

In search of the heart of modern day Riyadh: An evidence-based approach

By
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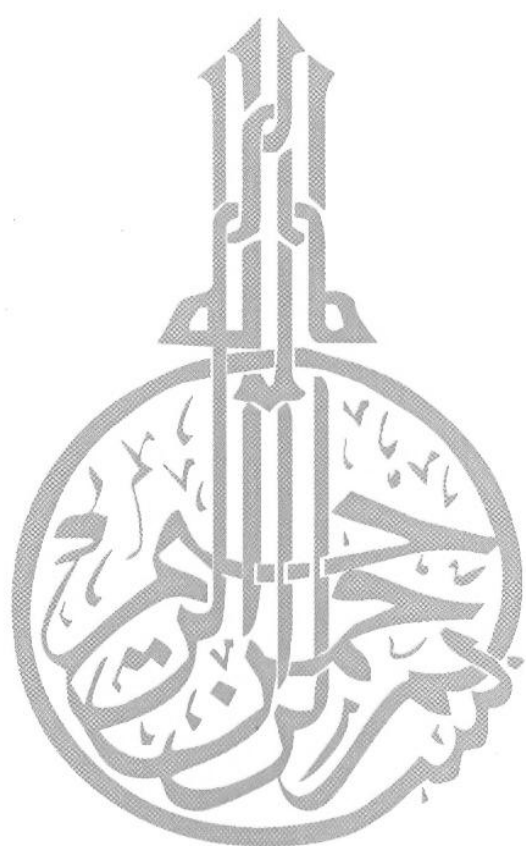
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Abstract:

Riyadh is a dynamic city characterised by its rapid growth (Struyk, 2005). This raises a number of concerns. One of which is the issue of centrality. The historical centre has long been regarded as the heart of Riyadh. However, the commercial strip of Riyadh has emerged over the last few decades as a hub of commerce, growing influence. It is a sprawling metropolis, which seeks to usurp the position of the historical centre of Riyadh. Accordingly, this research seeks to question the centrality of both these areas.

In order to undertake such a task, an evidence-based approach was employed to highlight the characteristics embodied in a historical centre contrasted with a much needed investigation on the impact of rapid growth, which may have tilted the scales against the continuance of the historical area's centricity. The methodological approach of this study utilises six layers of information to paint a more definitive picture of the loss or gain of centrality. These layers were: the syntactic analysis, the land-use analysis, the urban elements analysis, the human activities analysis, the historical analysis and finally the future planning analysis.

One of the most significant findings to emerge from this study is that assessing the centrality of a city is extremely complex. What was uncovered in our analysis of Riyadh was that there are in fact two prominent centres of modern Riyadh; the historical centre (HC) and the commercial strip (CS). At the domestic level, the characteristics of the HC meet the criteria of regarding it as the prominent centre of modern Riyadh. However, it can be argued that at a global level, there is a shift in the phenomenon of centrality in Riyadh from the HC into the CS. The implication is indeed very serious, since the rapid growth of Riyadh has a clear impact on the HC. Globally speaking, the ever-growing expansion of the CS simultaneously weakens the HC through appropriating much of the social and economic activities. Recommendations are also provided for the Higher Commission for the Development of Riyadh to overcome some issues of the HC, which may go some way in bridging the ever-widening gap between the HC and the CS.

Keywords: Historical centre; Riyadh; Centrality; Syntactic analysis; City centre; Growth.

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Chapter 1

Introduction

1.1. Historical centres in fast growing cities:

Massive transformations of towns and cities across the world took place during the Industrial Revolution. At the beginning of the 20th-century, the modernist movement was the impetus for the growth of cities across the world, which in turn witnessed a recognisable change in the typology of architectural style and its subsequent urban morphology (Jencks, 2000). The like of which has had a significant influence on the local identity, the urban structure of cities and beyond. The traditional images of cities have been affected by the scramble of architects, urban designers and planners to create modern spaces, buildings and gridiron patterns for planning the cities (Eben Saleh, 2001).

With this in mind, some cities are expanding more rapidly than others. In such cities, the impact of the modern movement can be witnessed effortlessly. One of the aspects of this impact, which can be looked at in more depth is the historical centre and its role in modern cities. In some cities, the historical centre is meticulously maintained, integrated with the more modern structure of the city and kept vibrant. Many of these centres have achieved recognition for their historical significance and uniqueness. This is a result of factors, which stem from an appreciation of the historicity and the values they represent. Our immediate concern is to what extent do historical centres, particularly in cities with a rapid development rate, perform and act as actual centres of modern cities.

1.2. Identification of the research problem:

With high annual growth rate of more than 4%, the city of Riyadh (Ar-Riyadh or Arriyadh), the capital of Saudi Arabia, is considered as one of the fastest growing cities in the world (UN, 2011). As the city of Riyadh grows rapidly, expanding horizontally not vertically, a number of issues have emerged. One of which is that since the historical centre of the city has undergone a major improvement, there remains a question mark surrounding its perceived centrality. Assuming that it is indeed the prominent centre, the other issue to be investigated is the role that these improvements serve in the advancement of modern day Riyadh. This particular avenue of discussion would eventually lead us to the fundamental issue of the recent growth in the historical area of the city.

1.3. Research questions:

- i. What are the characteristics of the historical centre of Riyadh?
- ii. Where is the centre of modern Riyadh and can the historical centre still be regarded as the main centre, a mere component of the city centre or the centre of Riyadh is located in a different area?
- iii. What is the impact of recent growth on the historical centre of Riyadh and what would the role of the historical centre be in the future of Riyadh?

1.4. Research aims and objectives:

The main purpose of this research was to critically examine whether the historical centre of the city of Riyadh is still considered to be the prominent centre of modern Riyadh, given the fact that the city has transformed dramatically and the centre of city may not be just the historical centre. In addition, this study is an attempt to not only explore the historical centre of Riyadh, but also to show the impact of recent growth. It will therefore be a contribution to the ongoing debate of understanding the centrality and the role of the historical centre in modern and fast growing cities.

1.5. Research literature:

There is seldom research in the area of exploring the role of the historical centre in modern cities, which have high rates of growth. In general, the literature appears to be concentrated either on centrality and its role in the city (Chiaradia et al. 2009), or on historical centres in terms of accessibility and movement (Gurgel and Trigueiro, 2012). Little attention has been given to ascertain whether the historical centres in fast growing cities can actually be referred to as centres of their respective cities.

With that said, there are some authors whose studies have slightly overlapped with this study's proposed research objectives. One of particular interest was authored by Hillier (2009) in which he highlights the issue of centrality historically and the challenge to understand it. Another useful piece of research is done by Dias and Trigueiro (2012) where an examination of traditional town centres is looked at syntactically in two cities that have undergone similar courses of transformation. Primarily, this study assembles its hypothesis from the bridging of theoretical works that emphasise the centrality and the historical centres and its wider role in modern cities.

1.6. Research methodology and data collection:

The main approach to answer the research questions posed was through developing layers of information. Relevant information represented in a set of layers that were designed to meet the research objectives of this study. These layers offer a systematic framework to reach meaningful conclusions in an environment saturated with variables. They are primarily designed to facilitate the investigation of different aspects of the three research questions, due to the fact that each question may need more than one layer of information, in order to address it effectively. What follows is a brief introduction to each and every layer.

1st Layer: The syntactic analysis of Riyadh model. This layer can be considered as a key layer. That is due to the fact that the syntactic approach is one of the most advanced methods in diagnosing the structure of the city. This technique can address the issue of spatial configuration regardless of the scale of the spaces within either buildings, neighbourhoods, towns or cities (Hillier, 1996 and 1999). It will show the spatial analysis of Riyadh's street

network – using Depthmap (a software that developed by Alasdair Turner of UCL) (Turner, 2000-2010).

2nd Layer: The land-use layer. This layer will focus on the commercial activities and institutional centres, given the fact that the concentration of these functions indicates the essential elements of the centre of Riyadh.

3rd Layer: The major urban elements and characteristics of the centre of Riyadh represent the main principal activities of the Riyadh within the first ring road. Not only would this layer examine where the concentration of these significant elements are, but also this layer will act as a reference point. In other words provide us with a sense of the identity of the centre and also offer more clarity of what the centre actually represents.

4th Layer: The layer of human activities. The aim of this layer is not to do a full study about human behaviour, but rather a concise investigation of the pedestrian movement and the level of flow, bearing in mind that both; gate-counts and observation points are powerful tools in measuring human involvement in space (Hillier, 1996), which therefore establishes conclusive evidence of whether the historical centre of Riyadh is the prominent centre of Riyadh. The idea is to launch an overall comparison, in which the level of flows along with human activities in different parts of the city and the historical centre are briefly experienced.

5th Layer: The history of Riyadh layer. In this layer, an overview of the centre of Riyadh and how the city has evolved in the last six decades will offer a clear understanding of the transformation of Riyadh and the stages of urban morphology development.

6th Layer: The planning layer of Riyadh. This will compare the past and the present with the future of Riyadh syntactically, whilst showing whether the prominent centre will remain unchanged over the next few decades.

A comprehensive analysis of these layers of information will help answer the questions raised, illustrating not only where exactly the current centre of the city is, but it may also indicate where the prominent centre might be in the future.

1.7. The structure of the research:

Chapter One: Every study of contemporary trends deserves to be cloaked within its actual context. Thus before a discussion of the core thesis, it is imperative that we perform a number of tasks that will establish the contextual basis of this study. These tasks include a concise background of the study, an indication of the research problem that highlights the gap in the literature, a set of research objectives and a discussion of the significance of this study.

Chapter Two: Even though this study roams in uncharted territory, this area of enquiry does not exist in a vacuum disconnected from conclusions reached by other authors. There was a need to connect the issue of centrality with the

emerging literature that offers a counter and more intuitive narrative. Thus, what follows this preparatory chapter is a critical reading of this literature.

Chapter Three: The following section revolves around the methodical approach; six layers of information employed will be looked at through a prism of the proposed research questions. Such an approach is employed to move the study away from the realm of personal observation towards a more quantitative and systematic approach.

Chapter four: This chapter consists of the results, where the main concern will be with the interpretation of this data.

Chapter five: In this chapter, discussing the results, adding more comments and noting the implications will be the main aim.

Chapter six: The last chapter seeks to build on the conclusions reached by the previous chapter by focusing on the wider implications of these findings. Additionally, there will be a series of recommendations for further studies and for the Authority of Riyadh (The Higher Commission for the Development of Riyadh), which may prove beneficial for Riyadh's continued importance and centrality.

1.8. The significance of the research:

The massive developments as well as the rapid growth in the capital have heightened the need for a detailed study that understands the issue of centrality in Riyadh and provides a much needed contribution to the future planning of Riyadh.

Chapter 2

Literature Review

2-1: Introduction:

In this chapter, there are three related areas to explore. Firstly the subject of urban growth and the transformation of cities will be introduced, showing the impact of urbanisation on the citizens of Riyadh and its immediate environment. Secondly, there will be a short discussion about the centrality of cities being influenced by rapid urbanisation. The latter part of this chapter commences with a succinct look at the urbanisation of Saudi Arabia and concludes with a representation of Riyadh and its historical centre.

2-2: Understanding urban growth:

Cities are constantly changing, they are rarely static. These changes may incorporate transformations in size, function or form. Each and every city can be possibly in terms of its spatial patterns. Batty and Longley (1994: 42) point out that when looking at how the form of a city evolves; the main elements of the spatial patterns to be traced are its spaces, buildings and networks. Hillier (2009: 04) thinks of cities as 'a generic dual form'. That is to say, cities can be represented by two networks; a foreground network and a background network. The latter is mainly residential spaces, whereas the former is street networks. Such networks can be studied and hence traced back the origin or development of these cities.

Cheng (2003: 13) believes that the rapid urbanisation, especially in developing countries, needs 'a scientific understanding of complex urban growth patterns and processes... based on elaborated complexity theory and a multidisciplinary framework.' One of the main issues with understanding accelerated growth in urban areas is that in order to deal with this growth, there is a number of related factors to contend with. Not only should growth be addressed geographically, but more importantly spatially. Frank (2000) emphasises this point by acknowledging that geography is not only about gathering facts, but rather understanding the reasons behind them. In other words, understanding the processes in space and time in which facts themselves can be created is vital. In urban planning, Osaragi and Kurisaki (2000) discuss one of the most important matters, showing the significance of forecasting the development of land use transition. In their approach, the emphasis is about understanding the fact that making a wrong decision in urban planning may lead to disaster. The issue here is to underline the significance of understanding growth, the level of risk and ambiguity of urban planning and management. Consequently, decision makers, particularly in fast growing economies, require a deep understanding of a number of dynamic processes. These involve a number of physical and socioeconomic factors at various spatial and temporal levels.

Growth might possibly lead to an immense functional and physical urban transformation and beyond. But the question to be asked is what causes this massive urbanisation in the first place? Sources clearly indicate that a healthy economy along with a dramatic increase in the world's population that has occurred over the last couple of decades has often resulted in a series of difficult challenges. For instance, the recent UN Habitat Report (2011) shows

that despite the fact that a lot of public attention has been captured by megacities (cities with more than 10 million inhabitants); most of future urban development will unexpectedly take place in smaller towns and cities. A real concern is that these small towns and cities have fewer resources to act in response to the dramatic changes that development brings. What exacerbates the problem of growth even more is that although more than half of the world's population now lives in towns and cities, sources show that yet more and more people would rather emigrate from rural to urban areas seeking social and economic opportunities (Ibid, 2011). The demographic shift is often referred to as an 'unbalanced equation'. According to the United Nations Population Fund (UNFPA, 2012), the migration boom is an obvious outcome of the fact that cities create jobs and hence income. Additionally, cities deliver good education and better healthcare along with other services more efficiently than less densely populated areas, since cities have the advantages of both; the scale and the proximity.

Urban growth has a powerful effect on the environment as well as humanity. Climate change (Zhou et al. 2004); agricultural lands and wetlands (Bolca et al. 2007); immigration (Cerrutti and Bertonecello, 2003) and poverty (Ravallion, Chen and Sangraula, 2007) are some cases in point. Moreover, Bloom, Canning and Fink (2008: 772), have shown little evidence that urbanisation influences the level of economic growth, "Our findings weaken the rationale for either encouraging or discouraging urbanization as part of a strategy for economic growth." What can be observed from these studies is that while urbanisation is often regarded as an advantageous avenue, it has clearly negative aspects, which entail environmental degradation and dehumanising the built environment. This leads us to agree with Cheng's (2003) emphasis on a requirement of scientific understanding of accelerated urbanisation, particularly in developing countries, built on better modelling, strategic approach and a multidisciplinary framework.

2-3: City centres and Centrality:

Given the fact that urbanisation is inevitable, the question to be addressed then is what the implication of urbanisation on cities in general and more specifically on their key areas. One of the most important parts of any city is the centre. This section will consist of a brief review of the city centre and centrality, which highlights its importance, spatially and functionally.

In order to establish our study on firm ground, it is necessary that we achieve utmost clarity in the terms we utilise. Definitions play an important role in all our methodological considerations. For methodology, definition is a means to a scientific end. Thus, what do we intend with the concept of 'centrality'. Both dictionaries; Oxford and Cambridge have indicated a similar definition of centrality in which, they picture centrality as a point in the middle and accessible from a variety of places as well as a concentration of particular kind of function. "A place with a high concentration of a specified type of thing" (Oxford, 2012). It can be clearly seen that the stress in both dictionaries is on 'central', 'accessibility' and 'concentration'.

In the field of urban geography, it can be seen that some scholars have defined centrality based largely on the idea of attractiveness (Losch, 1952 and Alonso, 1964). Others regarded it as the basis of the value of the location and the potential of accessibility (Isard, 1956). It is interesting to see that early geographers emphatically clung to the idea of attractiveness and gravity as well as accessibility.

In the field of urban planning, a well-known cited definition of centrality is proposed by Krafta (1994: 70) in which he says that "... centrality could be defined as a property of public spaces consisting of the capacity of falling on the shortest routes between every pair of built-form portions in a particular urban system". In fact, Krafta based his definition on Freeman's thought of centrality (1977: 35), which developed the notion of that "centrality was based upon the structural property of betweenness". In contrast to the early geographers, contemporary urban planners place a much broader emphasis on the proximity along with closeness.

In the Space Syntax literature, conceptual and empirical approaches were established by Hillier (1996, 1999 and 2009); Chiarldia et al. (2009); Dias and Trigueiro (2012) and others. Hillier (1999) has taken centrality a step further and argued that centrality can be better understood in terms of configuration and attraction. He points out that when the spatial factors are well defined, they can play a key role in the formation and location of centres (Ibid 1999: 01). A decade later, Chiarldia and others (2009) have looked at centrality from a slightly different angle, examining the spatial patterns along with the socio-economic factors. They conclude that 'centres have specific spatial configuration signatures which distinguish centres from their spatial context... the interaction between socio-economic compositional effect and the spatial signature... leads to preliminary centre socio-economic/spatial typologies' (Ibid 2009: 01). Hillier (2009: 08) introduces what he believes should be called 'pervasive centrality', in which he states 'the function of centrality provides the urban grid in a far more intricate way than has been thought, through, for example, notions of polycentricity'. The development of multi scale centrality, he thinks, ought to be looked at as a 'pervasive function of cities, with clear spatial correlates and not simply as a hierarchy of locations' (Ibid 2009: 08). In summary, it is possible to bridge these contrasting viewpoints together through the amalgamation of a three pronged characterisation; first centres can be easily recognised because of a distinct structure distinguished from the surrounding areas. Second, centres can be regarded as the wealth generators of cities. Third, centres can be looked upon as highly attractive places for social interaction.

Centres can possibly change. Not only can centres grow and shrink, but they also can shift, diversify, disappear or specialise (Chiarldia et al. 2009). Hillier has observed two ways that centres expand, linearly and convexly (2009: 06). The former is a common occurrence and centres have been observed to undergo a parallel configuration, whereas the latter, centres take the shape of 'spiky potatoes', in which popular shopping areas form a localised grid where the arrangement of the surrounding streets are formed in both; parallel and orthogonal. Centres and subcentres commonly appear to be diffused

throughout the whole system of cities. Some centres can be strong locally as well as globally. Some centres can grow and some can fail. A centre may fail because of other centres in close proximity. Hillier argues that 'the way in which the urban grid evolves tend to ensure that seeds for potential centres occur only at certain distances from each other' (2009: 08).

What differentiates centres and makes them distinguishable from their surroundings is not just their spatial configuration, but also their function. Dias and Trigueiro (2012: 08) show how centres attract and generate movement by the concentration of a variety of functions, that Hillier (1999: 01) refers to as 'live centrality'. Retail, catering, markets, administration, business, religious activities, entertainment and other services are cases in point.

This leads us to review some of Space Syntax theories of movement, given the fact that functions such as retail, catering, and markets benefit normally from movement. 'Live centres' are usually influenced by the level of movement. The theory of 'movement economy' has been outlined in Hillier (1996). It was developed from the idea of 'natural movement' (Hillier et al. 1993). Natural movement theory is based upon empirical evidence that shows movement flows being affected by the configuration of the street network. Urban movement economy is:

"... arising from the multiplier effect of space, depends on certain conditions: a certain size, a certain density, a certain distribution of land uses, a specific type of grid that maintains the interface between local and global" (Hillier, 1996: 175).

Therefore, it is not too much of a stretch to suggest that the process is largely a consequence of spatial configuration that generates movements. Hence movements impact the land use choices, which in turn influences density and eventually affects the city centres as well as subcentres.

2-4: The rapid urbanisation in Saudi Arabia:

As illustrated earlier, the pace and scale of growth vary widely between countries. A healthy economy and a dramatic increase in population with no strategic plans lead to rapid urbanisation. As a developing country, the Kingdom of Saudi Arabia has experienced fast urbanisation over the last four decades. The construction boom has been fuelled by the national revenue from inflated oil prices. A recent report by the International Monetary Fund (2012) suggests that Saudi Arabia is among the top twenty fastest growing economies in the world with a GDP annual growth of 4.2%.

In terms of the population, a recent census suggests that the growth rate among the population is 3.2% (CDSI, 2012). The fact that Saudi Arabia has a young population means that all the indicators show that its economy may grow even stronger and the population is set to increase significantly over the next ten years. This leaves planners and decision-makers facing inevitable urban challenges to deal with.

2-5: Riyadh:

2-5-1: Historical background:

Sources demonstrate that Riyadh was found 'on the ruins of several communities about 1740' (Alhathloul, 1996: 158). Figure 01 displays the walled city of Riyadh, which has undergone an enormous transformation that left only three characters of the old city: The Grand Mosque, the Fort and the public square of Safa. The old city was not well-known until King Abdul-Aziz Al-Saud, the founder of modern Saudi Arabia, took over in 1902. Riyadh was the permanent residence of the King and his entourage. In the 1930s, the first steps had been taken by the king himself to develop the city physically. A decision had been taken to move the capital from Makkah (Mecca), the holy city, to Riyadh in 1950 – many of the ministries were in fact in Jeddah, the second largest city in the Kingdom. Since then, the city has transformed dramatically as will be illustrated in the following section.

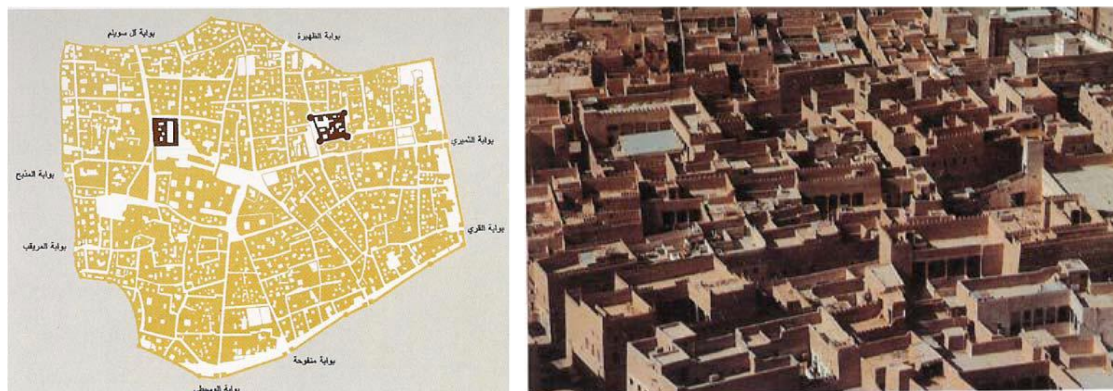


Fig. 01: On the left: The traditional walled town of Riyadh 1916. The darker coloured buildings are what remain from the old city of Riyadh. The building on the left is the grand mosque, while the one of the right is the fort. The vacant space between them is the most famous square of Safa. On the right: The urban pattern of the old communities (Source: The Higher Commission for the Development of Arriyadh).

2-5-2: Morphological transformation of the capital:

Riyadh preserved its size during the twenties, see Figure 01. Figure 02 illustrates the urban development of Riyadh exceeding the walled city. Between the 1930s and the 1960s, construction of three complexes transformed the urban morphology of the entire city. The first complex, known as Al-Murabba, just in the north of the old city, built in the late 1930s to be an administrative centre and also a royal residence. The second complex, known as Nasriyah, in a suburb of the west of old city, built in the mid-1950s, to be mainly a royal residence. The third complex and perhaps the most important one of all is known as Al-Malaz, in the far north-east of the old city. It was built in the late 1950s early 1960s to accommodate the government's employees who had moved from Jeddah to Riyadh when the latter became the capital (Alhathloul, 1996). Al-Malaz was known as 'New Riyadh' and also a 'progenitor of the ubiquitous grid' (Mubarak, 2004: 579). The development of Al-Malaz was important because of its urban morphology. Decision-makers

had seen Al-Malaz urban structure as an ideal form to be utilised in a wider context of Riyadh. Figure 03 displays the layout plan of Al-Malaz Housing Project. The organic structure of the capital of pre-Saudi reign was soon replaced with a patchwork of gridiron (Ibid, 576). Figure 04 shows the old city and the three new complexes, which indicate the first real transformation of the city.



Fig. 02: The first urban expansion outside the walled city of Riyadh, 1920s (Source: The Higher Commission for the Development of Arriyadh).



Fig. 03: Part of the layout plan of Al-Malaz Housing Project known as the new Riyadh, the late 1950s early 1960s (Source: The Higher Commission for the Development of Arriyadh).

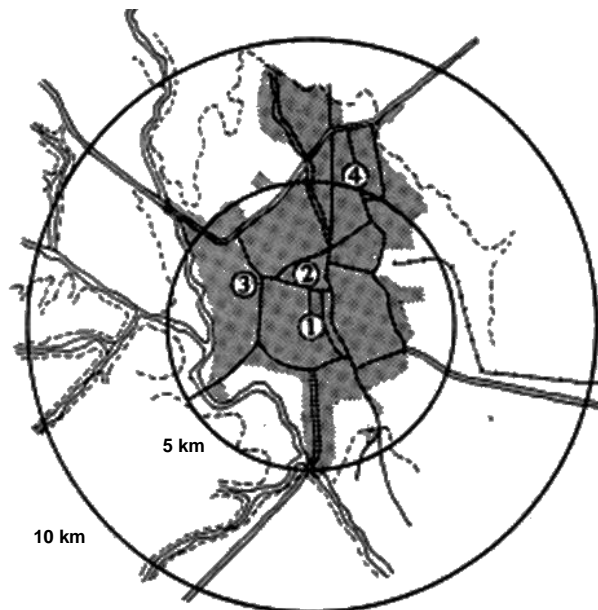


Fig. 04: The locations of the first three major construction projects outside the old city of Riyadh, between the 1930s and the 1960s where 1) is the old city of Riyadh; 2) is Al-Murabba complex; 3) is Nasriyah complex and 4) is Al-Malaz complex. (Source: The Higher Commission for the Development of Arriyadh).

Riyadh has experienced a massive urban expansion since the 1970's, thanks to the discovery of oil and its revenue. In the seventies, Riyadh was something quite different from what it had been only two decades earlier (Mubarak, 2004: 568).

The Ministry of Municipal and Rural Affairs (MOMRA) was established in 1975 to retain control over the cities and towns in the Kingdom. 'Riyadh's population is expected to increase by 3.5 times between 1996 and 2021; household numbers are forecasted to increase by 5 times, which translates into housing demand' (Ibid, 569). The MOMRA noticed a rapid growth in the capital and took three major steps to address the growth of the city. This has been seen by many to be steps in the right direction, although there were a lot of criticisms that questioned density and land uses (Alhathloul, 1996; Edadan and Alhathloul, 1995; and Mubarak, 2004).

The first attempt to lay down specific plans for the city of Riyadh was initiated by MOMRA's decision to assign the task to Doxiadis Associates International in 1973. The plan proposed by Doxiadis introduced a linear growth concept in which the city evolves along a central spine, known as the commercial strip, running in a north-south direction. Future extensions were possible from the south, east and north whereas in the west, there is a dry valley known as Wadi Hanifah. The plan is gridiron comprising a system of freeways and main roads that circumscribe super-blocks of 2x2 km. The plan was designed to serve the city's need until the year 2000 (Doxiadis, 1970). An effort made to revitalise the centre of Riyadh by an inclusion of a detailed design of individual Action Area Plans that covered 11.5 km². Although the plan was implemented to a certain extent, it was criticised in terms of the character of the city and above all it did not anticipate the pace and scale of urban growth accurately (Alhathloul, 1996).

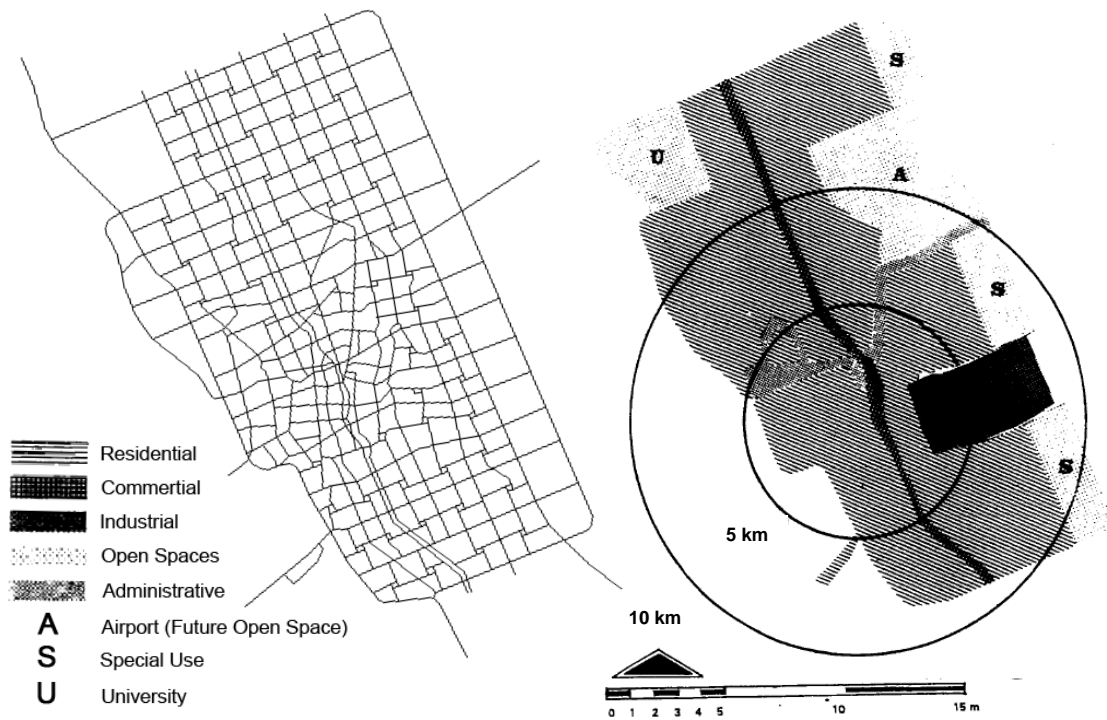


Fig. 05: The Doxiadis Master Plan and the Land-use Map of Riyadh, 1973 (Source: The Higher Commission for the Development of Arriyadh).

The second attempt to master plan the capital was when the SECT International firm was retained by MOMRA in 1976. The task was to update the Doxiadis Master Plan. Figure 06 illustrates the revised master plan by SECT International which was completed in 1982. The problem with the proposed plan was that it did not address the issue of low density and the leapfrog development (Mubarak, 2004).

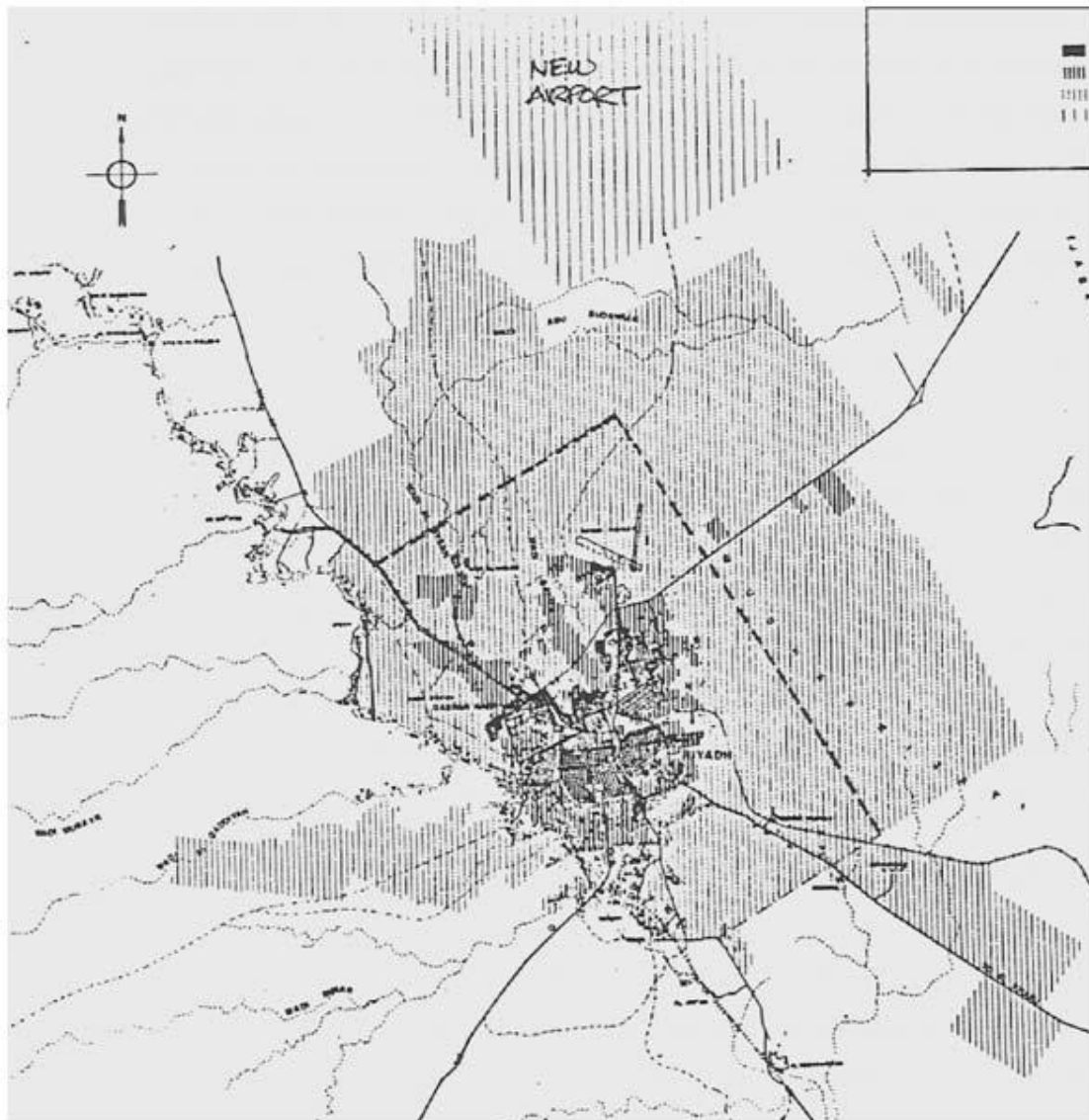


Fig. 06: The revised master plan by the SECT, 1982 (Source: The Higher Commission for the Development of Arriyadh).

The recent attempt to control the growth is carried out by the High Commission for the Development of Riyadh (HCDR), in which a radically new direction was adopted and phases of growth were proposed and agreed by the MOMRA between 1989 and 2005 and beyond. Figure 07 shows the strategic plan for the city up to 2025. Special attention has been paid to connect and integrate the suburbs within the city and to revitalise the centre of Riyadh, as is demonstrated with following point.

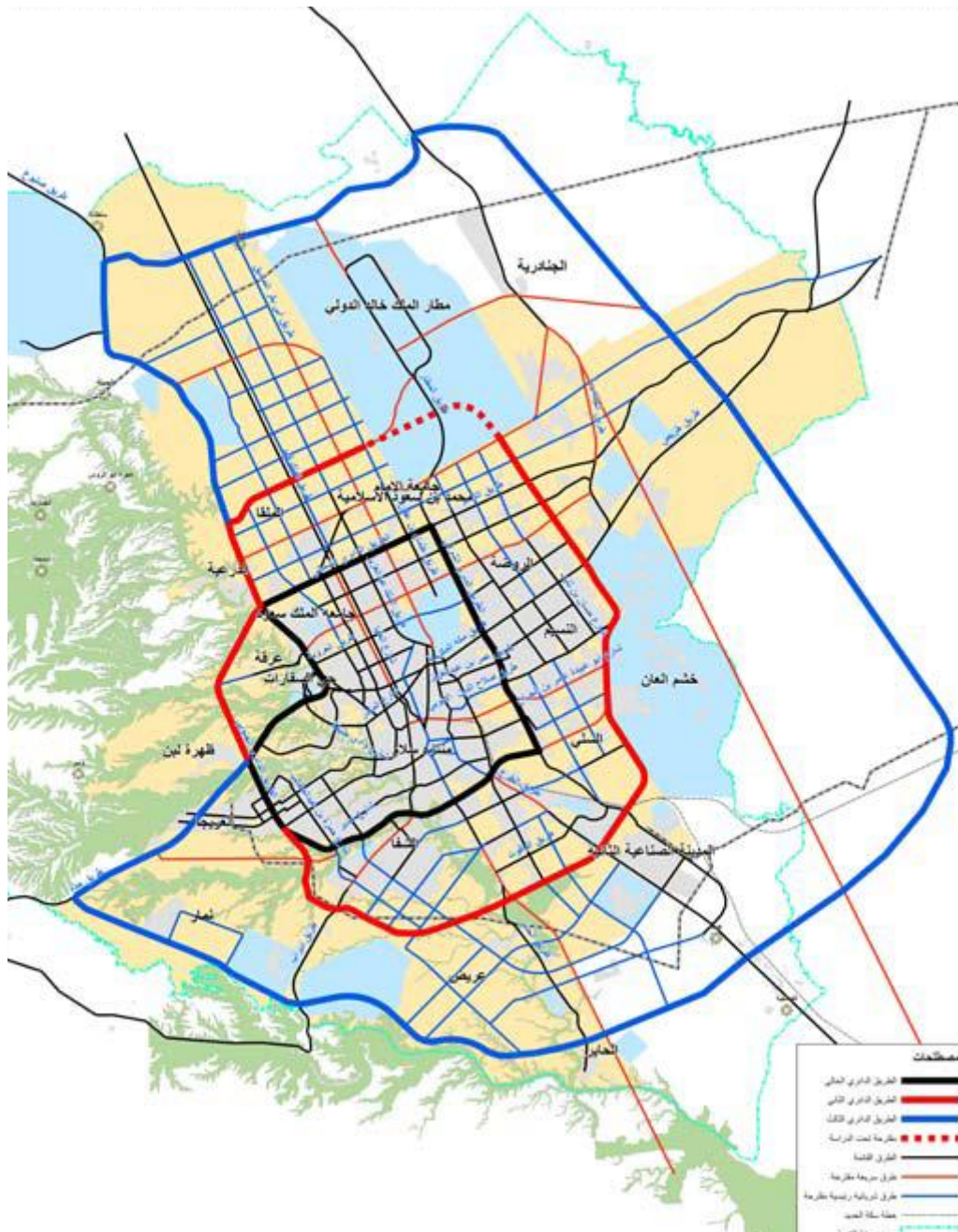


Fig. 07: The strategic master plan by the HCDR (Source: The Higher Commission for the Development of Arriyadh).

2-5-3: The historical centre of Riyadh:

The historical centre is believed to be the centre of modern Riyadh. The centre has transformed significantly. The old city centre was partially redeveloped by Rasem Badran Architects in 1991. In 1992, it was awarded the The Aga Khan Award for Architecture (AKAA, 2012). The plan has the identity and the image of traditional Riyadh in which it recreated and transformed the spatial character of the local Najdi architectural style and

idiom. The development designed to integrate the centre with the urban fabric surrounding the old city centre in a way in which it assures it meets the unique needs of the population; which includes the phenomena that in many old Arabian cities commercial and communal activities are carried out in a close proximity with the place of worship. The historical centre is surrounded by a number of attractors such as local markets as well as modern malls, the fort, the National Museum, the National Park and the King Abdul-Aziz Historical Centre.



Fig. 08: The historical centre (The centre of Riyadh) (Source: The Higher Commission for the Development of Arriyadh).

Chapter 3

Research Methodology and Data Collection

3.1. The research approach:

In this chapter, an account of how this research was carried out will be given. Each and every method, both to collect and analyse the data, will be identified and discussed in detail. The reasons for choosing the methods along with the expected outcome will also be presented.

Based upon the requirements of each question, certain methods have been employed in order to answer the research questions appropriately. The research questions are as follows:

- i. What are the characteristics of the historical centre of Riyadh?
- ii. Where is the centre of modern Riyadh and can the historical centre still be regarded as the main centre, a mere component of the city centre or the centre of Riyadh is located in a different area?
- iii. What is the impact of recent growth on the historical centre of Riyadh and what would the role of the historical centre be in the future of Riyadh?

Suitable information represented in a set of layers that has been created and analysed, which in turn defines a systematic framework through which a meaningful conclusion can be drawn. There are six layers of information; the syntactic analysis layer, the land-use layer, the urban elements layer, the human activities layer, the history of the city layer, and finally the layer of the planning of Riyadh. These layers are designed to facilitate the investigation of different aspects of the three research questions, due to the fact that each question may require more than one layer of information to adequately address a particular issue.

In order to answer the first research question, two layers are utilised; the urban elements layer and the land-use layer. The former is what is regarded as 'the landmarks of the city' such as buildings and public spaces that represent the main principal activities of the Riyadh within the first ring road. The urban elements, as Karimi puts it, accommodate prominent functions and land-uses, generate and attract movement, symbolise social and cultural values and characterise the architectural character of the city (2012: 43). Therefore, this layer will act as an overview of the major urban elements and the characteristics of the city of Riyadh within the first ring road. These urban elements have been categorised based on their functions such as commercial, institutional and others. Not only would this method illustrate the concentration of such significant elements, but also it will act as a reference point that will indicate the identity of the centre of the city and gives us far more clarity about what the centre consists of. The urban elements layer would illustrate comprehensively where the concentration of the commercial centres and the institutional buildings (government buildings) are located. The latter being the land-use layer. The purpose of the land-use map is to chart the public's utilisation of the land (commercial, residential, industrial or other uses). Interestingly, the land-use works hand-in-hand with the syntactic analysis (spatial configuration), since both layers are complementary to each other (Hillier et al. 1993) and through which an evidential facts can be launched that can be used to tackle the main research argument. The land-

use maps have been created in details based on a number of sources such as the Doxiadis Land-use Map of Riyadh of 1973 (Figure 05), the High Commission for the Development of Riyadh, Google Map as well as an intimate experience of the city. Thus, the researcher's endeavours to update the map have resulted in an up-to-date map, which reflects the reality of Riyadh within the first ring road. The land-use map allows us to distinguish the concentration of functions such as institutional centres and commercial centres. Consequently, this enables a relatively easy differentiation of the importance of particular areas in the city, in which a comparison between the historical centre and the rest of Riyadh can be determined.

In terms of the second research question, two layers of information are operationalised. These layers are: the syntactic analysis and the human activities analysis. The syntactic analysis can be regarded as the most fundamental layer. That is due to it being among the most advanced methods in identifying the structure of the city. This technique can address the issue of spatial configuration regardless of the scale of the spaces within either buildings, neighbourhoods, towns or cities (Hillier, 1996 and 1999). Through this layer, a number of syntactic measures – such as intelligibility (how hard is it to find your way around) and synergy (how local movement potentials within the area relate to movement potentials through the area or the relationship between local and global scale) (Hillier, 2004: 42) – will be captured. The urban area within the first ring road of Riyadh has been morphologically examined. A number of different morphologies have emerged. Exploring each part by its own juxtaposed with the whole system – Riyadh within the first ring road – had been conducted. Each and every part has been extracted from the whole system and examined as a separate system. This was achieved through using the QGIS software (The Quantum GIS project, 2012). The next step was done by the JMP software (SAS Institute, 2012) so as to compare and contrast these systems in terms of their measurements of intelligibility ($X=\text{Segment_Global_Integration_R5000}$ and $Y=\text{Connectivity}$) and synergy ($X=\text{Segment_Global_Choice_R800}$ and $Y=\text{Segment_Global_Choice_R5000}$). Additionally, the most important technical measures are integration and choice. The former is known as closeness or the measure of accessibility for to-movement of a space, whereas the latter is known as betweenness or the measure of through-movement potential assesses the degree to which each space lies on simplest or shortest paths between all pairs of spaces in the system (Hillier and Hanson, 1984: 108-114). At global scales (Radii R5000, R10000 and Rn) or at the level of the entire city, choice often identifies the natural boundaries of the area (Peponis et al. 1990), while at local scales (Radii R200, R400 and R800), the measures highlight a much more finer scale structure, which in turn reflect the fact that shorter trips will tend to prioritise more local spaces (Hillier and Vaughan, 2007: 217). Integration, on the other hand, represents spaces or streets that are much more significant culturally, socially and economically. Furthermore, integration value implies high accessibility and connectivity; meaning that spaces or streets that are integrated are highly accessible as well as highly connected to other parts of the city (Hillier and Hanson, 1984). Such a layer, therefore, will help us tremendously in addressing a number of issues including centrality. To reflect more clearly on

the syntactic layer, another layer has been conducted. That is the human activities layer. It was a brief first-hand investigation of the pedestrian movement, the level of flow and human activities. Gate-counts and observation points are powerful tools in measuring human involvement and behaviour in space (Hillier, 1996) and therefore provide a firm foothold to establish whether the so-called 'the central area' or 'the historical centre' is the prominent centre of modern Riyadh. The idea is to launch an overall comparison, in which the level of flows along with human activities in different parts of the city and the central area are experienced. This allows us to link the spatial analysis with people's activities and hence the socio-economic aspects of the examined areas (Riyadh within the first ring road). The gate-counts along with the observation points were chosen based upon a number of issues. First, the outcome of the syntactic analysis in which integrated streets have been observed for 15 minutes each. Second, the result of the land-use analysis and where the concentration of the commercial and institutional centres is situated. Finally, the perceived prominence of selected streets. The observation was mostly conducted in streets located within two prominent areas: the historical centre and Olayya area.

With regards to the third and final research question of (*What is the impact of modern growth on the historical centre of Riyadh and what would be the role of the latter in the future of Riyadh?*), two layers of information were used. That is, the history of Riyadh layer and the planning layer. The former was employed as a means of tracing back the evolution of Riyadh since 1916. The main goal was a consideration of the time in conjunction with the outline of the pattern of growth, expansion of Riyadh and the reasons which point to such trends. The planning layer, on the other hand, involved a discussion of the master plan of Greater Riyadh. The main objective of this particular layer was to demonstrate the strategic thinking for the future of the city. The comprehensive plan will be used to compare it with the spatial analysis of the entire Riyadh. Consequently, these layers focus mainly on addressing the issue of the impact of growth on the entire city along with a particular focus on the historical centre.

To conclude, the diagram below, figure 09, summarises the main research methods and the way the data was collected in order to answer the three research questions.

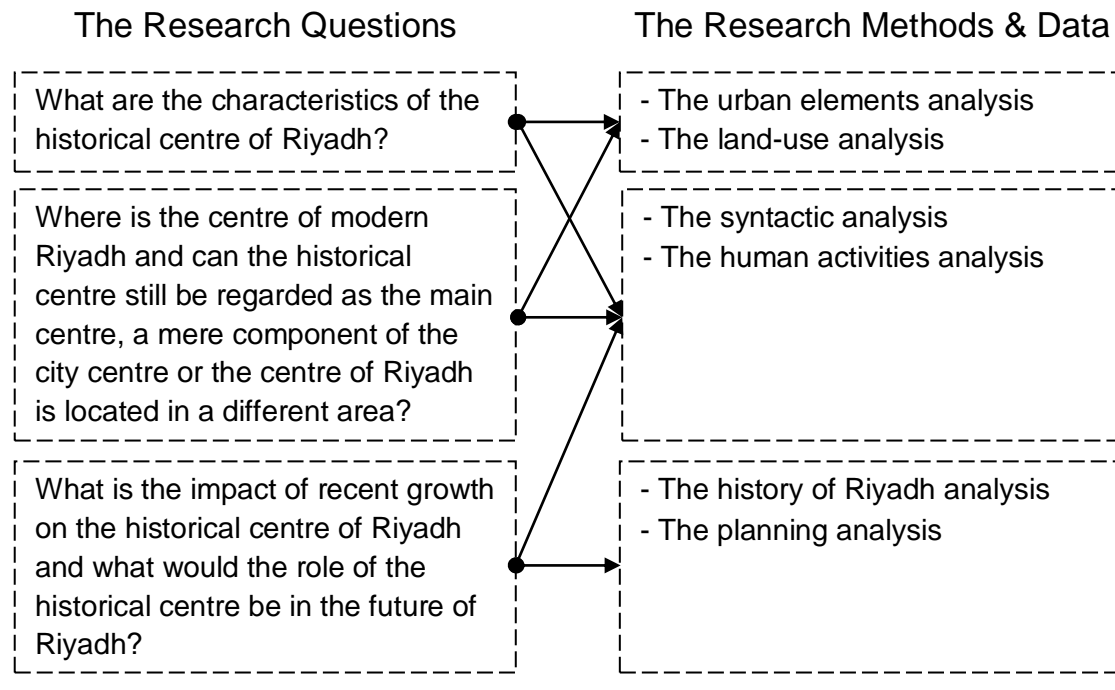


Fig. 09: The research questions and the research methodology.

3.2. The research limitations:

Though the methodology employed was an appropriate way to survey vast amounts of information, it has two problematic areas. First, it is restricted by an intense focus on a particular area, which may have led to some degree of reductionism. A fuller and more detailed picture would have emerged if the six layers of information have been conducted for the entire city of Riyadh instead of just Riyadh within the first ring road. Figure 10 shows the current street network of Riyadh and the studied area (the case study) highlighted in red. However, the desire for unparalleled accuracy prevented such indulgences of looking at a vast metropolis saturated with so many variables. The size of Riyadh, which is about 80-km north-south by 65-km east-west, is comparable with that of London, which is around 60-km north-south by 50-km east-west. To accurately analyse such a sprawling metropolis would prove unwise; rather a focus on a specific area would be the 'lesser evil.' Such lofty ambitions to incorporate all of the nuances and variables of a wider survey would only result in a grandiose theory that could not rival the accuracy of a more intimate study.

Another crucial factor was the issue of the severe weather common in this particular part of the world. The observation analysis was undertaken during the summer months, which was extremely hot, dry with regular sandstorms preventing observational analysis during the sunlight hours. Thus, much of the

observations were undertaken during the evenings. What exacerbates matters even more was that much of the observations were undertaken during month of Ramadan (Fasting Month), in which a significant amount of shops and other activities are closed almost during the daytime. However, these matters were offset by the reversal of activities during the Ramadan period. Due to delayed time of breaking one's fast, much of the festivities take place during the evenings of Ramadan. Thus, the research was not hampered by only being able to observe human activity during the evenings.

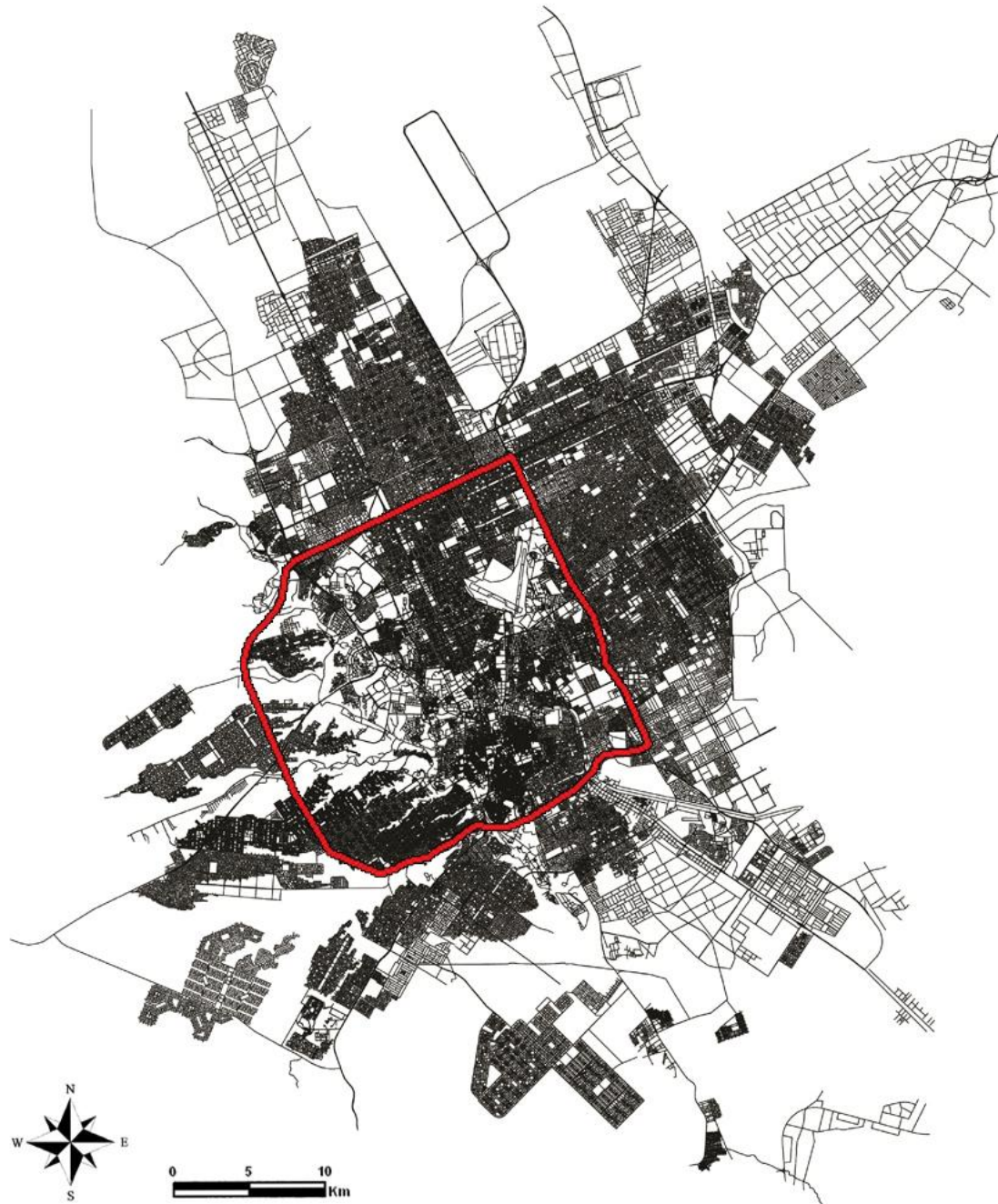


Fig. 10: The street network of Riyadh (Source: The Higher Commission for the Development of Arriyadh).

Chapter 4

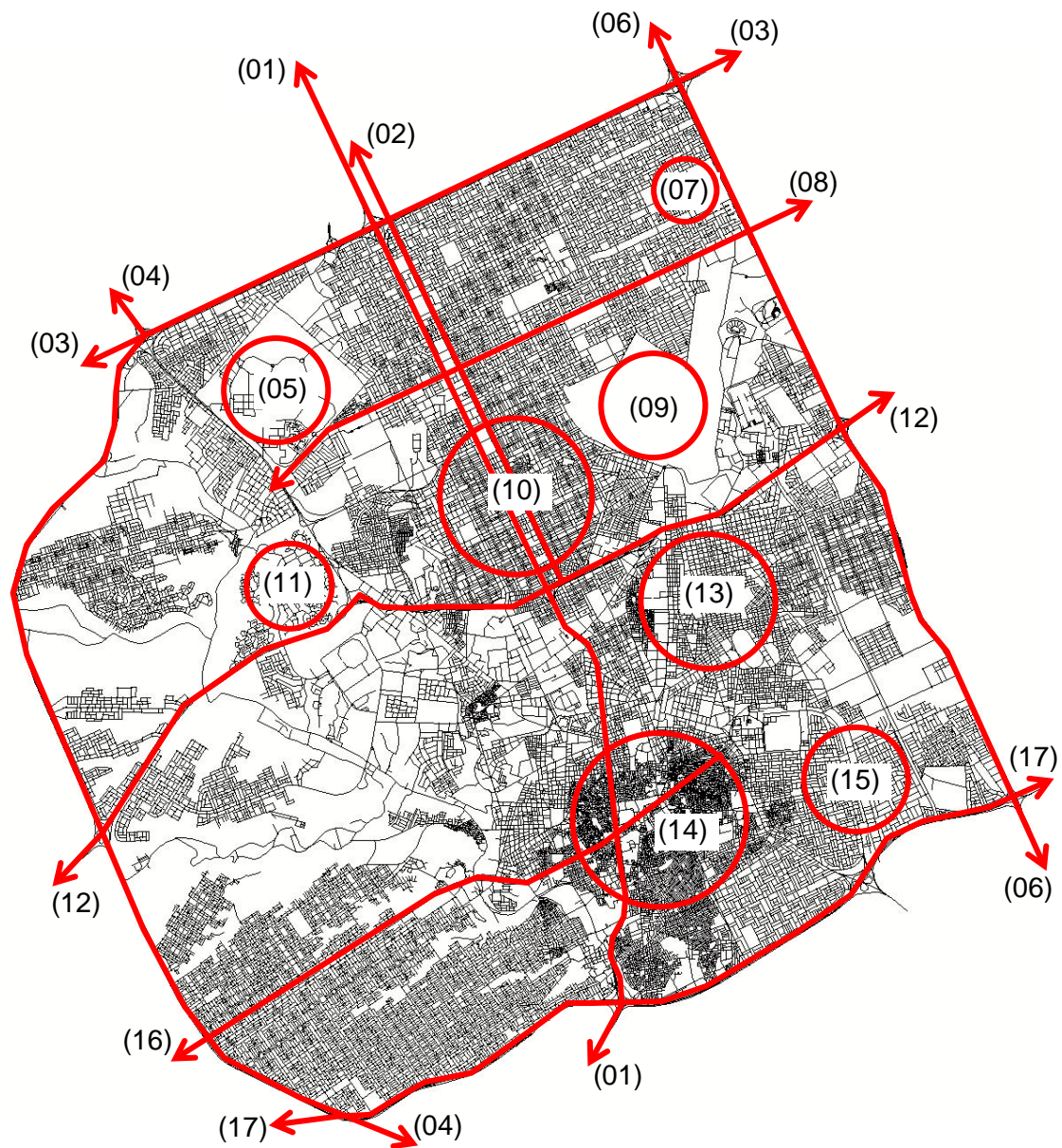
The Results

In this chapter, the main object is to present the results of the six layers of information mentioned earlier (the syntactic analysis, the land-use, the urban elements, the human activities, the history of the city and finally the planning of Riyadh)¹, which are designed to ascertain the issue of centrality in Riyadh. More elaborate discussion will be presented in the next chapter detailing the entire narrative of this research, with a strict focus on tackling the three research questions.

4.1. The syntactic results:

Figure 11 displays the studied area in details (21-km north-south by 20-km east-west); showing the street network and some of the key urban elements of the city within the first ring road. It clearly shows the historical part of the city grew organically. It is regarded as the centre of the city by the Higher Commission for the Development of Riyadh. The rest of the city seems to be largely planned and of an artificial nature. Another important section of the city is a part of the commercial strip, which is the area between King Fahd Road and Olayya Street (10-km long and 300-meter wide).

1. The order of representing the layers of information in this chapter is based upon the relevance of each layer in accordance to the research questions themselves.



- | | | |
|-------------------------------|-------------------------|---|
| 01. King Fahd Road. | 08. King Abdullah Road. | 15. Industrial Zone. |
| 02. Olayya Street. | 09. Riyadh Air Base. | 16. Medina Road. |
| 03. First Northern Ring Road. | 10. Olayya Area. | 17. First Southern Ring Road. |
| 04. First Western Ring Road. | 11. Diplomatic Quarter. | |
| 05. King Saud University. | 12. Makkah Road. | ► The area between King Fahd Road and Olayya Street is called the Commercial Strip. |
| 06. First Eastern Ring Road. | 13. Al Malaz District. | |
| 07. Princess Nora University. | 14. The Central Area. | |

Fig. 11: First ring of Riyadh: Main street network and the key elements of the city.

Figure 12 demonstrates the spatial analysis across the radii for the urban area within the first ring road of Riyadh. It provides a general overview of the spatial analysis for Riyadh within the first ring road. At micro or local scales,

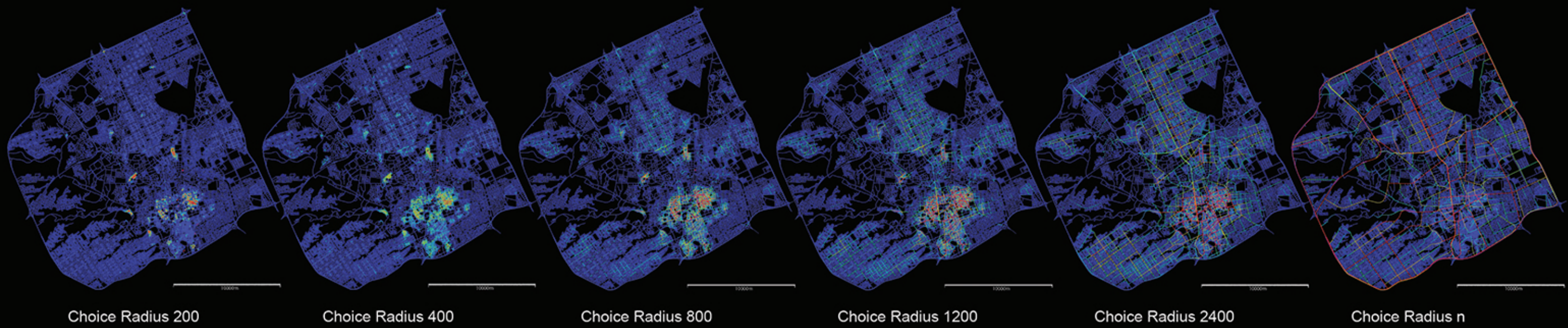
such as R200, R400 and R800¹ in both choice and integration measures, a number of hot spots can be noticed, which represent the 'seeds of the city'. These spots are largely the oldest parts of the city. They are unplanned settlements and organically grown. The analysis pinpointed the areas that show these types of urban structure are easily accessible by pedestrians. The historical centre has been clearly prioritised, meaning that the historical centre works flawlessly at the local scales, which encourage shorter trips and therefore enhance the 'movement economy'. Such an area facilitates a large number of socio-economic activities that could take place within a short distance.

At slightly bigger metric radii (meso scale or neighbourhood scale) such as R1200, R2400 and R5000, we can begin to see the main structure of the city. What the analysis of those metric radii clearly demonstrates are that the morphology of the historical centre is highlighted as the busiest parts of the urban grid as well as the most integrated streets in the entire system. This emphasises the fact that the historical centre has been picked up at those scales as the prominent centre of the city.

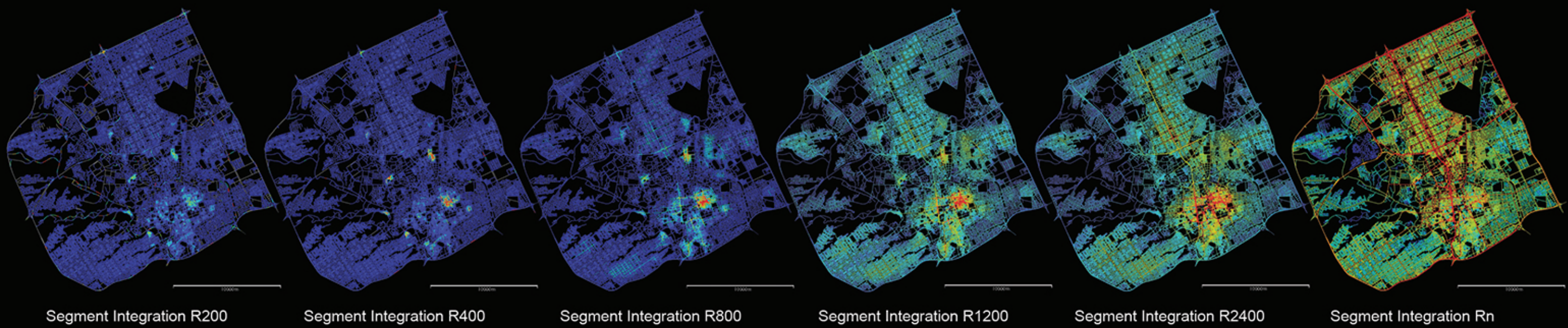
At a global scale or macro scale, choice Rn picks up the super structure of the city or its main foreground network. Integration Rn illustrates a very interesting result; one of which is that there is a shift in the number of integrated streets from the organic parts of the city to the planned parts. This meant that the northern sections of the city within the first ring road, which include the commercial strip, become far more integrated than the organic sections that include the historical centre.

1. R200, R400, or R800 are the equivalent of walking distances that generally take up to 3, 5, and 10 minutes respectively.

Fig. 12: Spatial Analysis for the urban area within the First Ring Road of Greater Riyadh



Normalised Choice (Segment Radii 200/400/800/1200/2400/n)



Integration (Segment Radii 200/400/800/1200/2400/n)

Figure 13 represents the main street network of the entire city. Since the size of Riyadh is immense, the focus was firmly planted on the city within the first ring road to be modelled in detail, while in the other parts of the city; only the main streets were modelled. In this way, we can overcome the issue of the size constraints and more importantly we can have gain a sense about the entire city and its future. (See section 3.2: The research limitations) in the previous chapter for more details.

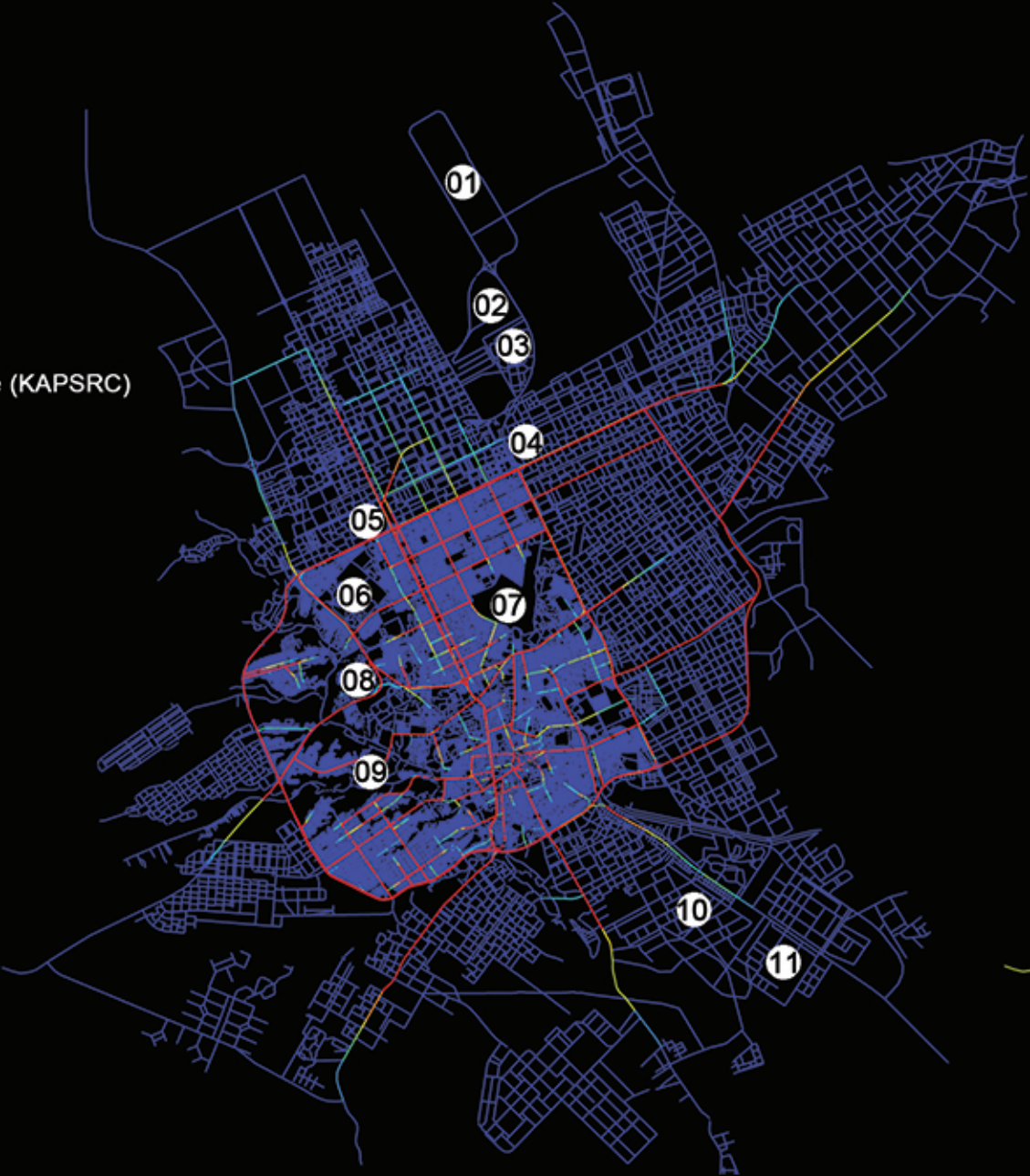
What the measure of integration R_n in the syntactic analysis at figure 13 demonstrates is that when the urban area within the first ring road is analysed in the context of the entire city, a rather interesting outcome emerges. That is that it confirms the first findings that there is a shift in the centre of Riyadh at a global scale. In contrast, it means that at the local scales, the historical centre of the city, which is regarded as the centre of Riyadh, has been highlighted as a very integrated part of the city (see figure 12).

However, at global scales, the commercial strip along with a number of key roads in the northern part of the city have been picked up as very integrated parts of Riyadh. The direct consequence of this result is that major projects and key urban elements of the city have been located in the most globally integrated parts of the city; that is the northern parts. For example, King Abdullah Financial District (KAJD) – the largest and leading financial centre in the Middle East to match major global financial centres such as that of London's Canary Wharf and Chicago's Financial District – has been located at the intersection of two of the most globally integrated roads, King Fahd Road and the First Northern Ring Road, giving the KAJD a strategic and highly connected location in addition to being next to the commercial strip (See figure 13). Princess Noura University (the world's largest and most modern women's institution of higher education), SABIC (ranked among the world's largest petrochemicals manufacturers with a global workforce of over 40,000 individuals in 40 countries) and others are cases in point of major institutions placed in the northern parts of the city by a close proximity to globally integrated roads in Riyadh.

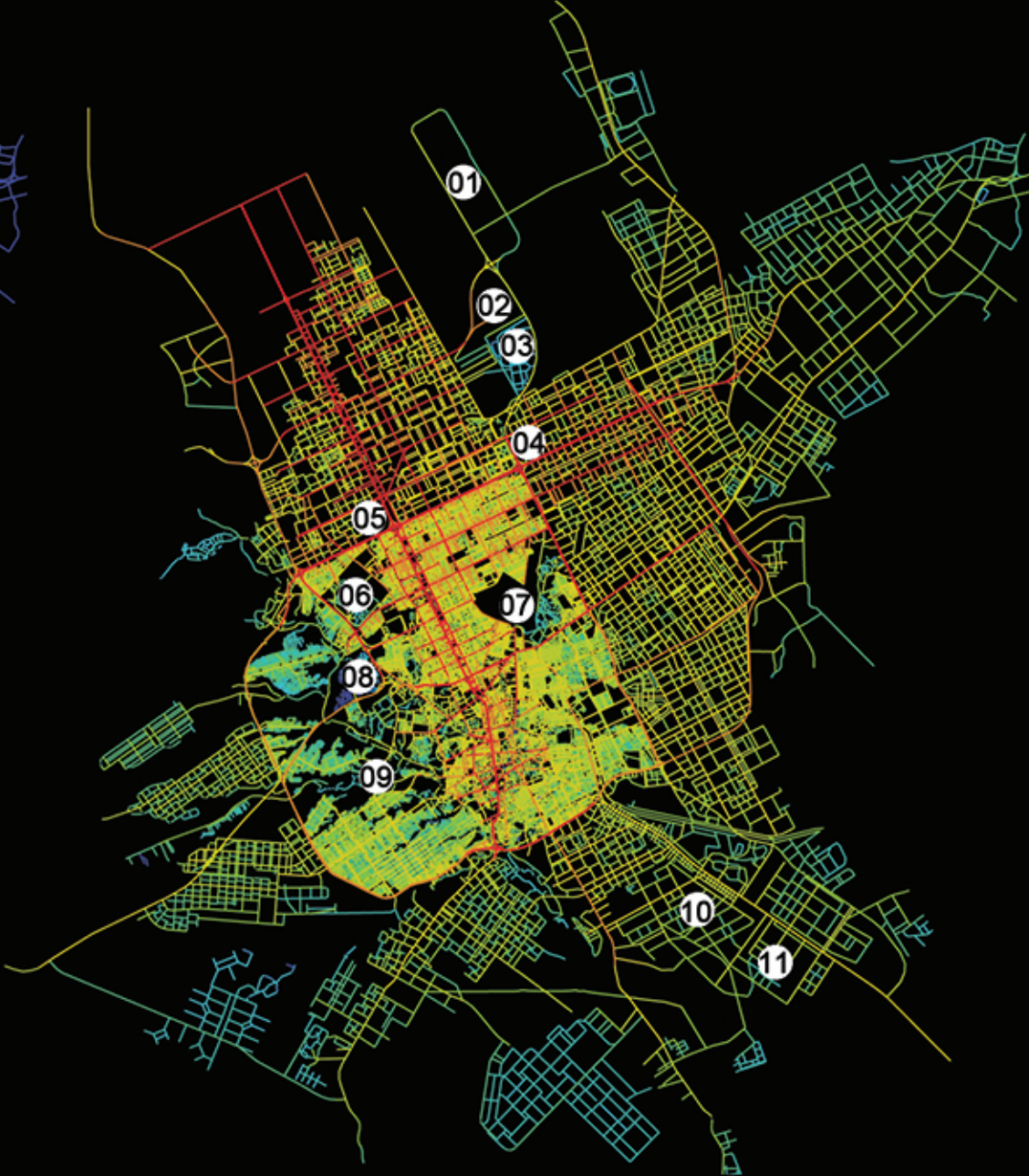
Further exploratory attempts to trace the notion of centrality as well as illustrating a variety of different morphologies in the city of Riyadh have been conducted. Starting with the Walled Riyadh (1916), Appendix A page 65 shows the map and the analysis of Walled city. What can be seen is known as Hillier's deformed wheel (2001), in which the idea based on a very integrated core usually in the centre of the settlement. The 9 gates of the city largely had a direct connection to the integrated street in the centre of the city. The locations of the public square as well as the market reflect the 'movement economy' and the segment analysis clearly. Therefore, the idea of centrality has been present in Riyadh since 1916. Thus, it can be argued that whatever the shape of the centre of the Walled Riyadh (spiky potato or liner as Hillier (1999) describes them), the defined spatial factors seem to play a key role in the creation and location of the centre of any settlement.

Fig. 13: Spatial Analysis of Greater Riyadh

- 01 King Khalid International Airport (KKIA)
- 02 King Abdullah Petroleum Studies & Research Centre (KAPSRC)
- 03 Princess Noura University (PNU)
- 04 SABIC
- 05 King Abdullah Financial District (KAFD)
- 06 King Saud University (KSU)
- 07 Riyadh Air Base (RIB)
- 08 Diplomatic Quarter (DQ)
- 09 Hanifa Valley (Wadi Hanifa)
- 10 First Industrial City
- 11 Second Industrial City



Normalised Choice (Segment Rn)



Integration (Segment Rn)



Princess Noura University



KAPSRC



King Abdullah Financial District



Another investigation is the attempt to highlight the variation of different morphologies in the city of Riyadh within the first ring road. This can bring about a true understanding of the city and its structure and hence the spatial-temporal aspects of its formation. In the figure below, figure 14, there are at least four different systems. Each and every system has clearly an interesting morphology. The graph illustrates a variety of urban structures and different systems. What is evident is the location of prominent urban morphologies.

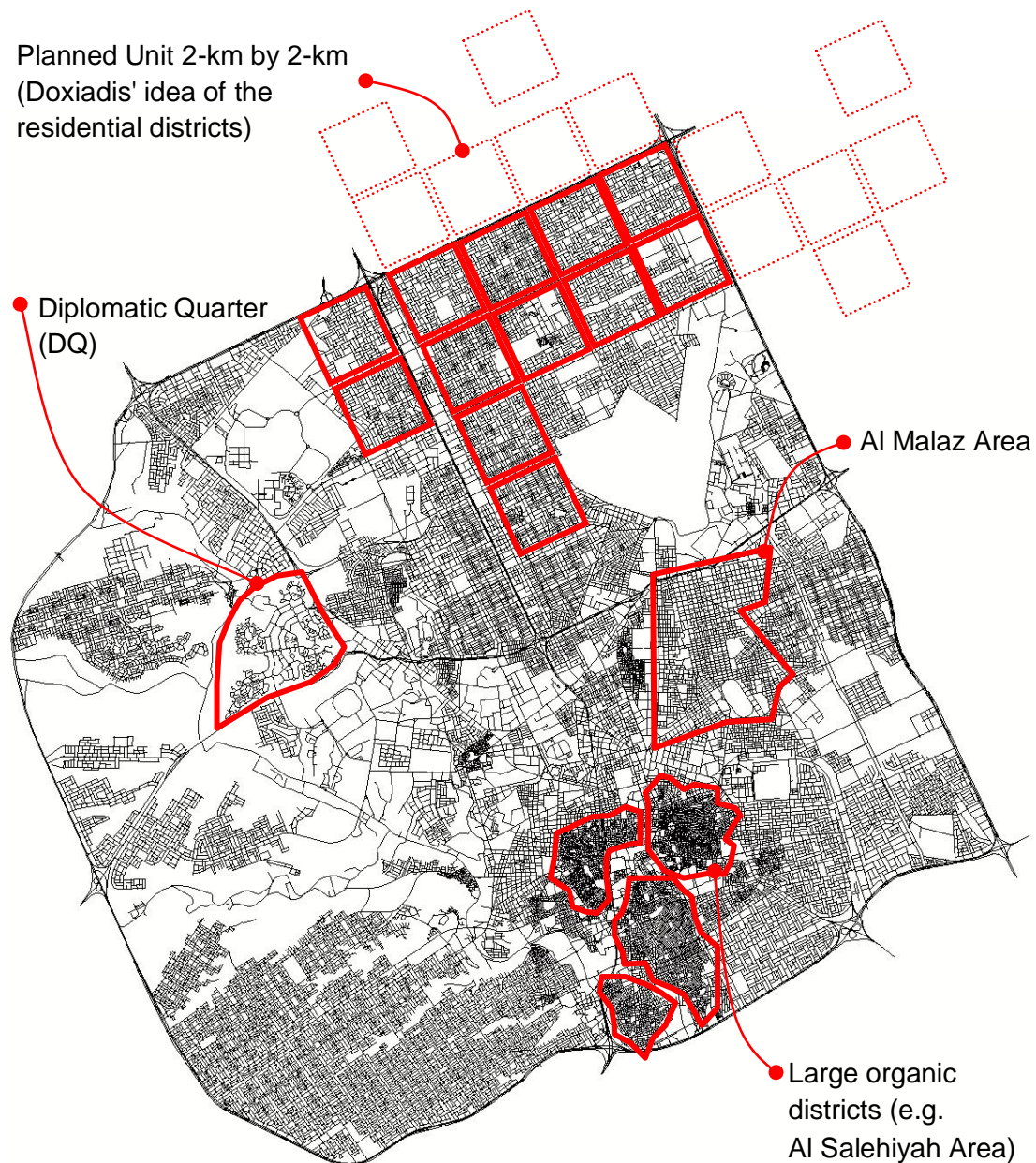


Fig. 14: The locations of some of the prominent urban morphologies in Riyadh within the first ring road.

Figure 15 displays the analysis of the most prominent urban morphologies mentioned in the figure above (Figure 14). It shows that the phenomenon of centrality is fairly visible and practically evidential on the local level. Although Riyadh has been built over a period of almost six decades by different planners, it is interesting that the fact that whatever the shape of the

settlement is, there is always 'live centrality' in which different socio-economic activities are remain a source of benefit continue to expand from the movement because of the spatial configuration of the settlement.

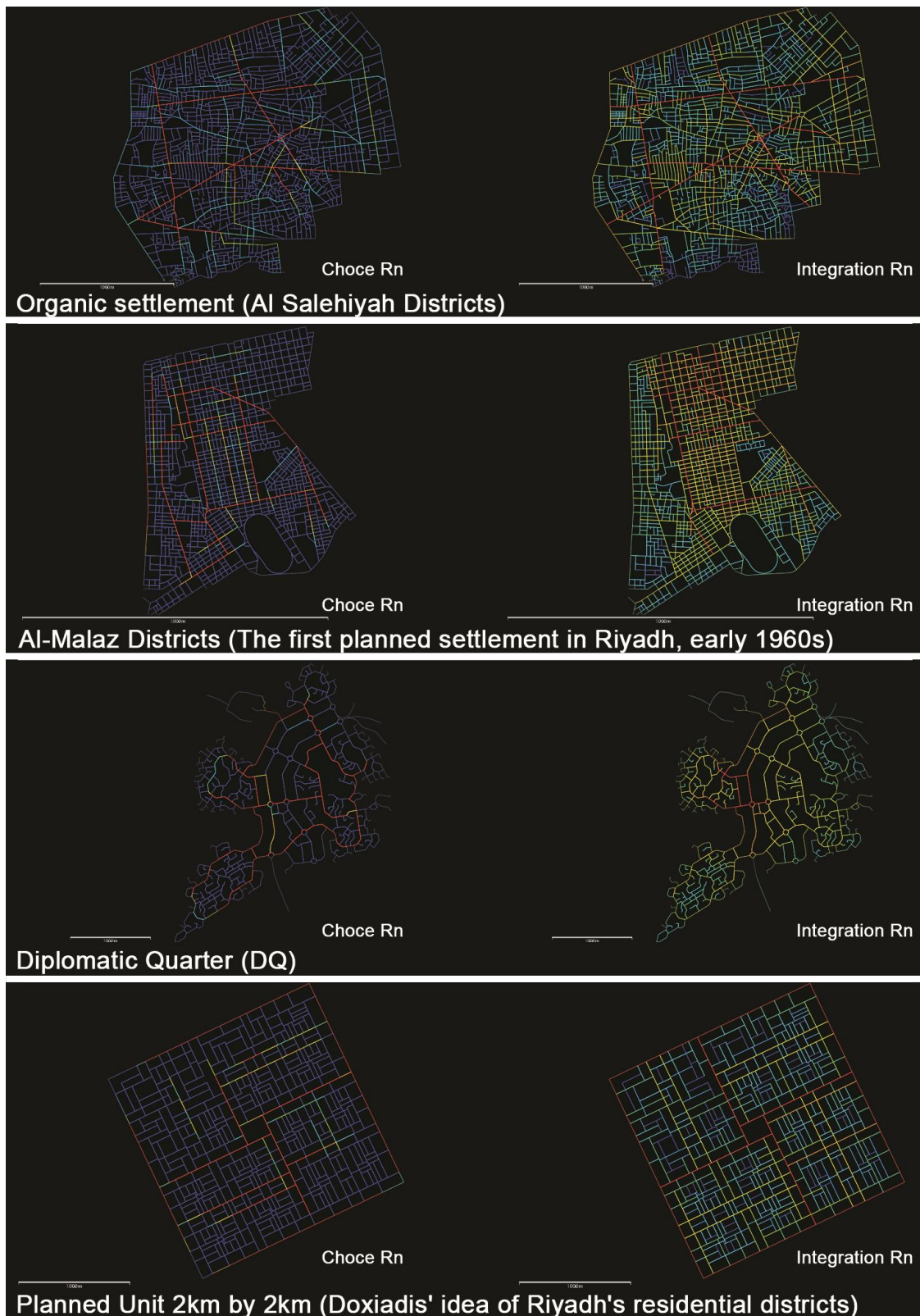


Fig. 15: The spatial analysis of some of the prominent urban morphologies in Riyadh.

Appendix B page 66 illustrates another interesting syntactic outcome. It highlights how King Fahd Road separates between Riyadh's oldest neighbourhoods; Al-Shimici and Al-Deerah districts. The segregation caused by such road has a huge impact on the central area of Riyadh. Not only does it disturb the neighbourhoods syntactically and therefore socially and economically, but it also affects the accessibility and connectivity between those districts at the local level.

4.2. The land-use results:

It is widely known that one of the important aspects, which define the city centre is the intensification of commercial activities (Hillier, 1999). Figure 16 and 17 show the initial examination of the land-use which indicates that there are two concentrated areas of commercial activities. The first and perhaps the most obvious one is the commercial strip. Given that it has been a major objective of modern planning of Riyadh, the strip is economically and socially active. The second concentration is in the historical centre. The latter has six major shopping centres and a number of very popular local markets for selling traditional goods (See appendix C page 67 for an example of local market).

In terms of the institutional centres (Government institutions), it can be said that there is a concentration in certain areas. Most ministries, for example, are located just in the north part of the historical centre along the old airport road or King Abdul-Aziz Road. A large number of institutional centres have been allocated in the area between Riyadh Air Base (the Old Airport) and the historical centre alongside the King road. The next layer will show this clearly, since it deals with the urban elements in far more detail. Large lots of lands have been used to host major government facilities and other public services such as bank headquarters and other financial services, all of which will move into the new location in the King Abdullah Financial Districts (KAFD) in early 2015 (KAFD, 2012).

With regards to the vacant and the valley or the green areas, it is not much of a stretch to assume that the map shows a number of areas that are not utilised to their full potential; raising the question of why this is the case, given the fact that they are located within the first ring road of the city, for which there is a high demand.

Fig. 16: Land Use Map for the urban area within the First Ring Road of Greater Riyadh

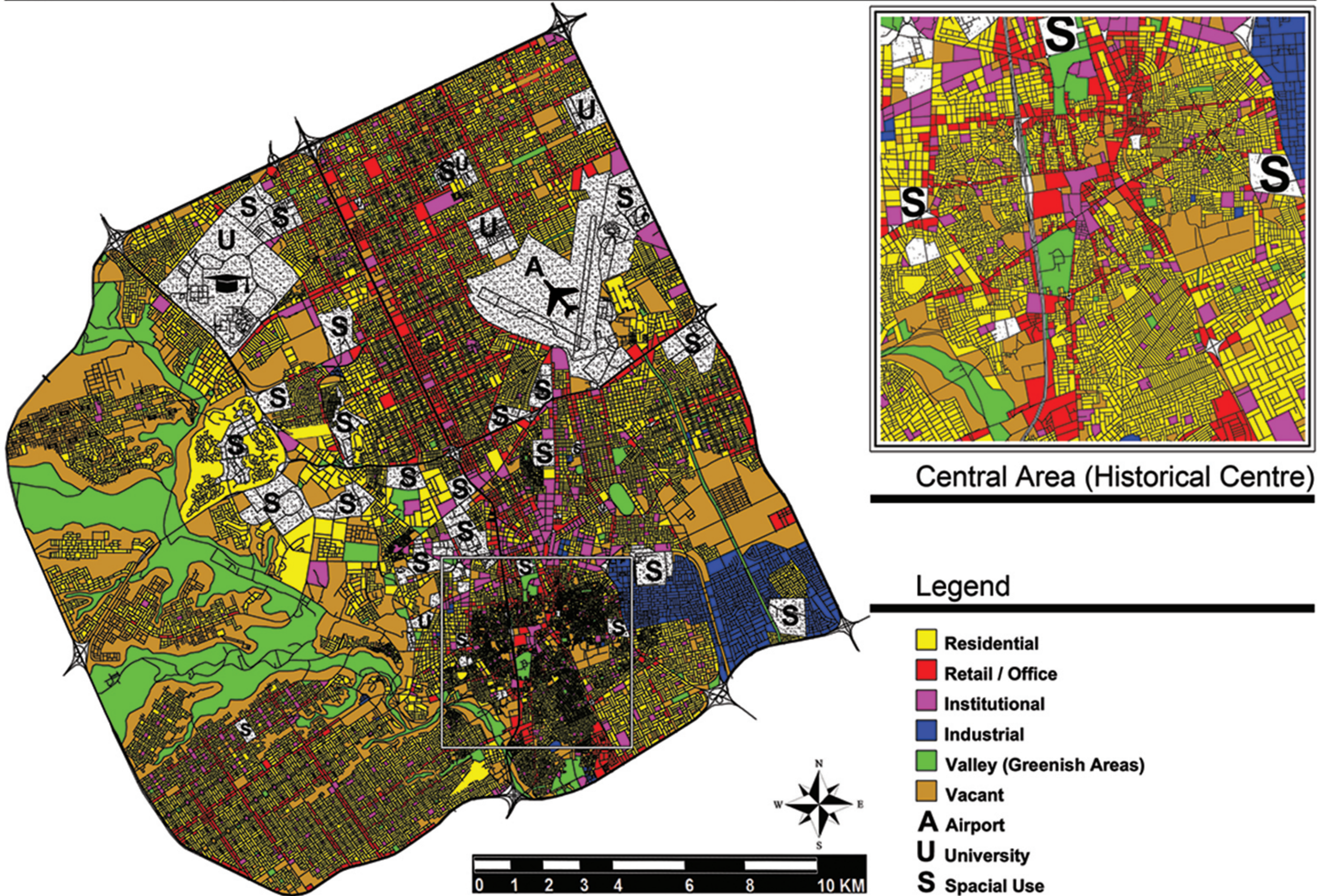
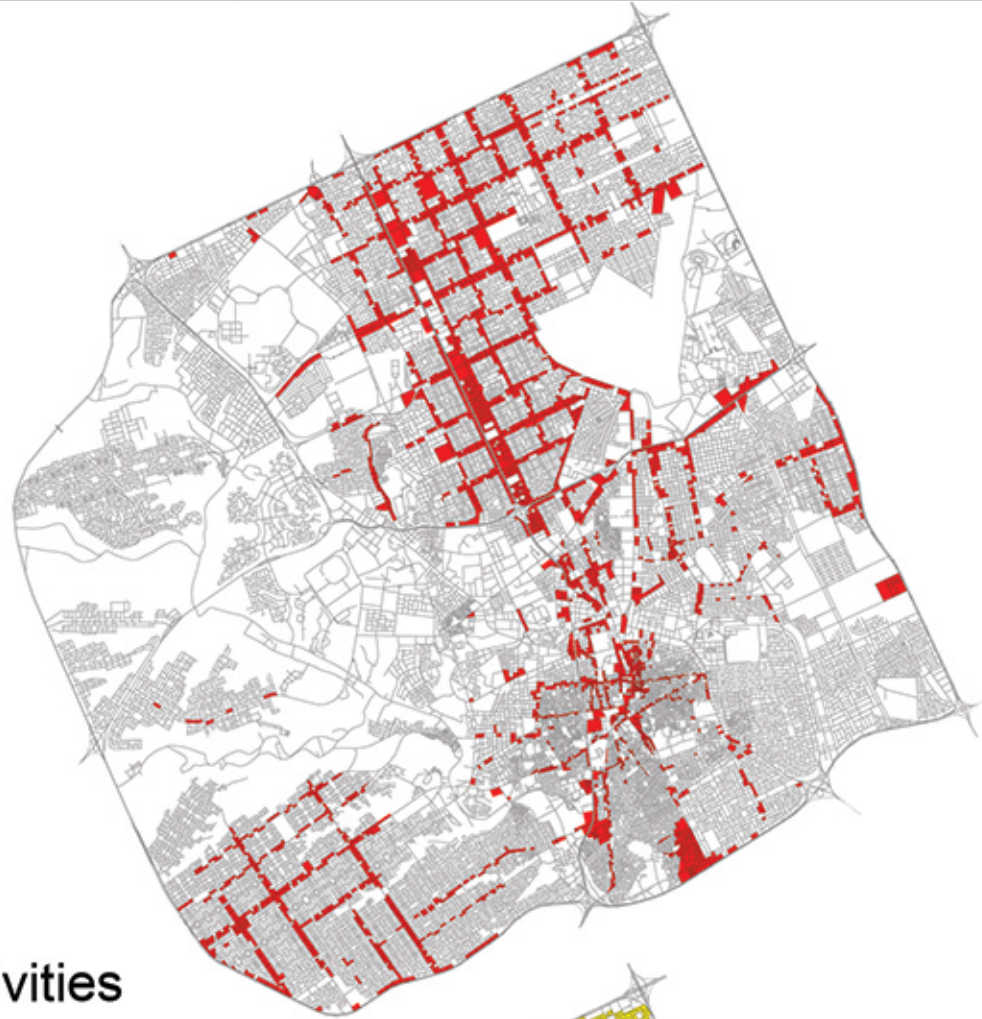
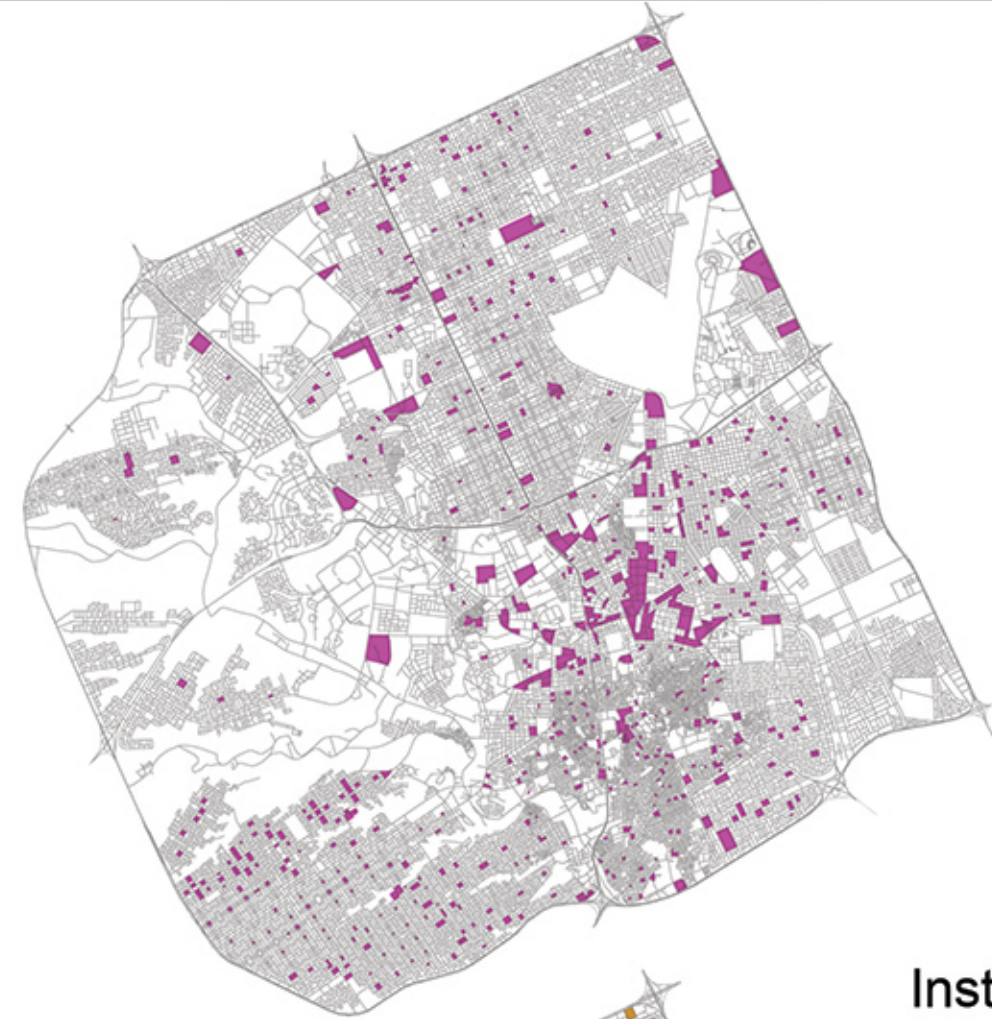


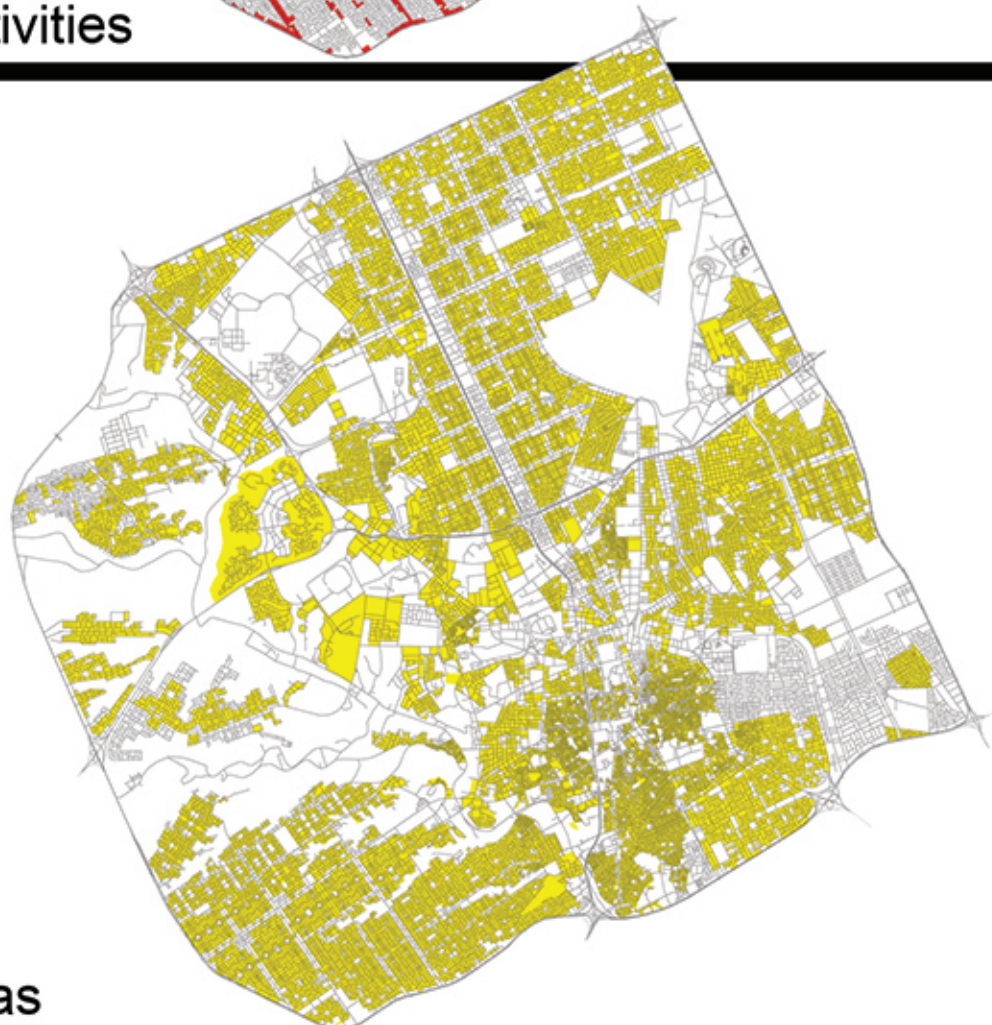
Fig. 17: Land Use Map for the urban area within the First Ring Road of Greater Riyadh



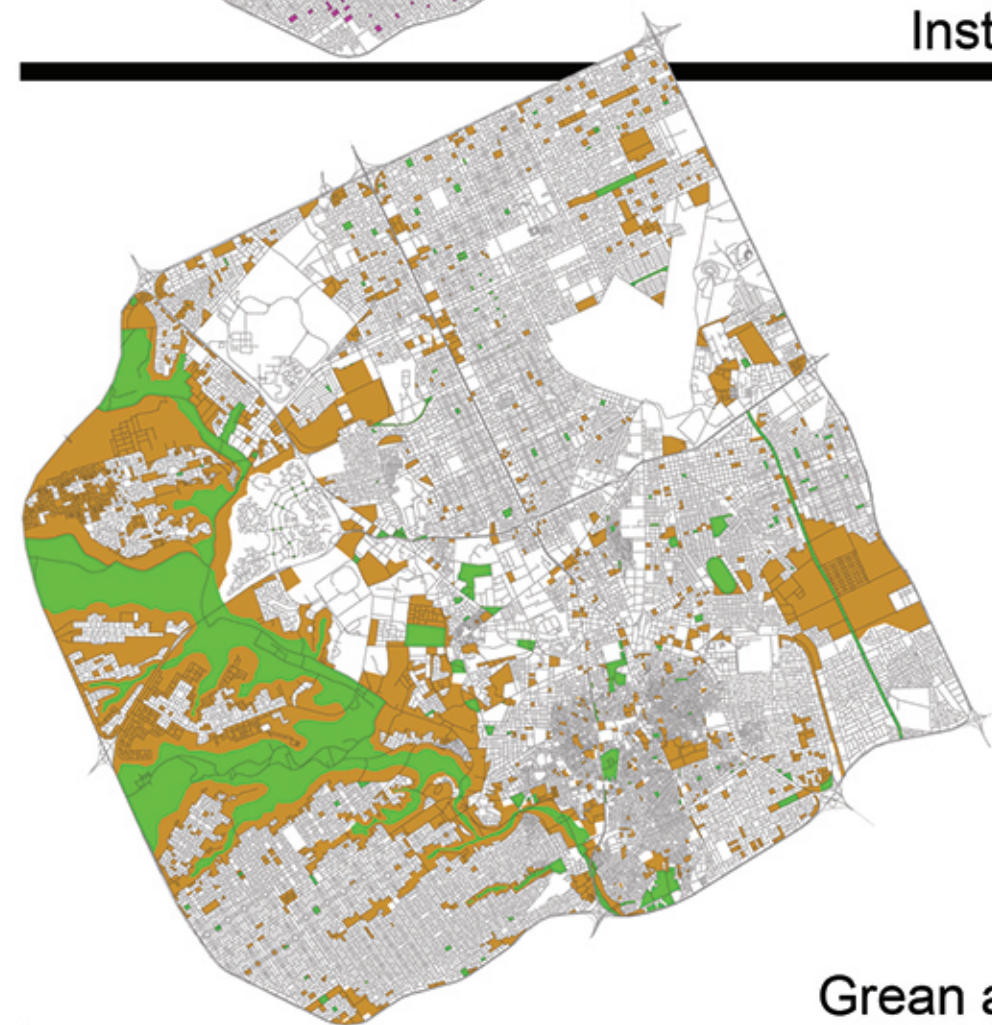
Commercial Activities



Institutional Activities



Residential Areas



Green and Vacant Areas

In relation to the industrial zones, it can be noticed that they are located in the south-east of the city, top-down approach, and the extension of the industrial zones are all towards the same direction; south-east.

To summarise the main points, we can say that based on the analysis of the land-use map, there are three parts of the city within the first ring road that require a further syntactic examination. These parts are; the historical centre (HC), the institutional centres (IC) and finally the commercial strip (CS). Each and every part will be examined on its own merit and as a part of the wider system within the entire city, in order to measure its intelligibility and synergy.

What both measures of intelligibility and synergy in figure 18 shows is that the HC (the city centre) seems to be intelligible and easily perceived as a system in its own right. What may ease an accurate understanding of the HC is a combination of its organic configuration and landmarks. Navigation within the HC system, to and from its spaces tends to be fairly easy and direct. Therefore, the spatial accessibility is much higher within the system.

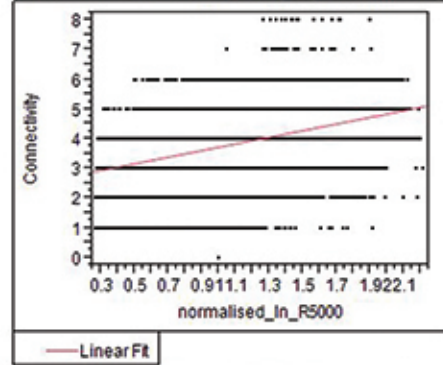
The opposite can be said about the CS and the IC. In both systems, the values of both the intelligibility and synergy are lower than that of the HC. This means that there are difficulties in understanding these systems as they remain complex to navigate through.

According to the line graphs analysis in the intelligibility graph, figure 18, the navigation (direction-finding) of Riyadh within the first ring road is even weaker. Not only do the graphs show a low value of intelligibility, but also a very low correlation between local and global measures. The low value of synergy could be a direct result of some of the very wide streets and roads that cause a difficulty to cross and a whole host of other traffic related issues, such as accessibility and safety (See appendix C page 67, which represents an example of a road that severs the neighbourhoods apart from each other.

Having examined each system separately, we must add further depth by to analysing these systems as part of the wider network (First Ring of Riyadh). The line graphs in figure 19 illustrate the fact that the CS has the highest value of both intelligibility and synergy. This means that when we talk about understanding the city of Riyadh within the first ring road, it is an understanding aided by accessibility and unproblematic navigation. This in turn leads us to question whether the HC is as user-friendly as its counterpart, the CS.

Fig. 18: Intelligibility (X=Seg_Global_Int_R5000 & Y=Connctivity) and Synergy (X=Seg_Local_Ch_R800 & Y=Seg_Global_Ch_R5000) for each system

Bivariate Fit of Connectivity By normalised_In_R5000



Linear Fit

Connectivity = 2.6163443 + 1.1196883*normalised_In_R5000

Summary of Fit

RSquare	0.128499
RSquare Adj	0.128489
Root Mean Square Error	0.887116
Mean of Response	3.895051
Observations (or Sum Wgts)	8388

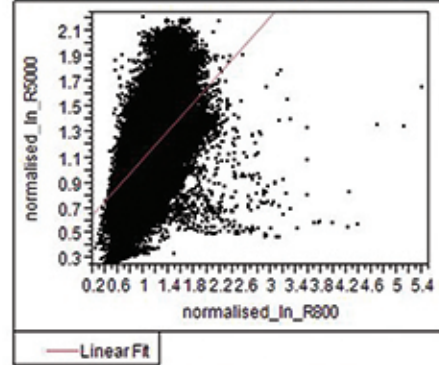
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	9733.803	9733.80	12368.62
Error	8386	66016.222	0.79	Prob > F
C. Total	8387	75750.025		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.6163443	0.011899	219.89	<.0001*
normalised_In_R5000	1.1196883	0.010068	111.21	<.0001*

Bivariate Fit of normalised_In_R5000 By normalised_In_R800



Linear Fit

normalised_In_R5000 = 0.5440098 + 0.5612175*normalised_In_R800

Summary of Fit

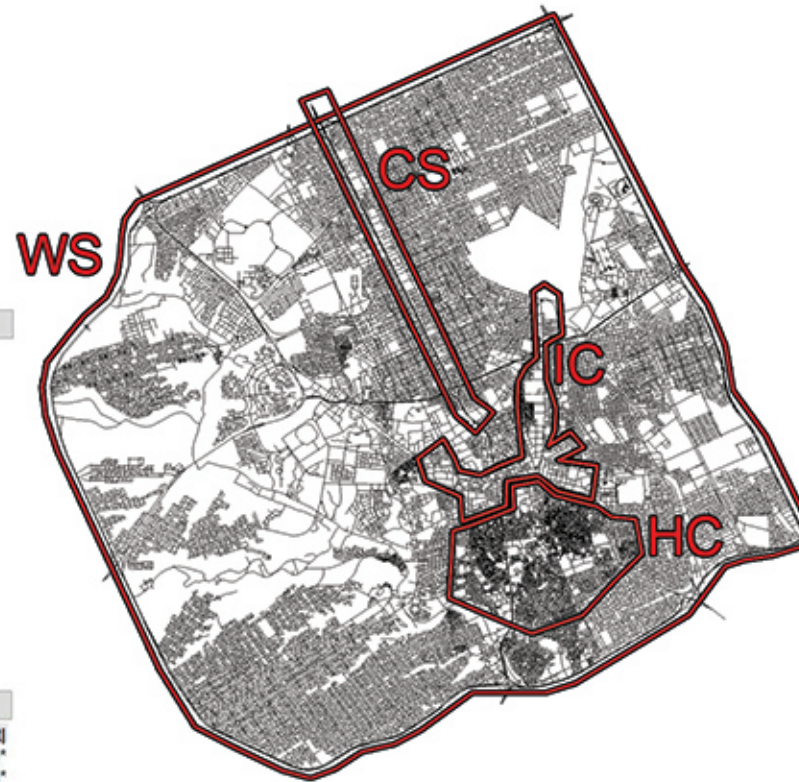
RSquare	0.302621
RSquare Adj	0.302613
Root Mean Square Error	0.254059
Mean of Response	1.14202
Observations (or Sum Wgts)	8388

Analysis of Variance

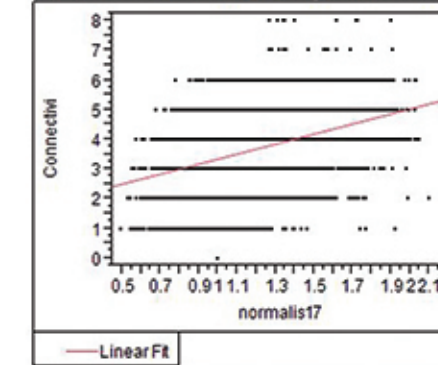
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2349.5656	2349.57	36401.56
Error	8386	5414.4834	0.064546	Prob > F
C. Total	8387	7764.0490		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.5440098	0.003255	167.14	<.0001*
normalised_In_R800	0.5612175	0.002942	190.79	<.0001*



Bivariate Fit of Connectivity By normalis17



Linear Fit

Connectivity = 1.6727558 + 1.6875381*normalis17

Summary of Fit

RSquare	0.134246
RSquare Adj	0.134189
Root Mean Square Error	1.074941
Mean of Response	3.686201
Observations (or Sum Wgts)	15306

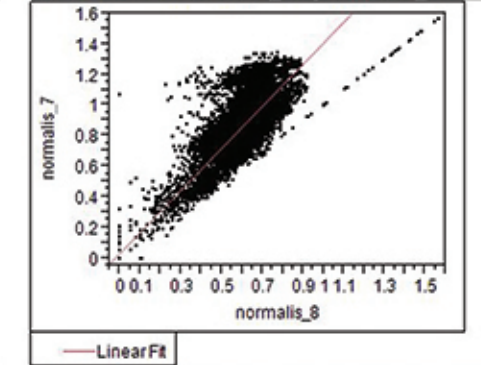
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2742.081	2742.08	2373.072
Error	15304	17683.745	1.16	Prob > F
C. Total	15305	20425.826		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	1.6727558	0.042235	39.61	<.0001*
normalis17	1.6875381	0.034642	48.71	<.0001*

Bivariate Fit of normalis_7 By normalis_8



Linear Fit

normalis_7 = 0.034977 + 1.3770797*normalis_8

Summary of Fit

RSquare	0.906102
RSquare Adj	0.906096
Root Mean Square Error	0.113265
Mean of Response	0.736634
Observations (or Sum Wgts)	15306

Analysis of Variance

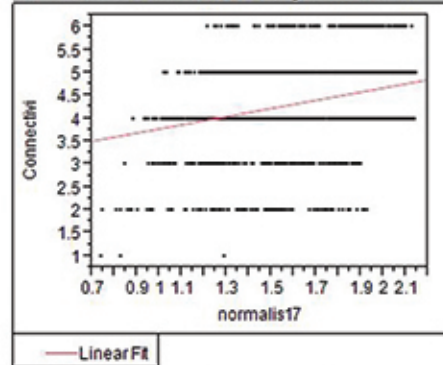
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1894.6023	1894.60	147681.3
Error	15304	196.3349	0.012829	Prob > F
C. Total	15305	2090.9372		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.034977	0.002043	17.12	<.0001*
normalis_8	1.3770797	0.003583	384.29	<.0001*

Whole System (WS) (First Ring of Riyadh)

Bivariate Fit of Connectivity By normalis17



Linear Fit

Connectivity = 2.8892721 + 0.8927051*normalis17

Summary of Fit

RSquare	0.092574
RSquare Adj	0.092187
Root Mean Square Error	0.854088
Mean of Response	4.308579
Observations (or Sum Wgts)	2343

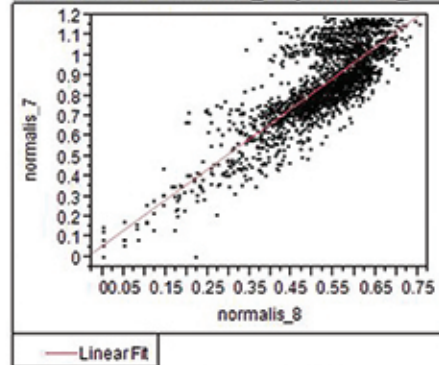
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	174.2156	174.216	238.8259
Error	2341	1707.6820	0.729	Prob > F
C. Total	2342	1881.8976		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.8892721	0.09352	30.89	<.0001*
normalis17	0.8927051	0.057765	15.45	<.0001*

Bivariate Fit of normalis_7 By normalis_8



Linear Fit

normalis_7 = 0.0608861 + 1.5150258*normalis_8

Summary of Fit

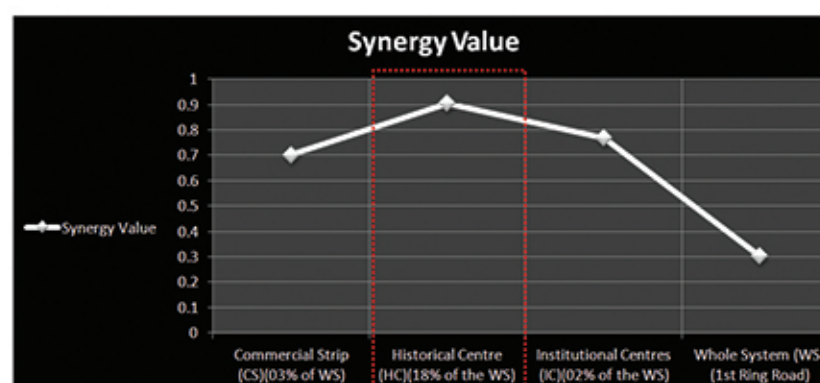
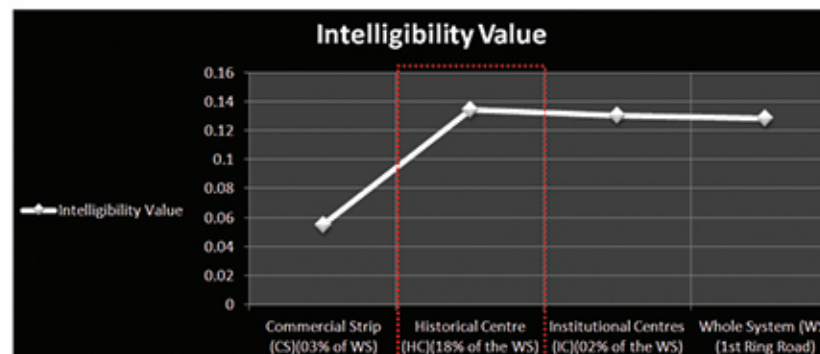
RSquare	0.715563
RSquare Adj	0.715441
Root Mean Square Error	0.116907
Mean of Response	0.852793
Observations (or Sum Wgts)	2343

Analysis of Variance

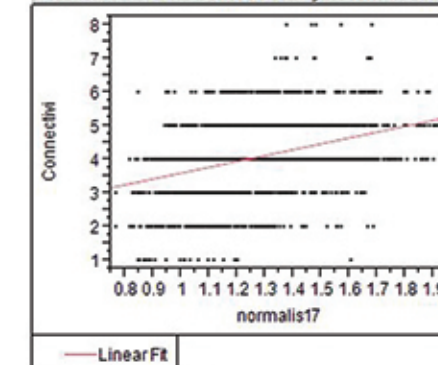
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	80.49041	80.4904	5889.287
Error	2341	31.99506	0.0137	Prob > F
C. Total	2342	112.48547		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.0608861	0.010598	5.75	<.0001*
normalis_8	1.5150258	0.019742	76.74	<.0001*



Bivariate Fit of Connectivity By normalis17



Linear Fit

Connectivity = 1.8713854 + 1.7406347*normalis17

Summary of Fit

RSquare	0.130194
RSquare Adj	0.129761
Root Mean Square Error	1.006499
Mean of Response	4.118349
Observations (or Sum Wgts)	2011

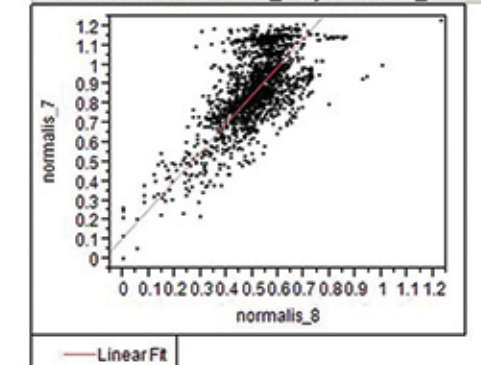
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	304.6331	304.633	300.7115
Error	2009	2035.1998	1.013	Prob > F
C. Total	2010	2339.8329		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	1.8713854	0.131504	14.23	<.0001*
normalis17	1.7406347	0.100377	17.34	<.0001*

Bivariate Fit of normalis_7 By normalis_8



Linear Fit

normalis_7 = 0.1149952 + 1.4730395*normalis_8

Summary of Fit

RSquare	0.768383
RSquare Adj	0.768268
Root Mean Square Error	0.143269
Mean of Response	0.813849
Observations (or Sum Wgts)	2011

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	136.80284	136.803	6664.809
Error	2009	41.23703	0.021	Prob > F
C. Total	2010	178.03987		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.1149952	0.009137	12.59	<.0001*
normalis_8	1.4730395	0.018043	81.64	<.0001*

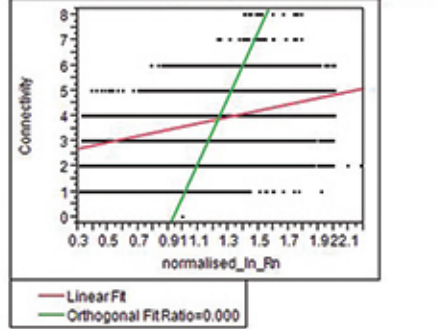
Commercial Strip (CS)

Historical Centre (HC)(City Centre)

Institutional Centres (IC)

Fig. 19: Intelligibility (X=Seg_Global_Int_R5000 & Y=Connctivity) & Synergy (X=Seg_Local_Ch_R800 & Y=Seg_Global_Ch_R5000) for systems within the WS

Bivariate Fit of Connectivity By normalised_In_Rn



Linear Fit
Connectivity = 2.3507009 + 1.2558955*normalised_In_Rn

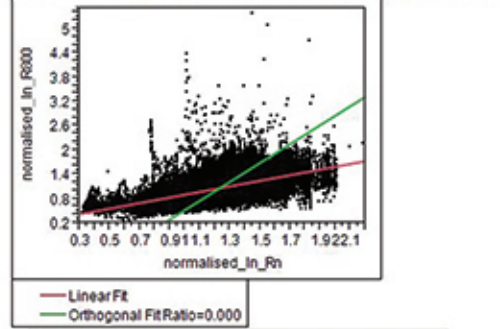
Summary of Fit				
RSquare	0.09645			
RSquare Adj	0.096439			
Root Mean Square Error	0.903281			
Mean of Response	3.895051			
Observations (or Sum Wgts)	83888			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	7306.058	7306.06	8954.420
Error	83886	68443.967	0.82	
C. Total	83887	75750.025		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.3507009	0.016616	141.48	<.0001*
normalised_In_Rn	1.2558955	0.013272	94.63	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.22968	0.234985	0	0.3106
Connectivity	3.895051	0.950264		
Intercept	Slope			
-12.1169	13.02126			

Bivariate Fit of normalised_In_R800 By normalised_In_Rn



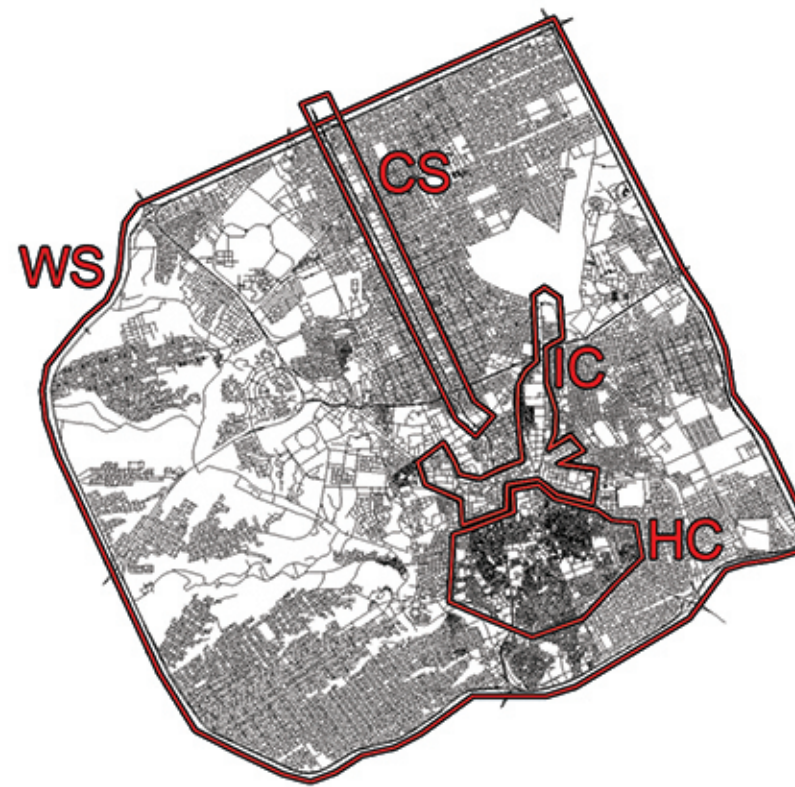
Linear Fit
normalised_In_R800 = 0.2169769 + 0.6900832*normalised_In_Rn

Summary of Fit				
RSquare	0.295702			
RSquare Adj	0.295693			
Root Mean Square Error	0.250263			
Mean of Response	1.065558			
Observations (or Sum Wgts)	83888			

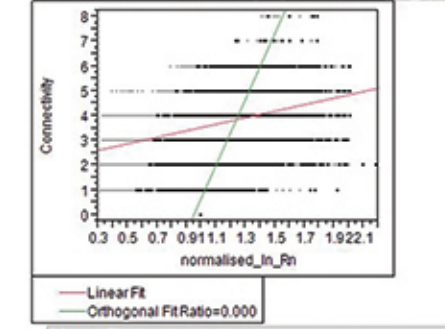
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2205.8658	2205.87	35219.79
Error	83886	5253.8997	0.062631	
C. Total	83887	7459.7655		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.2169769	0.004604	47.13	<.0001*
normalised_In_Rn	0.6900832	0.003677	187.67	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.22968	0.234985	0	0.5438
normalised_In_R800	1.065558	0.298205		
Intercept	Slope			
-1.80416	2.333714			



Bivariate Fit of Connectivity By normalised_In_Rn



Linear Fit
Connectivity = 2.2311483 + 1.3192635*normalised_In_Rn

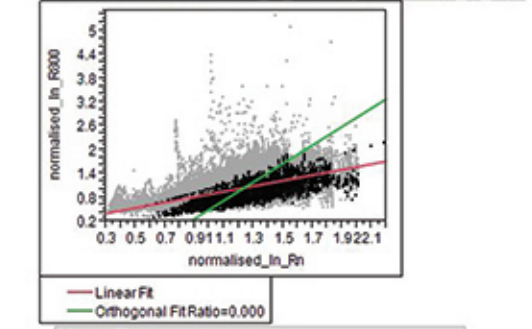
Summary of Fit				
RSquare	0.098985			
RSquare Adj	0.098976			
Root Mean Square Error	0.931006			
Mean of Response	3.859488			
Observations (or Sum Wgts)	94419			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	8990.721	8990.72	10372.64
Error	94417	81838.106	0.87	
C. Total	94418	90828.828		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.2311483	0.016273	137.11	<.0001*
normalised_In_Rn	1.3192635	0.012953	101.95	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.234279	0.233904	0	0.3146
Connectivity	3.859488	0.980809		
Intercept	Slope			
-12.5908	13.32787			

Bivariate Fit of normalised_In_R800 By normalised_In_Rn



Linear Fit
normalised_In_R800 = 0.1959267 + 0.691199*normalised_In_Rn

Summary of Fit				
RSquare	0.297724			
RSquare Adj	0.297717			
Root Mean Square Error	0.248308			
Mean of Response	1.049059			
Observations (or Sum Wgts)	94419			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2467.9574	2467.96	40027.35
Error	94417	5821.4472	0.061657	
C. Total	94418	8289.4046		

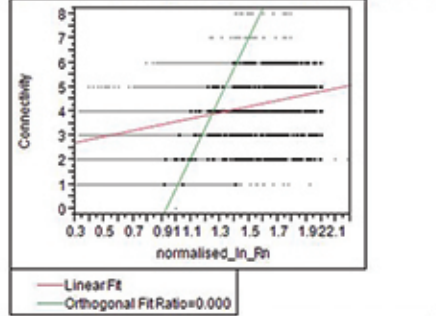
Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.1959267	0.00434	45.14	<.0001*
normalised_In_Rn	0.691199	0.003455	200.07	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.234279	0.233904	0	0.5456
normalised_In_R800	1.049059	0.296302		
Intercept	Slope			
-1.81645	2.321607			

Whole System (WS) (First Ring of Riyadh)

Historical Centre (HC)(City Centre)

Bivariate Fit of Connectivity By normalised_In_Rn



Linear Fit
Connectivity = 2.3686618 + 1.239897*normalised_In_Rn

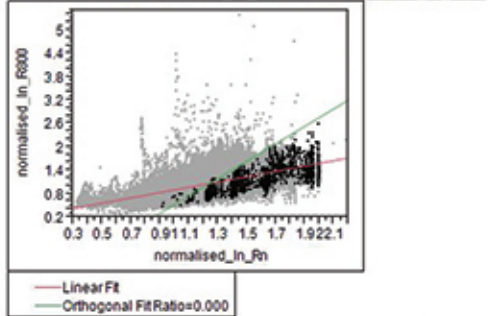
Summary of Fit				
RSquare	0.100358			
RSquare Adj	0.100348			
Root Mean Square Error	0.902227			
Mean of Response	3.906287			
Observations (or Sum Wgts)	86231			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	7830.126	7830.13	9619.158
Error	86229	70191.576	0.81	
C. Total	86230	78021.702		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.3686618	0.015976	148.26	<.0001*
normalised_In_Rn	1.239897	0.012642	98.08	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.240123	0.243035	0	0.3168
Connectivity	3.906287	0.951215		
Intercept	Slope			
-11.4151	12.3547			

Bivariate Fit of normalised_In_R800 By normalised_In_Rn



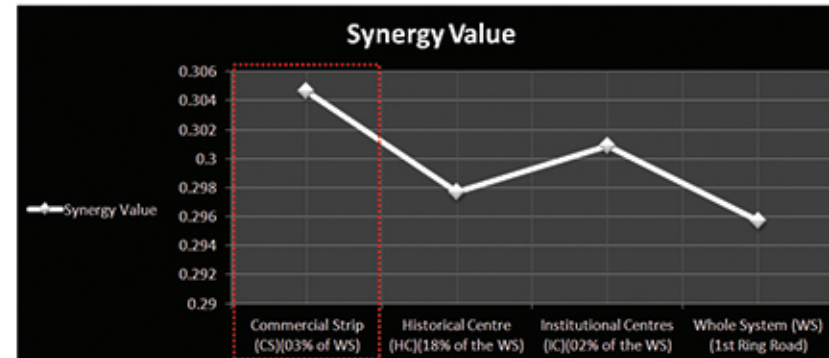
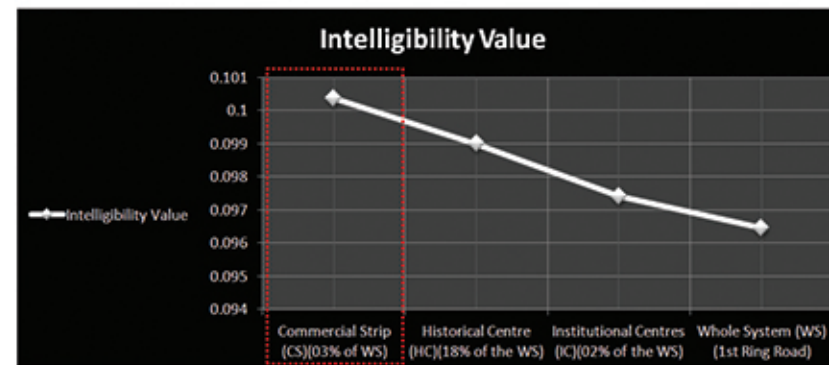
Linear Fit
normalised_In_R800 = 0.2257667 + 0.6808773*normalised_In_Rn

Summary of Fit				
RSquare	0.304655			
RSquare Adj	0.304647			
Root Mean Square Error	0.249998			
Mean of Response	1.070138			
Observations (or Sum Wgts)	86231			

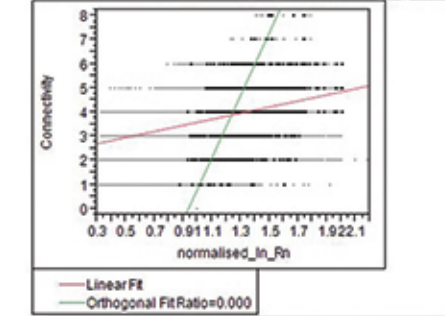
Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2361.2131	2361.21	37779.91
Error	86229	5389.2412	0.062499	
C. Total	86230	7750.4543		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.2257667	0.004427	51.00	<.0001*
normalised_In_Rn	0.6808773	0.003503	194.37	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.240123	0.243035	0	0.5520
normalised_In_R800	1.070138	0.299802		
Intercept	Slope			
-1.70143	2.234914			



Bivariate Fit of Connectivity By normalised_In_Rn



Linear Fit
Connectivity = 2.3408273 + 1.2644395*normalised_In_Rn

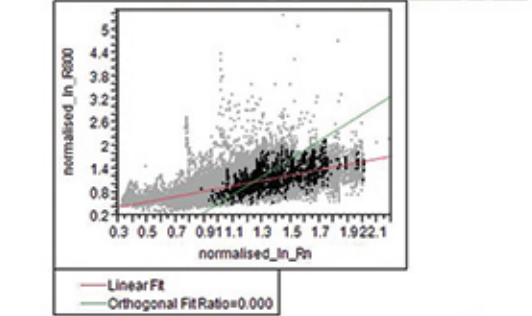
Summary of Fit				
RSquare	0.097406			
RSquare Adj	0.097396			
Root Mean Square Error	0.906414			
Mean of Response	3.900278			
Observations (or Sum Wgts)	85899			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	7615.973	7615.97	9269.837
Error	85897	70571.811	0.82	
C. Total	85898	78187.783		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	2.3408273	0.01649	141.96	<.0001*
normalised_In_Rn	1.2644395	0.013133	96.29	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.233314	0.23549	0	0.3121
Connectivity	3.900278	0.954065		
Intercept	Slope			
-12.1095	12.9811			

Bivariate Fit of normalised_In_R800 By normalised_In_Rn



Linear Fit
normalised_In_R800 = 0.2107634 + 0.6955095*normalised_In_Rn

Summary of Fit				
RSquare	0.300867			
RSquare Adj	0.300859			
Root Mean Square Error	0.249673			
Mean of Response	1.068545			
Observations (or Sum Wgts)	85899			

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2304.2810	2304.28	36965.15
Error	85897	5354.5252	0.062337	
C. Total	85898	7658.8062		

Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	0.2107634	0.004542	46.40	<.0001*
normalised_In_Rn	0.6955095	0.003617	192.26	<.0001*

Orthogonal Regression				
Variable	Mean	Std Dev	Variance Ratio	Correlation
normalised_In_Rn	1.233314	0.23549	0	0.5485
normalised_In_R800	1.068545	0.298599		
Intercept	Slope			
-1.78249	2.311685			

Commercial Strip (CS)

Institutional Centres (IC)

4.3. The urban elements results:

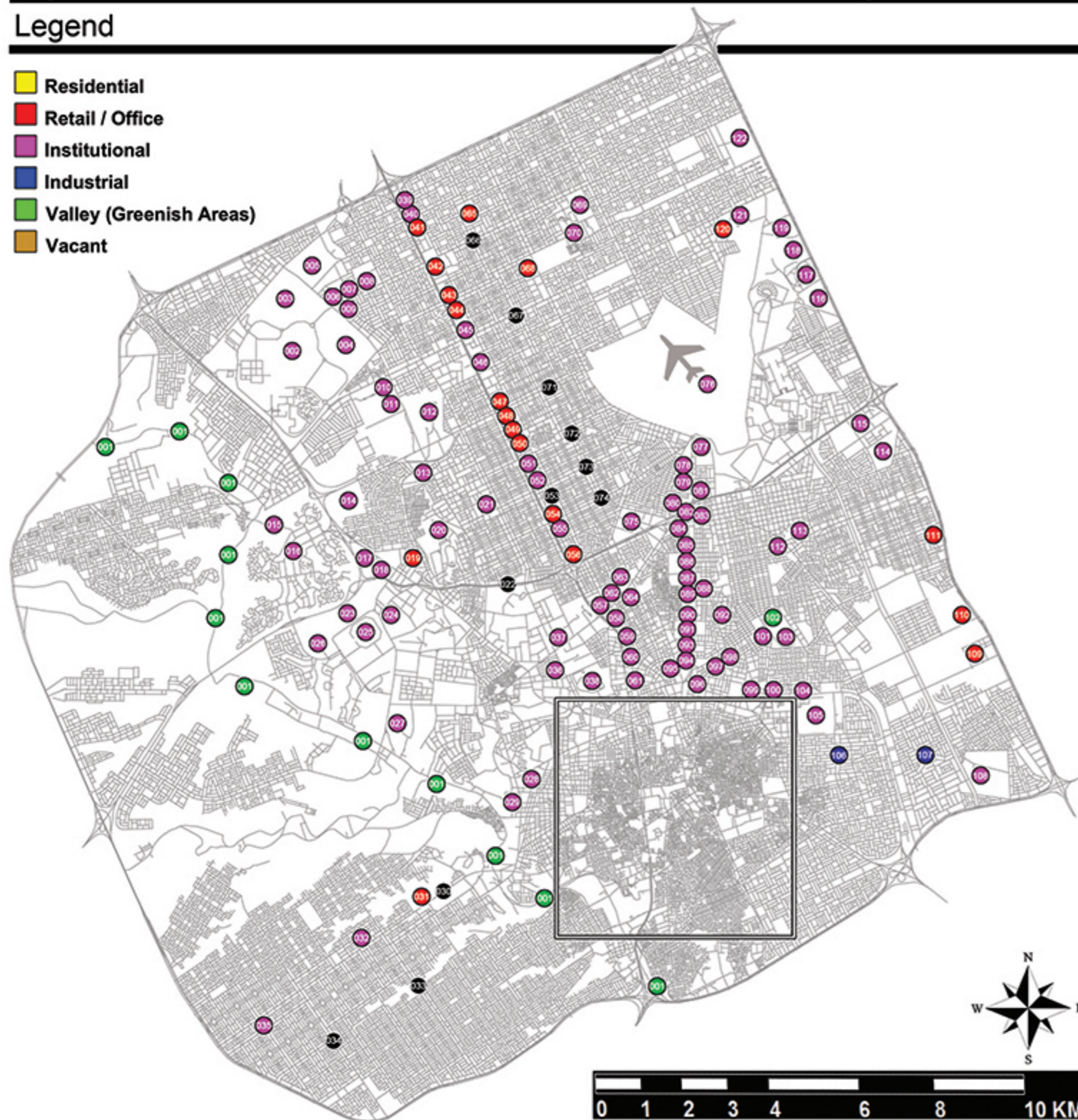
Figure 20 explains thoroughly the land-use map of Riyadh within the first ring road. It illustrates comprehensively where the concentration of both; the commercial centres and the institutional buildings are. This is another way of representing the land-use, but in a specific way that can help us grasp the complexity of the size of Riyadh. More importantly, it assists addressing the main research question of where the prominent centre of modern Riyadh is. In figure 20, there is a clear focus on institutional buildings alongside the route between Riyadh Air Base (Riyadh Old Airport) and the central area (the historical centre). The majority of ministerial buildings are located in this area, in order to have closer proximity to both the airport and the centre of the city. This means that the centre of administration was largely developed at some distance away from the historical centre, which diversifies the historic centre of Riyadh. Another essential function to point out is the commercial activities. Clearly, the commercial strip (CS) hosts a number of super stores along with major shopping malls. Not to mention that the CS has been designated for the development of Riyadh's towers and skyscrapers (Appendix D pages 68 and 69 displays some photos showing the CS and its high-rise buildings that has shaped Riyadh's skyline).

With regards to the central area, figure 21 illustrates the intensification of the most significant urban elements of all such as The National Museum, Riyadh Principality, Al-Houkm Palace, The Supreme Court, The National Park, King Abdulaziz Historical Complex and Water Tower. More importantly, the Grand Mosque, Al-Masmak Fort (The Castle) and Al-Safa Square, all of which are what remain of the walled city of Riyadh. (Appendix E pages 70 and 71 presents some photos of some of those buildings).

Fig. 20: The Main Urban Elements within the First Ring Road of Greater Riyadh

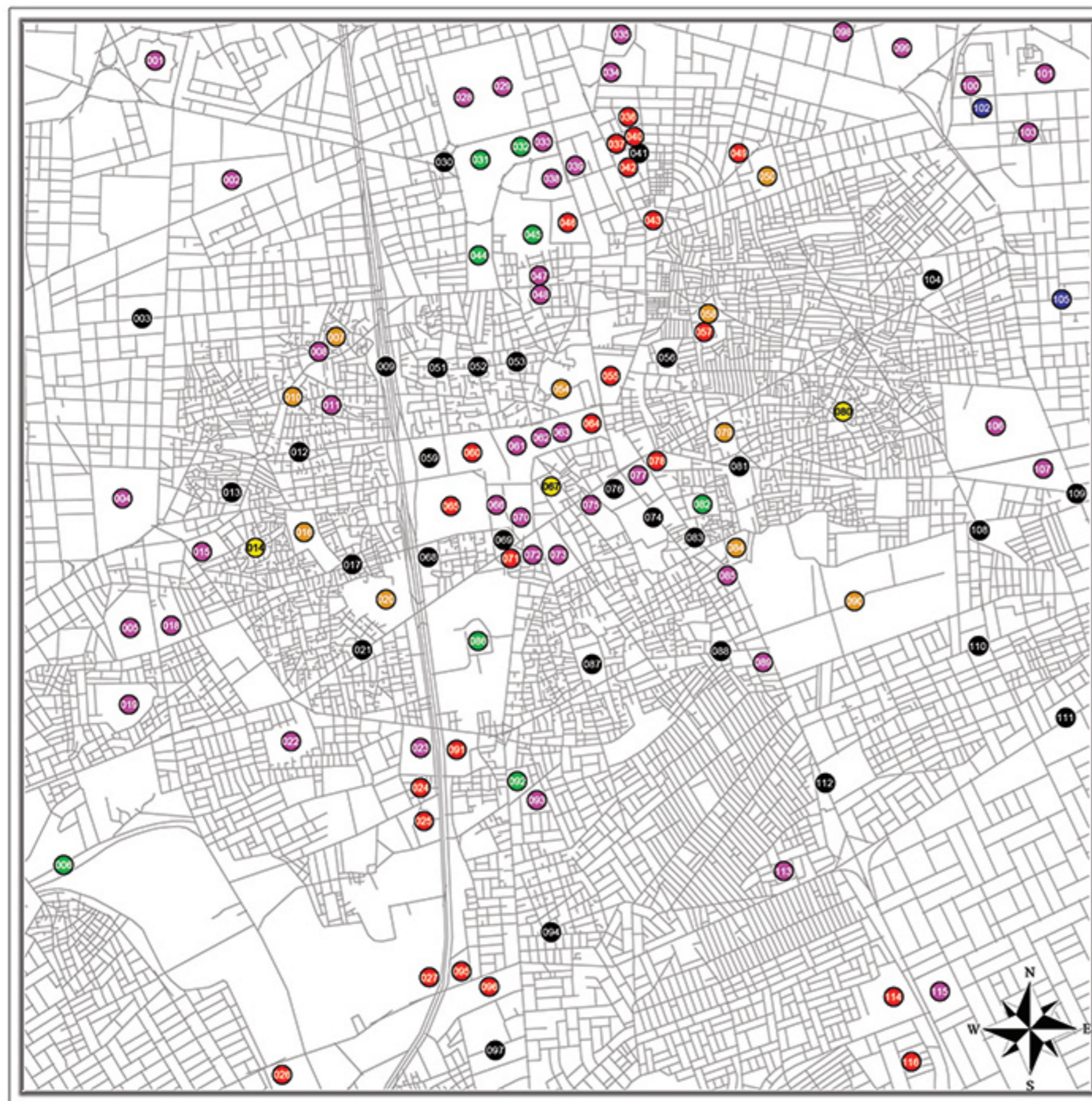
Legend

- Residential
- Retail / Office
- Institutional
- Industrial
- Valley (Greenish Areas)
- Vacant



- 001 Hanifah Valley (Wadi Hanifah)
- 002 King Saud University (KSU)
- 003 Riyadh Technology Valley (RTV)
- 004 KSU's Girls Campus
- 005 Government institution
- 006 Communication & Information Technology Commission (CITC)
- 007 SA General Investment Authority
- 008 Information Technology & Communication Complex
- 009 Saudi Standards, Metrology & Quality Org.
- 010 KACST (King Abdulaziz City for Science & Technology)
- 011 Mawhiba
- 012 Government institution
- 013 King Khalid Grand Mosque
- 014 King Khalid Eye Specialist Hospital
- 015 Tuwaiq Palace
- 016 Diplomatic Quarter (DQ)
- 017 Royal Commission for Jubail and Yanbu
- 018 The Cooperation Council for the Arab States of the Gulf
- 019 Hyper Market
- 020 Saudi Special Forces
- 021 Panorama Shopping Mall
- 022 Makkah Road
- 023 KAICC (King Abdulaziz International Conference Centre)
- 024 Al Yamamah Palace
- 025 Majlis Ash-Shura
- 026 Al Diriyah Palace
- 027 Prince Faisal Bin Fahd Olympic Complex
- 028 Girls' University (North Campus)
- 029 Girls' University (West Campus)
- 030 Madinah Road
- 031 Badiah Shopping Mall
- 032 Riyadh AD
- 033 Aishah Bint Abi Bakr Road
- 034 Hamzah Ibn Abdul-Muttalib Road
- 035 Local Markets
- 036 Riyadh Traffic Department
- 037 Ministry of Higher Education
- 038 Government Institution
- 039 Supreme Court
- 040 Saudi Air Line
- 041 Hyper Shopping Mall
- 042 Riyadh Gallery
- 043 Al-Uwais Shopping Market
- 044 Tahibah Shopping Market
- 045 Ministry of Municipal and Rural Affairs
- 046 Al Jeraisy Group
- 047 Andalusia Shopping Market
- 048 Olaya Shopping Mall
- 049 Kingdom Tower
- 050 Jawhara Tower
- 051 Administrative Court in Riyadh
- 052 Saline Water Conversion Corporation
- 053 Olaya Street
- 054 Al Faisaliah Tower
- 055 King Fahad Library
- 056 Computer Market
- 057 Home Office
- 058 Saudi Arabian Financial Investigation Unit
- 059 General Education Department
- 060 Department of Immigration
- 061 Ministry of Health
- 062 Saudi Agricultural Bank
- 063 Social Housing
- 064 Ministry of Hajj
- 065 Northern Vegetable Market
- 066 Imam Saud Road
- 067 King Abdullah Road
- 068 Life Shopping Mall
- 069 Saudi Telecom Company
- 070 College of Telecommunication & Information
- 071 Al Urubah Street
- 072 Musa Ibn Nusair Street
- 073 Prince Mohammed Street (Tahla Street)
- 074 Prince Sultan Street
- 075 King Fahad Medical City
- 076 Riyadh Air Base
- 077 Government Institutions
- 078 Royal Saudi Air Force Club
- 079 Royal Saudi Air Force Command Center
- 080 Riyadh Military Hospital
- 081 Royal Saudi Air Force
- 082 King Project for Developing Education
- 083 Ministry of Islamic Affairs
- 084 General Organisation for Social Insurance
- 085 Royal Saudi Naval Force
- 086 Family Medicine Center
- 087 Military Housing
- 088 Real Estate Development Fund
- 089 Ministry of Defence
- 090 Ministry of Interior
- 091 Ministry of Transport
- 092 Ministry of Agriculture
- 093 Ministry of Health
- 094 Ministry of Commerce and Industry
- 095 Ministry of Housing
- 096 Ministry of Finance
- 097 Ministry of Justice
- 098 General Presidency for Youth Welfare
- 099 Ministry Social Affairs
- 100 General Investment Authority
- 101 Riyadh Public Library
- 102 King Abdullah Park
- 103 Prince Faisal Bin Fahd Stadium
- 104 Riyadh Train Station
- 105 Riyadh Railway Shipping Company
- 106 Industrial Zone
- 107 Industrial Zone
- 108 Saudi Telecommunication Company
- 109 Ikea
- 110 Alreem Plaza
- 111 Alotheem Mall
- 112 Malaz Prison
- 113 Saudi Investment Bank
- 114 Government Institution
- 115 Government Institution
- 116 Military Medical Services
- 117 Government Institution
- 118 Government Institution
- 119 Saqr Aljazeera Aviation Museum
- 120 RICEC (Riyadh International Exhibition Centre)
- 121 Prince Salman Social Centre
- 122 Princess Nora University (PNU)

Fig. 21: Main Urban Elements within the Central Area of Greater Riyadh



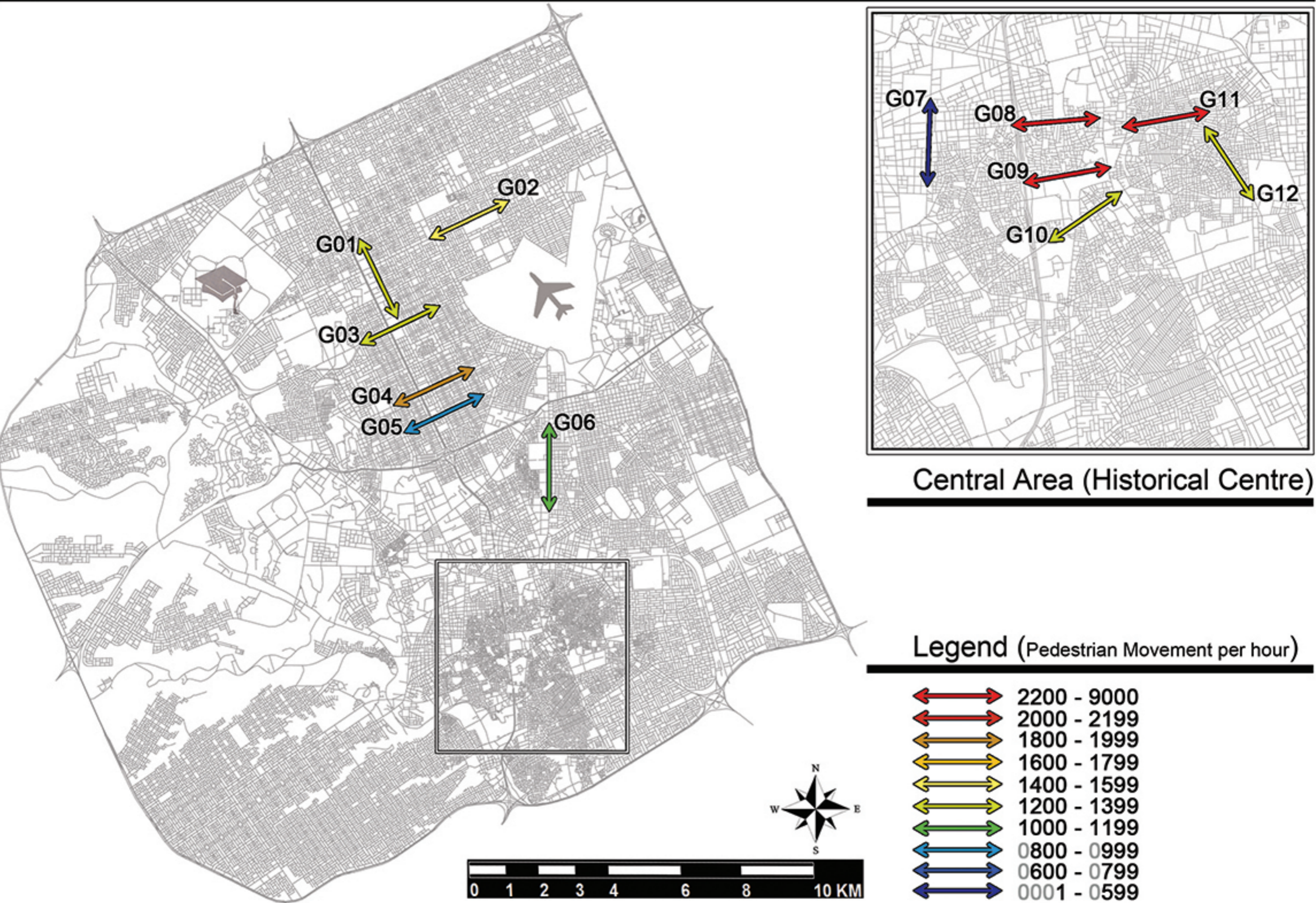
0 1 2 KM

- | | |
|---|--|
| 001 Ministry of Foreign Affairs | 083 Al-Masmak Fort (The Castle) |
| 002 National TV Centre | 084 Suwaiqa Market |
| 003 Imam Faisal Bin Turki Street | 085 ATameer Shopping Centre |
| 004 King Saud Medical City | 086 Riyadh Principality |
| 005 Government institution | 087 Al-Deerah Area |
| 006 Hanifah Valley (Wadi Hanifah) | 088 Parking Area |
| 007 Cemetery | 089 Parking Building |
| 008 Government institution | 090 Al-Huokm Palace |
| 009 King Fahad Road | 091 Falcon Market |
| 010 Cemetery | 092 Riyadh General Court |
| 011 Government institution | 093 Supreme Court |
| 012 Imam Turki Bin Abdullah Street | 094 King Faisal Street |
| 013 Parking Area | 095 Fire Station |
| 014 Al-Shimici District | 096 Parking Area |
| 015 Government institution | 097 Girls University |
| 016 Cemetery | 098 Local Shopping Centre |
| 017 Al-Sibalah Street | 099 Cemetery |
| 018 Government institution | 100 Al-Salehiah Area |
| 019 Housing Project | 101 Al-Hilla Street |
| 020 Cemetery | 102 Al-Ud Garden |
| 021 Madinah Road | 103 Al-Batha Road |
| 022 Housing Project | 104 Ibn Nssar Cemetery |
| 023 GPSRI (General Presidency of Scholarly Research & Ifta) | 105 Government institution |
| 024 Bin Dail Mall | 106 Salaam Park (Peace Park) |
| 025 Local Hyper Market | 107 Parking Space |
| 026 Al-Qasr Shopping Mall | 108 Al-Asha Street |
| 027 Al-Authem Shopping Centre | 109 Government institution |
| 028 King Abdulaziz Historical Complex | 110 Al-Ud Cemetery |
| 029 National Museum | 111 Shopping Centre |
| 030 Parking Area | 112 Public Space |
| 031 Open Space | 113 Government institution |
| 032 Nations Park | 114 Prince Abdullah Ibn Faisal Street |
| 033 Water Tower | 115 Banda Shopping Centre |
| 034 Saudi Post | 116 Otalikh Market (Auction Market) |
| 035 Ministry of Finance | 117 Parking Area |
| 036 Electrone Centre | 118 Saudi Electricity Company |
| 037 Al-Rajhi Shopping Centre | 119 Ministry of Social Affairs |
| 038 Court of Appeal | 120 General Investment Authority |
| 039 SA Monetary Agency - Riyadh Branch | 121 Specification & Quality Laboratory |
| 040 Local Hyper shopping Mall | 122 Industrial zone |
| 041 Al-Batha Parking Area | 123 Government institutions |
| 042 Al-Rajhi Buildings | 124 Parking Area |
| 043 Shopping Centre | 125 Industrial Zone |
| 044 Open Space (Public Squares, Tennis Courts...etc) | 126 Housing Project |
| 045 Green Space | 127 Housing Project |
| 046 Shopping Centre | 128 Al-Farazdaq Road |
| 047 Khaldia Towers | 129 Al-Kharj Road |
| 048 Khaldia Towers | 130 Ammar Ibn Yasir Street |
| 049 Shopping Centre | 131 Prince Muhammad Road |
| 050 Cemetery | 132 Al-Batha Road |
| 051 Adaayil Street | 133 Space used only For Eid Prayers |
| 052 Al-Sowailim Street | 134 Mahrajaan Market |
| 053 Al-Thaheerah Street | 135 Ministry of Justice - South Branch |
| 054 Cemetery | 136 Furniture Market |
| 055 Ibn Sulaiman Shopping Centre | |
| 056 Parking Building | |
| 057 Local Hyper Shopping Centre | |
| 058 Cemetery | |
| 059 Parking Space | |
| 060 Al-Maequliah Shopping Centre | |
| 061 Imam Turki Bin Abdullaah Grand Mosque | |
| 062 Al-Safa Square | |

4.4. The human activities results:

Figure 22 sums up the notes taken during the observation (See Appendix F pages 72-77). What the colour range in figure 22 demonstrates is the fact that the central area (Gates number G07, G08, G09, G10, G11 and G012) has a noticeably higher level of pedestrian movement than that of the Olayya area (Gates number G01, G02, G03, G04 and G05). Gate G11 is the busiest with an average of 8000 people per hour. It has almost certainly the highest density in the city of Riyadh. It is Al-Bata Area; famous with its commercial streets benefits from the high density and also the mixed activities, cultures and nationalities (See Appendix G page 78 for some photos). What follows is G8 and G9 with more or less 3000 people per hour. These gates were in popular streets and have mixture commercial activities along with being next to well-known public squares (See Appendix H page 79 for some photos). Gates in the area of Olayya (planned and modern area) have not been as busy as those in the central area. Pedestrian flow was recorded between 1500 and 2000 people per hour. The level of movement in Prince Mohammed Street (Known as Al-Tahlia St.) is less than 2000 people per hour, although the expectation was far more higher, since it is indeed very popular street with its stylish coffee shops, boutiques and wide pavements (See Appendix I page 80 for some photos). Another point to stress here is that in the Olayya area, cars remain a dominant feature. People tend to use their cars rather than walk, which may be due to their desire to only visit certain stores and hence use their own cars to arrive at the exact destination.

Fig. 22: Human Activities (Movement Volume)



4.5. The history of Riyadh:

What figure 23 shows is the evolution of Greater Riyadh over a period of six decades (1916 up to 2012). It was as big as three or four villages or small towns in the 1920s. The walled city is believed to be built at around 1916 (The Higher Commission for the Development of Riyadh, 2012). One of the most important buildings which still exist is the Al-Masmak Fort or the castle. The centre of the old town was the local market and the grand mosque, but when King Abdul-Aziz took over in 1902, he ordered for government buildings to be constructed in this area. In the 1960s, a slight move took place in which Al-Morabba neighbourhood was built to host the majority of the ruling family. The city started to take its shape and expand to the north and west. What was once the 'edge of the city' becomes a live centre, for example Al-Bata Area. After the boom, during the 1970s and 1980s, Riyadh had changed dramatically. New ideas emerged (i.e. the commercial strip) and institutional centres (i.e. ministries) moved to a new area in the north of the historical centre. This left the latter diversified with growth. This is to confirm Hillier's claim about centrality in which he says:

"As soon as we take time into account... we find that centrality is often neither clear nor stable, either in its focus or its limits. Although in many settlements the location and limits of the centre do remain more or less in the same place over a long periods, in others the centre not only expands or contracts, but may also shift its focus" (1999: 03).

When looking at Riyadh and its centre today, we can certainly find that there are centres within the first ring of Riyadh, which can be pointed at and be regarded as the prominent centre of the city. The special configuration along with other evidences supports such an argument.

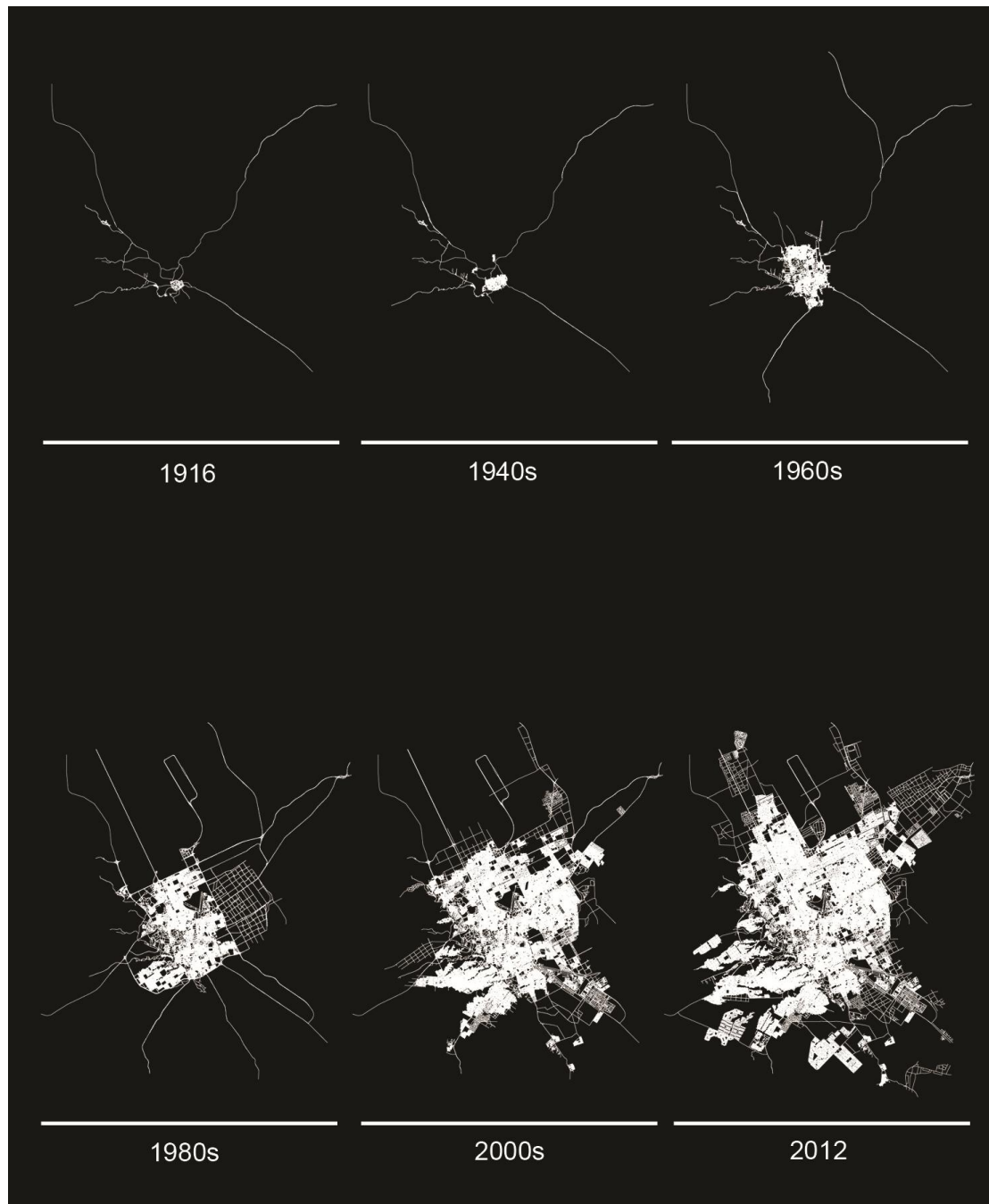


Fig. 23: The history of Riyadh (over a period of 6 decades).

4.6. The planning of Riyadh:

Figure 24 is the outcome of a comprehensive planning for the city of Riyadh done by the High Commission for the Development of ArRiyadh (HCDR) in order to direct public policy in relation to major and strategic projects such as public utilities, housing, public transport, land-use and above all economic growth. It is a significant component of a city wide plan that will reach completion in 2030. It shows that the city seems to be directed to grow towards the northern and eastern parts. It appears that this is the only way for the city to expand, given the fact that there is a protected area from the west (Hanifa Valley) and the industrial zone, as well as difficult topography from the south.

In terms of the centre of the city, we can clearly notice that the HCDR has prioritised the historical centre as the centre of the city. Another interesting point is that the majority of future sub-centres will be located right next to the ring roads. This offers high level of accessibility and connectivity.

The commercial strip (CS), on the other hand, will be extended further north and exceed 22-km long (which is more than three times the area of the Las Vegas strip). See Appendix J page 81 for more information. At a global scale, the consequence of such planning is indeed a “Pandora’s Box” of both benefit and detriment. It remains beneficial as a magnet to attract more social and economic activities. However, it could prove disastrous as a means of weakening the importance of the historical centre.

Figure 25 shows the correlation between the spatial analysis and the strategic master plan. What the syntactic analysis (Integration Rn) illustrates is that at global scale, the commercial strip and the northern first ring road are prioritised, in regards to its integration. However, the effect on the historical centre has not been carefully considered. Such negligence has the propensity to strengthen the commercial strip at the expense of the historical centre.

Fig. 24: Greater Riyadh Master Plan - 2030

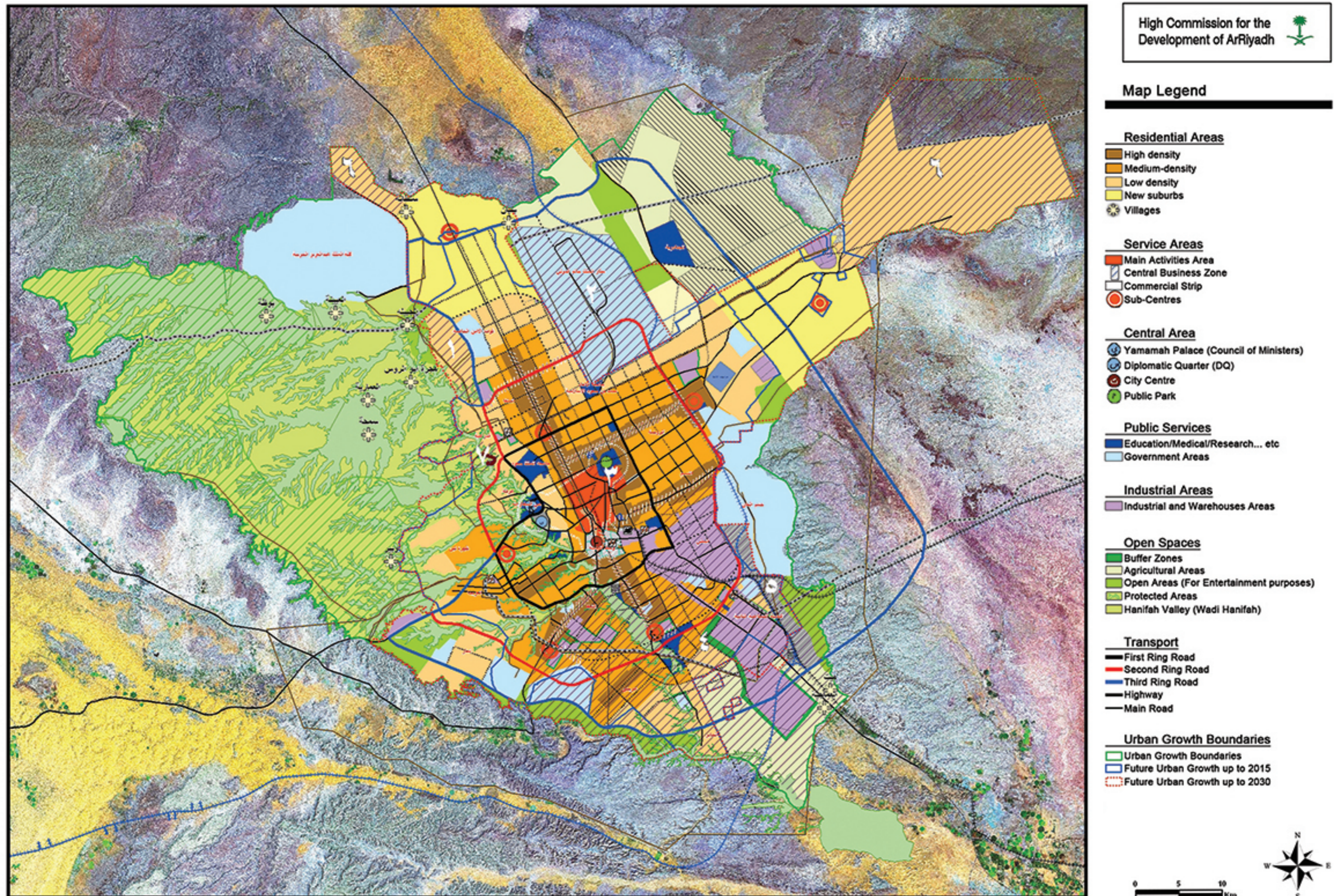
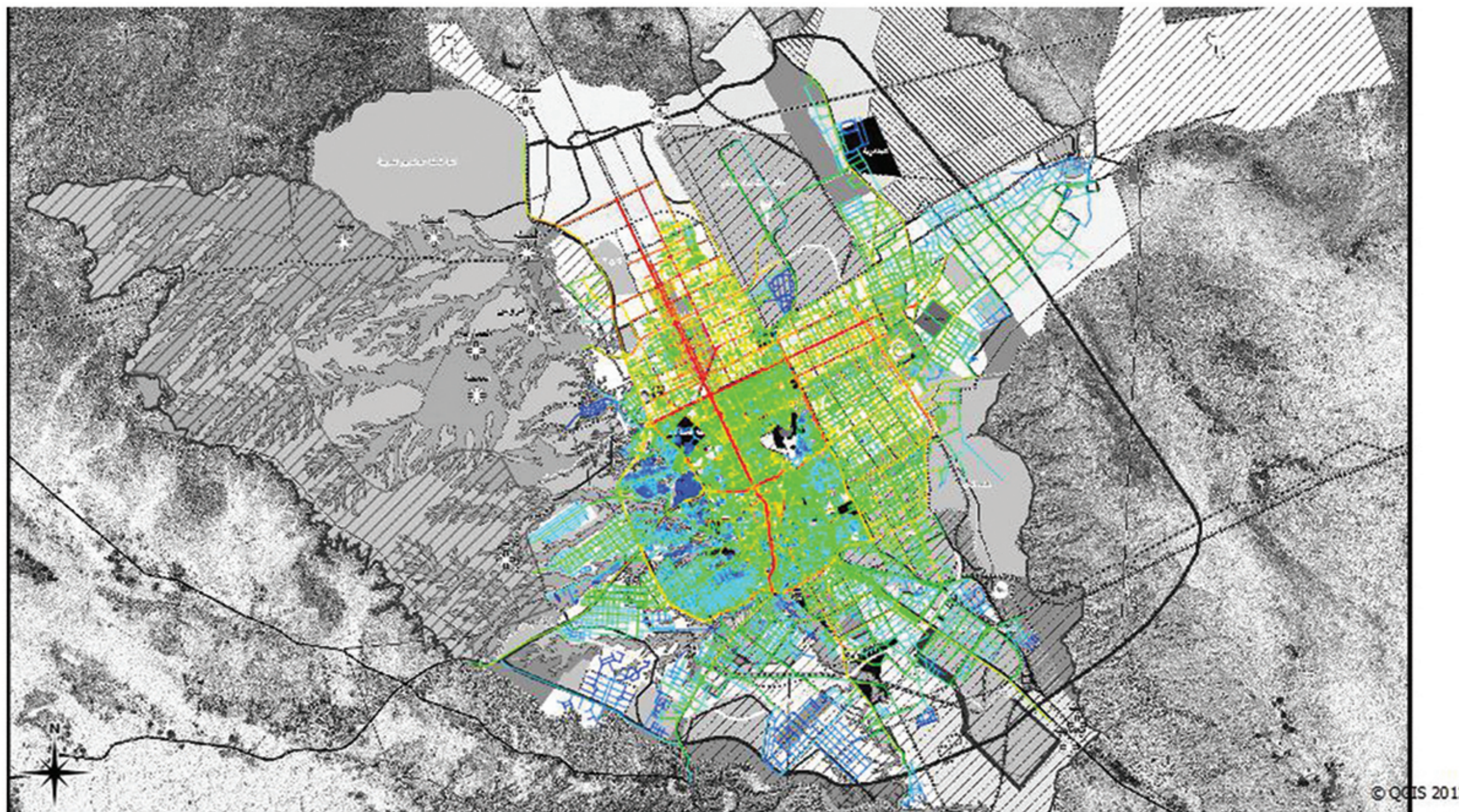


Fig. 25: The correlation between the spatial analysis and the master plan of 2030.



Chapter 5

Discussion

5.1. Overview:

This chapter will provide an overview of what has been discussed prior and also build on these findings by offering a reflection on the wider implications. The discussion will include a look at the six layered tool utilised to answer the three research questions.

5.2. Discussing the results:

The objective of this study was to investigate the issue of centrality in Riyadh. The main concern is to ascertain the location of the prominent centre of modern day Riyadh based upon practical evidences.

The evidence clearly indicates that the historical centre (HC) has been prioritised among other districts, which provides the platform for the achievement of 'live centrality'. This correlation is not at all unusual, given the fact that the HC has a number of interesting characteristics. One of which is that the morphology of the HC is unlike the rest of the entire city of Riyadh. It is truly organic with a high level of accessibility and connectivity, which stands in contrast from its more artificial neighbours. It is also an intelligible system on its own merit, which is largely due to the organic configuration and its famous landmarks, since the HC has a noticeable intensification of the most significant elements of the entire city (See figure 21 page 49). Another characteristic of the HC is that the results of the observation substantiate the syntactic analysis. Simply put, that the HC has a remarkably higher level of pedestrian movement than that of the Olayya area (including the commercial strip). This is certainly due to the high density caused by the small block size, concentration of the commercial activities in Al-Bata Street, which has a high rate of pedestrian movement of 8000 people per hour, remarkably similar to that of Oxford Street and of course a large number of public squares and open spaces in the HC area, which attract even more movement.

Nevertheless, when moving to a larger scale, the commercial strip (CS) is often regarded as a far more prominent centre of Riyadh. This outcome was confirmed by the syntactic analysis of the entire city (See figures 13 and 25 pages 38 and 56 respectively). In the context of the first ring of Riyadh, the CS is an intelligible system, easier to find and navigate across when compared with other systems. One of the features of the CS is that it has a visible intensification of commercial activities together with it being the location of the majority of Riyadh's towers and skyscrapers, which shape Riyadh's skyline.

Another issue that requires our attention is that further exploratory methods were carried out to examine the idea of centrality at the local level from the walled city of Riyadh up until the modern planned districts clearly. These methods showed that the phenomenon of centrality was found even in different morphologies. This point remains fundamental in establishing that spatial configuration plays a critical role in the formation, as well as the location of the centre (Hillier, 1999).

Concerning the impact of recent growth on the HC, the analysis indicates that the planning of Riyadh is a mixed bag of inherent advantages and disadvantages. The main issue with the HC is the rapid expansion of the CS exceeds 22-km long, which is the source of much of its problems. Particularly, in regards to the global level, strengthening the CS and weakening the HC seriously affects the HC by usurping much of the social and economic activity. However, a positive aspect is that it may become the main characteristic of the city of Riyadh, without any comparison.

Based on the results of the six layered analysis, the HC can play a crucial role in the future of Riyadh. For example, the HC could be structurally reengineered in order to integrate with the surrounding neighbourhoods. Appendix B page 66 is an example of a poorly planned road that isolated key neighbourhoods, affecting the HC socially as well as economically. The consequence of reengineering some of the street networks in and around the HC could help the HC to be globally intelligible, meaning it may become easier to find and navigate through in the context of the first ring of Riyadh. Therefore, balancing the equation, which enabled the CS to dominate the landscape of Riyadh.

Chapter 6

Conclusion and Recommendations

This journey of enquiry has reached its finality. This section will summarise the main areas that were covered, alongside a final commentary that will illuminate the answers of the three research questions. There will also be an offering of some suggestions that highlight the ways in which the historical centre of Riyadh can maintain its present dominance.

This study was designed to explore the issue of centrality in Riyadh. This work has not only given an account of the historical centre of Riyadh, but also provided reasons for why the issue of centrality remains an important matter of enquiry. Based on the utilisation of the evidence-based approach, we can faithfully conclude that the historical centre's unique characteristics are a means of identifying its prominence. Its urban morphology, intensification of commercial activities, diversification of functions, noticeable concentration of the most significant attractions, the high level of pedestrian movement and above all its long history all signify its pre-eminence over other regions.

However, when looking at the centrality issue within the context of Greater Riyadh, a considerable threat emerges. The commercial strip positions itself as a worthy contender for the prize of modern Riyadh. The strip has the potential to dethrone the historical centre. Therefore, it can be argued that we are witnessing a gradual shift of centrality of the historical centre towards the ever more important commercial strip. Taken together, we are now faced with a conundrum of sorts that places these two prominent centres at a junction. Enough data has been gathered to suggest that the rapid growth of Riyadh has had a negative impact on the historical centre. It has shown that the accelerated expansion of the commercial strip further strengthens the commercial strip, but simultaneously weakens the historical centre by usurping much of the social and economical activities. Optimistically, this study will act as an impetus for further work to establish whether these centres can work together for the benefit of a more sustainable Riyadh.

Evidence from this study suggests that the historical centre can not only maintain its dominance but also increase its potential to play a larger role in modern Riyadh. However, the historical centre must meet a number of conditions; one of which is that the Higher Commission for the Development of Riyadh ought to think of integrating the historical centre not only with immediate neighbourhoods surrounding the historical centre, but rather with the wider regions of Riyadh. This could go some way in solving the navigational issues and endear its national presence.

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Appendices:

Appendix A: The old Riyadh (The walled Riyadh).



Appendix B: An example of a road that severed neighbourhoods from each other leaving them isolated
(Source: The Higher Commission for the Development of Arriyadh).



King Fahd Road (100-meter wide).



Appendix D: The commercial Strip (CS).

(Source: The Higher Commission for the Development of Arriyadh).



The Commercial Strip (CS).



The Commercial Strip (CS)
(Cairo Square – the intersection of Makkah Road and King Fadh Road).

Appendix D: The commercial Strip (CS).

(Source: The Higher Commission for the Development of Arriyadh).



The Commercial Strip (CS) and The Kingdom Tower.



The Commercial Strip (CS) and The Al Faisaliah Tower.

Appendix E: Some of the main urban elements in the central area.
(Source: The Higher Commission for the Development of Arriyadh).



(On the left is The National Museum and on the right is King Abdulaziz Historical Complex).



The National Park and the Water Tower.

Appendix E: Some of the main urban elements in the central area.



The Imam Turki Bin Abdullah Grand Mosque.



Al-Masmak Fort (Riyadh's Castle)(1916).

Appendix F: Notes taken during the observation.

Olaya St.

Gate Number (G.....) 01 Day (.....) Monday Date (....../....../2012G) 30/7 Tem. 40°C 10:30 PM

323 x 4 = 1292 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc	the area human activities
During the day			<ul style="list-style-type: none"> Cars dominate the scene. famous retail branches Sandis' / more than foreigners' huge numbers of cars 	
During the night			<p>30 %</p> <p>70 %</p>	

King Abdullah

Gate Number (G.....) 02 Day (.....) Tuesday Date (....../....../2012G) 31/7 Tem. 38°C 11:00 PM

382 x 4 = 1528 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc	the area human activities
During the day			<ul style="list-style-type: none"> newly redesigned and finished. Cars dominate the scene. A lot of shopping centres Pedestrian movement is very low, given the fact that people use cars to move around and go from centre to another. 	
During the night				

Appendix F: Notes taken during the observation.

Al Urobah
Gate Number (G03) Day (Monday) Date (30/7/2012G) Time (11:00 pm) Temp. 39°C

302 x 4 = 1208 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc	the area the human activities
During the day		100	<ul style="list-style-type: none"> A large number of retail shops Major construction works at the end of it. Streets based, not pedestrian Individuals largely shopping 	
During the night		100		

Tahia St 64
Gate Number (G....) Day (Monday) Date (30/7/2012G) Time (11:30 pm) Temp. 39°C

498 x 4 = 1992 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc	the area the human activities
During the day		100	<ul style="list-style-type: none"> famous street free wifi designed to host a lot of coffee shops and famous retail + restaurant restaurants. is used for meeting and enjoying the walk and brief chatting (groups) The temp. was really hot and dry and some sand storms. (the weather wasn't clear). Fasting month. People stay indoors. 	
During the night		100		

Appendix F: Notes taken during the observation.

Prince Sultan 05 *جدة* Monday 30/7 Tem. $^{\circ}\text{C}$ 12:00 mid-night am the area human activities

Gate Number (G....) Day (.....) Date (../../2012G) Time (..... :

218 x 4 = 875 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day			<p>Famous St.</p> <p>a lot of small and big net shops.</p> <p>BUT again:</p> <p>* the weather</p> <p>* fasting month</p>
During the night			<p>even though the observations were taken during the night, yet, still the observation doesn't reflect the reality.</p>

King Abdulaziz 06 *جدة* Tuesday 31/7 Tem. $^{\circ}\text{C}$ 12:00 mid-night am the area human activities

Gate Number (G....) Day (.....) Date (../../2012G) Time (..... :

264 x 4 = 1056 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day			<p>Description of the area observed/ Pedestrian Movement/activities.</p> <p>Ministries and gov. institutions, a long side the street.</p>
During the night			<p>Very high security</p> <p>There are some malls, but largely, it's streets with gov. centers. a lot of</p>

Appendix F: Notes taken during the observation.

Imam Abdulaziz bin Mohammed *Saudi* Gate Number (G.O.) Day (.....) Date 28/7/2012G Temp. 35°C Time (..... :) 12:00 am

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day		113 x 4 = 452 p/h	<ul style="list-style-type: none"> - mostly dominated by cars - poor level
During the night			

the area human activities

Imam Faisal bin Abdulaziz *Saudi* Gate Number (G.O.) Day (.....) Date 29/7/2012G Temp. 40°C Time (..... :) 11:15 pm

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day		240 x 4 = 3360	<ul style="list-style-type: none"> - very quiet - shops in just one side - Women with bags full of stuff - Garden/open space. - Khaleel Towers. (Queen ~) - Groups "always". - sandis + for talking and shopping
During the night			

ATM describe are area pedestrian movement human activities

Appendix F: Notes taken during the observation.

Imam Tmkw

Gate Number (G....) *9* Day (*Sunday*) Date (*29/7/2012G*) Time (*12:00 am*)

580 x 4 = 2,900 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day—	<i>(Handwritten tally marks and circled numbers 10, 12, 13, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)</i>		<ul style="list-style-type: none"> Games shop Women & children Perfumes shop localst for.
During the night	<i>(Handwritten tally marks and circled numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)</i>		

the area human activities

Almashay Rd.

Gate Number (G....) *10* Day (*Sunday*) Date (*29/7/2012G*) Time (*12:30 am*)

265 x 4 = 1,325 p/h

	Number of People (Observations of pedestrian flows)	Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day—	<i>(Handwritten tally marks and circled numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)</i>		<ul style="list-style-type: none"> There is not lot of shops and shoppers Gov. Buildings/ institutions people in groups
During the night	<i>(Handwritten tally marks and circled numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)</i>		

describe the area human activities

Appendix F: Notes taken during the observation.

Al Bata Gil "displays" Tem. 40°C 10:30 pm

Gate Number (G...)	Day (...Sunday...)	Date (29/7/2012G)	Time (10:30 : ...)
Number of People (Observations of pedestrian flows)		Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day 		1600 x 4 = 6400 p/h Al Bata St. Very very busy Yet, it is in the mid of the week everything you like group and individual every direction foreigners/buying No taxis are waiting for people to come and	describe the area / Pedestrian Movement / Human activities
During the night 		Al Swaiting St. busier than the G9. Will be even busier between 9 pm up to 1 am During the weekend is the extreme.	

Al Farazdag Saturday 28/7 Tem. 37°C 11:00 PM

Gate Number (G...)	Day (...Saturday...)	Date (28/7/2012G)	Time (11:00 : ...)
Number of People (Observations of pedestrian flows)		Total (p/h)	Notes Weather/activities/individuals /groups/behaviour/directions/ other stationary activities... etc
During the day 		340 x 4 = 1360 p/h	the area / Human activities
During the night 			

scene

Appendix G: Some photos from Al-Bata Area.



Abu Ayyub Al-Ansari Street, Central Area, Riyadh (Taken at 10:30pm).

Appendix H: Some photos of popular public squares in the central area.
(Source: The Higher Commission for the Development of Arriyadh).



Public spaces in front of the National Museum.

Appendix I: Some photos of the most popular street in Riyadh.



Tahliah St. (Prince Mohammed Bin Abdullaziz).

Appendix J: Las Vegas Commercial Strip.



L.V. Commercial Strip (Source: <http://www.arrivelasvegas.com/>).



L.V. Commercial Strip (Source: <http://www.arrivelasvegas.com/>).

CD:

The CD-ROM includes a (PDF) format file of the dissertation

