz is home to 73 infill developments spanning 11.97 km^2, around 44% of existing development area (27.39 km^2). Development within Al-Malaz is comparatively diverse with 42% industrial development, 29% government development (predominantly clustered along King Abdul Aziz Road), and 10% transportation development. Just over 52% of development is public sector vs. private at 46% and semi-private at 4%. Gated development accounts for 54%, with the remainder either non-gated (40%), or soft gated (7%).

Al-Malaz is one of Riyadh's most central sub-municipalities and includes popular attractions including King Abdullah Park, Prince Faisal Bin Fahd Stadium, and Riyadh Zoo. Popular commercial centres within the Al-Malaz include the Al-Othaim Mall and the Rimal Centre Mall, home to the City's only IKEA.

Al-Mathar

The Central District contains just two neighbourhoods of the Al-Mathar sub-municipality. Twelve projects were identified within this area totalling 1.68 km^2. Around two-thirds of this development was dedicated to Security uses attributed to the headquarters of Saudi Arabia's Special Forces.

Al-Olaya

Home to 86 identified major developments, Al-Olaya is one of the most active sub-municipalities by number in Riyadh with 26.45 km^2 under development. Much of this development is attributed to Riyadh Air Base, a military installation on the site of Riyadh's former international airport which moved to King Khalid International Airport north of the city in 1983. The Riyadh Air Base is intended to be transformed into one of the world's largest urban parks. Similarly to neighbouring Al-Mathar and Al-Malaz development within Al-Olaya is highly diversified with Government projects accounting for 13% of development area, Resi Gated Community 5%, Commercial for 5% of development area, and Education for 4%.

Many of Riyadh's iconic modern buildings can be found in Al-Olaya, flanking the east of King Fahd Rd, including Saudi Arabia's first skyscraper Al-Faisaliah Centre (2000) and Kingdom Centre (2002), as well as many of Riyadh's premier shopping centres including Gallery Mall,

Hayat Mall, Olaya Mall, Kingdom Mall, Al-Nakheel Mall, Sahara Mall, and Mode Al-Faisaliah. Cultural institutions include King Fahad National Library, Al-Olaya Park, and Al-Faisal Arabic and Islamic Arts Museum.

Al-Uriaja

The Central District is home to just one neighbourhood of Al-Uraija accounting for less than 5% of the sub-municipality and contains no major developments.

Ash-Shomaisi

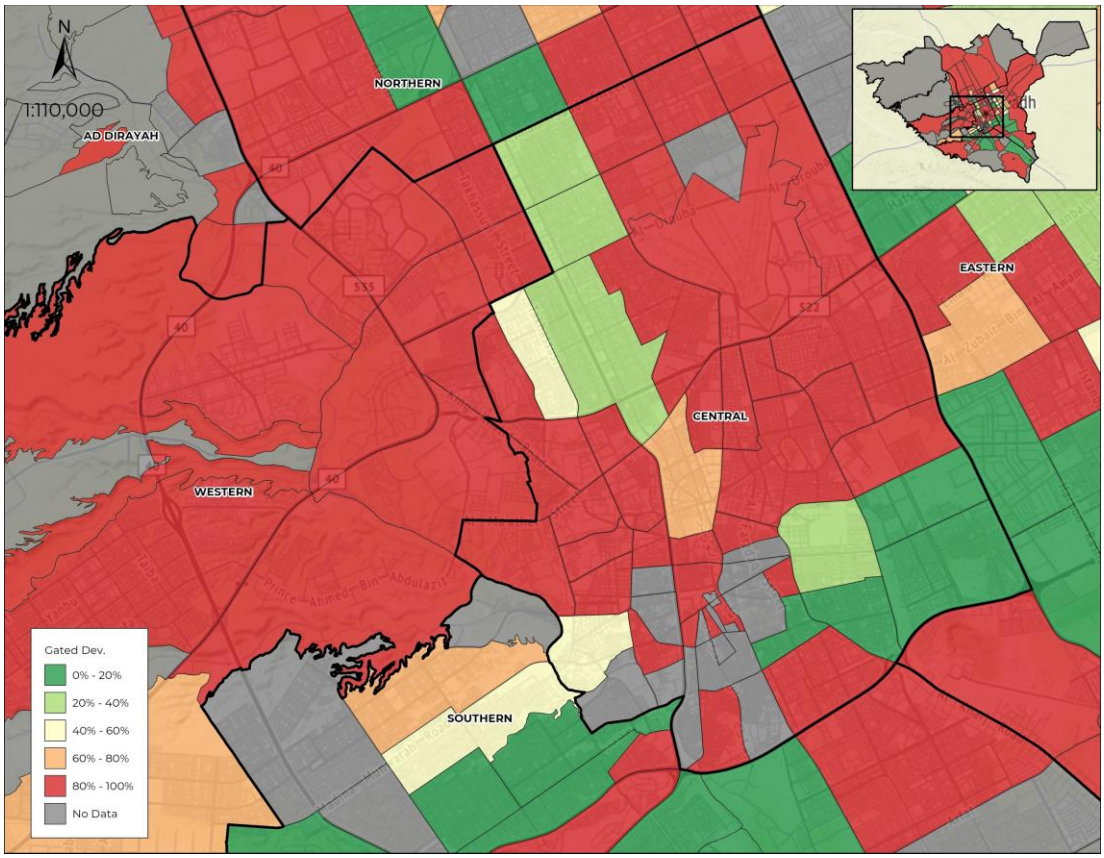
With 52 identified projects within the Central District's neighbourhoods of Ash-Shomaisi, the area is the second most active sub-municipality by number of developments across Riyadh, totalling 6.86 km^2 with an average project size of 13 hectares.

Development within Ash-Shomaisi can be categorized as highly diversified, with 27% of identified project area dedicated to Government (1.88 km^2) including the Ministry of Foreign Affairs, a landmark development designed by Henning Larsen, 16% to Education (1.10 km2), 14% to Royal Residences (0.95 km^2), and 13% to Security (0.93 km^2), including the headquarters of the Royal Guard.

Unsurprisingly development within this municipality is heavily gated and restricted, with 99% of projects identified gated and restricted and just 1% non-gated. Ash-Shomaisi is transected by Line 3 / Orange Line of Riyadh's Metro and will have two stations when the line is activated in 2020 / 2021. This will potentially encourage denser forms of development within the Capital, providing residents with convenient traffic-free access to Central Riyadh in minutes.

Central District - Gated Development

The Central District is the third least gated District across the Capital, with 71% or 39.77 km^2 identified development Gated. While 12.85 km^2 of development was Non-Gated across the District, much of this was attributed to industrial development in Al-Batha. Excluding Industrial development just 2.07 km^2 of development across the Central District was either Soft or Non-Gate, much of which Commercial, Mixed-Use, Government, or Education developments situated along King Fahd Road.



Map 6 Central District - Gated Development

Table 7 Central District - Gated Development (km²)

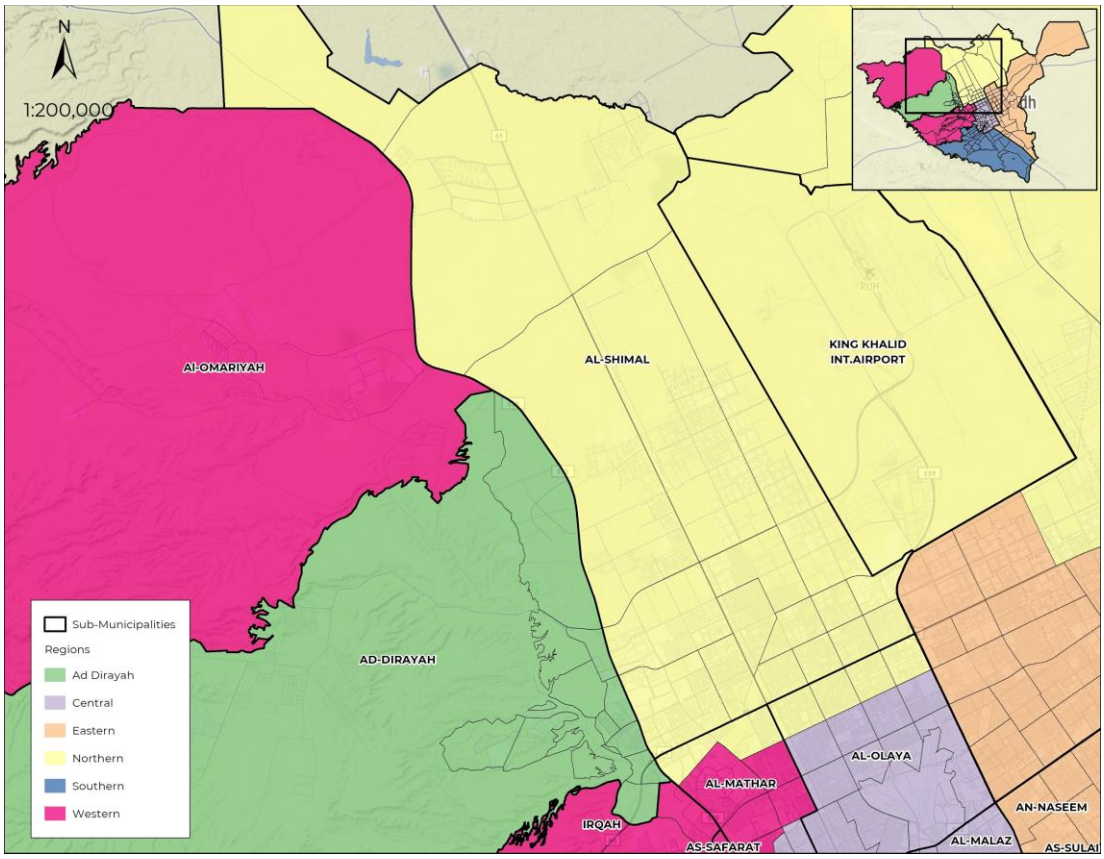
	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
Central District	Al-Batha	0.76	9%	0.03	0%	8.06	91%	**8.84**
	Al-Malaz	6.46	54%	0.78	7%	4.73	40%	**11.97**
	Al-Mathar	1.41	84%	0.27	16%	0.00	0%	**1.68**
	Al-Olaya	24.43	92%	1.96	7%	0.06	0%	**26.45**
	Al-Uraija	0.00	0%	0.00	0%	0.00	0%	**0.00**
	Ash-Shomaisi	6.71	98%	0.15	2%	0.00	0%	**6.86**
	Total	**39.77**	**71%**	**3.18**	**6%**	**12.85**	**23%**	**55.79**

Northern District

Northern District - Summary and Context

Spanning 1,296.15 km² the Northern District is the third-largest District. The Northern District contains the sub-municipalities of Al-Shimal, King Khalid Int. Airport, around 60% of Ar-Rawdah, and a small portion of the central Districts of Al-Mathar and Al-Olaya. Development is concentrated towards Central Riyadh, with vast areas to the north unoccupied desert leaving around 75% of land District-wide undeveloped. The area has the second-lowest number of developments (31) occupying a total of 49.69 km². Across the Northern District

projects identified as gated occupied around 4% of the Districts entire area. Gated development accounted for 22% of all land within the Northern District's portion of Al-Shimal.



Map 7 Northern District - Summary and Context

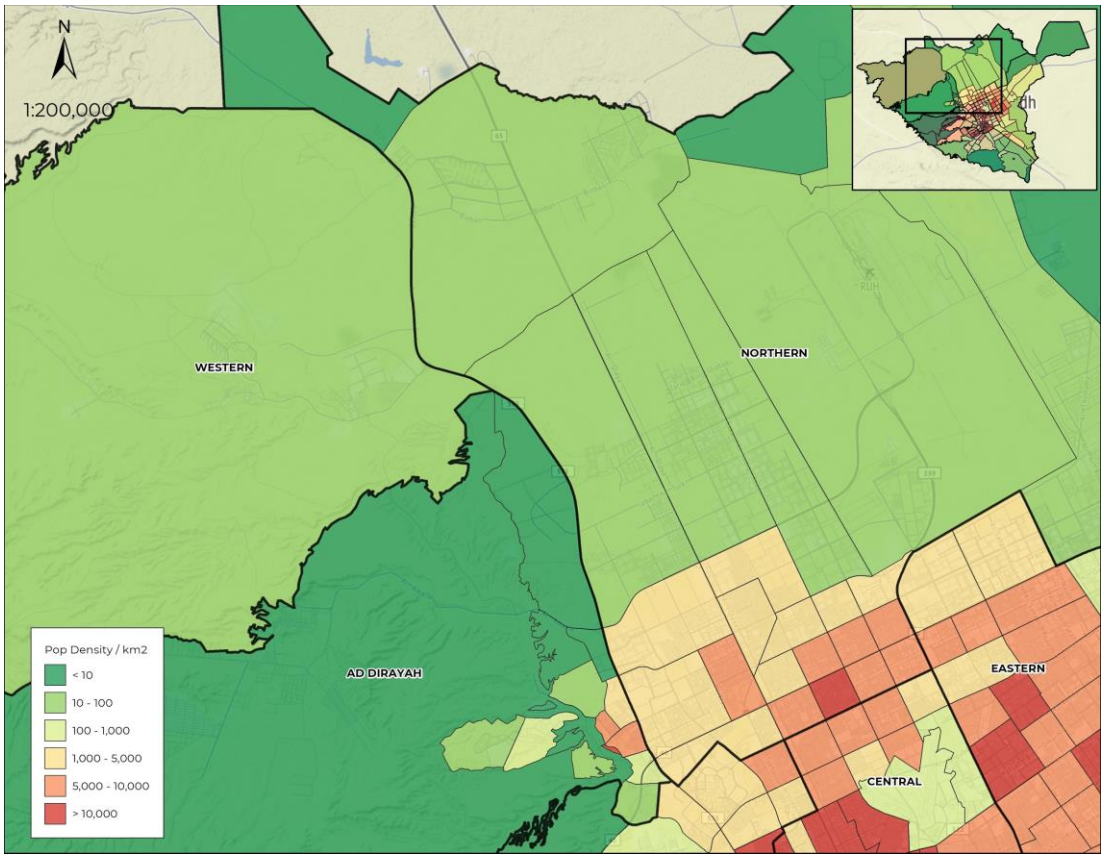
Table 8 Northern District - Summary and Context

	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
Northern District	Al-Mathar	2.11	22%	2.11	22%	9.77	3.87	2.84	3.07
	Al-Olaya	0.83	5%	0.44	3%	16.76	8.44	2.23	6.10
	Al-Shimal	34.20	7%	32.85	7%	483.32	56.09	351.19	77.04
	Ar-Rawdah	2.39	0%	2.39	0%	551.22	105.95	427.39	17.88
	King Khalid Int. Airport	10.15	4%	10.15	4%	234.07	42.05	188.00	4.02
	Total	**49.69**	**4%**	**47.94**	**4%**	**1,295.15**	**216.38**	**971.65**	**108.11**

Northern District - Population Density

With 524,955 residents across 1,295.15 km^2, the Northern District was the Capital's fourth most populous District as well as the fourth most densely populated with 405 residents per km^2. The majority of the District's population was clustered in mature suburbs that border the Central District, in the sub-municipalities of Al-Olaya and Al-Shimal. Much of Al-Shimal

contains vast super-blocks that are currently undeveloped, meaning density to the north is likely to increase in coming years.



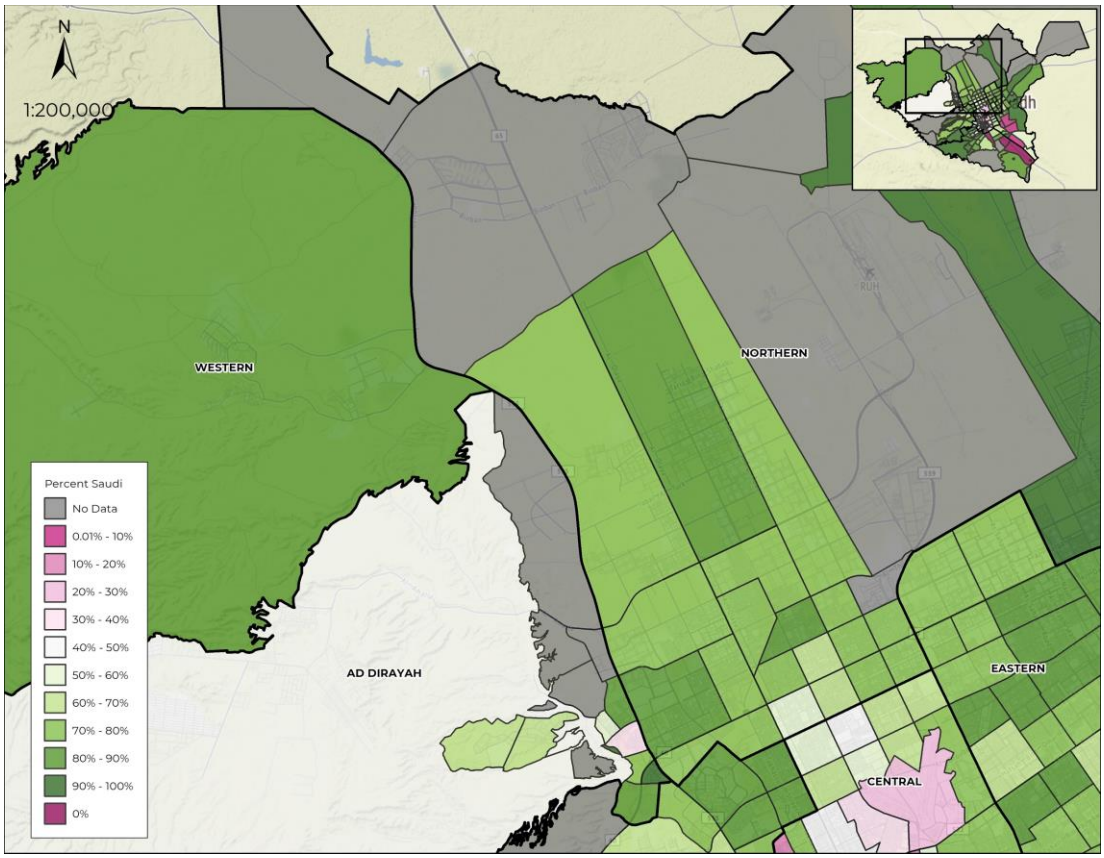
Map 8 Northern District - Population Density

Table 9 Northern District - Population Density

	Sub-Municipality	Area	Pop	per km²
Northern District	Al-Mathar	9.77	31,074	3,180
	Al-Olaya	16.76	159,000	9,486
	Al-Shimal	483.32	315,283	652
	Ar-Rawdah	551.22	2,966	5
	King Khalid Int. Airport	234.07	16,632	71
	Total	**1,295.15**	**524,955**	**405**

Northern District - Citizenship Status

Around 30% of the Northern District's residents (142,496) were Non-Saudi, making it the third most diverse District across the capital. Non-Saudi residents were almost entirely clustered into neighbourhoods close to the Central District in the sub-municipalities of Al-Olaya, Al-Mathar, and Al-Shimal.



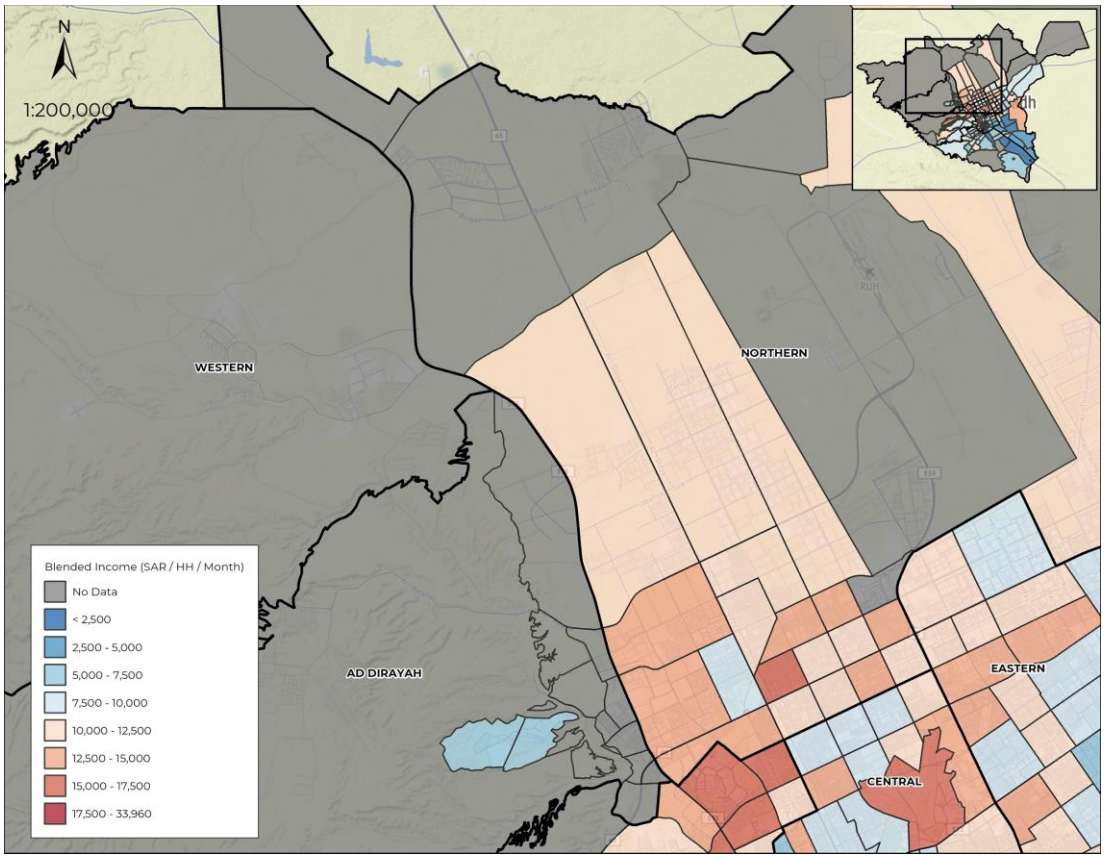
Map 9 Northern District - Citizenship Status

Table 10 Northern District - Citizenship Status

	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
Northern District	**Al-Mathar**	22,063	71%	9,011	29%	**31,074**
	Al-Olaya	101,996	64%	57,004	36%	**159,000**
	Al-Shimal	221,190	74%	76,244	26%	**297,434**
	Ar-Rawdah	2,727	92%	237	8%	**2,964**
	King Khalid Int. Airport	-	0%	-	0%	**-**
	Total	**347,976**	**71%**	**142,496**	**29%**	**490,472**

Northern District - Income Distribution

Home to many of Riyadh's most desirable neighbourhoods and many affluent Saudi families, the Northern District has the highest blended monthly household income at SAR 11,499, 38% above the Citywide average. Higher incomes were observed in the mature neighbourhoods of southern Al-Shimal and the Northern District's portion of Al-Olaya which both sit in close proximity to universities, amenities, and financial districts.



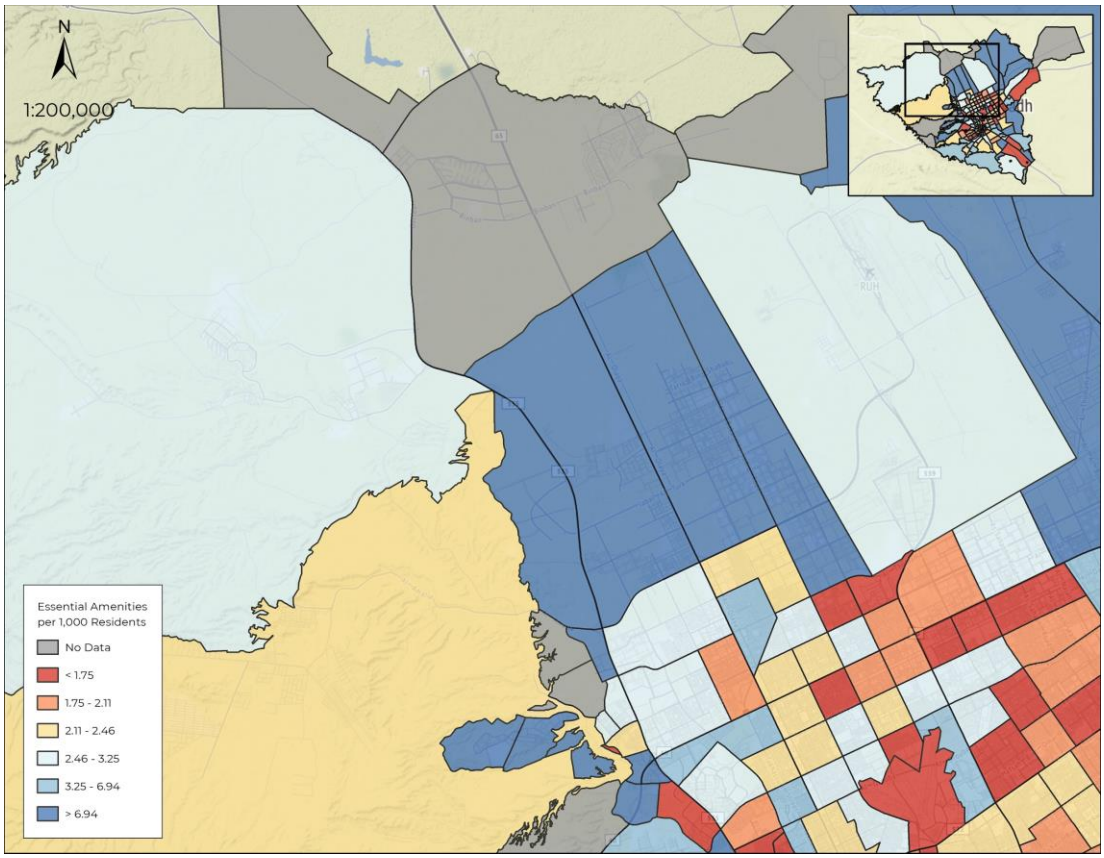
Map 10 Northern District - Income Distribution

Table 11 Northern District - Income Distribution

	Sub-Municipality	Saudi HH Inc.	Non-Saudi Inc.	Blended Inc.
Northern District	**Al-Mathar**	17,200	2,441	**12,920**
	Al-Olaya	14,095	4,670	**10,716**
	Al-Shimal	14,877	2,770	**11,774**
	Ar-Rawdah	11,650	3,080	**10,965**
	King Khalid Int. Airport	-	-	**-**
	Total	**14,770**	**3,510**	**14,695**

Northern District - Amenity Distribution

At 2.49 amenities per 1,000 residents, the Northern District has the third-highest amount of amenities on a per capita basis, 15% above the Citywide average. The majority of these amenities were concentrated in the Northern District's portion of Al-Olaya and Al-Shimal. Ar-Rawdah had the most amenities per 1,000 residents, bolstered by a high concentration of religious amenities (35) for a population of 2,966.



Map 11 Northern District - Amenity Distribution

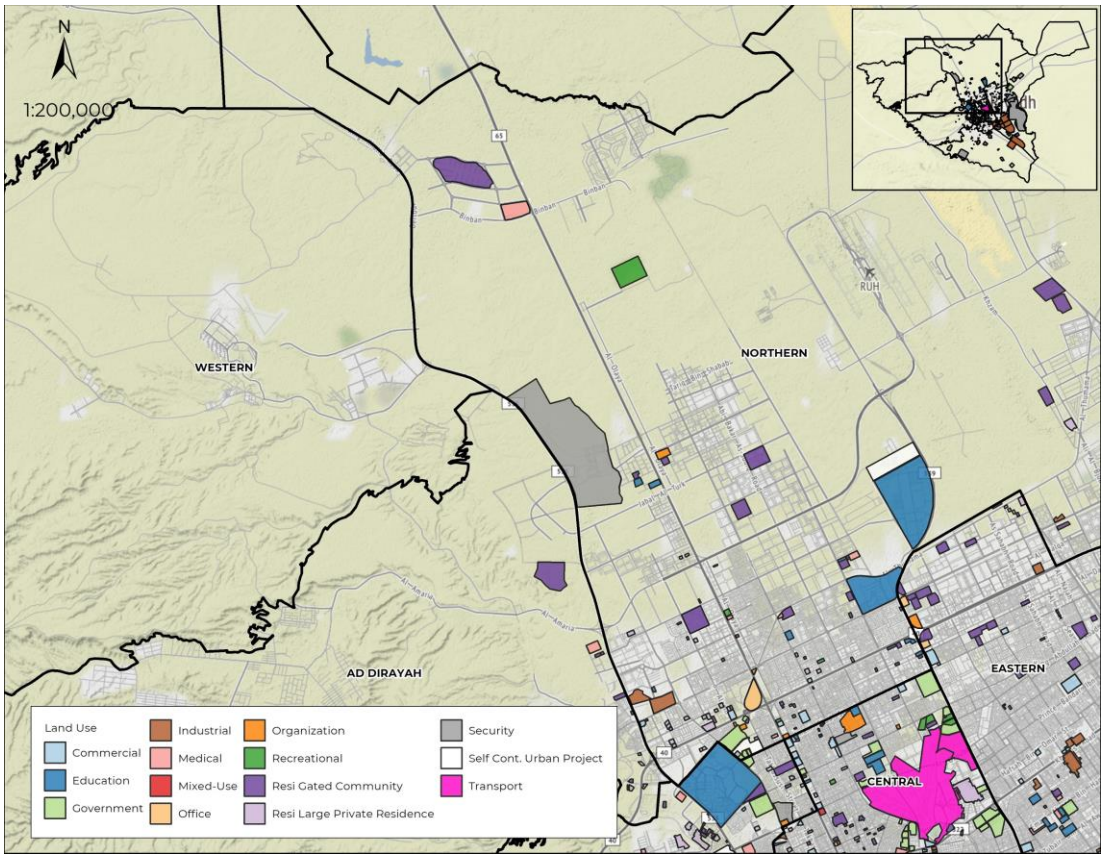
Table 12 Northern District - Amenity Distribution

	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Northern District	Al-Mathar	31,074	1	30	30	7	39	**107**
			(0.03)	(0.965)	(0.965)	(0.225)	(1.26)	**(3.44)**
	Al-Olaya	159,000	3	122	36	45	98	**304**
			(0.02)	(0.767)	(0.226)	(0.283)	(0.61)	**(1.91)**
	Al-Shimal	315,283	8	190	97	66	453	**814**
			(0.03)	(0.603)	(0.308)	(0.209)	(1.43)	**(2.58)**
	Ar-Rawdah	2,966	1	0	5	1	35	**42**
			(0.34)	(0)	(1.686)	(0.337)	(11.80)	**(14.16)**
	King Khalid Int. Airport	16,632	2	12	16	2	9	**41**
			(0.12)	(0.722)	(0.962)	(0.12)	(0.54)	**(2.47)**
	Total	**524,955**	**15**	**354**	**184**	**121**	**634**	**1,308**
			(0.03)	**(0.67)**	**(0.35)**	**(0.23)**	**(1.21)**	**(2.49)**

Northern District - Development by Land Use

Development across the Northern District totals 49.69 km^2, making it the fourth most developed District. The District is notable for containing the most Education development - 12.6 km^2, including the Princess Nourah Bint Abdul Rahman University and the Imam University. The District is also home to 8.96 km^2 of Gated Communities (second-highest healthcare-related behind the Western District), the highest amount of Office development 0.9 km^2 in the futuristic King Abdullah Financial District, and two innovative Self Contained

Urban Developments (2.77 km^2). The Northern District contains 1.39 km^2 Industrial concentrated close to Central Riyadh, making it the second least industrialized area.



Map 12 Northern District - Development by Land Use

Table 13 Northern District - Development by Land Use

Northern District						
Sub-Municipality	**Al-Mathar**	**Al-Olaya**	**Al-Shimal**	**Ar-Rawdah**	**King Khalid Int. Airport**	**Total**
Education	0.00	0.00	0.00	0.00	0.00	**0.00**
Government	0.00	0.00	0.00	0.00	0.18	**0.18**
Industrial	0.00	0.00	0.00	0.00	0.00	**0.00**
Commercial	0.00	0.00	0.00	1.13	0.00	**1.13**
Medical	0.00	0.00	0.00	0.00	0.00	**0.00**
Mixed-Use	0.00	0.00	0.00	0.00	0.00	**0.00**
Office	0.00	0.00	0.00	0.00	0.00	**0.00**
Organization	0.00	0.00	0.00	0.00	0.00	**0.00**
Resi Gated Community	0.00	0.00	0.00	0.00	0.00	**0.00**
Royal Residence	0.00	0.00	0.00	0.00	0.00	**0.00**
Recreational	0.00	0.00	0.00	0.00	0.00	**0.00**
Security	0.00	0.00	0.00	0.00	0.00	**0.00**
Self Cont. Urban Development	0.00	0.00	0.00	0.00	0.00	**0.00**
Transport	0.00	0.00	0.00	0.00	0.00	**0.00**
Total	**0.00**	**0.00**	**0.00**	**1.13**	**0.18**	**1.31**

Al-Mathar

The Eastern District's portion of Al-Mathar is home to one of the District's first mixed-use developments, Digital City, which is located adjacent to King Saud University.

Al-Olaya

Most development within Al-Olaya is located within the Central District, with just 0.83 km^2 development within the Northern District's portion. Satellite imagery reveals the largest project to be the North Riyadh Fish Market.

Al-Shimal

Al-Shimal is home to 64 identified projects that total 34.2 km^2, making it the third most active sub-municipality in Riyadh by total area of development. Although only 11.6% of Al-Shimal is developed, the sub-municipality has one of the most expansive road networks within Riyadh, and is well connected to Central Riyadh via King Fahd Road, and adjacent mature/maturing suburbs such as Al-Mathar and Al-Olaya, making it an attractive area to develop. Al-Shimal is home to many of Riyadh's most ambitious and newest developments, including the futuristic King Abdullah Financial District that includes 1.6 million m^2 floor area, as well as some of the District's newest and most contemporary shopping centres including Riyadh Park Mall and Riyadh Boulevard, as well as more traditional shopping centres including Tala Mall, Al-Makan Mall.

A large security base in central Al-Shimal accounts for almost half of the development within Al-Shimal, with the remainder diversified including Residential Gated Community (19%), Education (13%), Recreational (5%), and Industrial (4%). The majority (96%) development within Al-Shimal is gated, with the remaining 4% soft-gated.

Ar-Rawdah

The Northern District's portion of Ar-Rawdah is largely exurban and contains just six projects. The majority (80%) of development is Residential Gated Communities.

King Khalid Int. Airport

Due to increased demand for international travel and limited capacity at the international airport's former site in Central Riyadh, the King Khalid Int. Airport was opened in 1983. A fifth terminal was introduced in 2015, with annual passenger traffic reaching 26 million passengers by 2018, making the airport the second busiest in the Kingdom.

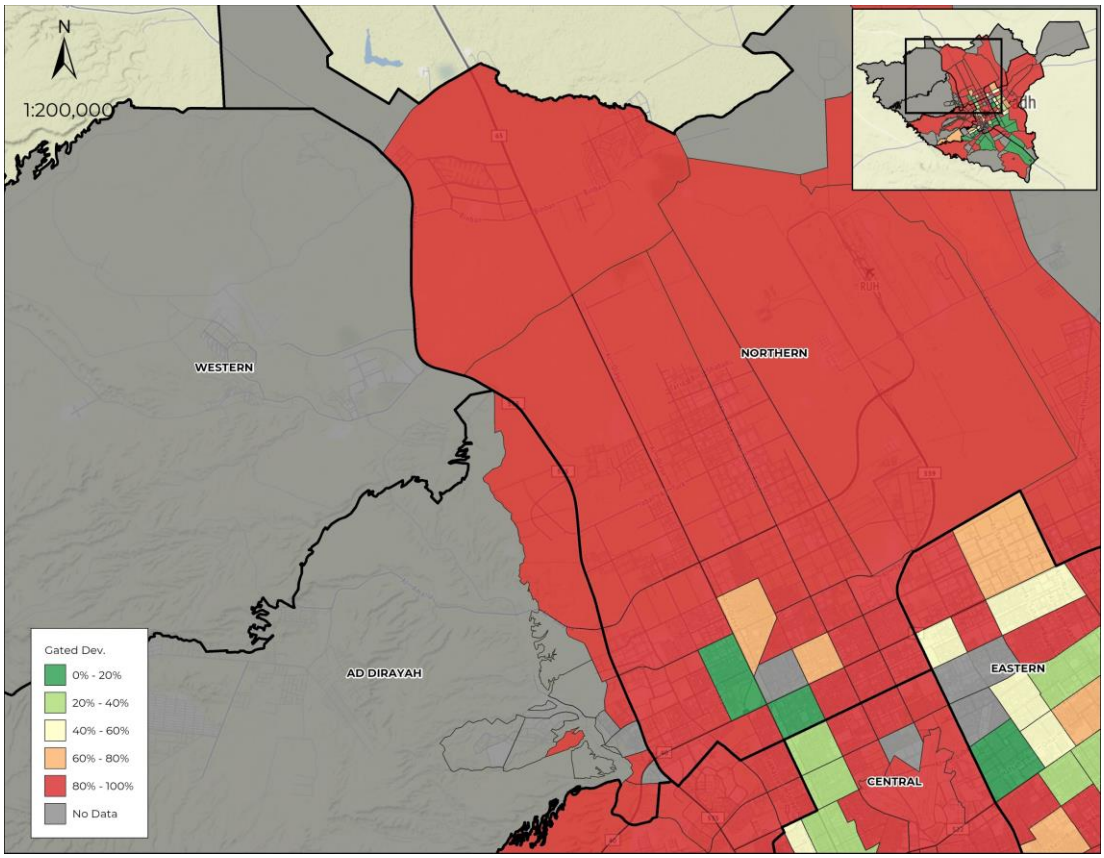
Just two projects were identified within this sub-municipality, totalling 10.15 km^2, or 24% of existing land use (42.05 km^2). Education accounts for 8.1 km^2 of this land area, in the form of the Princess Nourah Bint Abdul Rahman University, opened in 2011. Just north of the

university sits the 2.04 km^2 LEED Platinum Certified King Abdullah Petroleum Studies and Research Centre, a modern and expansive campus dedicated to research energy economics. Both of these projects are gated, multi-use developments with restricted access.

Projects that have been introduced in the past year include Riyadh Front approx 0.3 km^2, an upscale lifestyle centre mall which frames 750m narrow courtyard, as well as a similarly sized office complex housing co-working facilities, and KPMG among other office tenants. Both projects are excluded from analysis but are semi-gated and single-use.

Northern District - Gated Development

Home to many of Riyadh's newest neighbourhoods, super-block developments, master-planned communities, modern shopping centres, and affluent Saudi families, the Northern District is home to just 0.06 km^2 of Non-Gated development, with over 96% of development across the District Gated. Pockets of Soft-Gated development can be found in the south of the District, which are mostly shopping centres and offices.



Map 13 Northern District - Gated Development

Table 14 Northern District - Gated Development

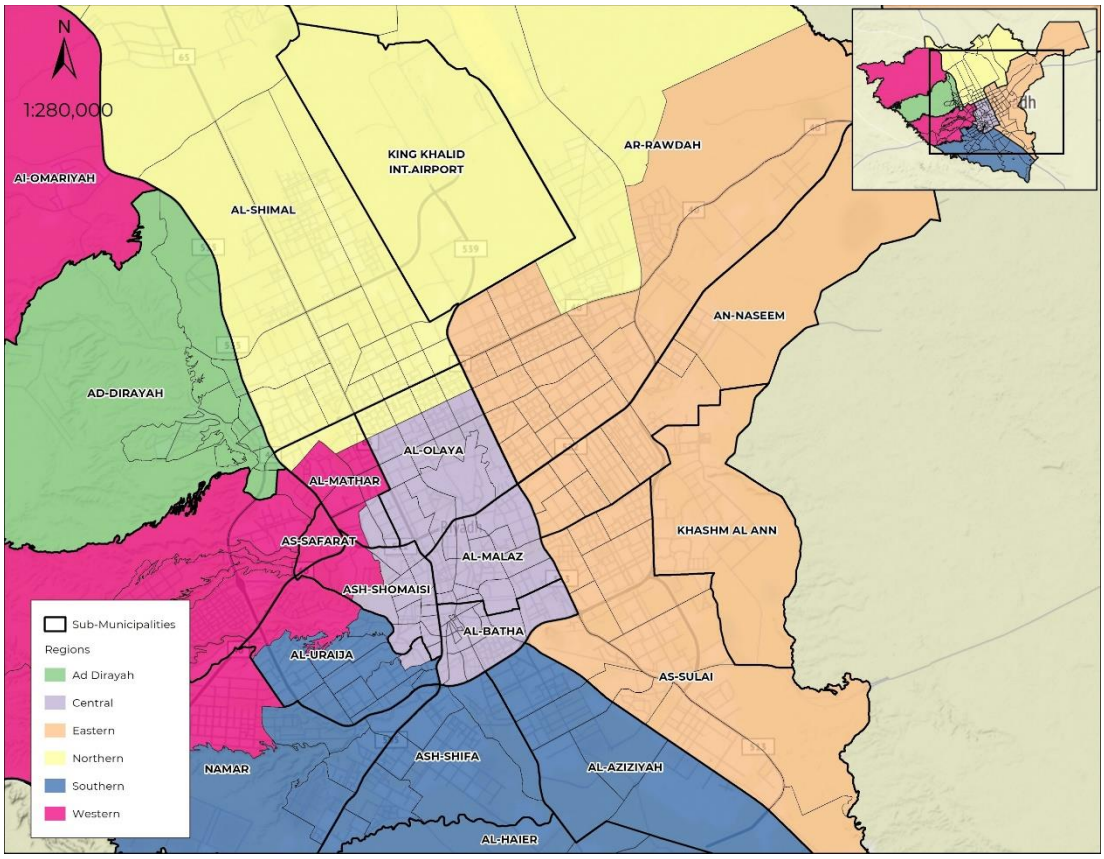
	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
Northern District	**Al-Mathar**	2.11	100%	0.00	0%	0.00	0%	**2.11**
	Al-Olaya	0.44	53%	0.39	47%	0.00	0%	**0.83**
	Al-Shimal	32.85	96%	1.29	4%	0.06	0%	**34.20**
	Ar-Rawdah	2.39	100%	0.00	0%	0.00	0%	**2.39**
	King Khalid Int. Airport	10.15	100%	0.00	0%	0.00	0%	**10.15**
	Total	**47.94**	**96%**	**1.68**	**3%**	**0.06**	**0%**	**49.69**

Eastern District

Eastern District - Summary and Context

Containing As-Sulai, Khashm Al-Ann, An-Naseem, the Eastern Suburbs, and around 40% of Ar-Rawah, the Eastern District is the Capital's second-largest by area at 1,465.97 km^2 and second most populated. Districtwide around 30% of the land has been improved, although this is largely concentrated in the urban areas that fringe Central Riyadh, with much of the exurbs largely undeveloped, particularly in the 488.73 km^2 Eastern Suburb which is almost entirely undeveloped. With a total of 234.08 km^2 projects identified under development, the Eastern District is home to the highest total area of development across the Capital. Around 12% of the Eastern District's total area is occupied with projects identified as Gated, making

it the second most gated District by percentage terms, but the largest in absolute terms with 179.10 km^2 Gated, predominantly within the Khashm Al-Ann military complex.



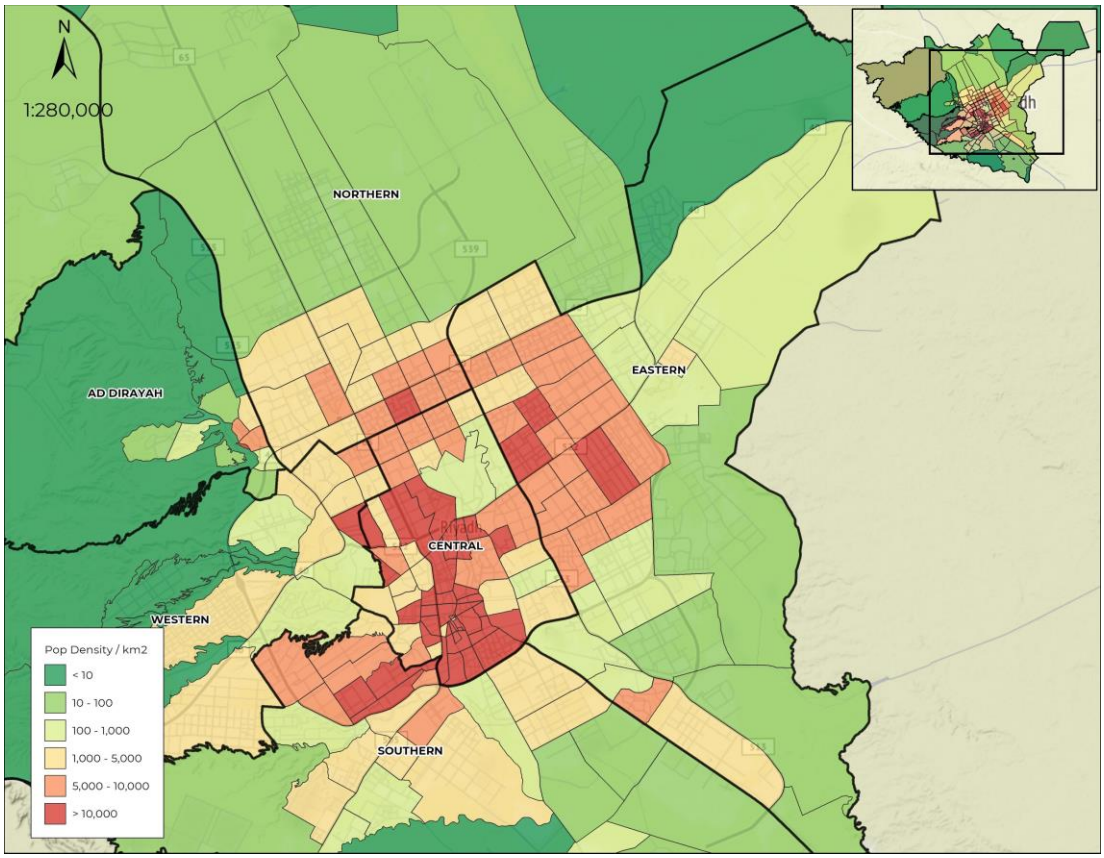
Map 14 Eastern District - Context and Summary

Table 15 Eastern District - Context and Summary

	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
Eastern District	**An-Naseem**	25.54	11%	24.07	11%	225.65	53.11	142.82	30.37
	Ar-Rawdah	30.08	9%	28.51	8%	352.12	68.91	215.41	67.79
	As-Sulai	103.65	38%	16.26	6%	270.97	67.33	159.69	43.95
	Eastern Suburb	-	0%	0.00	0%	488.73	1.00	450.70	38.02
	Khashm Al-Ann	110.26	86%	110.26	86%	128.50	43.73	77.95	6.82
	Total	**269.53**	**18%**	**179.10**	**12%**	**1,465**	**234.08**	**1,046**	**186.95**

Eastern District - Population Density

Home to 1,496,772 residents within a 1,465.97 km^2 area the Eastern District is the second most populous District and the third most densely populated. The majority of the Eastern District's population is located in the suburbs of Ar-Rawdah and An-Naseem that fringe Central Riyadh. These suburbs are laid out on vast superblocks zoned predominantly for single-family housing in the 1970s.



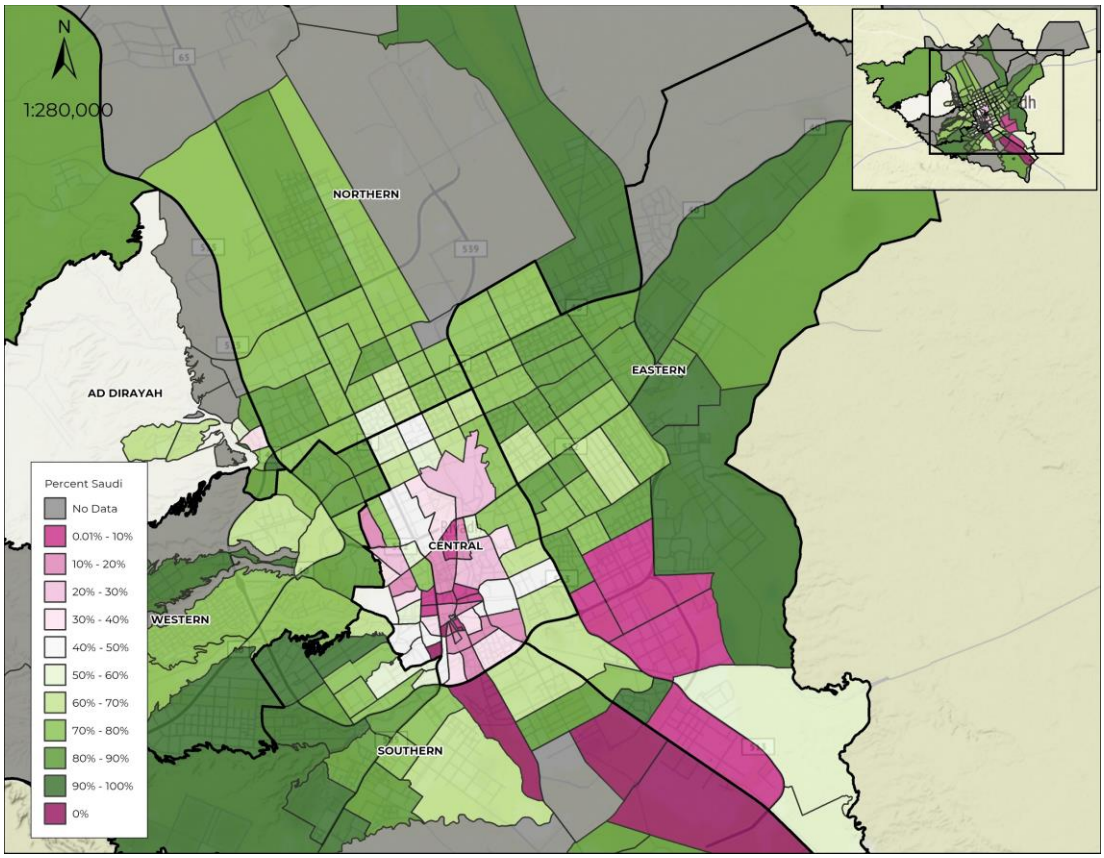
Map 15 Eastern District - Population Density

Table 16 Eastern District - Population Density

	Sub-Municipality	Area	Pop	per km²
Eastern District	**An-Naseem**	225.65	519,012	2,300
	Ar-Rawdah	352.12	693,768	1,970
	As-Sulai	270.97	276,528	1,021
	Eastern Suburb	488.73	-	-
	Khashm Al-Ann	128.50	7,464	58
	Total	**1,465.97**	**1,496,772**	**1,021**

Eastern District - Citizenship Status

The Eastern District is home to 1,135,649 Saudis, making it the most populous District for Saudis, and in percentage terms the second most homogenous District of the Capital. There are four predominantly non-Saudi districts in the Eastern District, which are both in the south of the District, and all contain industrial developments, meaning that these residents are likely low-income Non-Saudis. The Capital's least diverse sub-municipality is Khasm Al-Ann, which is 95% Saudi, which is unsurprising considering the sub-municipality contains a military base.



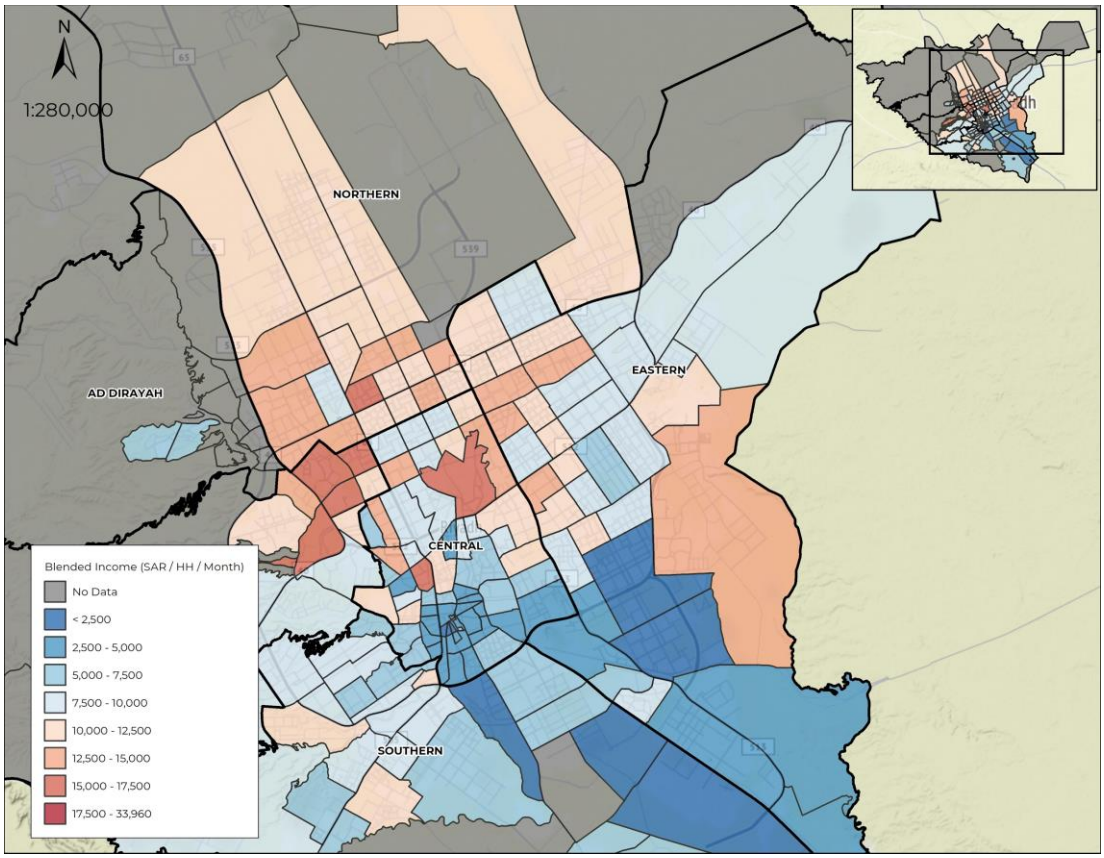
Map 16 Eastern District - Citizenship Status

Table 17 Eastern District - Citizenship Status

	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
Eastern District	**An-Naseem**	403,910	78%	115,102	22%	**519,012**
	Ar-Rawdah	545,808	79%	147,961	21%	**693,769**
	As-Sulai	178,915	65%	97,613	35%	**276,528**
	Eastern Suburb	-	0%	-	0%	**-**
	Khashm Al-Ann	7,016	94%	448	6%	**7,464**
	Total	**1,135,649**	**76%**	**361,124**	**24%**	**1,496,773**

Eastern District - Income Distribution

With a blended monthly household income of SAR 9,323 (12% above the Citywide average), the Eastern District is the third most affluent with wealth concentrated into the northwestern suburbs that fringe Central Riyadh. While wealthier neighbourhoods tend to be in the north of the Eastern District, there are concentrations of low-income neighbourhoods in the south of the District, and as observed within other areas these are home to high numbers of Non-Saudis and large industrial hubs, meaning that they are likely inhabited by low skilled industrial workers. Residents of the Khashm Al-Ann sub-municipality had the second-highest income across the District at SAR 13,958.



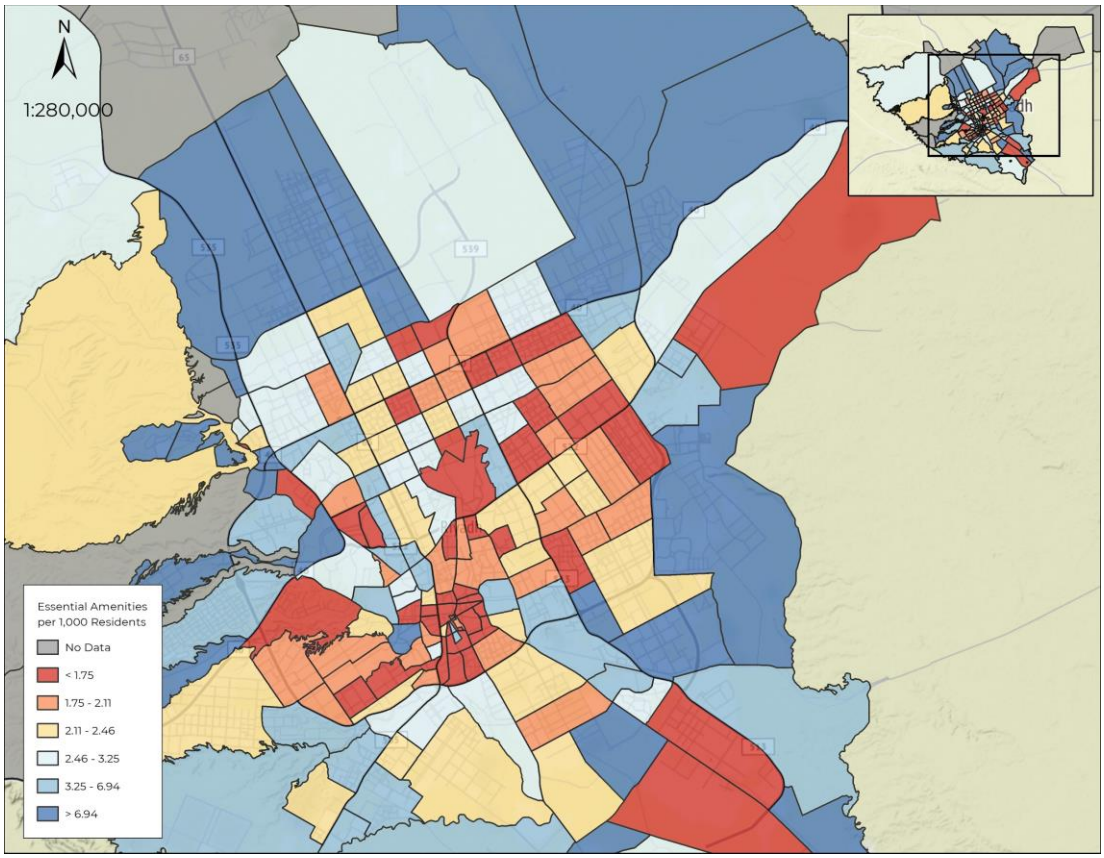
Map 17 Eastern District - Income Distribution

Table 18 Eastern District - Income Distribution

	Sub-Municipality	Saudi	Non-Saudi	Blended
Eastern District	**An-Naseem**	10,198	3,061	**8,615**
	Ar-Rawdah	12,510	3,122	**10,508**
	As-Sulai	10,413	2,305	**7,551**
	Eastern Suburb	-	-	**-**
	Khashm Al-Ann	14,764	1,341	**13,958**
	Total	**11,371**	**2,879**	**9,323**

Eastern District - Amenity Distribution

The Eastern District generally recorded similar values to the Citywide average with 2.21 amenities per 1,000 residents. The majority of these amenities were found in the urban areas of sub-municipalities such as Ar-Rawdah and As-Sulai.The Eastern Region was home to the highest amount of religious amenities with 1,451.



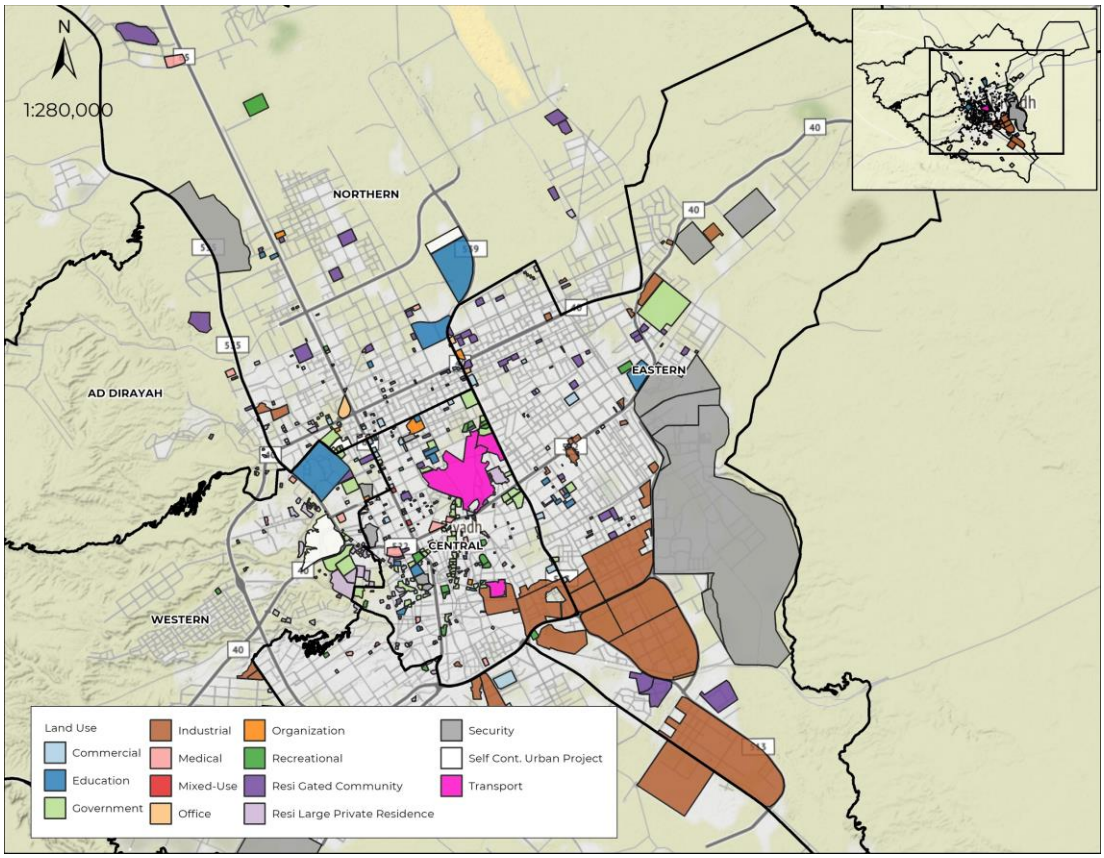
Map 18 Eastern District - Amenity Distribution

Table 19 Eastern District - Amenity Distribution

	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Eastern District	An-Naseem	519012	5	434	73	99	477	**1088**
			0.01	0.836	0.141	0.191	0.92	**2.1**
	Ar-Rawdah	693780	10	415	86	154	659	**1324**
			0.01	0.598	0.124	0.222	0.949868835	**1.91**
	As-Sulai	276528	8	141	76	31	306	**562**
			0.03	0.51	0.275	0.112	1.106578719	**2.03**
	Eastern Suburb	1	0	0	0	0	0	**0**
			0	0	0	0	0	-
	Khashm Al-Ann	7464	1	3	327	1	9	**341**
			0.13	0.402	43.81	0.134	1.205787781	**45.69**
	Total	**1496785**	**24**	**993**	**562**	**285**	**1,451**	**3,315**
			0.02	**0.66**	**0.38**	**0.19**	**0.97**	**2.21**

Eastern District - Development by Land Use

Containing 270 km^2 development, the Eastern District is home to 57% of Riyadh's entire identified projects and contains four times as much development as the Southern District, its closest competitor. Much of this development is attributed to Security uses including the expansive Khashm Al-Ann military base which spans 135.2 km^2. The Eastern District is home to expansive Industrial complexes totalling 97.1 km^2, making it home to almost 70% of the Capital's industrial development.



Map 19 Eastern District - Development by Land Use

Table 20 Eastern District - Development by Land Use

Eastern District						
Sub-Municipality	An-Naseem	Ar-Rawdah	As-Sulai	Eastern Suburb	Khashm Al-Ann	**Total**
Education	0.9	2.02	0	0	0	**2.92**
Government	0.36	7.24	0.12	0	0	**7.72**
Industrial	1.29	3.56	92.25	0	0	**97.1**
Commercial	0.28	1.16	0.09	0	0	**1.53**
Medical	0.26	0	0.05	0	0	**0.31**
Mixed-Use	0	0	0	0	0	**0**
Office	0	0.3	0	0	0	**0.3**
Organization	0	0.29	0	0	0	**0.29**
Gated Community	0.43	4.09	8	0	0	**12.51**
Royal Residence	0	0.17	0	0	0	**0.17**
Recreational	0	0.5	0.24	0	0	**0.74**
Security	22.02	10.74	2.91	0	110.26	**145.93**
Self Cont. Urban Development	0	0	0	0	0	**0**
Transport	0	0	0	0	0	**0**
Total	**25.54**	**30.08**	**103.65**	**0**	**110.26**	**269.53**

An-Naseem

Currently, 25.54 km^2 of projects are under development across An-Naseem, equivalent to 48% of the existing 53.11 km^2 development throughout the sub-municipality. Two military projects are located close to the geographic centre of An-Naseem, one of which is a portion of the expansive Khashm Al-Ann military base. Worth noting is that the portions of the

military base within An-Naseem are primarily healthcare-related facilities including the King Saud bin Abdulaziz University for Health, hospitals, and associated colleges.

Development outside of these military bases is diversified including Industrial (5%), Education (4%), and Residential Gated Community (2%). From satellite observation, much of An-Naseem's suburbs are predominantly single-use residential areas, although independent businesses/retailers are often found in street format retail on major streets.

Ar-Rawdah

Due to the sub-municipalities vast size and coverage of many of Riyadh's northeastern suburbs, Ar-Rawdah contains the largest amount of developed land. Within the Eastern District's portion of Ar-Rawdah 60 projects were identified totalling 30.08 km2 with 36% of development Security, 24% Government, and 14% Gated Residential.

Notable developments within Ar-Rawdah include Granada Mall, as well as the adjacent GOSI Office Park. Al-Hamra Mall can also be found within Ar-Rawdah, as well as the King Fahd International Stadium, and the King Fahd Security College. Line 2 and Line 6 of Riyadh's Metro are under development in Ar-Rawdah which will perhaps catalyse denser forms of development in the area.

As-Sulai

Identified projects under development/developed across As-Sulai are largely industrial (89%), and the sub-municipality is one of the City's key manufacturing hubs.

Khasm Al-Ann

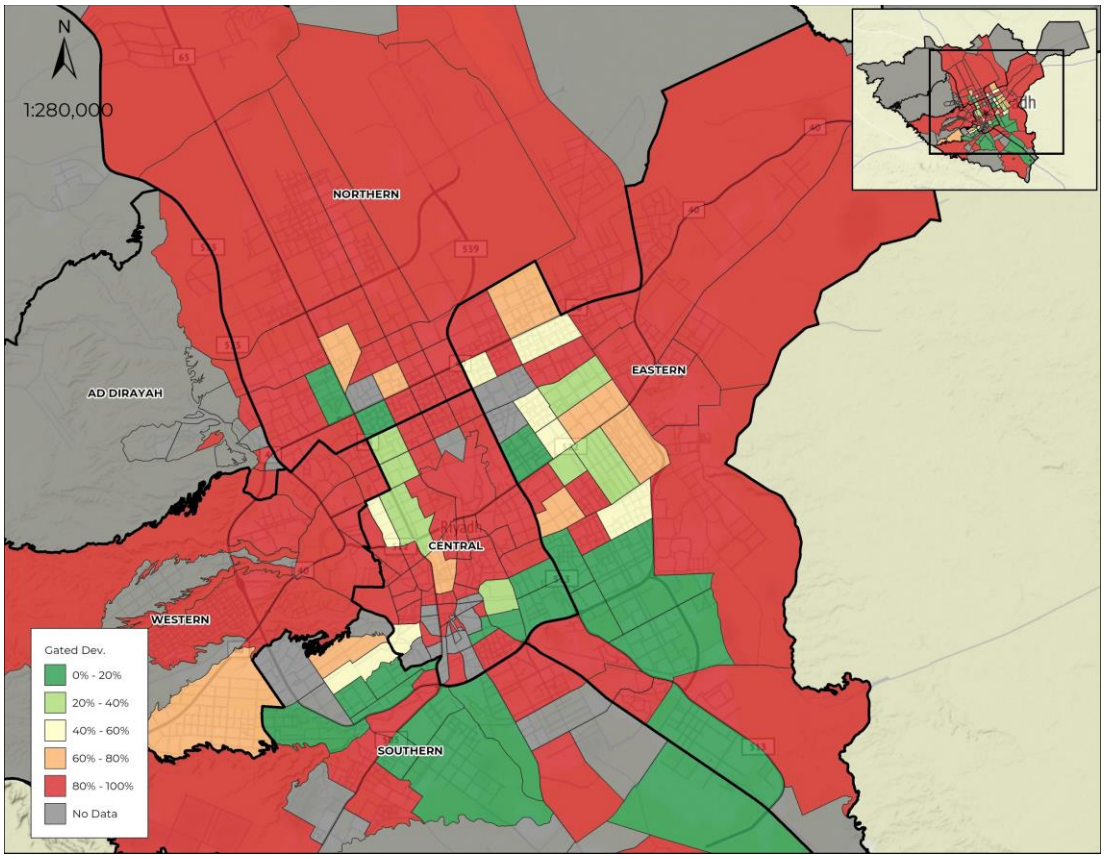
Khashm Al-Ann contains just one identified development which is by far the largest project across the City at 110.26 km^2 - accounting for 252% of the existing developed area of 43.73 km^2. The project spans into various neighbouring municipalities, and is therefore subdivided so that each district has a respective share of the development. The project is entirely gated and restricted.

Eastern Suburbs

There were zero recorded projects either built or under development in the Eastern Suburbs. With just one km^2 of development within the District's 488.73 km^2 the area is one of Riyadh's least developed municipalities.

Eastern District - Gated Development

Two-thirds of development or 179.10 km^2 of development across the Eastern District was gated, with the majority of other development Non-Gated (89.11 km^2), the second most Non-Gated Districts across the Capital. Non-Gated development is almost entirely located within the Sub-Municipality of As-Sulai and is overwhelmingly contained within Industrial complexes. The majority of projects in the Eastern District's newer, Saudi suburbs in An-Naseem and Ar-Rawdah are overwhelmingly gated, at 94% and 95%, respectively.



Map 20 Eastern District - Gated Development

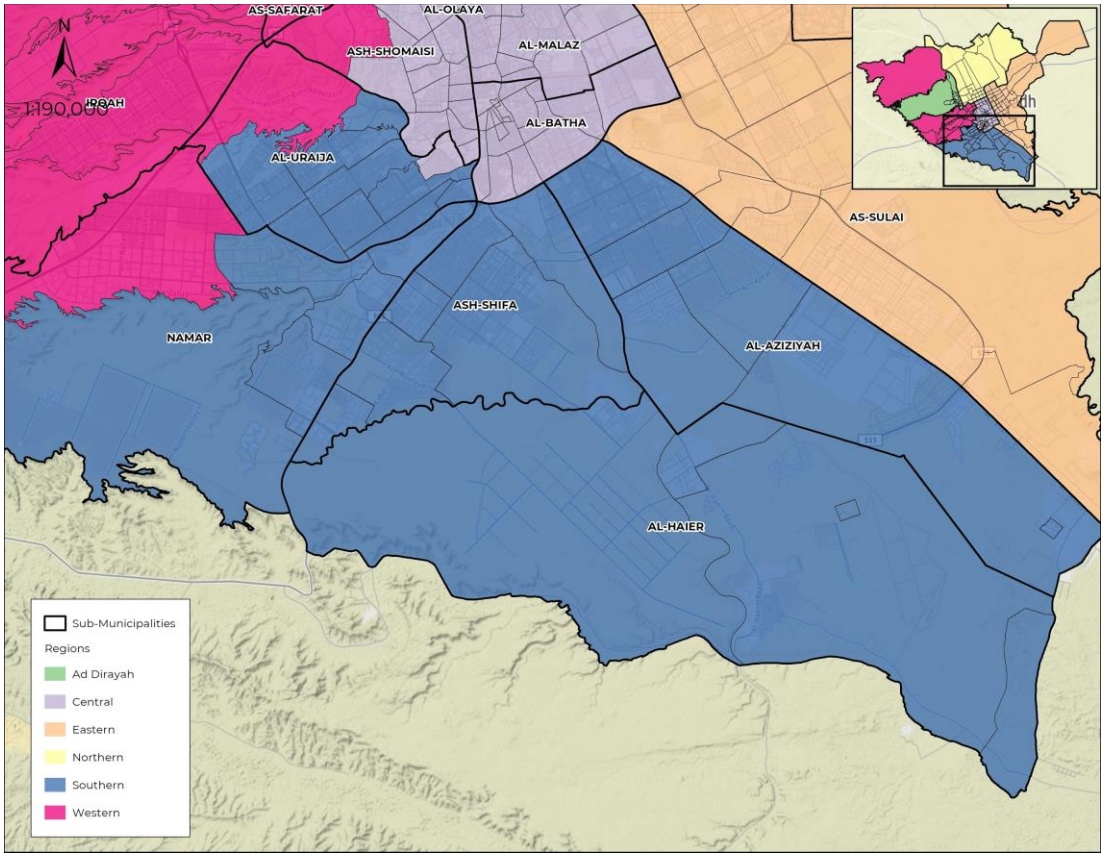
Table 0.1 Eastern District - Gated Development

	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
Eastern District	**An-Naseem**	24.07	94%	0.05	0%	1.42	6%	**25.54**
	Ar-Rawdah	28.51	95%	1.18	4%	0.39	1%	**30.08**
	As-Sulai	16.26	16%	0.09	0%	87.31	84%	**103.65**
	Eastern Suburb	0.00	0%	0.00	0%	0.00	0%	**0.00**
	Khashm Al-Ann	110.26	100%	0.00	0%	0.00	0%	**110.26**
	Total	**179.10**	**66%**	**1.32**	**0%**	**89.11**	**33%**	**269.53**

Southern District

Southern District - Summary and Context

The Southern District contains the sub-municipalities of Al-Haier, Al-Aziziyah, Ash-Shifa, the majority (66%) of Al-Uraija, and much of Namar for a total of 893.88 km^2, the fourth largest District. Outside of the Al-Uraija and Ash-Shifa as well as central pockets of Namar and Al-Aziziyah the Southern District has large areas of unimproved land, with almost 72% of land within the District undeveloped (645.33 km^2). The District has an extensive network of roads that crisscross the mostly undeveloped Al-Haier and Namar, which based on satellite observation are likely to be built out as part of a government initiative to grant Saudi nationals with plots of land to develop. Projects identified as gated covered 4% of all land within the Southern District, with much of this development located within Namar and Al-Haier primarily within military and governmental institutions.



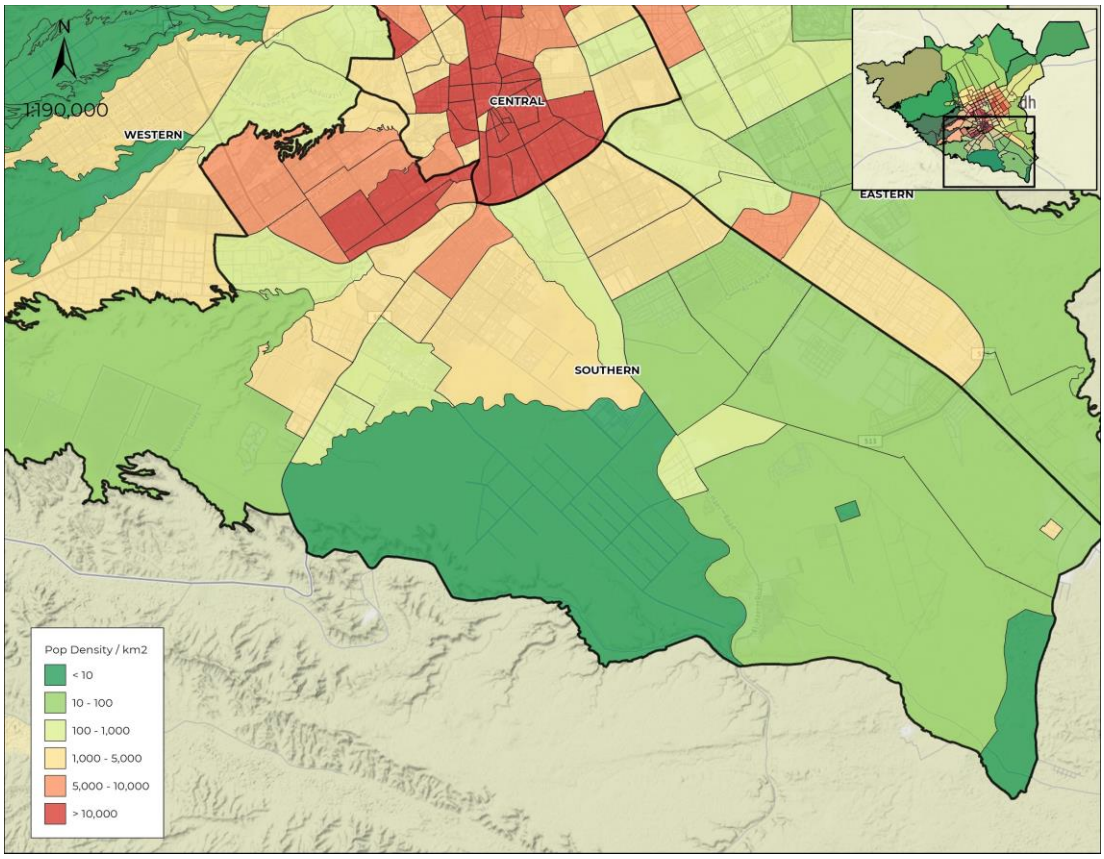
Map 21 Southern District - Context and Summary

Table 22 Southern District - Context and Summary

Southern District	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
	Al-Aziziyah	17.28	9%	1.59	1%	186.25	37.86	125.18	23.20
	Al-Haier	6.75	2%	6.75	2%	357.17	26.24	305.09	27.84
	Al-Uraija	0.75	1%	0.38	1%	59.66	27.68	14.42	17.56
	Ash-Shifa	12.64	12%	1.27	1%	108.21	26.19	57.77	24.25
	Namar	26.00	14%	25.89	14%	182.60	11.95	143.06	27.58
	Total	**63.41**	**7%**	**35.88**	**4%**	**893.88**	**129.92**	**645.53**	**120.43**

Southern District - Population Density

The majority of the Southern District's population live in northern neighbourhoods abutting Central Riyadh, with populations decreasing further from the centre. The Southern District is home to 959,852 spread over an area 893.88 km^2, with a district-wide population density of 1,073 per km^2, the second-highest after the Central District. Over half of the Southern District's population live within the sub-municipality of Al-Uraija, one of the city's first western expansions which was made possible in the 1960s by a series of bridges that cross the Wadi.



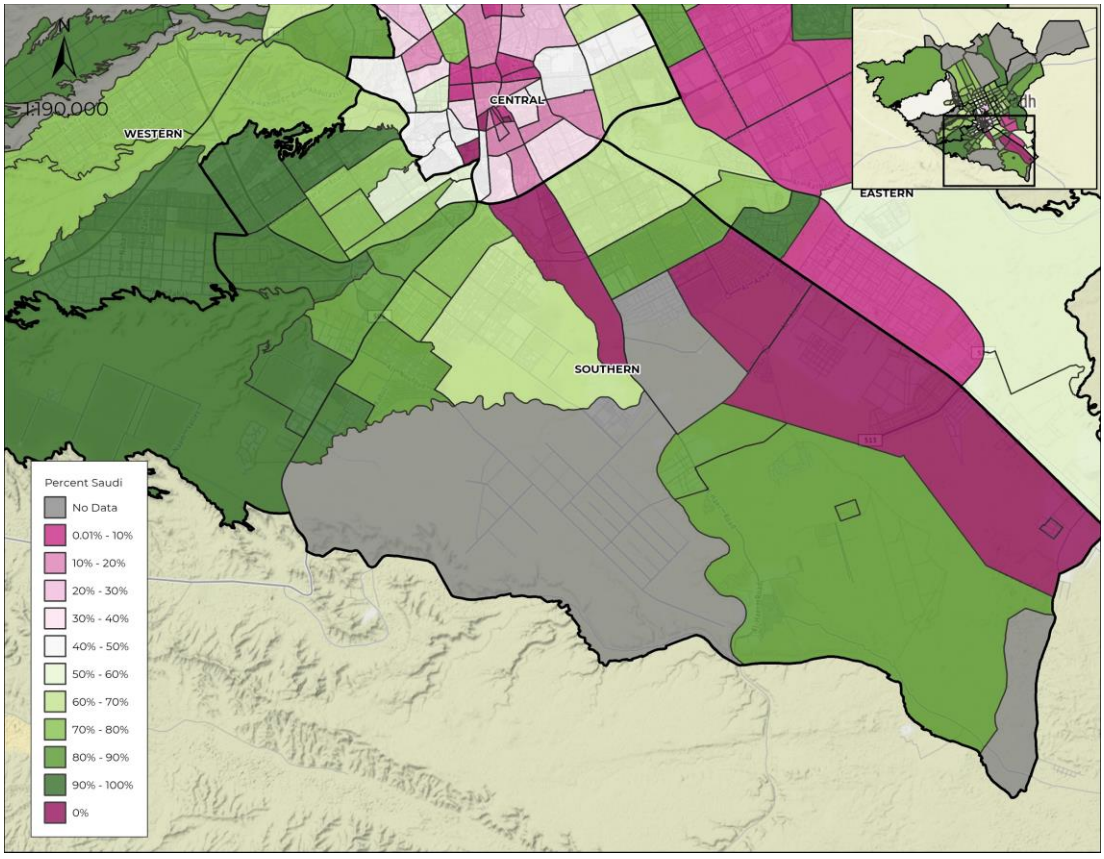
Map 22 Southern District - Population Density

Table 23 Southern District - Population Density

	Sub-Municipality	Area	Pop	per km²
Southern District	**Al-Aziziyah**	186.25	163,176	876
	Al-Haier	357.17	13,994	39
	Al-Uraija	59.66	507,528	8,507
	Ash-Shifa	108.21	204,228	1,887
	Namar	182.60	70,926	388
	Total	**893.88**	**959,852**	**1,074**

Southern District - Citizenship Status

District-wide Saudi's accounted for 75% of the population or 710,243 making the Southern District the third most homogenous district across the Capital. Four notable bright pink or Non-Saudi neighbourhoods can clearly be shown on the below map (Map 23) - these areas are almost entirely inhabited by Non-Saudis, and likely employees of the Industrial complexes found within these neighbourhoods. Neighbourhoods of Namar within the Southern District were also observed to have high concentrations of Saudi residents, likely due to government granted land to Saudi nationals.



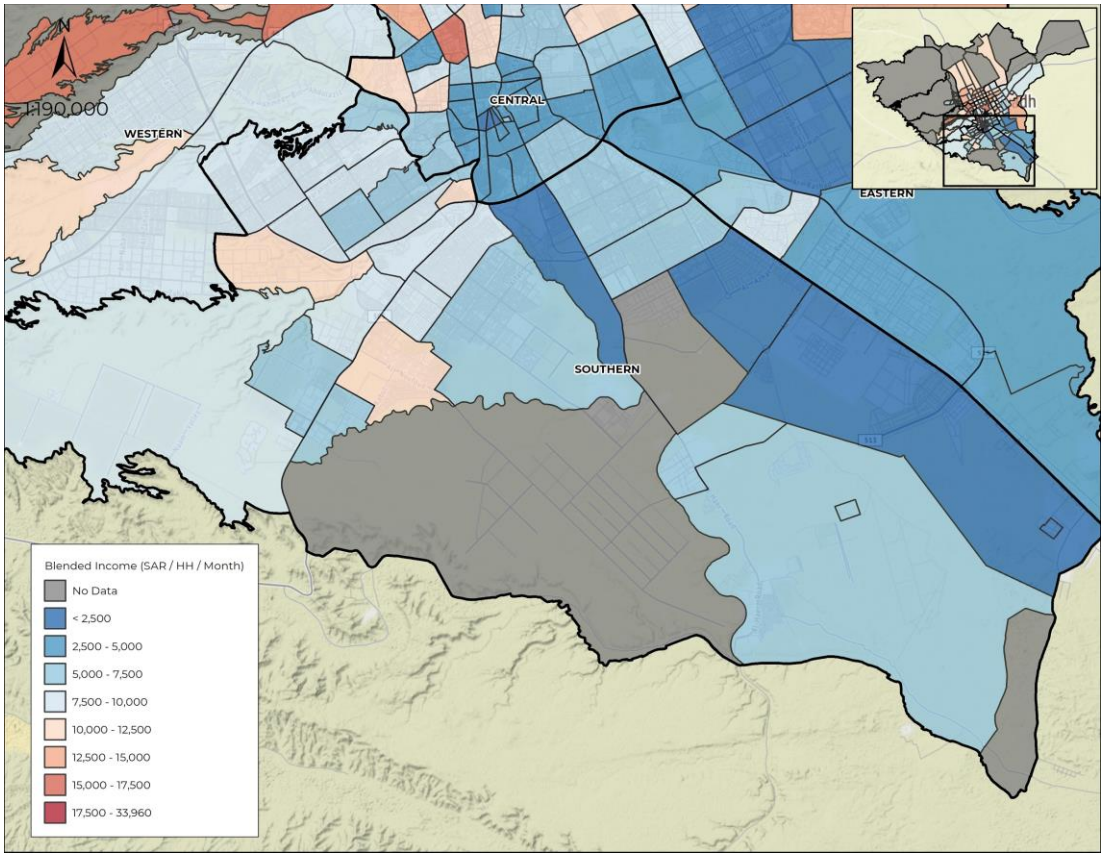
Map 23 Southern District - Citizenship Status

Table 24 Southern District - Citizenship Status

	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
Southern District	**Al-Aziziyah**	112,110	69%	50,172	31%	**162,282**
	Al-Haier	11,485	83%	2,352	17%	**13,837**
	Al-Uraija	394,971	78%	112,557	22%	**507,528**
	Ash-Shifa	141,130	69%	63,098	31%	**204,228**
	Namar	50,547	90%	5,524	10%	**56,071**
	Total	**710,243**	**75%**	**233,703**	**25%**	**943,946**

Southern District - Income Distribution

On average blended monthly household incomes across the Southern District were SAR 7,683, 8% below the Capital's average. Some of the Capital's poorest neighbourhoods can be found in the Southern District, which are also home to massive Industrial developments, and therefore these low income workers likely work in low-skilled industrial work. Incomes increase to the northwest of the Southern District in sub-municipalities such as Namar and Al-Uraija which are home to predominantly Saudi families.



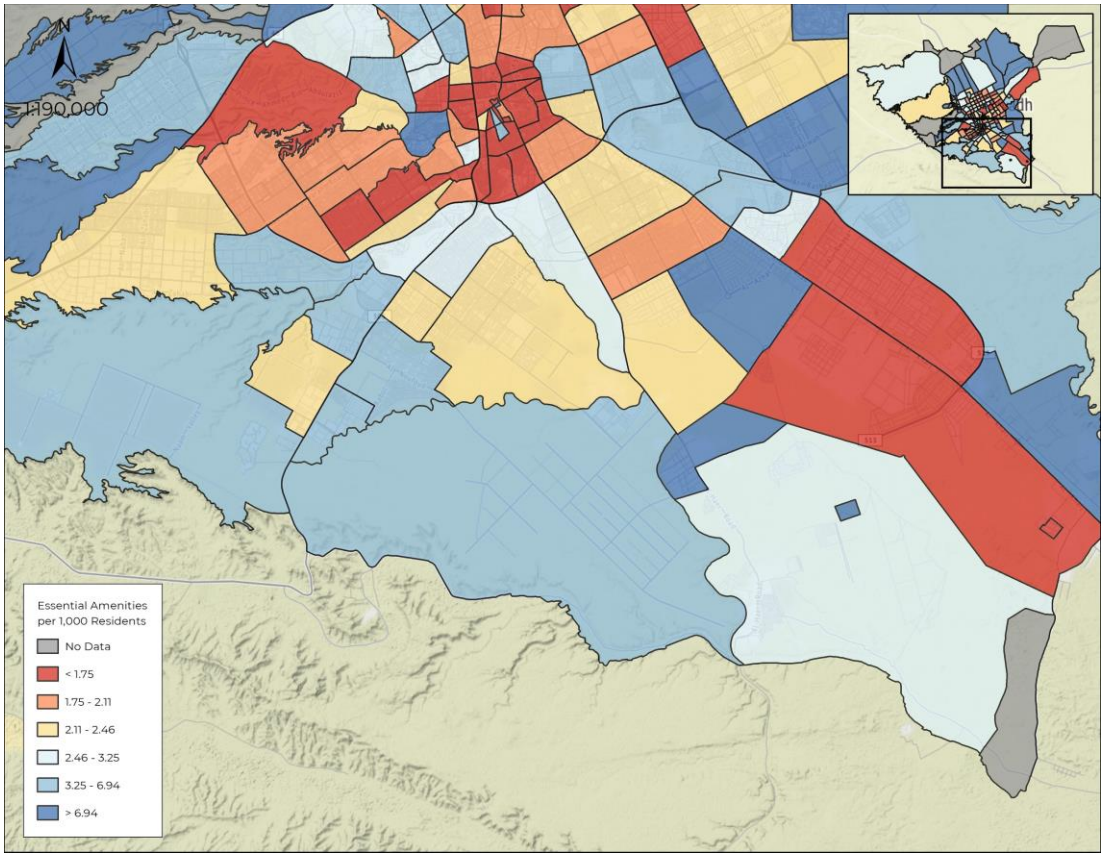
Map 24 Southern District - Income Distribution

Table 25 Southern District - Income Distribution

	Sub-Municipality	Saudi	Non-Saudi	Blended
Southern District	**Al-Aziziyah**	8,405	3,611	**6,923**
	Al-Haier	6,822	2,023	**6,006**
	Al-Uraija	9,388	2,744	**7,914**
	Ash-Shifa	9,755	2,423	**7,490**
	Namar	11,908	2,049	**10,936**
	Total	**9,443**	**2,820**	**7,804**

Southern District - Amenity Distribution

The Southern District is home to 2.32 amenities per 1,000 residents, slightly above the Citywide average. The area is home to the lowest amount of Cultural amenities, with just 10 for 959,852 residents - 0.01 per capita. The area is also home to the lowest amount of Government amenities per capita at 0.21 per capita vs. Citywide average of 0.34 per capita.



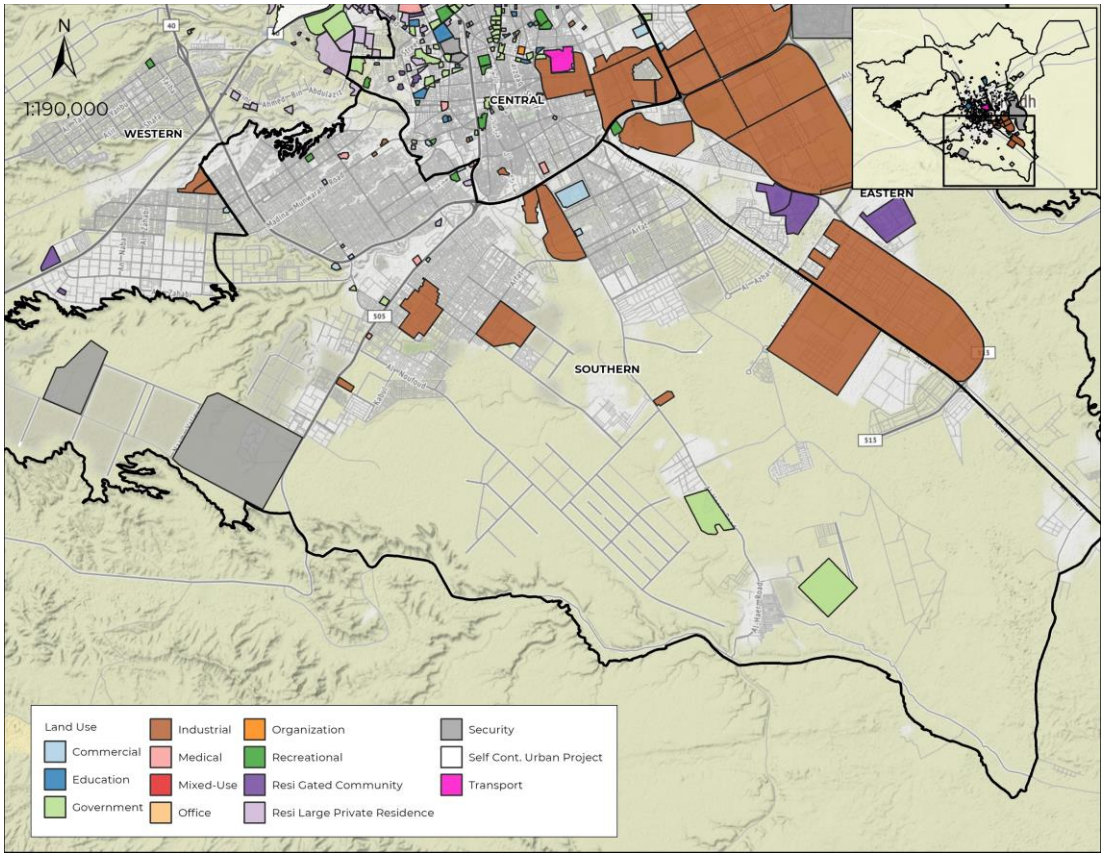
Map 25 Southern District - Amenity Distribution

Table 26 Southern District - Amenity Distribution

	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Southern District	Al-Aziziyah	163176	1	101	21	25	201	**349**
			(0.01)	(0.619)	(0.129)	(0.153)	(1.23)	**(2.14)**
	Al-Haier	13994	0	21	24	12	46	**103**
			(0)	(1.501)	(1.715)	(0.858)	(3.28)	**(7.36)**
	Al-Uraija	507528	6	385	53	94	450	**988**
			(0.01)	(0.759)	(0.104)	(0.185)	(0.88)	**(1.95)**
	Ash-Shifa	204228	3	161	43	32	283	**522**
			(0.01)	(0.788)	(0.211)	(0.157)	(1.38)	**(2.56)**
	Namar	70926	0	52	65	12	132	**261**
			(0)	(0.733)	(0.916)	(0.169)	(1.86)	**(3.68)**
	Total	**959852**	**10**	**720**	**206**	**175**	**1,112**	**2,223**
			(0.01)	**(0.75)**	**(0.21)**	**(0.18)**	**(1.16**	**(2.32)**

Southern District - Development by Land Use

Development within the Southern District is dominated by two land uses - Industrial at 28.63 km^2 (45% identified project area) and Security at 25.53 km^2 (40% identified project area). The Southern District has one of the least diversified land-use patterns, with no Education, Mixed-Use, Office, Organization, Residential Gated Communities, Self-Contained Urban Development identified within the sprawling district.



Map 26 Southern District - Development by Land Use

Table 27 Southern District - Development by Land Use

Southern District						
Sub-Municipality	Al-Aziziyah	Al-Haier	Al-Uraija	Ash-Shifa	Namar	**Total**
Education	0	0	0	0	0	**0**
Government	0	6.75		0	0.18	**6.93**
Industrial	15.97	0	0.11	12.56	0	**28.63**
Commercial	1.31	0	0.15	0.03	0.11	**1.59**
Medical	0	0	0.18	0.05	0.12	**0.35**
Mixed-Use	0	0	0	0	0	**0**
Office	0	0	0	0	0	**0**
Organization	0	0	0	0	0	**0**
Gated Community	0	0	0	0	0	**0**
Royal Residence	0	0	0.09	0	0.07	**0.16**
Recreational	0	0	0.23	0	0	**0.23**
Security	0	0	0	0	25.53	**25.53**
Self Cont. Urban Development	0	0	0	0	0	**0**
Transport	0	0	0	0	0	**0**
Total	**17.28**	**6.75**	**0.75**	**12.64**	**26**	**63.41**

Al-Aziziyah

There are four developments under construction within Al-Aziziyah, covering 17.28 km^2 which is equivalent to 46% of existing development within the sub-municipality (37.86 km^2). An expansive industrial development accounts for 92% of this development, spanning into neighbouring sub-municipality As-Sulai. Much of this industrial development is understood to be non-gated, meaning that the area is home to some of the lowest rates of gating within Riyadh's sub-municipalities.

Al-Haier

Currently two projects are under development in the Al-Haier, both of which are government facilities. These projects span 6.75 km^2, equivalent to 26% existing development area which currently stands at 357.17 km^2. Both of these developments are gated.

Al-Uraija

Al-Uraija predominantly functions as a residential area although key thoroughfares are home to street format retail, with the area mostly lacking major enclosed shopping centres. Only 0.75 km^2 development is underway within the Southern District's Al-Uraija neighbourhoods, accounting for just 3% of existing development at 27.68 km^2, meaning it is experiencing some of the lowest new growth to existing growth ratios across Riyadh.

Line 3, or the Orange Line, of Riyadh's rapidly expanding/developing metro system is currently under construction along one of the sub-municipalities key arterials, Al-Madinah Al-Munawwarah, which could potentially catalyze more dense development in coming years.

Ash-Shifa

Seven master-planned developments were identified within Ash-Shifa, covering a total of 12.64 km^2, equivalent to 48% of developed land within the sub-municipality (26.19 km^2). Much of the area's developed lands are occupied by organic single-family housing development, with retail scattered throughout the sub-municipality. Identified developments were predominantly Industrial, at 12.56 km^2 or 99% of projects, one of which contains a 0.5 km^2 auto mall. Interestingly within Ash-Shifa Industrial development is enveloped in residential development.

Over 90% of development within Ash-Shifa is non-gated, making it one of the most ungated districts in the City, although it should be noted that most of this development is Industrial. All development (100%) is single-use within Ash-Shifa. No major commercial centres other than strip malls were identified within Ash-Shifa.

Namar

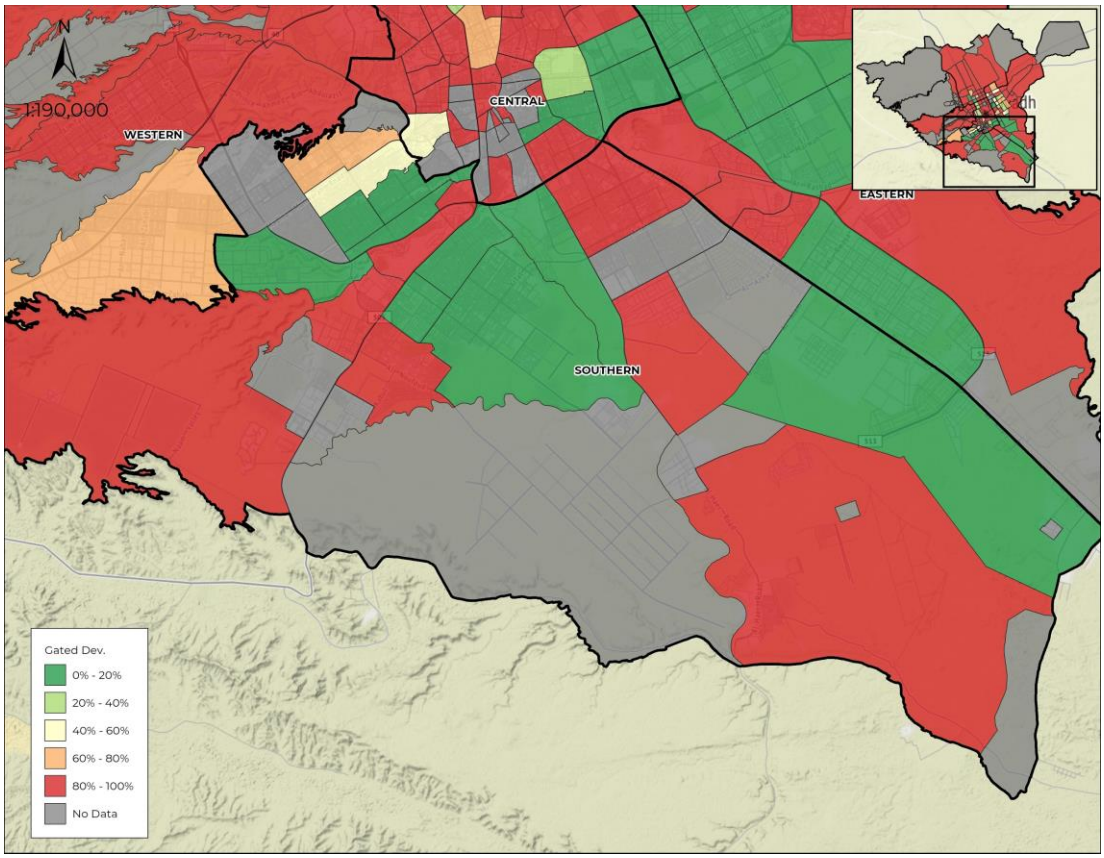
Namar is one of Riyadh's newest suburbs, having been approved for sub-division in the nineties, with development intensifying in early 2010. Large swaths of sub-division remain available for development, with around 50% of the sub-municipality within the Southern District undeveloped to date (21.12 km^2).

Two expansive military installations account for 98% of projects in the municipality. The sub-municipality contains one key commercial node - the newer Salaam Mall. Due to the lack of diversified land use within Namar, it is likely that this community functions predominantly as a commuter settlement.

Gated development accounted for 98% of all recorded projects within Namar, with just 2% non-gated. The majority of developments were restricted access at 98%.

Southern District - Gated Development

With a total of 26.95 km^2 or 42% of development non-gated, the Southern District is, on average, Riyadh's least gated District, however, it is important to note that almost all the ungated development within this District (and across all of Riyadh) is designated as Industrial land.



Map 27 Southern District - Gated Development

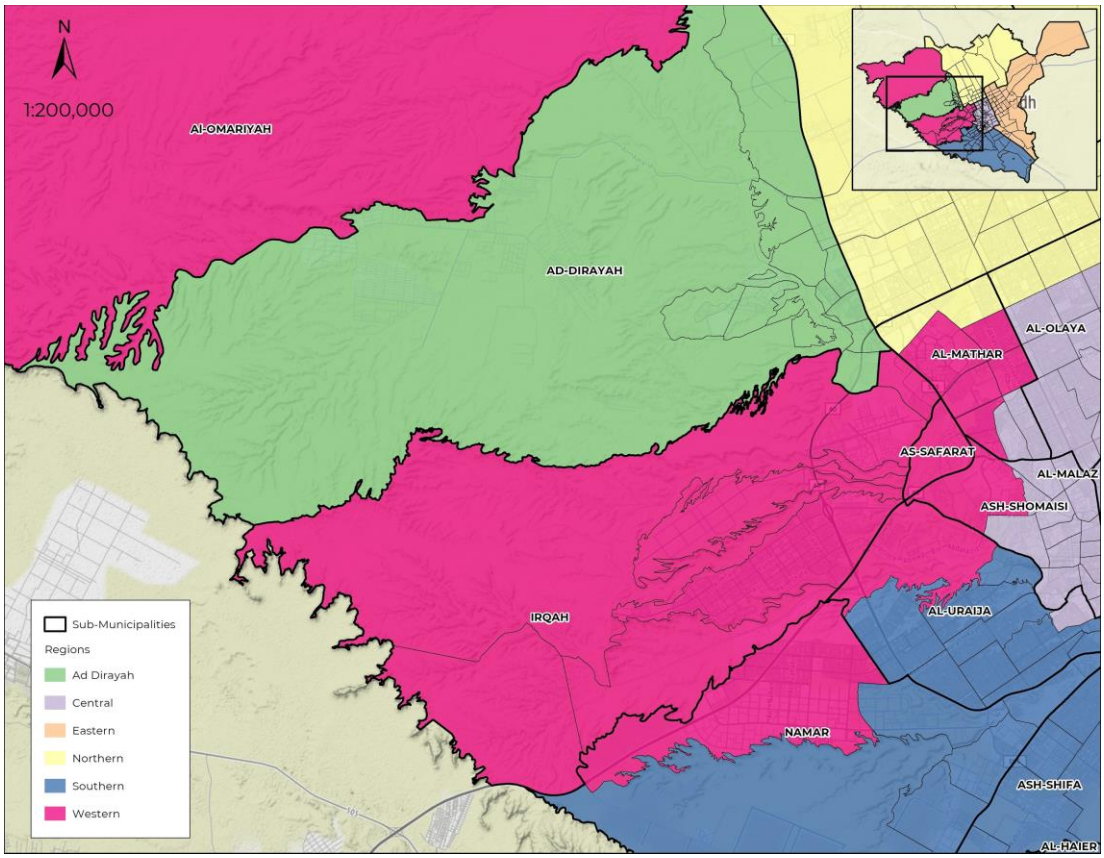
Table 28 Southern District - Gated Development

	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
Southern District	**Al-Aziziyah**	1.59	9%	0.09	0%	15.60	90%	**17.28**
	Al-Haier	6.75	100%	0.00	0%	0.00	0%	**6.75**
	Al-Uraija	0.38	51%	0.37	49%	0.00	0%	**0.75**
	Ash-Shifa	1.27	10%	0.03	0%	11.34	90%	**12.64**
	Namar	25.89	100%	0.11	0%	0.00	0%	**26.00**
	Total	**35.88**	**57%**	**0.59**	**1%**	**26.95**	**42%**	**63.41**

Western District

Western District - Summary and Context

Containing vast areas of undeveloped rugged terrain, the Western District is Riyadh's largest spanning 1,539.14 km^2. The Western District extends westwards from Central Riyadh and contains the entire sub-municipalities of the uninhabited Al-Omariyah, Diplomatic District As-Safarat, and Irqah, and neighbourhoods from Al-Uraija, Ash-Shomaisi, and neighbourhoods from the densely populated areas of Al-Mathar and Namar. Districtwide just 10% of the land is improved, making the Western District the least developed overall, although undeveloped land in central sub-municipalities such as Al-Mathar and Ash-Shomaisi is much scarcer with just 30% of land undeveloped.



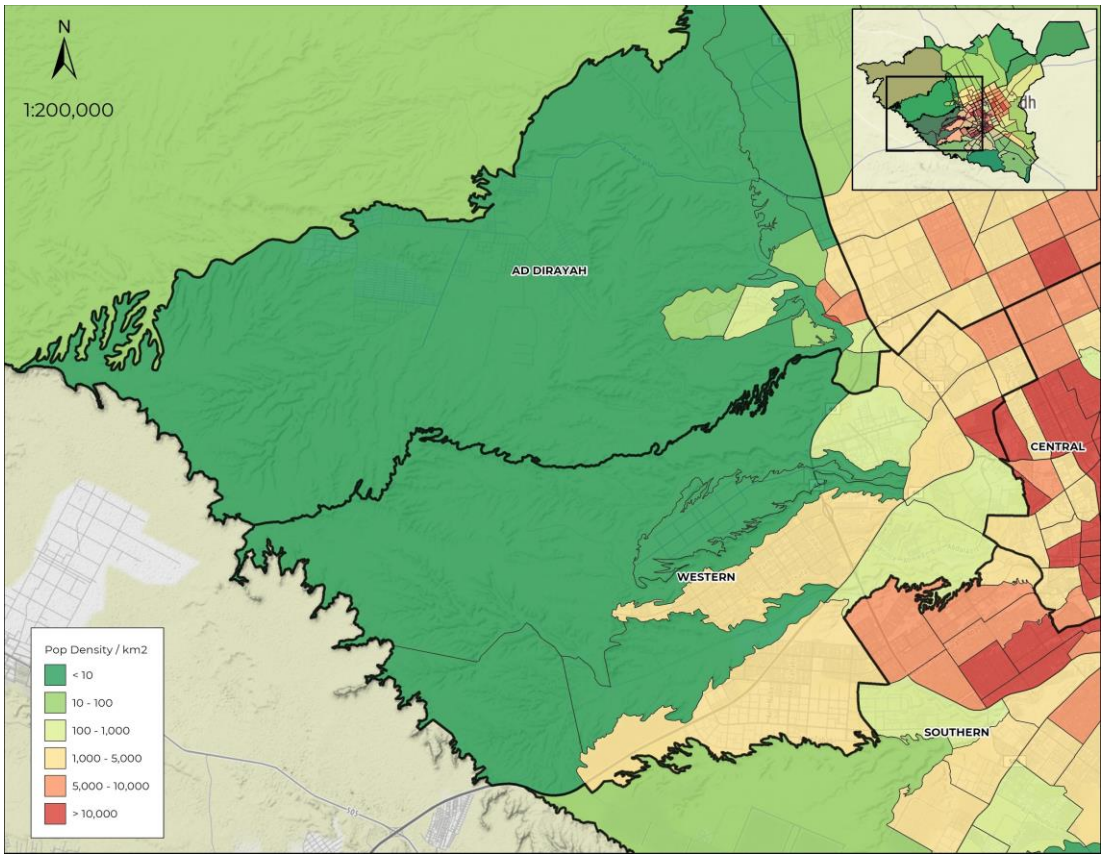
Map 28 Western District - Context and Summary

Table 29 Western District - Context and Summary

	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
Western District	**Al-Mathar**	12.47	47%	12.44	46%	26.78	13.21	7.68	5.89
	Al-Omariyah	12.47	1%	0.00	0%	1,010.98	24.10	977.58	9.30
	Al-Uraija	0.69	3%	0.69	3%	24.89	6.83	14.37	3.69
	Ash-Shomaisi	6.99	51%	6.99	51%	13.82	7.90	3.94	1.98
	As-Safarat	6.82	73%	6.82	73%	9.34	3.14	4.47	1.72
	Irqah	1.46	0%	1.42	0%	392.98	20.45	348.74	24.79
	Namar	1.80	3%	1.33	2%	60.36	9.16	36.15	15.04
	Total	**42.68**	**3%**	**29.69**	**2%**	**1,539.14**	**84.79**	**1,392.93**	**62.41**

Western District - Population Density

The Western District's population is predominantly concentrated to the east of the District, on the periphery of Central Riyadh. Much of the District, including the vast sub-municipality of Al-Omariyah (1,010.98 km^2) and Irqah contains rugged terrain and are largely undeveloped. On average the District is the second least populated (335,932 residents) and the second least densely populated at 218 people per km^2, however, if excluding the unpopulated sub-municipality of Al-Omariyah the District's density rises three times to 636 residents per km^2.



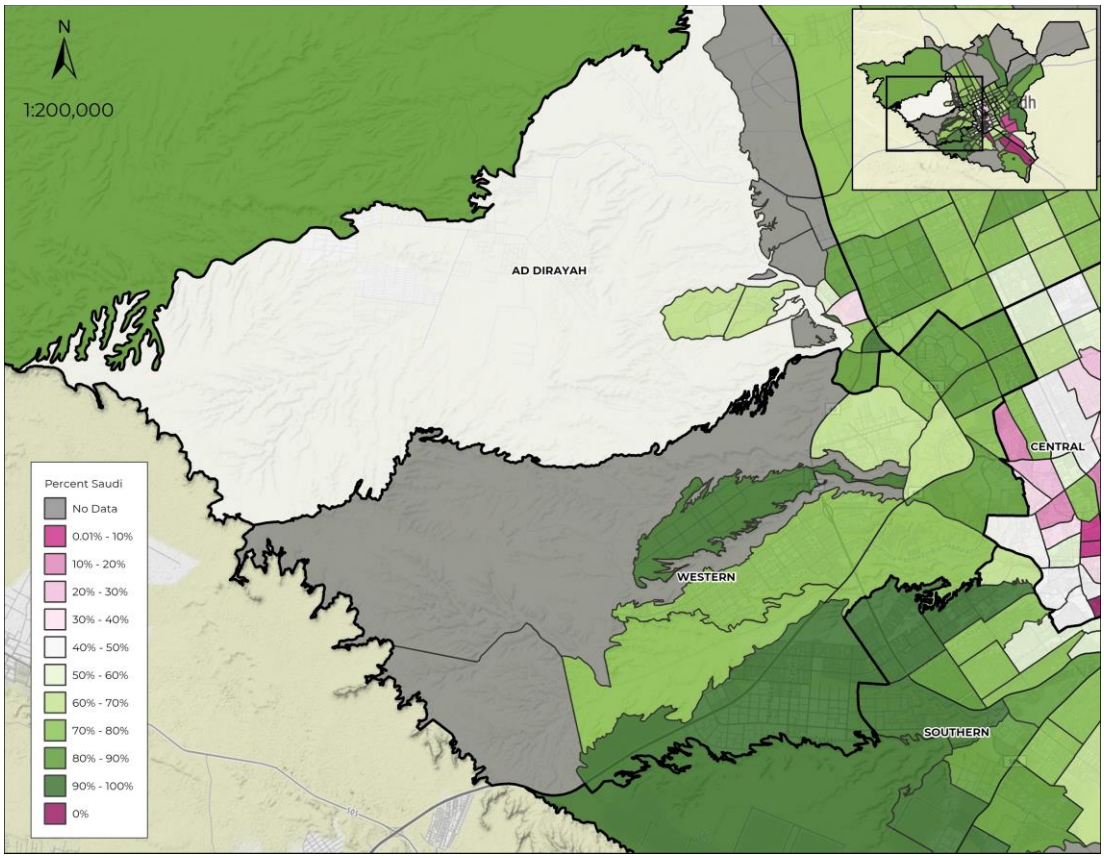
Map 29 Western District - Population Density

Table 30 Western District - Population Density

	Sub-Municipality	Area	Pop	per km²
Western District	**Al-Mathar**	26.78	105,480	3,939
	Al-Omariyah	1,010.98	19,410	19
	Al-Uraija	24.89	14,814	595
	Ash-Shomaisi	13.82	5,316	385
	As-Safarat	9.34	9,540	1,022
	Irqah	392.98	75,650	193
	Namar	60.36	125,352	2,077
	Total	**1,539.14**	**355,562**	**673**

Western District - Citizenship Status

In percentage terms, the Western District was the least ethnically diverse District across Riyadh, with 83% of residents Saudis (294,910). Saudi residents were particularly concentrated in pockets of Namar, which are thought to contain high amounts of land gifted to Saudi nationals under a government housing initiative. The most diverse sub-municipality within the Western District was As-Safarat, which is likely populated by diplomats and other skilled + affluent Non-Saudis.



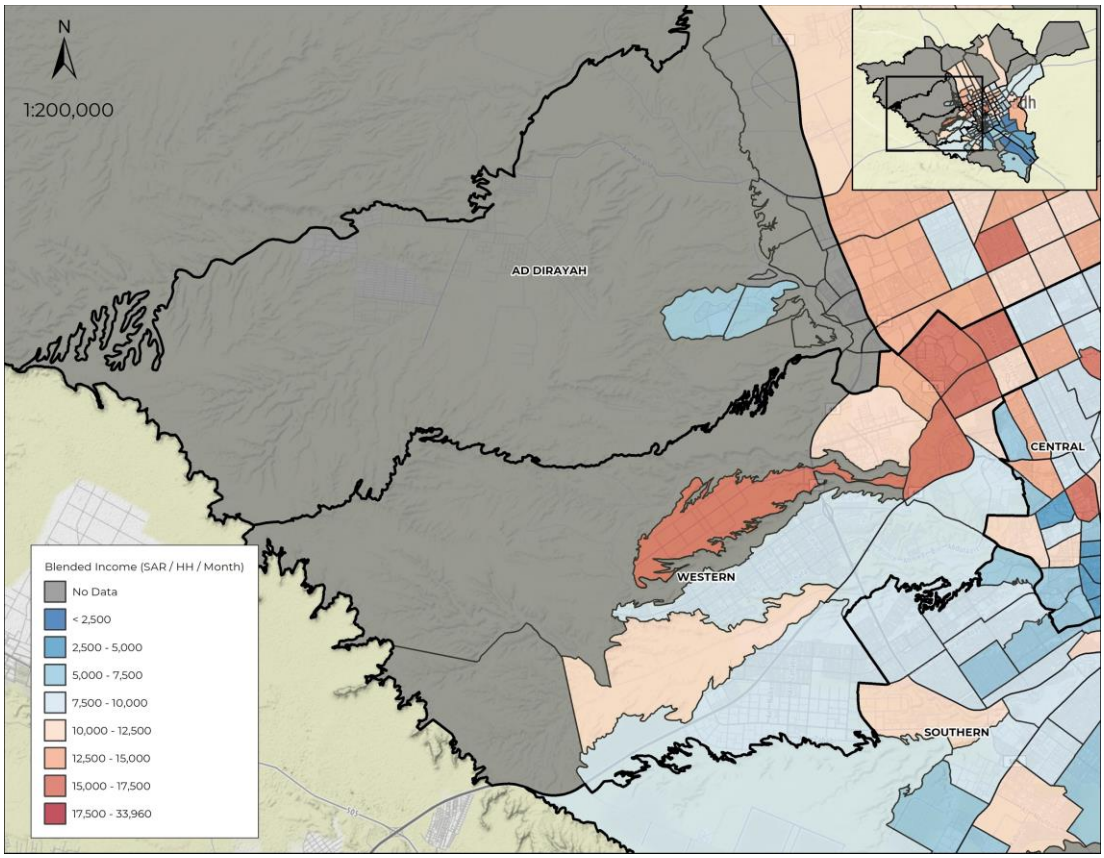
Map 30 Western District - Citizenship Status

Table 31 Western District - Citizenship Status

	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
Western District	**Al-Mathar**	84,096	80%	21,384	20%	**105,480**
	Al-Omariyah	15,722	81%	3,688	19%	**19,410**
	Al-Uraija	11,851	80%	2,963	20%	**14,814**
	Ash-Shomaisi	4,306	81%	1,010	19%	**5,316**
	As-Safarat	6,201	65%	3,339	35%	**9,540**
	Irqah	54,903	73%	20,518	27%	**75,421**
	Namar	117,831	94%	7,521	6%	**125,352**
	Total	**294,910**	**83%**	**60,423**	**17%**	**355,333**

Western District - Income Distribution

The Western District was Riyadh's second most affluent after the Northern District, elevated by high concentrations of Saudi residents and high incomes in the suburbs just north of Central Riyadh that sit in close proximity to the university, government institutions, financial districts, and the Diplomatic Quarter. Blended monthly household incomes were SAR 11,405, 37% above the Citywide average. The Western District contains Riyadh's most affluent neighbourhood, As-Safarat where blended incomes were SAR 33,960, 408% of the Citywide average.



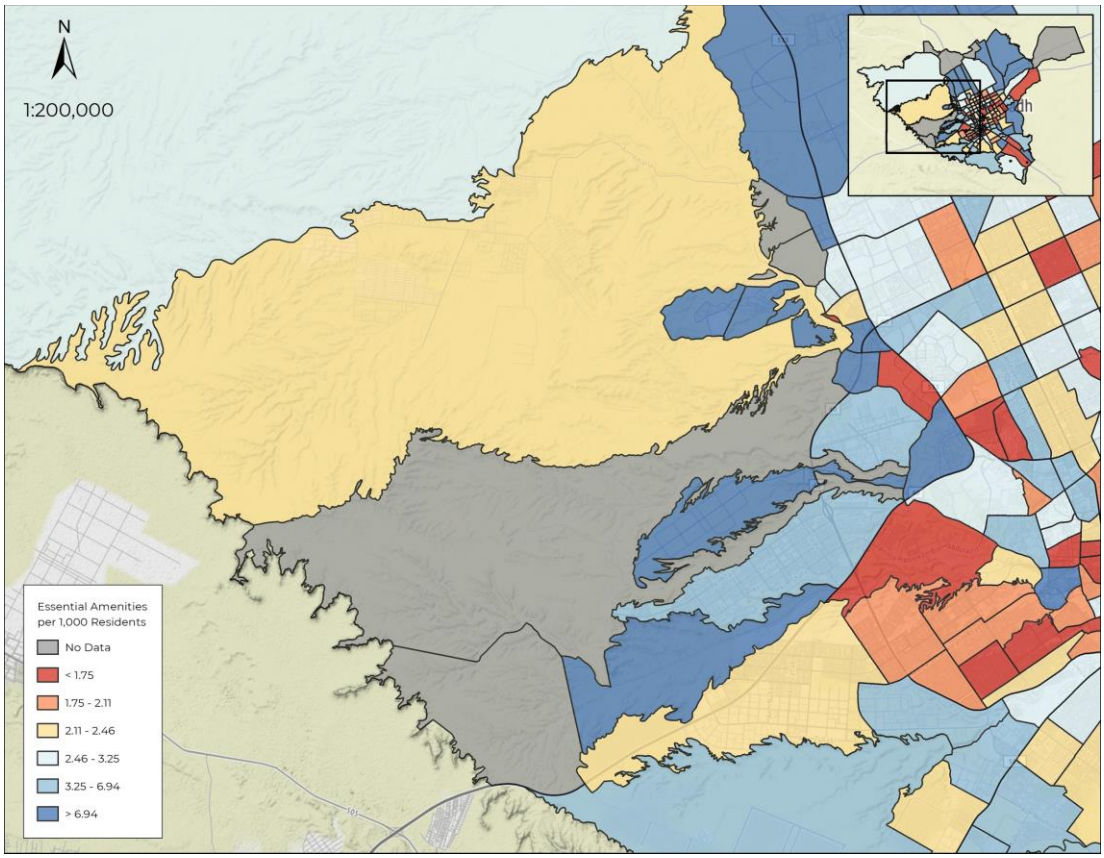
Map 31 Western District - Income Distribution

Table 0.2 Western District - Income Distribution

	Sub-Municipality	Saudi	Non-Saudi	Blended
Western District	**Al-Mathar**	17,617	4,276	**14,912**
	Al-Omariyah	-	-	**-**
	Al-Uraija	11,607	2,935	**9,872**
	Ash-Shomaisi	11,118	1,463	**9,284**
	As-Safarat	34,800	32,400	**33,960**
	Irqah	12,686	4,284	**10,400**
	Namar	7,979	1,893	**7,614**
	Total	**11,934**	**5,162**	**10,782**

Western District - Amenity Distribution

At 2.72 amenities per 1,000 residents, the Western District had the second-highest per capita of amenities across the Saudi capital, approximately 25% above the Citywide average.



Map 32 Western District - Amenity Distribution

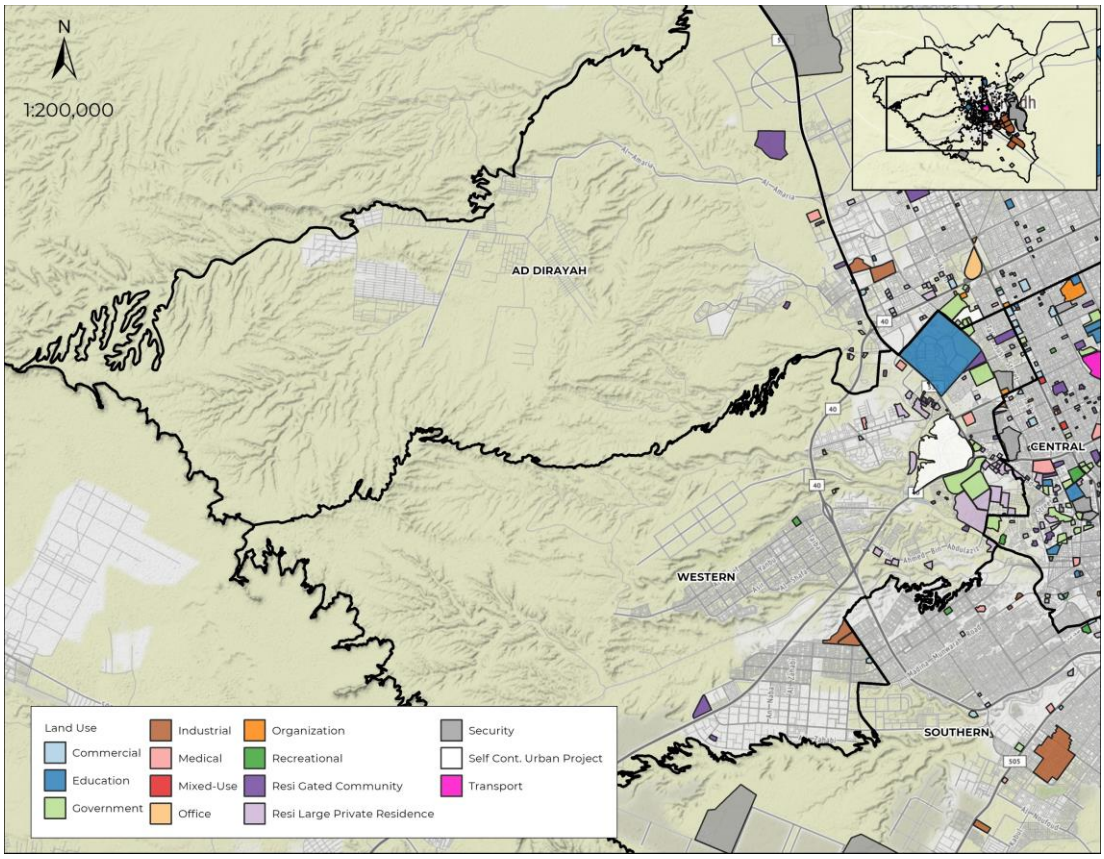
Table 33 Western District - Amenity Distribution

	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Western District	Al-Mathar	105480	9	113	34	32	68	**256**
			(0.09)	(1.071)	(0.322)	(0.303)	(0.64)	**(2.43)**
	Al-Omariyah	19410	1	8	11	4	37	**61**
			(0.05)	(0.412)	(0.567)	(0.20)	(1.90)	**(3.14)**
	Al-Uraija	14814	0	4	2	2	11	19
			(0)	(0.27)	(0.135)	(0.135)	(0.74)	**(1.28)**
	Ash-Shomaisi	5316	0	3	5	0	6	**14**
			(0)	(0.564)	(0.941)	(0)	(1.12)	**(2.63)**
	As-Safarat	9540	6	17	75	2	8	**108**
			(0.63)	(1.782)	(7.862)	(0.21)	(0.83)	**(11.32)**
	Irqah	75650	1	37	14	16	170	**238**
			(0.01)	(0.489)	(0.185)	(0.212)	(2.24)	**(3.15)**
	Namar	125352	2	70	11	17	165	**265**
			(0.02)	(0.558)	(0.088)	(0.136)	(1.31)	**(2.11)**
	Total	**355562**	**19**	**252**	**152**	**73**	**465**	**961**
			(0.05)	**(0.71)**	**(0.43)**	**(0.21)**	**(1.31)**	**(2.7)**

Western District - Development by Land Use

Within the Western District 30.21 km^2 development was identified, the second least of any District behind Ad-Dirayah. The Western District was notable for having the largest amount of royal residential development at 6.04 km^2, the largest amount of Self Contained Urban Development (all contained within the Diplomatic Quarter) at 6.43 km^2, and the second-largest amount of education land use at 9.13 km^2. Notable landmarks within the Western

District include the Diplomatic Quarter, King Saud University, and the Al-Yamamah Palace, and the Shura.



Map 33 Western District - Development by Land Use

Table 0.3 Western District - Development by Land Use

Western District								
Sub-Municipality	Al-Mathar	Al-Omariyah	Al-Uraija	Ash-Shomaisi	As-Safarat	Irqah	Namar	**Total**
Education	9.13	0	0	0	0	0	0	**9.13**
Government	1.07	0	0	2.81	0	0	0	**3.88**
Industrial	0	0	0	0	0	0	1.12	**1.12**
Commercial	0.08	0	0	0	0	0.03	0.07	**0.18**
Medical	0.3	0	0	0	0	0.26	0	**0.56**
Mixed-Use	0	0	0	0	0	0	0	**0**
Office	0	0	0	0	0	0	0	**0**
Organization	0.1	0	0	0	0	0	0	**0.1**
Gated Community	0.9	0	0.08	0.06	0.01	0.27	0.6	**1.91**
Royal Residence	0.15	0	0.61	4.12	0.38	0.78	0	**6.04**
Recreational	0	0	0	0	0	0.11	0	**0.11**
Security	0.75	0	0	0	0	0	0	**0.75**
Self Cont. Urban Development	0	0	0	0	0	0	0	**0**
Transport	0	0	0	0	0	0	0	**0**
Total	**12.47**	**0**	**0.69**	**6.99**	**0.39**	**1.46**	**1.8**	**23.79**

Al-Mathar

There are 18 identified developments distributed throughout the Western District's portion of Al-Mathar, totalling 12.47 km^2, with an average project size of 69 hectares. Development

within Al-Mathar is predominantly dedicated to education due to the presence of King Saud University which occupies 9.13 km^2. Al-Mathar is also home to the King Abdulaziz City for Science and Technology and U-Walk, a lifestyle centre by mall developer Arabian.

Al-Omariyah

With just 2.4% of land developed within Al-Omariyah (24.10 km^2), this sub-municipality is one of Riyadh's least developed municipalities. Notable developments within the municipality detected from reviewing satellite imagery include the King Abdulaziz War College directly north of the village of Al-Uyaynah. There are no major developments identified within this sub-municipality.

Al-Uraija

Just one neighbourhood of Al-Uraija falls within the Western District, and is home to six identified projects for a total of 0.69 km^2, all of which are residential gated communities, the majority of which are located overlooking Wadis.

As-Safarat

As Riyadh's Diplomatic Quarter As-Safarat is almost entirely zoned for embassies and related uses - the Self Contained Urban Project containing the Diplomatic Quarter makes up 6.43 km^2 of the 6.82 km^2 development within the sub-municipality (94%). The remaining 6% is made up primarily of Royal Large Private Residences.

Due to security concerns and concentrations of foreign diplomats, As-Safarat is entirely gated. Multi-use development accounts for 94% of land use (from the Diplomatic Quarter), with the remaining 6% single-use residential districts. As the entire municipality is enveloped on one side by a motorway and the other by a valley, walkability in this neighbourhood is very low.

Ash-Shomasi

Just one neighbourhood of the Ash-Shomasi sub-municipality is located within the Western District, however, it is notable as having the highest amount of Royal Residences including the Al-Yamamah Palace, the residence of King Salman bin Abdulaziz and home of the Consultative Assembly of Saudi Arabia (Shura).

Irqah

With just 1.46 km^2 of development identified within the sub-municipality, Irqah has one of the lowest amounts of identified projects in the City. Most of these projects are clustered in the sub-municipalities eastern reaches towards Al-Mathar and As-Safarat. Due to the eastern reaches of the municipality bordering Riyadh's Diplomatic Quarter, 53% of development coverage within Irqah was Royal Large Private Residences, with notable other uses including Residential Gated Communities (19%) and Medical (18%).

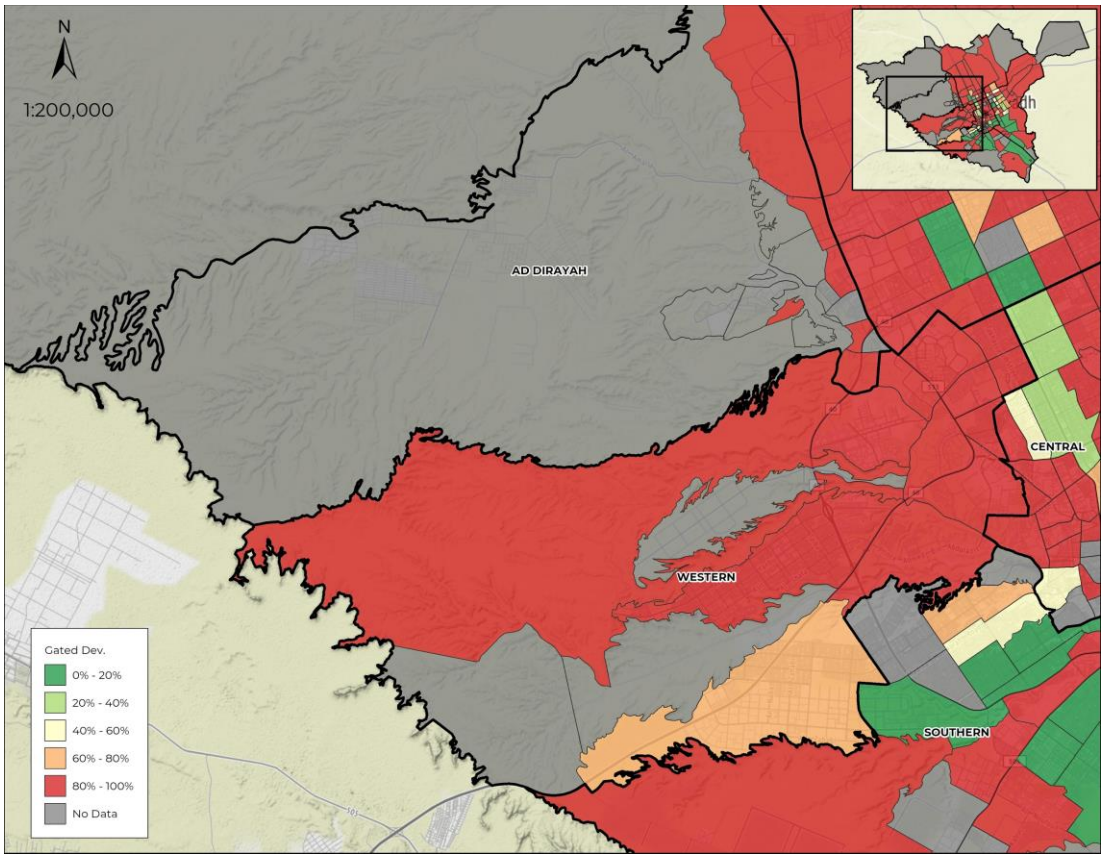
Average project size was just 8 hectares, the second-lowest average recorded across the City. Identified projects were 98% gated, with just 2% soft-gated. Single-use development accounted for 82% of development.

Namar

Around 60% of the five projects identified within the Namar neighbourhoods of the Western District were Industrial, covering a total of 1.12 km^2. The majority of remaining land uses were Residential Gated Community at 0.60km^2.

Western District - Gated Development

Following the Ad-Dirayah District, the Western District was the second most gated District across Riyadh, with 98% or 26.69 km^2 of all development gated. All of the Western District's non-gated development was located in Industrial developments in the sub-municipality of Namar.



Map 34 Western District - Gated Development

Table 0.4 Western District - Gated Development

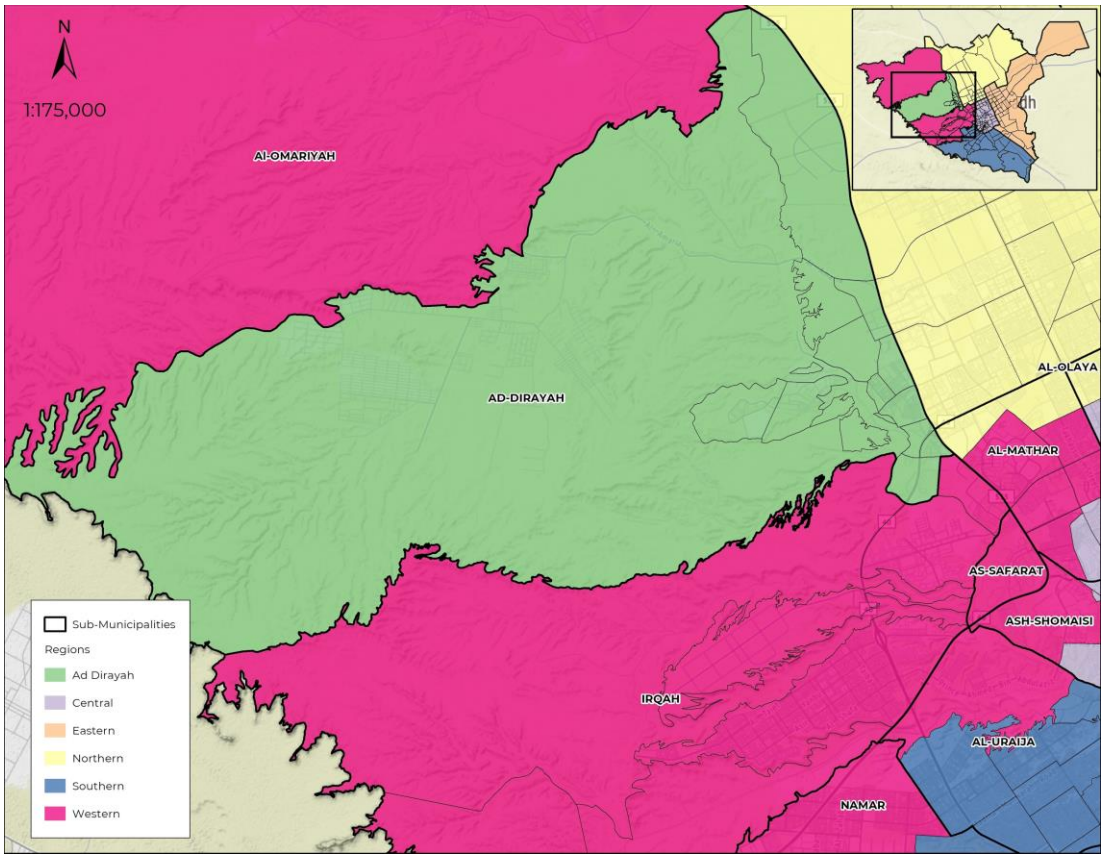
	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
Western District	**Al-Mathar**	12.44	100%	0.03	0%	0.00	0%	**12.47**
	Al-Omariyah	0.00	0%	0.00	0%	0.00	0%	**0.00**
	Al-Uraija	0.69	100%	0.00	0%	0.00	0%	**0.69**
	Ash-Shomaisi	6.99	100%	0.00	0%	0.00	0%	**6.99**
	As-Safarat	6.82	100%	0.00	0%	0.00	0%	**6.82**
	Irqah	1.42	98%	0.03	2%	0.00	0%	**1.46**
	Namar	1.33	74%	0.00	0%	0.47	26%	**1.80**
	Total	**29.69**	**98%**	**0.06**	**0%**	**0.47**	**2%**	**30.21**

Ad-Dirayah District

Ad-Dirayah District - Summary and Context

Located to the northwest of Central Riyadh, the Ad-Dirayah District shares its boundary with the official Government designated sub-municipality of Ad-Dirayah. Ad-Dirayah plays a nationally significant role in the history of Saudi Arabia and was home to the original home of the Saudi royal family. Ad-Dirayah contains the Turaif district, a historic settlement that was the country's first capital from 1744 to 1818 which was designated a UNESCO World Heritage site. Ad-Dirayah contains villages including Al-Uyaynah, Al-Jubaylah, and Al-Maaria,

which are all located within Wadis and feature concentrations of farming land. Largely undeveloped, Ad-Dirayah is less than one% occupied by Gated development.



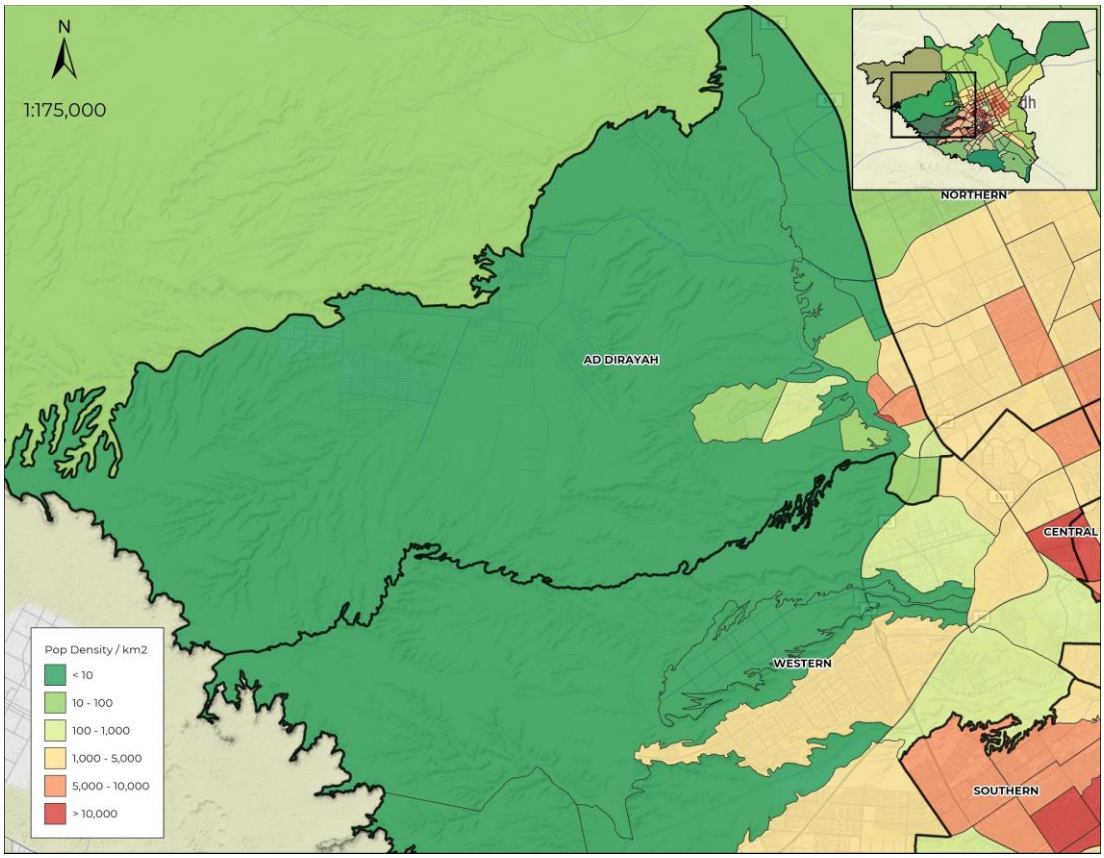
Map 35 Ad-Dirayah District - Summary and Context

Table 0.5 Ad-Dirayah District - Summary and Context

Ad-Dirayah District	Sub-Municipality	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
	Ad-Dirayah	2.53	0%	2.53	0%	563.69	62.77	497.41	6.90
	Total	**2.53**	**0%**	**2.53**	**0%**	**563.69**	**62.77**	**497.41**	**6.90**

Ad-Dirayah District - Population Density

Located northwest of Central Riyadh, Ad-Dirayah is the third-largest sub-municipality covering 564 km^2. Despite being the third-largest sub-municipality Ad-Dirayah is largely uninhabited with the majority of the area's 40,000 residents living within a thin strip east of the Wadi Hanifa.



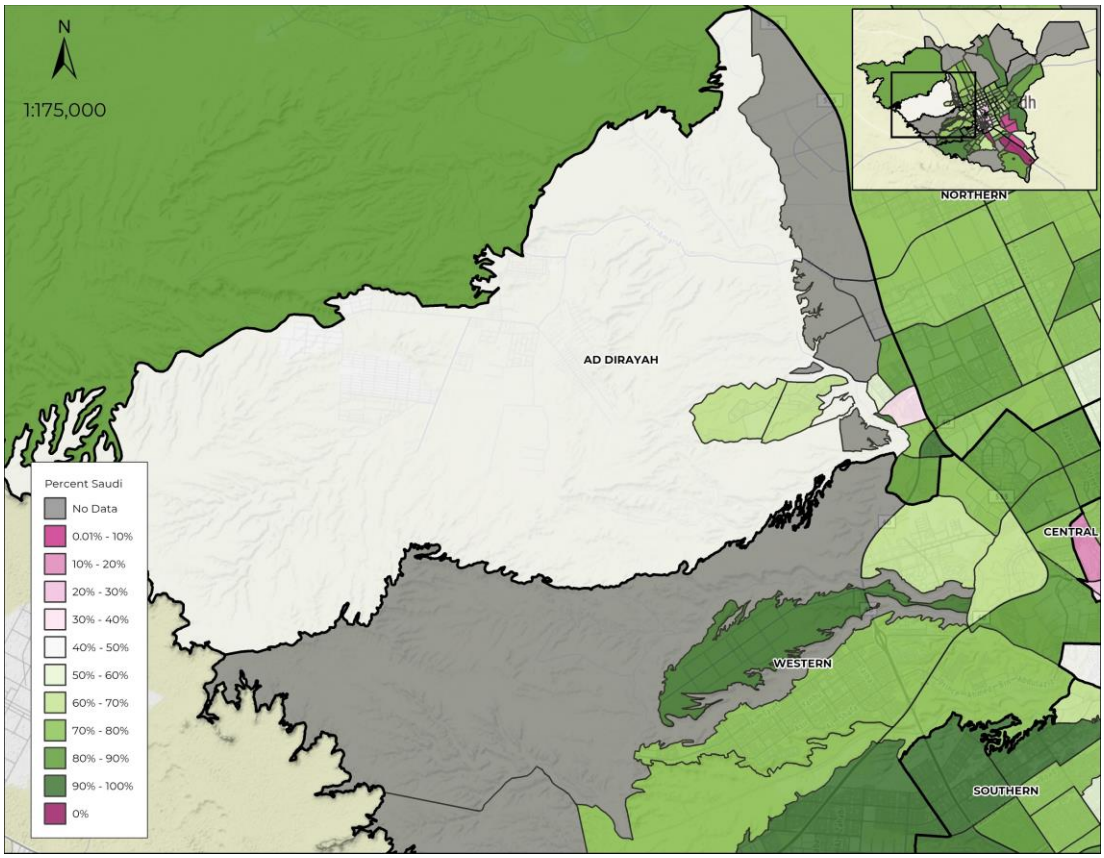
Map 36 Ad-Dirayah District - Population Density

Table 0.6 Ad-Dirayah District - Population Density

Ad-Dirayah District	Sub-Municipality	Area	Pop	per km²
	Ad-Dirayah	563.69	39,903	71
	Total	**563.69**	**39,903**	**71**

Ad-Dirayah District - Citizenship Status

Based on available data sets Saudis account for 60% of the population of Ad-Dirayah.



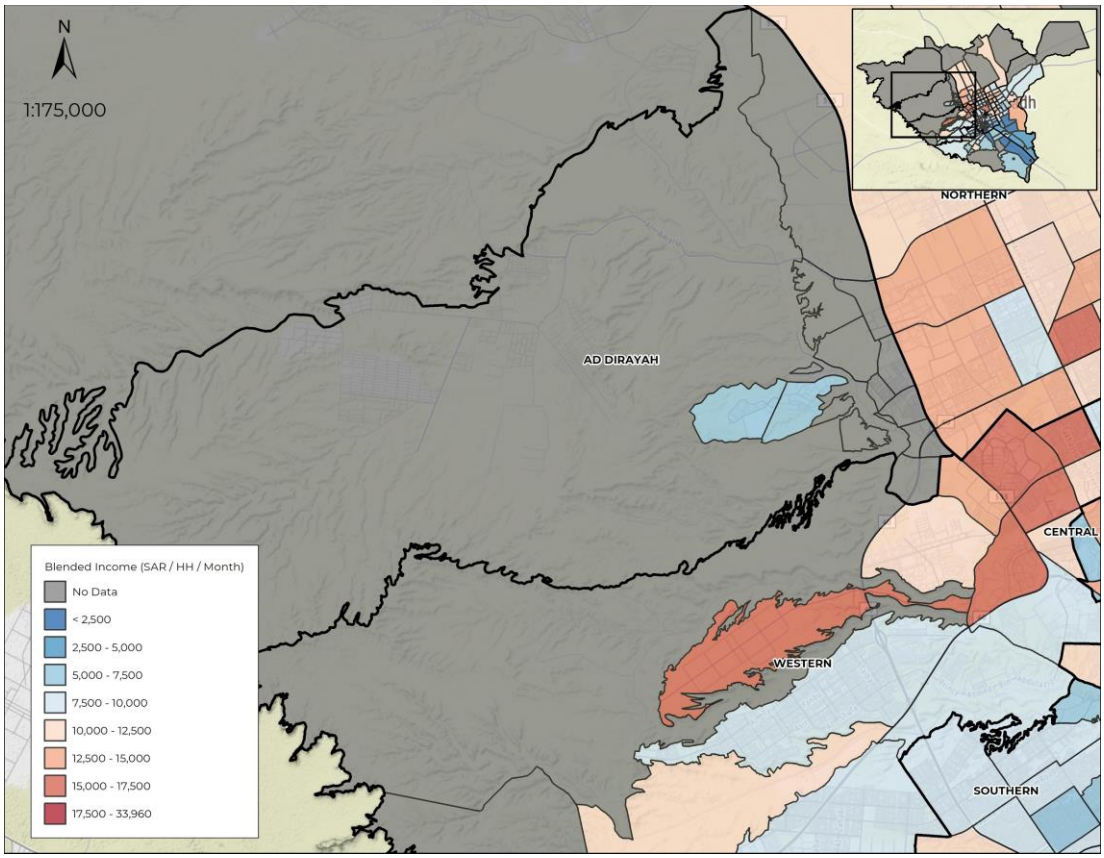
Map 37 Ad-Dirayah District - Citizenship Status

Table 0.7 Ad-Dirayah District - Citizenship Status

Ad-Dirayah District	Sub-Municipality	Saudi	%	Non-Saudi	%	Total
	Ad-Dirayah	23,679	60%	16,089	40%	**39,768**
	Total	**23,679**	**60%**	**16,089**	**40%**	**39,768**

Ad-Dirayah District - Income Distribution

Little data regarding household income was available for Ad-Dirayah, with data available for just two neighbourhoods. Blended household income per month per family was SR 6,593, or 79% of average across the Capital.



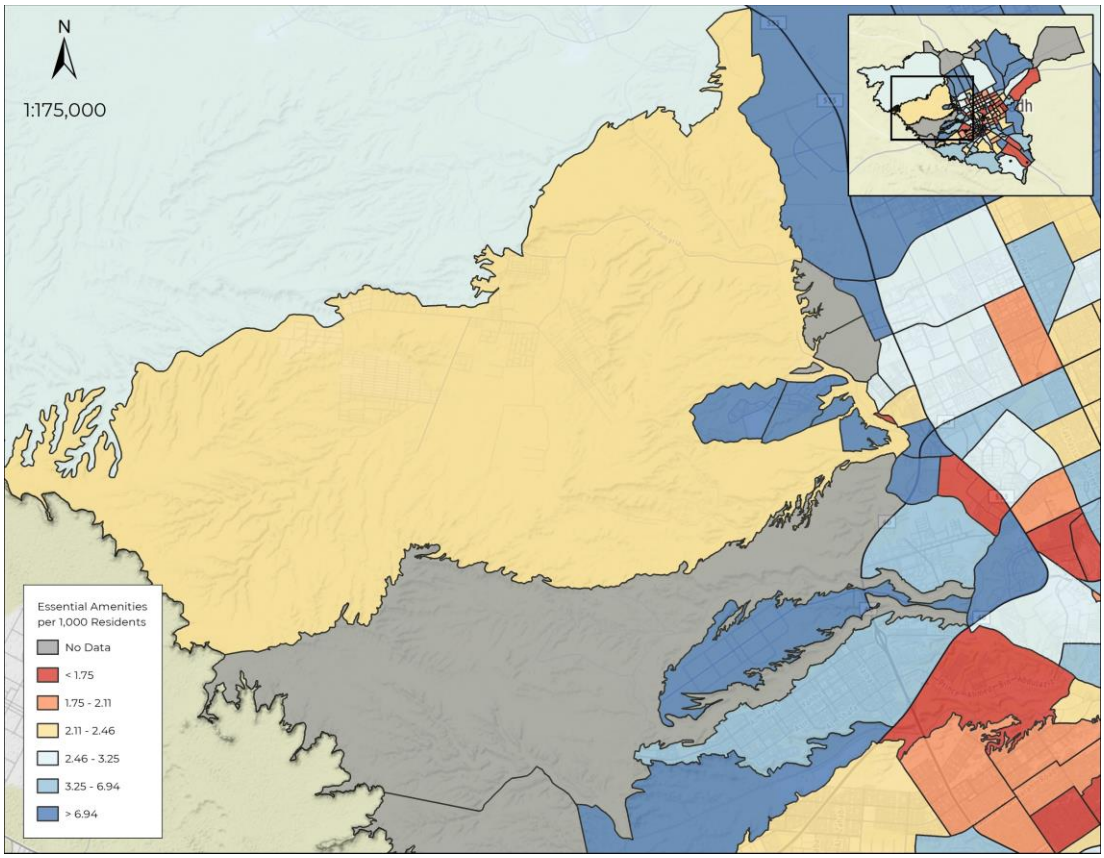
Map 38 Ad-Dirayah District - Income Distribution

Table 0.8 Ad-Dirayah District - Income Distribution

Ad-Dirayah District	Sub-Municipality	Saudi	Non-Saudi	Blended
	Ad-Dirayah	8,451	2,268	**6,593**
	Total	8,451	2,268	**6,593**

Ad-Dirayah District - Amenity Distribution

Ad-Dirayah had by far the highest amount of amenities per capita, almost five times above the Citywide average at 10.02. Ad-Dirayah was also by far the least populated region, with a population around 10% of its closest neighbour, the Western District (355,562). Ad-Dirayah was home to 61 cultural amenities, more than any other district. Ad-Dirayah also had the most Government (2.18), Education (1.85), and Religious (3.83) amenities per 1,000 residents.



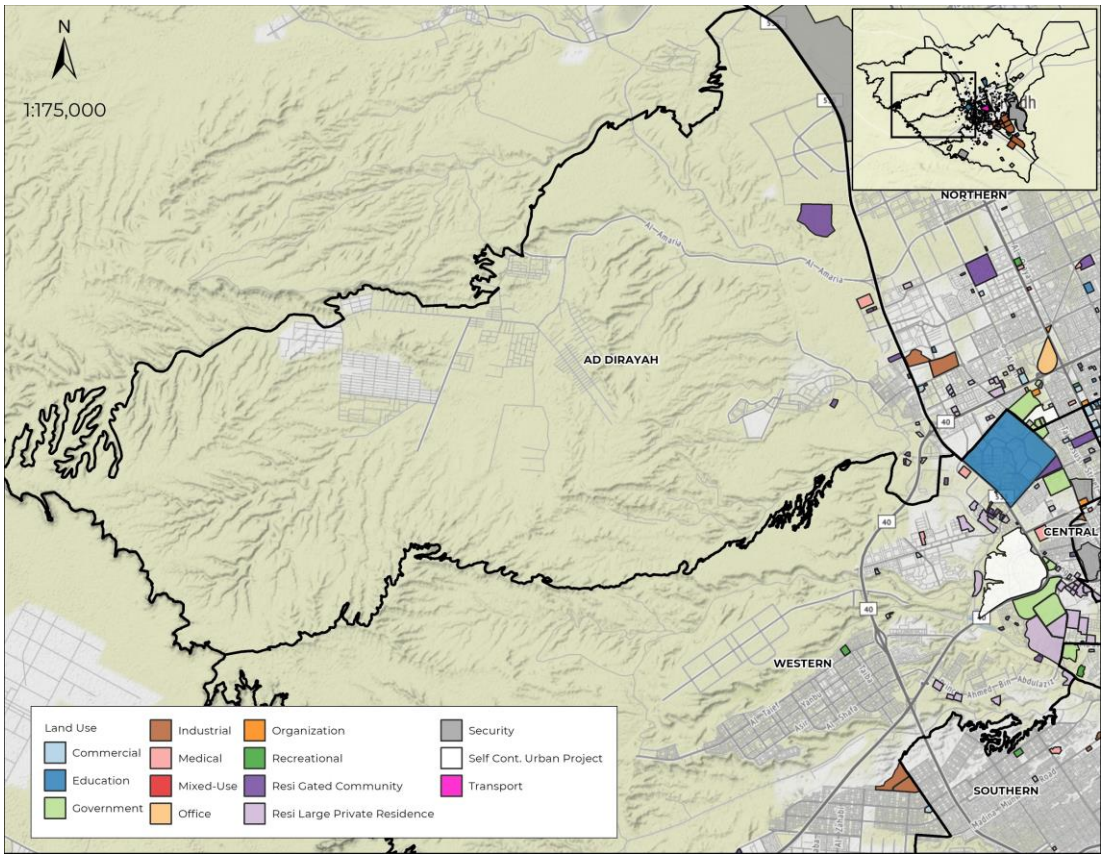
Map 39 Ad-Dirayah District - Amenity Distribution

Table 0.9 Ad-Dirayah District - Amenity

Ad-Dirayah District	Sub-Municipality	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
	Ad-Dirayah	39,903	61	74	87	25	153	**400**
			(1.53)	(1.854)	(2.18)	(0.627)	(3.83)	**(10.02)**

Ad-Dirayah District - Development by Land Use

There are currently 13 developments under construction within Ad-Dirayah, covering 2.53 km^2 which is equivalent to just 4% of existing development within the sub-municipality (62.77 km^2). Gated residential communities account for 80% of development within Ad-Dirayah. All projects identified within Ad-Dirayah are understood to be gated.



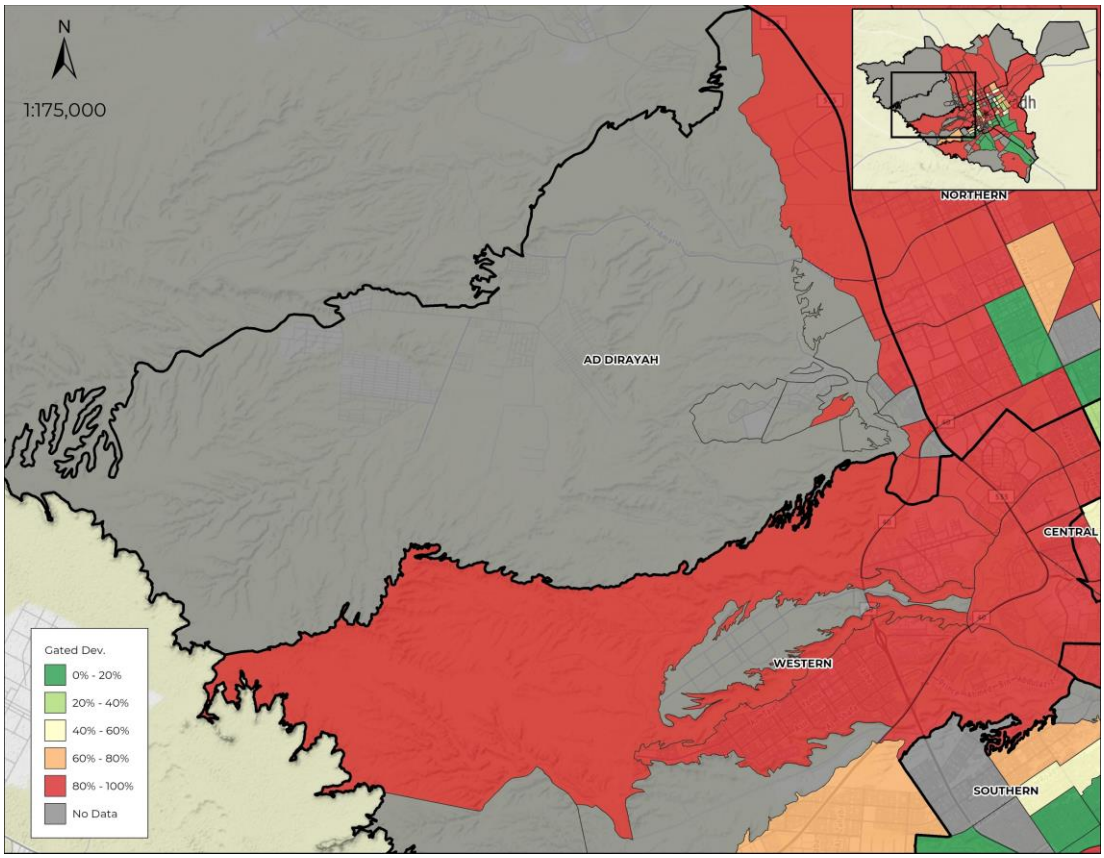
Map 40 Ad-Dirayah - Development by Land Use

Table 0.10 Ad-Dirayah - Development by Land Use

Ad-Dirayah District		
Sub-Municipality	**Ad-Dirayah**	**Total**
Education	0.02	**0.02**
Government	0.02	**0.02**
Industrial	0	**0**
Commercial	0	**0**
Medical	0.29	**0.29**
Mixed-Use	0	**0**
Office	0	**0**
Organization	0	**0**
Gated Community	2.08	**2.08**
Royal Residence	0.13	**0.13**
Recreational	0	**0**
Security	0	**0**
Self Cont. Urban Development	0	**0**
Transport	0	**0**
Total	**2.53**	**2.53**

Ad-Dirayah District - Gated Development

Within the Ad-Dirayah District 100% of the identified 2.53 km^2 development was gated, making it the most gated District in percentage terms.



Map 41 Ad-Dirayah District - Gated Development

Table 0.11 Ad-Dirayah District - Gated Development

Ad-Dirayah District	Sub-Municipality	Gated	%	Soft	%	Non-Gated	%	Total
	Ad-Dirayah	2.53	100%	0.00	0%	0.00	0%	**2.53**
	Total	**2.53**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.53**

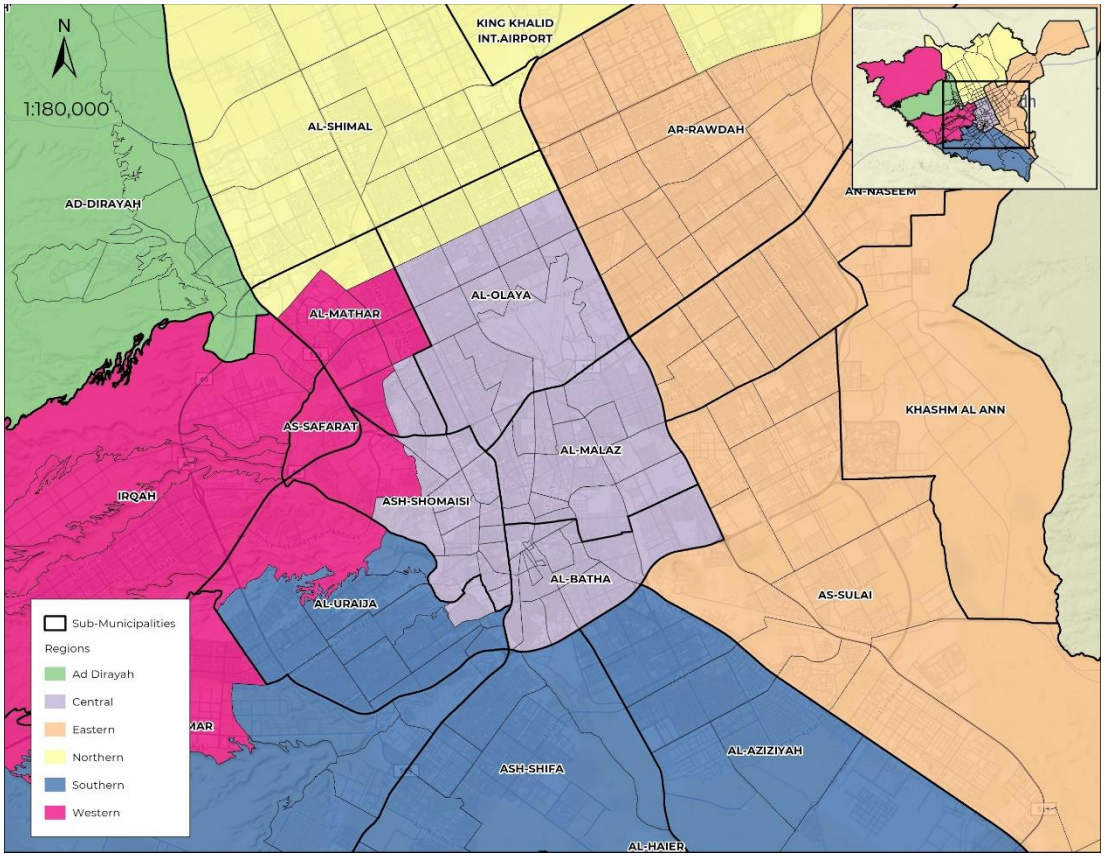
Summary

Summary and Context

As previously mentioned, 571 projects were identified across Riyadh, with development being found in around 75% of Riyadh's 193 neighbourhoods. Across Riyadh's six Districts, the highest development count was in the Central District at 233, double the amount of projects vs. its nearest neighbour, the Eastern District at 116. Ad-Dirayah was home to the least number of projects, at just thirteen.

While the Central neighbourhoods was home to the highest number of developments, the Eastern District dominated land area coverage due to a concentration of expansive industrial estates and large military complexes, with 269.5 km^2 development vs. the Central District's 55.8 km^2.

Although the Central District was home to the highest number of developments these projects averaged just 0.24 km^2 (24 hectares), although it is worth noting that while these developments might be smaller in area they are likely significantly denser than suburban developments such as industrial estates. On average projects in the Eastern District were over ten times the size of Central District developments, at 2.32 km^2 (232 hectares).



Map 42 Citywide - Summary and Context

Table 0.12 Citywide - Summary and Context (km^2)

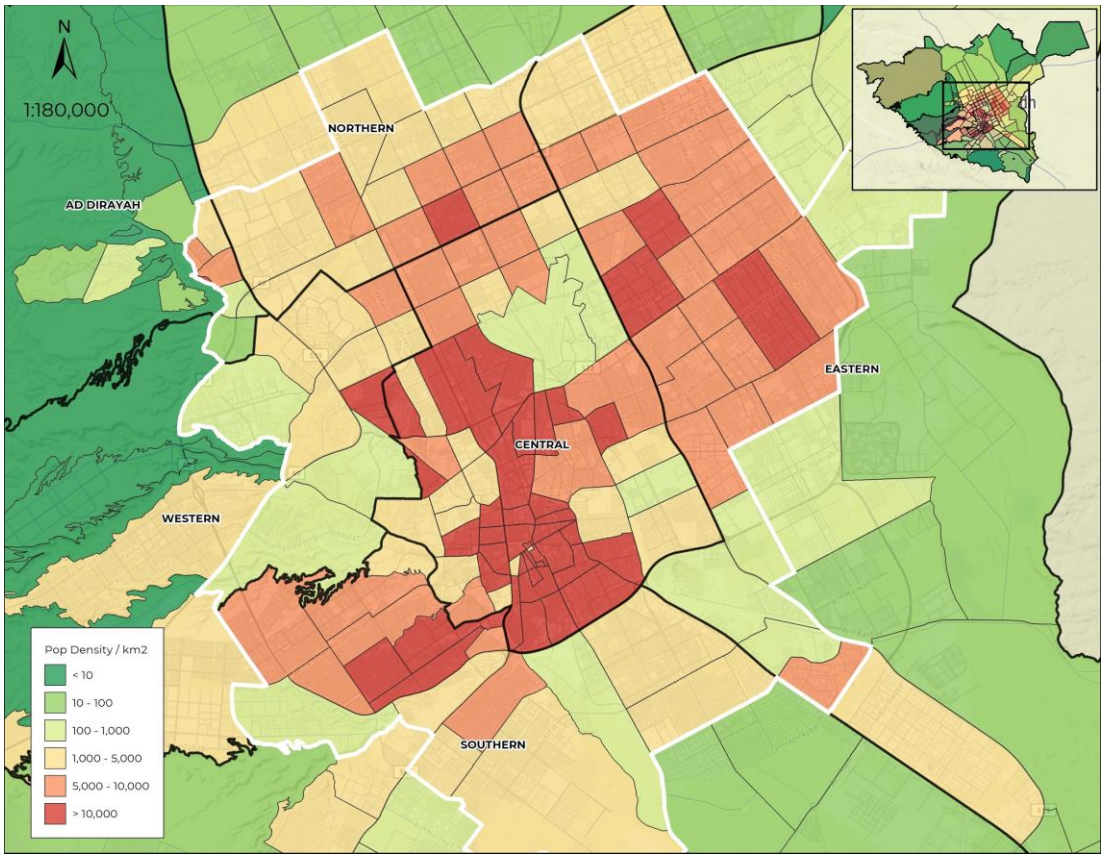
District	Project Area	% Land Area	Gated	% Gated	Land Area	Dev. Area	Undev. Area	Street Area
Central	55.79	27%	39.77	20%	203.87	122.96	24.61	57.78
Northern	49.69	4%	47.94	4%	1,295.15	216.38	971.65	108.11
Eastern	269.53	18%	179.10	12%	1,465.97	234.08	1,046.58	186.95
Southern	63.41	7%	35.88	4%	893.88	129.92	645.53	120.43
Western	30.21	2%	29.69	2%	1,539.14	84.79	1,392.93	62.41
Ad-Dirayah	2.53	0%	2.53	0%	563.69	62.77	497.41	6.90
Total	**471.17**	**8%**	**334.91**	**6%**	**5,961.70**	**850.90**	**4,578.73**	**542.59**

Summary - Population Density

Spanning almost 6,000 km^2, the City of Riyadh encompasses vast amounts of uninhabited desert. Riyadh's population is just over 5.3 million, with 90% of the City's population (4.78 million) living within the thick white band outlined within the map above, just 14.3% of the city's entire area (855.23 km^2), equivalent to 5,589 residents per km^2, compared to the Riyadh-wide average of 890 residents per km^2.

Of the six Districts outlined earlier in this appendix, the Central District is by far the most densely populated with 1.93 million residents living within 203.9 km^2, equivalent to 9,456 residents per km^2, almost ten times the density of the Eastern and Southern Districts. Ad-Dirayah is the least populated district, with a population of 39,903 living within 563.7 km^2, equivalent to 71 residents per km^2, less than a hundredth of the Central District's density.

Riyadh's population density distribution can be clearly viewed in the table 44, with many of City's oldest and densest neighbourhood registering population densities of > 15,000 per km^2 (Burdett, Travers, Czischke, Rode, & Moser, 2004), rivalling dense London neighbourhoods such as Islington and Tower Hamlets. Many residents within these neighbourhoods live in mid-rise apartment buildings.



Map 43 Citywide - Population Density

Table 0.13 Citywide - Population Density

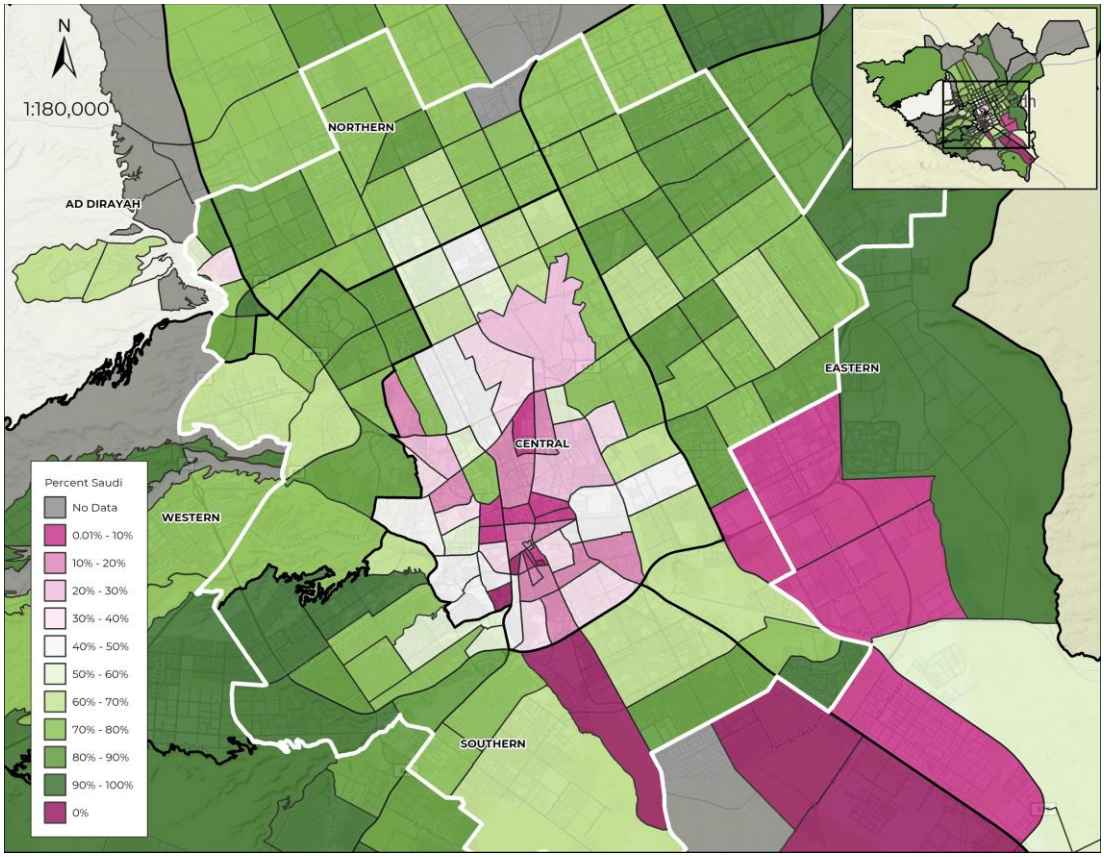
District	Area	Pop	per km²
Central	203.87	1,927,830	9,456
Northern	1,295.15	524,955	405
Eastern	1,465.97	1,496,785	1,021
Southern	893.88	959,852	1,074
Western	1,539.14	355,562	231
Ad-Dirayah	563.69	39,903	71
Total	**5,961.70**	**5,304,887**	**890**

Summary - Citizenship Status

Saudi nationals account for almost 60% of Riyadh's population, typically residing in the Capital's expansive suburbs that circle Riyadh's central area. Riyadh's Eastern, Southern, and Western neighbourhoods, home to Riyadh's newer suburbs and government granted land are around three-quarters Saudi citizens (ranging from 75.5% - 78.5%). Just 8.5% of Ad-Dirayah residents are Non-Saudi making it the most homogenous sub-municipality.

Over 2.13 million Non-Saudis live within the Riyadh area, accounting for over two-fifths of the population (41.5%), and provide a vital source of unskilled (and low paid) labour. Over time Riyadh's Non-Saudi population has become concentrated into Riyadh's older core, with many central areas home to extremely high population densities. Non-Saudi populations also cluster around industrial land uses, which can be explained either by living in Industrial complexes/camps or due to lower residential values adjacent to industrial uses.

There is a strong correlation between the Saudi Capital's income distribution and its demographic makeup with the highest concentrations of Non-Saudis located in the densely populated core of Riyadh in apartment buildings or alternatively clustered around industrial developments in the Southern District.



Map 44 Citywide - Citizenship Status

Table 0.14 Citywide - Citizenship Status

District	Saudi	%	Non-Saudi	%	Total
Central	612,053	32%	1,315,581	68%	1,927,634
Northern	347,976	71%	142,496	29%	490,472
Eastern	1,135,649	76%	361,124	24%	1,496,773
Southern	710,243	75%	233,703	25%	943,946
Western	294,910	83%	60,423	17%	355,333
Ad-Dirayah	23,679	60%	16,089	40%	39,768
Total	**3,124,510**	**59%**	**2,129,416**	**41%**	**5,253,926**

Summary - Income Distribution

Household income information for Riyadh residents was available for much of the Capital's neighbourhoods, allowing an exploration between demographics, population density, and development. Citywide the average blended monthly household income was SAR 8,322. On average Saudi households commanded far higher incomes, with the average Saudi monthly household income at SAR 11,442 vs. Non-Saudi incomes at SAR 3,734.

Dramatic differences in monthly household incomes were observed across Riyadh, with a clear north/south divide clearly seen in the figure, particularly pronounced in the highlighted area which outlines neighbourhoods in which 90% of the population live in. Riyadh's 20 most affluent neighbourhoods had an average annual blended household income of SAR 192,000 inline with residents of highly developed nations such as Norway and Sweden, while Riyadh's 20 poorest had incomes of just SAR 30,000, comparable to developing economies such as China.

Riyadh's most central and southern neighbourhoods are predominantly understood to be populated with Non-Saudis, many of which are unskilled workers. Across the Capital, Non-Saudi incomes were estimated at just a quarter of Saudi incomes. Average incomes in the Central and Southern Districts were the lowest across Riyadh, at SAR 6,500 and SAR 7,500, respectively.

Towards the north and west of Riyadh incomes increase dramatically, with residents having access to larger lots, newer amenities/facilities, as well as access to key employment centres such as universities and Riyadh's financial districts. Riyadh's Northern and Western Districts had blended monthly household incomes of around SAR 1,500.

Table 0.15 Citywide - Income Distribution (SAR)

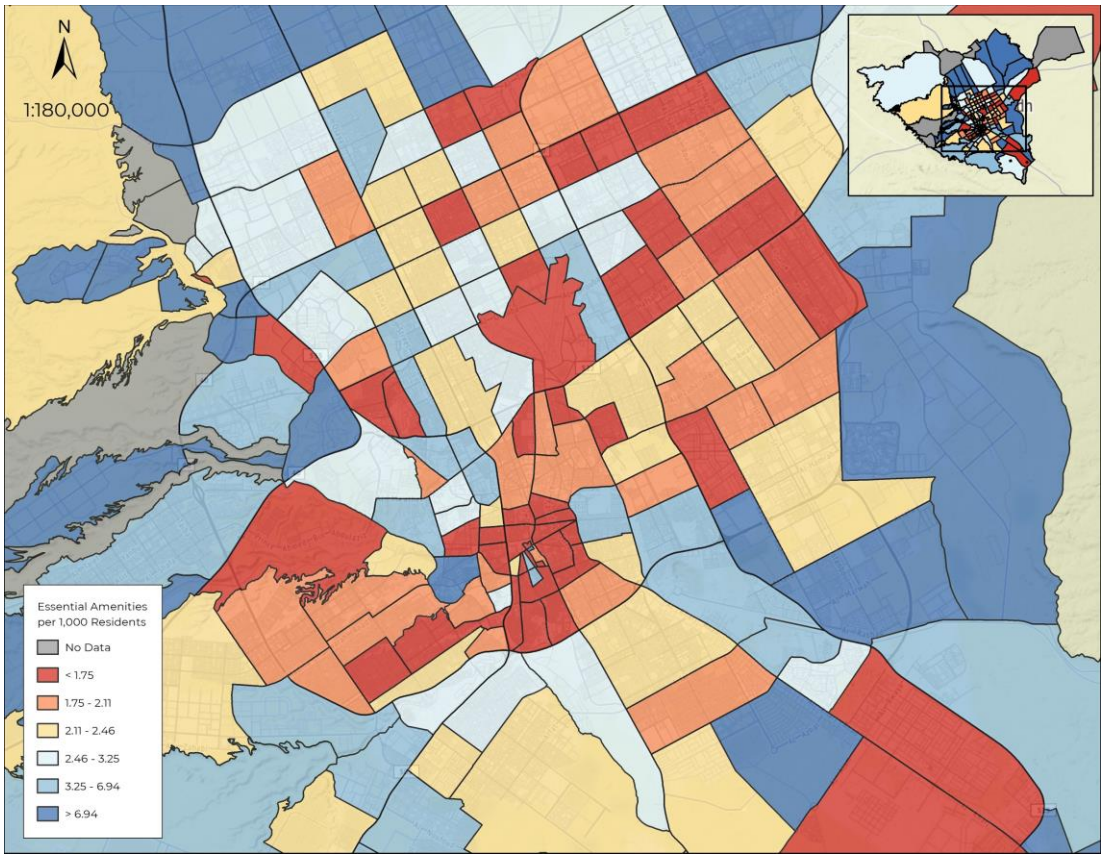
District	Saudi	Non-Saudi	Blended
Central	11,766	4,081	6,521
Northern	14,770	3,510	11,499
Eastern	11,371	2,879	9,323
Southern	9,443	2,820	7,804
Western	11,934	5,162	10,782
Ad-Dirayah	91	16	61
Total	**11,357**	**3,701**	**8,254**

Summary - Amenity Distribution

In addition to exploring the demographics of Riyadh, this research has explored the relationship between Riyadh's population and access to amenities using data collected by the Royal Commission of Riyadh. To achieve this essential amenities (Culture, Education, Government, Health, and Religion) within each neighbourhood were analysed and combined to compare against the population of a given neighbourhood to explore the number of amenities per 1,000 residents. The higher the number, the greater the availability per capita of amenities.

While this provides a high-level insight in amenity availability it is important to note that all amenity counts are treated equally - for example, two hospitals have the same weighting, although one hospital may have five beds and the other 500. In an ideal scenario sizes for amenities e.g. no. students, no. hospital beds, no. police officers, floor area of mosque would provide a clearer picture of amenity accessibility. Exploring accessibility to government-provided amenities provides some insight into where the Saudi government is investing resources.

Across Riyadh, residents had access to 2.19 amenities per 1,000 residents. The Ad-Dirayah District had the highest amount of amenities per 1,000 residents, at 10.02, while the Central District had the lowest amount of amenities with 1.77 per 1,000 residents. Generally, neighbourhoods with higher population have access to lower amounts of amenities per capita, which could be due to amenities in urban areas having higher capacity (e.g. larger hospitals and schools), or that government investment is being placed into affluent, less populated neighbourhoods.



Map 45 Citywide - Amenity Distribution

Table 0.16 Citywide - Amenity Distribution

District	Population	Culture (per 1,000 Residents)	Education (per 1,000 Residents)	Government (per 1,000 Residents)	Health (per 1,000 Residents)	Religion (per 1,000 Residents)	Total (per 1,000 Residents)
Central	1,927,830	45	1,051	608	461	1,241	**3,406**
		(0.02)	(0.545)	(0.315)	(0.239)	(0.64)	**(1.77)**
Northern	524,955	15	354	184	121	634	**1,308**
		(0.03)	(0.674)	(0.351)	(0.23)	(1.21)	**(2.49)**
Eastern	1,496,785	24	993	562	285	1,451	**3,315**
		(0.02)	(0.663)	(0.375)	(0.19)	(0.97)	**(2.21)**
Southern	959,852	10	720	206	175	1,112	**2,223**
		(0.01)	(0.75)	(0.215)	(0.182)	(1.16)	**(2.32)**
Western	355,562	19	252	152	73	465	**961**
		(0.05)	(0.709)	(0.427)	(0.205)	(1.31)	**(2.7)**
Ad-Dirayah	39,903	61	74	87	25	153	**400**
		(1.53)	(1.854)	(2.18)	(0.627)	(3.83)	**(10.02)**
Total	**5,304,887**	**174**	**3,444**	**1,799**	**1,140**	**5,056**	**11,613**
		(0.03)	**(0.65)**	**(0.34)**	**(0.21)**	**(0.95)**	**(2.19)**

Summary - Development by Land Use

Across Riyadh 571 major projects were identified covering a total of 471.17 km^2. The Central District contains the most projects at 233, covering 55.8 km^2 while the highest land coverage is in the Eastern District at 270 km^2 which includes vast Industrial and Security complexes. Below outlines highlights by Land Use:

Education - Three university campuses accounted for 80% land occupied by Education projects (26.97 km^2) across the Saudi capital - the Princess Nora bint Abdul Rahman University and the Imam University in the Northern District (12.59km^2) and King Saud University in the Western District (9.13km^2).

Government - Most Government projects are concentrated around Riyadh's centre, with 8.96 km^2 within the Central District, 7.72 km^2 in the Eastern District (clustered around Central Riyadh), and 6.93 km^2 in the Southern District.

Industrial - Almost 70% of Riyadh's 141.46 km^2 Industrial development was located in the Eastern District (97.10 km^2), with an additional 20% located in the Southern District (28.63 km^2), and around 10% in the Central District.

Commercial - Riyadh's 5.72 km^2 of Commercial development was evenly distributed between the Central (31%), Eastern (27%), and Southern (28%) Districts. This development is predominantly concentrated on major roads such as King Fahd Rd. Riyadh's Northern, Western, and Ad-Dirayah Districts are home to the other 14% Commercial land.

Medical - Two-fifths of medical services are concentrated into the Central District (1.87 km^2), with an additional 28% in the Northern District (1.30 km^2), and 12% in the Western District (0.56 km^2).

Mixed-Use - Just four mixed-use developments were identified across Riyadh covering 0.25 km^2 (25 hectares) making it by far the smallest land use. Three of four projects were concentrated along King Fahd Road in the Central District and include the iconic and nationally significant Kingdom Centre and Faisaliah Centre.

Office - Covering 1.25 km^2 Riyadh's office development was found primarily in the Northern District (0.9km^2), and mostly at the King Abdullah Financial District.

Organization - Riyadh's 2.00 km^2 Organization development was located predominantly in the Central District (1.15 km^2), with the remaining 0.85 km^2 clustered around Central Riyadh.

Gated Communities - Occupying 27.64 km^2 Gated Communities are the fourth highest land user across identified projects. These developments are predominantly concentrated away from the mature central areas in Districts with vast developable areas including the Eastern (45%) and Northern (32%) Districts.

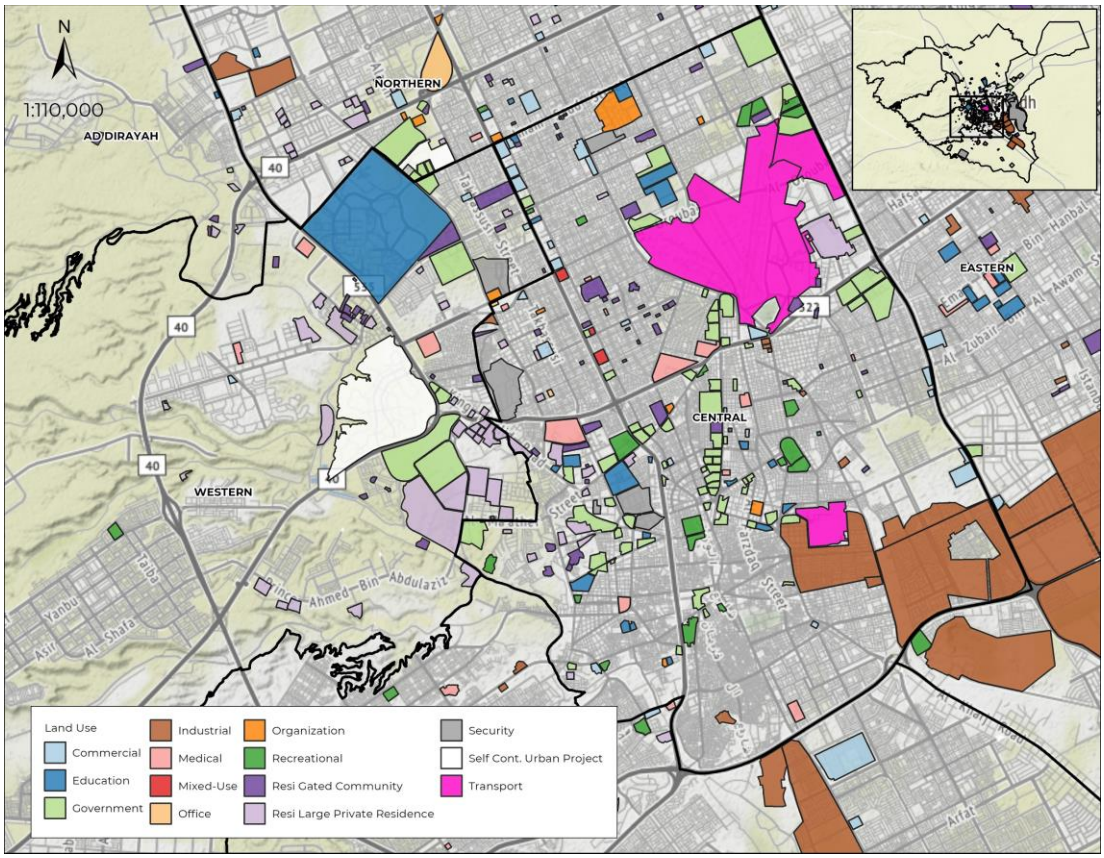
Royal Gated Properties - Located almost entirely within 10 km of the Al-Yamama Palace, Riyadh's royal residences cover 9.84 km^2 and are clustered around Central Riyadh, 60% in the Western District alone.

Recreation - Across Riyadh, just 5.47 km^2 of recreation space was identified which includes all of Riyadh's park space (A 2012 study showed Riyadh to have one of the lowest park spaces per capita in the world). Riyadh's park space is predominantly clustered in the Central (2.57 km^2) and Northern District (1.82 km^2).

Security - Security projects occupy a massive 191.16 km^2 of Riyadh, making it the largest land use of identified developments. Around 75% of this development is at the Khashm Al-Aan military installation in the Eastern District.

Self Contained Urban Development - Three of these project types exist across Riyadh with a total of 9.2 km^2, the largest of which is the Diplomatic Quarter (6.43 km^2) which occupies most of As-Safarat. The other two projects are located in the Northern District - Digital City and the King Abdullah Petroleum Studies and Research Centre.

Transport - Transportation accounted for 16.9 km^2 development, entirely located in the Central District.



Map 46 Citywide - Development by Land Use

Table 0.17 Citywide - Gated Development by District (km²)

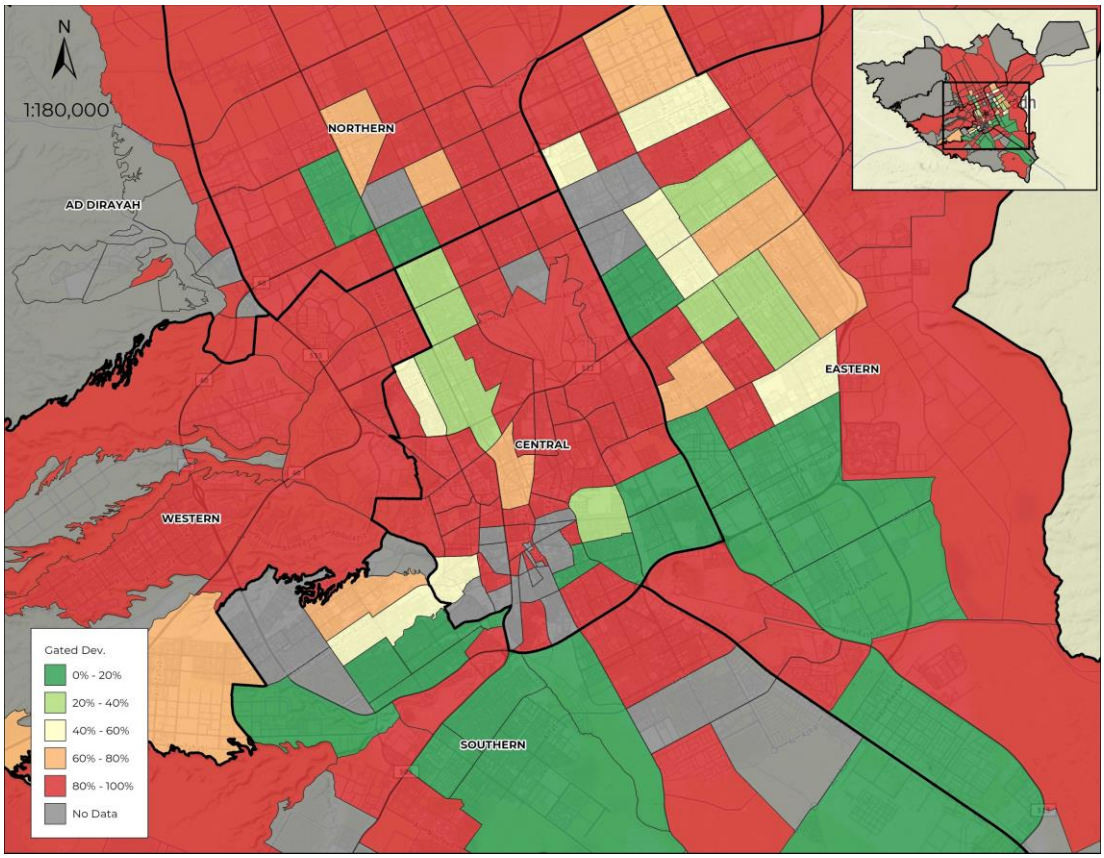
District	Central	Northern	Eastern	Southern	Western	Ad-Dirayah	Total
Education	2.31	12.59	2.92	-	9.13	0.02	**26.97**
Government	8.96	1.13	7.72	6.93	3.88	0.02	**28.64**
Industrial	13.21	1.39	97.1	28.63	1.12	-	**141.5**
Commercial	1.79	0.63	1.53	1.59	0.18	-	**5.72**
Medical	1.87	1.3	0.31	0.35	0.56	0.29	**4.68**
Mixed-Use	0.22	0.02	-	-	-	-	**0.24**
Office	0.05	0.9	0.3	-	-	-	**1.25**
Organization	1.15	0.46	0.29	-	0.1	-	**2**
Gated Community	2.17	8.96	12.51	-	1.91	2.08	**27.63**
Royal Residence	2.14	1.21	0.17	0.16	6.04	0.13	**9.85**
Recreation	2.57	1.82	0.74	0.23	0.11	-	**5.47**
Security	2.45	16.49	145.9	25.53	0.75	-	**191.1**
Self Cont. Urban Development	-	2.77	-	-	6.43	-	**9.2**
Transportation	16.9	-	-	-	-	-	**16.9**
Total	**55.79**	**49.69**	**269.5**	**63.41**	**30.21**	**2.53**	**471.2**

Summary - Gated Development

Over the past couple of decades, gated development has continued to define much of development across the Saudi capital, driven through a confluence of factors including low costs of fuel, preferences for suburban housing from Saudis, government land grants for Saudi citizens, newer services/amenities in northern/western suburbs, and security. Across the Saudi capital, gated development accounted for 71% of the development area (of identified projects), although this figure is heavily skewered by ungated Industrial development. Excluding industrial development, 97.8% development across Riyadh (322.61 km^2) was gated, with the only notable, sizable amount of either non-gated or soft-gated development attributed to Commercial development - shopping centres, which are heavily regulated public realms. Just 6.22 km^2 of non-Industrial projects across Riyadh were Soft/Non-Gated, a third of which in the Central District.

In the District's newest, most prestigious, affluent, and homogenous (Saudi) areas, the Northern and Western Districts, gated development accounts for 96% and 98% of land use, respectively. The most Non-Gated areas are Riyadh's Southern and Eastern Districts, both of which are home to vast industrial zones that are generally ungated.

Gating appears to follow a similar pattern to income, with higher income areas showing almost 100% gated development, except for neighbourhoods running along King Fahd Road which are home to large quantities of commercial/business centres that typically have soft gating.



Map 047 Citywide - Distribution of Gated Developments

Table 0.18 Citywide - Distribution of Gated Development (km²)

District	Gated	%	Soft	%	Non-Gated	%	Total
Central	39.77	71%	3.18	6%	12.85	23%	**55.79**
Northern	47.94	96%	1.68	3%	0.06	0%	**49.69**
Eastern	179.10	66%	1.32	0%	89.11	33%	**269.53**
Southern	35.88	57%	0.59	1%	26.95	42%	**63.41**
Western	29.69	98%	0.06	0%	0.47	2%	**30.21**
Ad-Dirayah	2.53	100%	0.00	0%	0.00	0%	**2.53**
Total	**334.91**	**71%**	**6.83**	**1%**	**129.43**	**27%**	**471.17**

Appendix I Ethical Approval

OFFICE USE ONLY
UECREF
Date
Paper

Ethics Application Form

Please answer all questions

1. Title of the investigation

Urban Fragmentation of Major Cities in the Arab States of the Gulf, The Socio-Economic Implications of Policies and Practices Shaping the Urban Form - The Case of Saudi Cities

Please state the title on the PIS and Consent Form, if different:

2. Chief Investigator (must be at least a Grade 7 member of staff or equivalent)

Name: Professor Ashraf Salama
☒ Professor
☐ Reader
☐ Senior Lecturer
☐ Lecturer
☐ Senior Teaching Fellow
☐ Teaching Fellow
Department: Department of Architecture
Telephone: +44 (0)141 548 3995
E-mail: ashraf.salama@strath.ac.uk

3. Other Strathclyde investigator(s)

Name: Mohammad Almahdi
Status (e.g. lecturer, post-/undergraduate): Post-graduate
Department: Department of Architecture
Telephone: +44 7563 750103
E-mail: mohammad.almahdi@strath.ac.uk

4. Non-Strathclyde collaborating investigator(s) (where applicable)

Name:
Status (e.g. lecturer, post-/undergraduate):
Department/Institution:
If student(s), name of supervisor:
Telephone:
E-mail:
Please provide details for all investigators involved in the study:

5. Overseas Supervisor(s) (where applicable)

Name(s):
Status:
Department/Institution:
Telephone:
Email:
I can confirm that the local supervisor has obtained a copy of the Code of Practice: Yes ☐ No ☐
Please provide details for all supervisors involved in the study:

6. Location of the investigation

At what place(s) will the investigation be conducted

The investigation will be done in the city of Riyadh, Saudi Arabia. It will take place in and around three areas in the city. 1. the university campus: (King Saud University)

2. the medical centre: (King Fahad Medical City)

3. the self-contained large-scale urban project: (Riyadh Diplomatic Quarter)

If this is not on University of Strathclyde premises, how have you satisfied yourself that adequate Health and Safety arrangements are in place to prevent injury or harm?

The investigation area is safe, and the researcher is familiar with. The places are clear of any risks to health and safety.

7. Duration of the investigation

Duration(years/months): 3 months

Start date (expected): 01 / 05 / 2019 Completion date (expected): 31 / 07 / 2019

8. Sponsor

Please note that this is not the funder; refer to Section C and Annexes 1 and 3 of the Code of Practice for a definition and the key responsibilities of the sponsor.

Will the sponsor be the University of Strathclyde: Yes ☒ No ☐

If not, please specify who is the sponsor:

9. Funding body or proposed funding body (if applicable)

Name of funding body:

Status of proposal – if seeking funding (please click appropriate box):

☐ In preparation

☐ Submitted

☐ Accepted

Date of submission of proposal: / / Date of start of funding: / /

10. Ethical issues

Describe the main ethical issues and how you propose to address them:

The investigation will include the use of semi-structured interviews, questionnaires, additionally some information will be gathered through fieldwork in the form of urban interface mapping.

The main ethical concern in the research regards the employment of semi-structured interviews and questionnaires both of which will be anonymised. Participants in questionnaires, and semi-structured interviews will all asked to provide their consent. They will also be provided in the beginning of the questionnaire or interview with a clear and informative section on the nature, objective and duration of the proposed investigation. Participants will have the freedom to withdraw from participation at any time without any obligation to provide an explanation.

11. Objectives of investigation (including the academic rationale and justification for the investigation)

Please use plain English.

The objective of this investigation is first and reach a better understanding of the issues of urban continuity and fragmentation by discussing the existence, impact of and response to fragmentary building types, policies, and practices. This objective is reached through semi-structured interviews.

The second objective of this investigation is to assess the socio-spatial impact of fragmented built environments on the quality of life of users and neighbours of the identified cases. This is achieved through questionnaires.

12. Participants

Please detail the nature of the participants:

Summarise the number and age (range) of each group of participants

Semi-structured interviews: the participants are expert individuals in fields of architecture, urban planning and design and are active in areas of academia and research, decision and policy making, and professional practice. They should also be familiar with the Arabian Gulf region and the Saudi context.
Number: 15-20 *Age (range) 35-60+*

Questionnaires: the participants are residents of the three areas being investigated in Riyadh and the surrounding neighbourhoods.
Number: 300 *Age (range) 18-55+*

Please detail any inclusion/exclusion criteria and any further screening procedures to be used:

There is only one main criteria for participants of the questionnaire, which is the participants' residential location. The residential location should be in or neighbouring one of the three research areas being investigated in Riyadh. 1. King Saud University campus 2. King Fahad Medical City 3. Riyadh Diplomatic Quarter

13. Nature of the participants

Please note that investigations governed by the Code of Practice that involve any of the types of participants listed in B1(b) must be submitted to the University Ethics Committee (UEC) rather than DEC/SEC for approval.

Do any of the participants fall into a category listed in Section B1(b) (participant considerations) applicable in this investigation?: Yes ☐ No ☒

If yes, please detail which category (and submit this application to the UEC):

14. Method of recruitment

Describe the method of recruitment (see section B4 of the Code of Practice), providing information on any payments, expenses or other incentives.

The investigation adopts principles of purposive sampling the recruitment of expert participants in the semi-structured interviews. Participants are approached based on the professional sector they are active. Individuals are approached through email invitations where interview time and date are agreed on.
For the recruitment of participants in the web-based questionnaires the investigation adopts principles of the respondent-driven sampling method. the participants use their social networks to invite their friends or relatives and neighbours to participate in the questionnaire. The recruitment process began with the researcher selecting a small number of participants form the three study areas as seeds who were the first individuals to participate in the study. These seeds then recruit others to participate. This process is repeated until the desired sample size is reached. Weblinks for the questionnaires will be sent to participants through email and social media platforms.
There will be no payments, or financial incentives to persuade the participants to take part in the investigation (interviews and questionnaire).

15. Participant consent

Please state the groups from whom consent/assent will be sought (please refer to the Guidance Document). The PIS and Consent Form(s) to be used should be attached to this application form.

A full informed consent is included in the application form filled by the participant. The questionnaire provides an informative section clarifying the nature, objective and duration of the proposed investigation.
The participants will be made aware that they are free to withdraw from the research at any given time with no explanation required.

16. Methodology

Investigations governed by the Code of Practice which involve any of the types of projects listed in B1(a) must be submitted to the University Ethics Committee rather than DEC/SEC for approval.

Are any of the categories mentioned in the Code of Practice Section B1(a) (project considerations) applicable in this investigation? ☐ Yes ☒ No

If 'yes' please detail:

Describe the research methodology and procedure, providing a timeline of activities where possible. Please use plain English.

The questions this research aims at answering prescribe the exploratory nature of this research, prompting the pursuit of an empirical investigation in the emergence of urban spatial fragmentation, and its implications on the city's urban structure. It is worth mentioning that the ambiguity characterizing the debate around urban fragmentation has posed a major challenge to this research's attempt at devising the appropriate methods of investigation. A wider look at the limited body of the literature that investigates the issue and shares a similar perspective to the concept of urban spatial fragmentation; going beyond the descriptive use of the term fragmentation finds the prevalence of the geosciences point of view which study's urban fragmentation as an attribute urban sprawl and measures it in quite constraining and literal terms.

Based on the discourse analysis that involves the development of a conceptual framework of understanding the issue of urban fragmentation a two-phase strategy is proposed. These two phases investigate the thesis issue in two scales of the built environment macro and micro. In **the first phase -macro-** a mapping of building typologies associated with patterns of continuity and fragmentation in the built environment is conducted, and then their collective impact on the city's urban structure is explored through the tools of space syntax. Later in the first phase the research documents the understanding of scholars, practitioners, and policymakers of the issue of urban fragmentation through semi-structured interviews. **The second phase -micro-** is a case study investigation that is based on the first phase mapping of building typologies associated with urban fragmentation. Based on a selection criteria three building types are developed into case studies in which socio-spatial dimensions of urban spatial fragmentation are investigated in detail. The tools employed here are questionnaires that target users and neighbours of these areas and interface mapping of their immediate urban context.

Data Collection Tools

Phase One: This is the stage of macro investigation and it employs three tools to collect data:

a. ***Urban Mapping*** of typologies associated with urban fragmentation based on previous work of that identifys a number building and urban types that contribute to the emergence of the phenomenon. These types are 1. squatter settlements 2. Urban areas divided by infrastructure 3. Social housing blocks 4. Social housing neighbourhoods 5. Monofunctional business districts 6. Business and industrial parks 7. Shopping centres 8. permanent gated communities 9. Gated tower complexes 10. Self-contained large-scale urban projects. These typologies are clearly not exclusive to the areas of which these investigations were conducted in; they are rather products of global urban trends and can be found anywhere including cities of the Arabian Gulf.
   The initial mapping of fragmentary building typologies will be done remotely for the three cities of Doha, Dubai, and Riyadh using satellite imagery on the google earth platform and then in ArcMap which is a geographic information system (GIS) software for additional details. Mapped building types are classified according to their public or privet ownership, the number of uses and structures within the mapped development, the level of gating. In addition to their centrality in relation to the city centre and finally wither it is restricted openly accessible. Two steps of verification the first was through Wikimapia a Volunteered Geographic Information (VGI) platform. the second step verification that was done only in the case of Riyadh was on the field.

b. ***Space Syntax*** tools and techniques are used in this step to analyse the collective impact of fragmentary building typologies on the city's urban structure. This step will be performed in the Riyadh case since it is the primary focus area of this thesis. Many empirical studies have demonstrated the importance of space syntax for modelling and understanding of urban patterns and structures. This step, therefore, will improve the case study selection process later.

c. ***Semi-structured interviews*** with scholars, practitioners, and policymakers are proposed. Based on the findings of the two prior steps. these interviews will help reach a better understanding of the issues of urban continuity and fragmentation by discussing the existence, impact of and response to fragmentary building types, policies, and practices. In detail the aim here is first to document the general understanding of the issues of urban fragmentation within the professional community, the underlying goal here is a verification of the conceptual framework. Then to explore its drivers and is it a by-product of increased globalisation or a local response to it. Also, what are possible impacts and effects on the urban context? Finally, to discuss an adequate response to the issue in areas of policy and practice and whether concepts of urban catalyst and integration can shape this response.

Phase Two: This is the stage of micro investigation and it employs two tools to collect data:

a. ***Survey Questionnaire*** of users' experiences in the three most dominant building typologies based on the mapping of typologies associated with urban fragmentation. The three case studies are in the city of Riyadh, and two groups of users are targeted by the questionnaire. The first group are those users of

the particular development either residents or employees. Similarly, the second group are residents or employees from adjacent neighbourhoods.

b. ***Urban Interface Mapping*** between public and private spaces in the vicinity of the selected case studies. The implementation of this tools aims at identifying in visible terms the wider impact of fragmentary building types on their immediate urban context. The urban interface mapping tool identifies five mine urban types based on their relation to the surrounding public space. The five types are 1. The impermeable interface (inactive, and not contributing to street life). 2. The direct-opaque interface (direct entry into private space and minimal visual transparency). 3. The direct-transparent interface (direct entry into private space with visual transparency). 4. The pedestrian-setback interface (entry is set back from the legal boundary, behind a mediating pedestrian space). 5. The car-setback interface (entry is set back from the legal boundary separated from pedestrian movement, behind a car parking space).

What specific techniques will be employed and what exactly is asked of the participants? Please identify any non-validated scale or measure and include any scale and measures charts as an Appendix to this application. Please include questionnaires, interview schedules or any other non-standardised method of data collection as appendices to this application.

Where an independent reviewer is not used, then the UEC, DEC or SEC reserves the right to scrutinise the methodology. Has this methodology been subject to independent scrutiny? Yes ☐ No ☒
If yes, please provide the name and contact details of the independent reviewer:

17. Previous experience of the investigator(s) with the procedures involved. Experience should demonstrate an ability to carry out the proposed research in accordance with the written methodology.
Previous experience of the chief investigator Professor Ashraf Salama includes long and extensive experience in urban research cities of the Global South. His experience spans six countries in four continents, including academic and professional experience in Egypt, the United States, The United Kingdom, and the Middle East. He established the Cluster for Research in Architecture and Urbanism of Cities in the Global South (CRAUCGS) at the University of Strathclyde in 2014. This research is part of ongoing effort to produce new knowledge on cities outside of the Western world. He currently supervises a range of urban research in various cities across the Global South, among which several investigations in the African Continent.

Being form Saudi Arabia the field investigator Mr mohammad almahdi is very familiar with Riyadh the city of investigation. He is a teaching assistant at Umm Alqura University. his past experiences include participating in a number of research teams investigating a variety of urban issues in Saudi cities.

18. Data collection, storage and security

How and where are data handled? Please specify whether it will be fully anonymous (i.e. the identity unknown even to the researchers) or pseudo-anonymised (i.e. the raw data is anonymised and given a code name, with the key for code names being stored in a separate location from the raw data) - if neither please justify.

The data from the questionnaire will be anonymous and identities unknown even to the researchers. Interviews will be pseudo-anonymised, and audio recorded. Later, the interviews audio recordings will be transcribed by the researcher, with the consent of the participant. No data will be disseminated without the written consent of the participant.
Explain how and where it will be stored, who has access to it, how long it will be stored and whether it will be securely destroyed after use:

All research data will be stored and backed-up on secure central university servers. The questionnaire data will be stored on Qualtrics account: https://stratheng.eu.qualtrics.com/ControlPanel/. For the duration of the research, the data will be stored on the H: drive only, which is covered by central back-up.
Will anyone other than the named investigators have access to the data? Yes ☐ No ☒
If 'yes' please explain:

19. Potential risks or hazards

Briefly describe the potential Occupational Health and Safety (OHS) hazards and risks associated with the investigation: The city that the investigation will be conducted in is safe and is in the investigator's home country of Saudi Arabia. The investigated locations are clear of any health and safety risks.
Please attach a completed OHS Risk Assessment (S20) for the research. Further Guidance on Risk Assessment and Form can be obtained on Occupational Health, Safety and Wellbeing's webpages

20. What method will you use to communicate the outcomes and any additional relevant details of the study to the participants?
Other than the research's final product there is no intention to communicate the outcomes to the participants in the investigations before completing the whole work.

21. How will the outcomes of the study be disseminated (e.g. will you seek to publish the results and, if relevant, how will you protect the identities of your participants in said dissemination)?
Outcome, results and findings of the study will regularly be shared with the chief investigator and will be material for potential dissemination through publication after completing the investigation.

Checklist	**Enclosed**	**N/A**
Participant Information Sheet(s)	☒	☐
Consent Form(s)	☒	☐
Sample questionnaire(s)	☒	☐
Sample interview format(s)	☒	☐
Sample advertisement(s)	☐	☐
OHS Risk Assessment (S20)	☐	
Any other documents (please specify below)	☐	☐
	☐	☐
	☐	☐
	☐	☐
	☐	☐

22. Chief Investigator and Head of Department Declaration
Please note that unsigned applications will not be accepted and both signatures are required

I have read the University's Code of Practice on Investigations involving Human Beings and have completed this application accordingly. By signing below, I acknowledge that I am aware of and accept my responsibilities as Chief Investigator under Clauses 3.11 – 3.13 of the Research Governance Framework and that this investigation cannot proceed before all approvals required have been obtained.

Signature of Chief Investigator 

Please also type name here: Prof. Ashraf Salama

I confirm I have read this application, I am happy that the study is consistent with departmental strategy, that the staff and/or students involved have the appropriate expertise to undertake the study and that adequate arrangements are in place to supervise any students that might be acting as investigators, that the study has access to the resources needed to conduct the proposed research successfully, and that there are no other departmental-specific issues relating to the study of which I am aware.

Signature of the Convener of the Department Research Ethics on behalf of the Head of Department 

Please also type name here: Zhen Chen

Date: 27 / 02 / 2019

23. Only for University sponsored projects under the remit of the DEC/SEC, with no external funding and no NHS involvement

Head of Department statement on Sponsorship
This application requires the University to sponsor the investigation. This is done by the Head of Department for all DEC applications with exception of those that are externally funded and those which are connected to the NHS (those exceptions should be submitted to R&KES). I am aware of the implications of University sponsorship of the investigation and have assessed this investigation with respect to sponsorship and management risk. As this particular investigation is within the remit of the DEC and has no external funding and no NHS involvement, I agree on behalf of the University that the University is the appropriate sponsor of the investigation and there are no management risks posed by the investigation.
If not applicable, tick here ☐

Signature of Head of Department

Please also type name here

Date: / /

For applications to the University Ethics Committee, the completed form should be sent to ethics@strath.ac.uk with the relevant electronic signatures.

24. Insurance

The questionnaire below must be completed and included in your submission to the UEC/DEC/SEC:

Is the proposed research an investigation or series of investigations conducted on any person for a Medicinal Purpose? Medicinal Purpose means: ▪ treating or preventing disease or diagnosing disease or ▪ ascertaining the existence degree of or extent of a physiological condition or ▪ assisting with or altering in any way the process of conception or ▪ investigating or participating in methods of contraception or ▪ inducing anaesthesia or ▪ otherwise preventing or interfering with the normal operation of a physiological function or ▪ altering the administration of prescribed medication.	**No**

If "**Yes**" please go to **Section A (Clinical Trials)** – all questions must be completed
If "**No**" please go to **Section B (Public Liability)** – all questions must be completed

Section A (Clinical Trials)

Does the proposed research involve subjects who are either: i. under the age of 5 years at the time of the trial; ii. known to be pregnant at the time of the trial	Yes / No

*If "**Yes**" the UEC should refer to Finance*

Is the proposed research limited to: iii. Questionnaires, interviews, psychological activity including CBT; iv. Venepuncture (withdrawal of blood); v. Muscle biopsy; vi. Measurements or monitoring of physiological processes including scanning; vii. Collections of body secretions by non-invasive methods; viii. Intake of foods or nutrients or variation of diet (excluding administration of drugs).	Yes / No

*If "**No**" the UEC should refer to Finance*

Will the proposed research take place within the UK?	Yes / No

*If "**No**" the UEC should refer to Finance*

Title of Research	
Chief Investigator	
Sponsoring Organisation	

Does the proposed research involve:	
a) investigating or participating in methods of contraception?	Yes / No
b) assisting with or altering the process of conception?	Yes / No
c) the use of drugs?	Yes / No
d) the use of surgery (other than biopsy)?	Yes / No
e) genetic engineering?	Yes / No
f) participants under 5 years of age (other than activities i-vi above)?	Yes / No
g) participants known to be pregnant (other than activities i-vi above)?	Yes / No
h) pharmaceutical product/appliance designed or manufactured by the institution?	Yes / No
i) work outside the United Kingdom?	Yes / No

If **"YES"** to **any** of the questions a-i please also complete the **Employee Activity Form** (attached).
If **"YES"** to **any** of the questions a-i, and this is a follow-on phase, please provide details of SUSARs on a separate sheet.
*If "**Yes**" to any of the questions a-i then the UEC/DEC/SEC should refer to Finance (*insurance-services@strath.ac.uk*).*

Section B (Public Liability)	
Does the proposed research involve:	
a) aircraft or any aerial device	**No**
b) hovercraft or any water borne craft	**No**
c) ionising radiation	**No**
d) asbestos	**No**
e) participants under 5 years of age	**No**
f) participants known to be pregnant	**No**
g) pharmaceutical product/appliance designed or manufactured by the institution?	**No**
h) work outside the United Kingdom?	**Yes**

*If **"YES"** to any of the questions the UEC/DEC/SEC should refer to Finance (*insurance-services@strath.ac.uk*).*

For NHS applications only - Employee Activity Form

Has NHS Indemnity been provided?	Yes / No
Are Medical Practitioners involved in the project?	Yes / No
If YES, will Medical Practitioners be covered by the MDU or other body?	Yes / No

This section aims to identify the staff involved, their employment contract and the extent of their involvement in the research (in some cases it may be more appropriate to refer to a group of persons rather than individuals).

Chief Investigator		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
Others		
Name	**Employer**	**NHS Honorary Contract?**
		Yes / No
		Yes / No
		Yes / No
		Yes / No

Please provide any further relevant information here: