ACTIVATING THE ROLE OF SUSTAINABILITY TO TRANSITION THE HISTORIC
DISTRICT OF RIYADH TOWARDS DEVELOPMENT

A RESEARCH PAPER
SUBMITTED TO THE GRADUATE SCHOOL
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FOR THE DEGREE
MASTERS OF URBAN AND REGIONAL PLANNING

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In the Name of Allah, the Compassionate, the Merciful
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ABSTRACT

RESEARCH PAPER: Activating the Role of Sustainability to Transition the Historic District of Riyadh Towards Development

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DEGREE: Masters of Urban and Regional Planning

COLLEGE: Architecture and Planning

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The Arab region is one of the most vulnerable to climate change owing to its status as the most water insecure region. In response to drivers of energy security and climate change, Saudi Arabia is able to enact new policies and actions plans to introduce clean energy and green technologies in the redevelopment of existing cities and historic centers. Conservation of existing settlements is one sustainable strategy to mitigate the increase in development and its related ecological footprint. This thesis will examine how sustainable strategies such as creating green spaces, zoned transportation, pedestrian paths and new parking designs can act as transitional motivation for historic areas to adopt more sustainable oriented principles. The case of Al-Dirah district in the historic center of Riyadh is currently undergoing transformation towards intensive high density development. This thesis undertakes a study of existing sustainable projects in the al-Dirah area and the current spatial conditions in order to create a transitional development proposal for the Al Dirah district. Recommendations for future action is presented.

KEYWORDS:

Sustainable development, eco city, historic Riyadh, environment, social, cultural, historic buildings, green spaces, pedestrian movement, transportation.
CHAPTER ONE

Introduction

The motivation for the thesis project I chose is due to the importance of sustainable development to any country. In my country Saudi Arabia has a special situation not present for most countries needing to explore sustainable development, the low price of oil. The present abundance of oil and the fact that Saudi Arabia is a major oil producing country results in low oil prices. But Saudi Arabia does face future challenges with regards to sustainable water and energy supplies. There will come a time when oil production will end in Saudi Arabia, and that day Saudi Arabia will need a solution. Sustainable development will be the best solution now to transition the country and its people to a new mode of lifestyle and future development of the nation. Adapting to the hot climate, improving public transportation, and access to green open spaces are problems facing Saudi Arabia today and in its future. The best means to deal with this is through sustainable development (Al alshek, 2009).

The Arab region is one of the most vulnerable to climate change owing to its status as the most water insecure region. “When resources are scarce - whether energy, water or arable land -- our fragile ecosystems become strained, as do the coping mechanisms of groups and individuals. This can lead to a breakdown of established codes of conduct and even outright conflict.” (Ki-Moon, 2007, p.1). Conservation of existing settlements is one strategy to mitigate the increase in development and its related ecological footprint. There is a need for clean energy and green technologies to become integrated in the redevelopment of the historic city of Riyadh to take advantage of its world leading solar radiation and wind resources. In response to drivers of energy security and climate change, Saudi Arabia is able to enact new policies and actions plans
to expand clean energy as a means of reducing energy intensity of growth, preserving scarce resources for future generations. As further noted at the recent MDG+10 Summit in September 2010, “lack of access to modern energy services is a serious hindrance to economic and social development and must be overcome if the UN Millennium Development Goals (MDGs) are to be achieved. Access to modern forms of energy is essential for the provision of clean water, sanitation and healthcare and provides great benefits to development through the provision of reliable and efficient lighting, heating, cooking, mechanical power and transport” (Khoday, 2009, p.18-19).

In this thesis I would like to demonstrate how sustainable development is beneficial to Saudi Arabia. Specifically how it is easy to use as a good solution for the development of many of Saudi’s problems. One of the important goals is to provide a good sense of direction to help my country, and I will take advantage of my education here in the U.S. to help Saudi Arabia develop sustainably. Therefore, I chose the field of my study on the topic "Sustainable Development in Saudi Arabia". The contribution of my study will be a starting for Saudi Arabia to draw public attention to sustainable development.

My thesis will examine the historic district of Al-Dirah in the capital city of Riyadh. The thesis will have four main sections. The first section will be about economic sustainability and its relationship with the overall development of the country. Then, I will talk about environmental sustainability and its impact on sustainable development on the environment. After that, I would like to highlight the current situation of sustainable development in Saudi Arabia and examine recent projects and new development proposals for the historic area of Riyadh. Finally, I would like to propose general directions and future vision for Saudi Arabia to apply sustainable development ideas and principles specifically in the historic city of Riyadh. Sustainable
Development actions that are to be integrated in development strategies include: construction of green areas that create links to new development elements in the surrounding area through Al-Dirah district, innovative parking solutions, and pedestrian and highspeed traffic flows.

Sustainability

Sustainability is the most modern concepts and common at the moment for the preservation of resources. This study is concerned particularly in Riyadh city (which contains the historic district study area). Riyadh is the capital and largest city of size and population in Saudi Arabia. As capital city it contains the majority of activities and various social services for the country. Over time with the pace of urban development in the city, the inappropriate distribution of services occurred, specifically in shared public facilities and open space parks in the central city. There is a need to find proper planning, balanced and sustainable land use in the Riyadh city and specifically in the historic district.

The most important reason for the deterioration the central area of Riyadh is the lack of control of land uses in that area. This in turn creates problems such as overcrowding, lack of green space, poor transportation and parking situations. The present study attempts to address these issues. Additionally the historic area is experiencing a decline in livability due to the deterioration of buildings many of which are constructed of mud. Currently there area proposals to redevelop the area of Al-Dirah. Hence the importance of this study is to examine how sustainability may be applied as a transitional strategy to integrate new development with the existing physical urban fabric of the historic area.

This thesis will address the following problems.

- The communal land uses and the lack of green areas.
- Pedestrian movement.
- Transportation system and the traffic.
- Lack of parking.

Objectives Study

This study aims to address the problems of the historic area of downtown Riyadh by developing special sustainable development strategies to guide the future development for the area. Applying sustainability principles will give us the opportunity to avoid some of the expected problems transitioning the area to future development. The main objective of this study is to apply the concepts of sustainability in the study area. The outcome will be to develop proposals that help to develop in this direction in the future. Moreover, this study seeks to establish a base from which to achieve a number of other goals in the future including:

- Achieving sustainable of the built environment.
- Focus on the importance of preserving the environment and resources and reduce pollution.
- Work on the development of land use in the city and identify related problems, and find appropriate solutions for water and energy conservation.
- Identify problems related to transportation network and analyzed as congestion and pollution problems, parking and pedestrian problems and work on the development of such a network.
- Try to develop standards for designing external spaces and the movement of residents and visitors.

This Thesis Will,

a) Develop the eco principles that are to be used for planning future projects.
b) Define what an Eco-city is in the context of KSA by examining the design approaches and their underlying values.

c) Present a redevelopment concept proposal.

1) To develop new economic use of the historic area. (Food Street proposal)

2) Propose solutions to solve transportation/parking problems.

3) Reshape the existing environment for pedestrians (new street designation for traffic – pedestrian uses, adding new green spaces, dealing with garbage bins).

The Study Area

This study analyzes the current state of land use and transportation in the Al-Dirah district of Riyadh. This area is located in the middle of Riyadh downtown and the extents of the area are shown in Figure 1. A summary of the most important reasons for choosing this site are the following:

- The location of the study area as an important part of Riyadh downtown.
- The high historical value of the study area.
- The pressing need to redevelop small neighborhoods and redevelop large commercial areas of the area.
- Provide direction to the redevelopment of the district as it is very complex.
- The surround area is rich in development projects.
Riyadh’s Urban Profile

Figure 1. The spatial extents of Al-Dirah district in Riyadh.

Figure 2. Map of Saudi Arabia.

Figure 3. Aerial view north along the main commercial spine of Riyadh. (Photo courtesy of the ADA, 2009)
Riyadh’s Geography, History, and Culture

Riyadh (ArRiyadh) is the capital city of Saudi Arabia, situated in the center of the Arabian Peninsula on the Najd plateau at an altitude range of about 600 meters above sea level. The city extends 1600 square kilometers, located about 400 km from the east coast (Gulf) and 1000 km from the west coast (Red Sea) at latitude 24’ 39’ N and longitude 46’ 43’ E. The climate of this north and east central region of Saudi Arabia is extremely arid with occasional precipitation and sandstorms. The name Riyadh is derived from the Arabic word meaning a place of gardens and tree’s (rawdah). The city while relatively flat in topography is traversed by numerous wadi’s. Wadi Qaddiya, and Wadi Wubayr surround the city joining in an area to the west, Wadi Al Aysan a secondary wadi that modulates the topography of the city, flows north-northwest to south-southeast, and Wadi Hanifa, a deep and wide ravine forms a strong natural edge to the west of the city, as do two major steep escarpments located to the east and south.(Middleton, 2011)

Saudi Arabia was established as the first new country in the Arabian Peninsula region. Abdul Aziz initiated a political strategy to settle and unify the one hundred nomadic tribes who controlled various regions of the country, achieving control of most of the Arabian Peninsula by 1926. Britain officially recognized Saudi Arabia as a sovereign state with the signing of the 1927 Treaty of Jeddah, followed by Abd Al-Aziz Bin Abd Al-Rahman bin Faisal Al Saud proclamation as King on September 23, 1932 (Al Hathloul and Edadan, 1993). The Treaty of Taif formalized the Kingdom of Saudi Arabia’s present boundary and aerial control in 1934 (Al Hathloul, 1981). Arriyadh was the capital of the first Saudi state when it was established in 1240H (1824G) during the reign of Imam Turki Bin Abdullah, and upon the defeat of Ottoman forces by King Abdulaziz Bin Abdulrahman Al Saud in 1902, regained its distinction as capital
city upon British recognition of the Kingdom in 1932. Riyadh was selected as the capital of the new nation as it was the principle city in the Najd region, which formed the Al Saud territorial base. The Supreme Planning Board designated Riyadh as one of the 13 Emirate capital cities in 1961, with Saudi Arabian Ministerial decree establishing the High Commission of Riyadh, on 19, June 1974. (Middleton, 2011)

As the national capital, Riyadh is a significant city of the Kingdom of Saudi Arabia. It is home to King Abdullah bin Abdulaziz, ruler of Saudi Arabia who has his official home, his court and office located within the city, and is considered to be the historic heartland of the Kingdom. The Council of Ministers, the highest government organization supporting the King, and the Shura Council representing the citizens of the country form the government and are located close to the Royal court, as are The Gulf Cooperative Council (GCC) and the international diplomatic community, which are headquartered in the city. (Middleton, 2011)

The historic central area is the administrative and cultural focal point of the city, located geographically at the center of Riyadh, the historic area encompasses a total area of 530 ha, bounded by Al Washm street from the north, Alasha street to the south, AlBat’ha street from the East, and King Fahad Road to the west. A major initiative being undertaken is the establishment of the boundaries for a Central National Area, with the identification of key access routes and designation of lands to be kept for future national capital purposes (ADA, 2009). The character, status and identity of the Central National Area is being strengthen by key development projects, such as the National Museum and restoration of the Historic Palace of King Abdulaziz, completed in 2004 as a public open space and cultural precinct.
Historical Area of Riyadh

The historical area of Riyadh is located in the center of Riyadh city, the city of Riyadh is the capital of the Kingdom of Saudi Arabia and it has a deep-rooted in the history. That is because the old city of Riyadh has a significant role in the Barrier of Najd through more than three centuries. In the era of Imam Turki bin Abdullah Riyadh was the capital of the Second Saudi State between 1824 and 1891. Then in 1902 the King Abdul Aziz Al Saud regained the power. The name of Riyadh means in Arabic language the place that rich of gardens and orchards because it was in past green place. In the eighteenth century the name Riyadh was launched on the city, before that it has different names (History of Riyadh, 2012).

Riyadh’s historical area has a high and significant value due to its authenticity, its distinguished planning, and its unique architecture. Currently the central area is struggling with many social, economic, urban and environmental problems such as the increasing outward emigration of Saudi residents from the area, poor economic development and unequal distribution of densities. The lack of services and public facilities, inadequate pedestrian walkways, high traffic density, and insufficient parking areas, are serious problems contributing to the areas continuing rapid deterioration. Due to it size, the central area poses challenges to devising a redevelopment framework that will modernize and upgrade services and building structures and preserving existing buildings and the urban and social fabric while also conserving the areas historic urban landscape and buildings. A new urban renewal conservation and redevelopment program is in the planning stages, aiming to reverse outward migration of residents by exploiting and diversity of the cultural and economic potentials of the area (ADA, 2009).
The rate of relative poverty in Arriyadh is estimated to be near 15% distributed across the city but most noted in the districts of Sulai, Shuaissi, and Batha. Urban poverty in Riyadh is characterized by a strong relationship of low education to poverty of householders with those experiencing relative poverty at the ends of the age spectrum, with 71% 60 years of age and older, and 41% under the age of 20. Rather than an indicator of economical decline of the inner city, unemployment, low levels of education and migration movements to Riyadh are characteristic of relative poverty in the city and reflect the state of labor market changes where skill sets do not meet labor market needs. Social development projects aim to reduce poverty rates in the city from 15%-7%, and unemployment from 12% to 5% over the coming 10 years, with access to technical and vocational training, recruitment, social funding, and mobile health care a priority in disadvantaged communities. Urban areas experiencing the highest rate of unemployment include Jaradiah, Salihiah, Faisaliah, Manfuah, AlOuds and Shumissi, with the percentage of unemployment across the city at 12% experienced within the 25-29 demographic, and 30 % between the ages of 20 – 24 (ADA, 2009). White-collar employment growth is projected to occur in the private sector by 6% annually to 2023 (ADA, 2009) Saudi Arabia’s early dependency upon foreign consultants has steadily shifted towards the Saudisation of the workforce which is a key Saudi Arabian goal focused on establishing self-sufficiency, retaining knowledge resources within the Kingdom, and the development of employment opportunities across the country for Saudi nationals both female and male. (Middleton, 2011).
<table>
<thead>
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<td>1998</td>
<td>3,500,000</td>
</tr>
<tr>
<td>2009</td>
<td>4,878,723</td>
</tr>
</tbody>
</table>

Table 1. The population of city of Riyadh has since 1902.

Figure 4. Population Density per hectare per Submunicipality in Riyadh (Graph courtesy of the Arriyadh Development Authority, 2009)
Creating higher education opportunities for both genders is highly valued in Saudi Arabia, and is a key area of development investment as demonstrated by recent completed projects such as Princess Nora Bint Abdulrahman University for Women (PNU), the largest university for women in the world situated 25 km east of the capital city, and King Abdullah University of Science and Technology (KAUST) located near Jeddah. The young demographic character of Riyadh’s inhabitants and the increasing accessibility to global communication is influencing Saudi culture and society, which also continues to be strongly traditionally and religious. Higher international interaction and global trends in development are key drivers promoting education, shopping, healthcare, recreation and entertainment oriented projects.

There are many ideas on how to apply sustainability principles in historic city areas, but the difficulty lies in selecting the best fit with the situation of historical Riyadh. Therefore, the actions should include reasonable procedures to develop the whole area while conserving the high value of the historic districts. The historic districts of Riyadh are unique examples of early settlements and Nadj culture of Saudi Arabia, which is very different from other countries of the world. This also is a significant area in the country of Saudi Arabia as a historical district. The most important actions that I would like to add are green areas which help mitigate climate change, and provide urban cooling in Saudi cities. Additionally creating links across the historic districts of the city from the northern side to the southern side is very important. The historic Al-Dirah district is located between two developed areas and the linking will help the whole of the historic city center.
Overview on Need for Sustainability

There is a need to develop ecological principles and implement sustainability to transform historic city centers to be more livable. Conservation of existing settlements is one strategy to mitigate the increase in development and its related ecological footprint. There is a need for clean energy and green technologies to become integrated in the redevelopment of the historic city of Riyadh. Access to modern forms of energy is essential for the provision of clean water, sanitation and healthcare and provides great benefits to development through the provision of reliable and efficient lighting, heating, cooking, mechanical power and transport” (Khoday, 2009, p.18-19).

There are several reasons why sustainability is important for historic city areas. The first reason is that sustainability is a viable solution to meet the most important problems for any area which are social problems, economic problems and the environmental problems. The second reason is the historic city suffers of neglect for a long time, which reflected on the general situation of the area. Sustainability will provide the area with the ability to achieve regeneration. This is a challenge to accomplish due to the options for development in the historic area are limited due to the important conservation of monuments and buildings in the area. Sustainable strategies implemented now will help the historic area to keep abreast of future developments. The third reason is that weather and climate change such as increasing rain and higher temperatures is considered a significant problem for Saudi Arabia and its cities. Developing sustainable approaches to cities will help solve this problem significantly.

Climate change projections show that harsher conditions lie ahead, with millions of people across the region at risk of being affected. The Inter-Governmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007) estimated an increase in temperature in the
Arab region of up to 2°C by 2030 and 4°C by 2100, with reduction of water run-off by 20-30% by 2050, owing to rising temperatures, less precipitation and increased drought likelihood. (IPCC, 2007) And there are many reasons make the sustainability the best choice to develop the historic area because the sustainability are not only stands at solving the problems, but extended to include helping the residents, workers, developers and the governments. (Elasha, 2010)

Background to Sustainability in Saudi Arabia

The kingdom of Saudi Arabia has ratified a number of conventions for the protection of culture, social development, and the environment resources and adopted united nation goals for sustainable development. Ratification of United Nations Conventions for the protection of culture, social development, and the environment. (UNESCO) A few conventions include;

- Convention concerning the Protection of the World Cultural and Natural Heritage. Paris, 16 November 1972. (Acceptance),

In late twentieth century the “Human Development Report” was published in 1990. The report encourages members of the United Nations to adopt universal development goals. The kingdom of Saudi Arabia is one of the members of the United Nations since 1945, and has embraced the United Nations Development Programme. The Millennium Development programme is comprised of eight goals which are "Eradicate Extreme Poverty and Hunger, Achieve Universal Primary Education, Promote Gender Equality and Empower Women, Reduce
Child Mortality, Improve Reproductive Health (Maternal Health), Combat HIV/AIDS, Malaria and other Diseases, Ensure Environmental Sustainability and Develop a Global Partnership for Development. By the year 2015 these eight goals have to meet in the 193 member countries in the United Nation. Relevant to this thesis, are the targets to ensure and achieve environmental sustainability, and eradicate extreme poverty, and achieve universal primary education (UNDP, 2009).

The first goal is “Eradicate Extreme Poverty and Hunger” which has two targets should to meet between 1990 and 2015. First target is reducing the proportion of those who have income less than one dollar a day, to halve from the total citizens of the member countries in the United Nations. And the second target is reducing the proportion of the hungry people in the member countries in the United Nations to halve. For the kingdom of Saudi Arabia there are two signs reflecting the progress in the first goal. The first sign is the changing in the percentage of poor families in Saudi Arabia between 2004 and 2008 from 1.63% to 0.8% (which means reduce 51%). Second sign is the changing in the percentage of underweight children under five 5 years of age in Saudi Arabia between 2006 and 2010 from 6.4% to 5.3% (which means reduce 17.2%). (UNDP, 2009)

The second goal is “Achieve Universal Primary Education” by 2015 or before. This goal aims to ensure equality between both genders and provide the opportunity to study the primary education fully. With regards to kingdom of Saudi Arabia, three signs shows the progress to achieve the second goal. First sign is the changing in the percentage of the total numbers of the students who joined to the primary school in Saudi Arabia between 1990 and 2010 from 82.00% to 106.00% (which means increase 24%). Second sign is the changing in the percentage of the students who joined the primary school in first grade and complete to fifth grade between 1990
and 2010 from 74.5% to 98.30% (which means increase 23.8%). Third sign is the changing in the percentage of the educated people "literacy" in age 15-24 year olds between 1990 and 2010 from 85.90% to 98.00% (which means increase 12.1%). (UNDP, 2009)

The third goal is to “Promote Gender Equality and Empower Women”. This target goal aims to eradicate difference between the gender "in primary and secondary education preferably by 2005, and at all levels by 2015". With regards women education in the kingdom of Saudi Arabia had started in the late sixties which show the difficulty of the situation, but there are three signs show the big progress to achieve the third goal. The first sign is the changing in the percentage of the girl’s numbers in primary, secondary and higher education to the boy’s numbers between 1990 and 2010 from 85.10% to 99.10% (which means increase 14%). The second sign is the changing in the percentage of the educated women in age 15-24 year olds to educated men in the same age between 1990 and 2010 from 73.70% to 98.60% (which means increase 24.9%). Third sign is the changing of the women part in job opportunities in the nonagricultural sector between 1990 and 2009 from 17.9 to 14.2. (UNDP 2009).

The fourth goal is to “Reduce Child Mortality” an important target in Saudi Arabia. The target is to reduce 66.66% from the proportion of kid’s deaths in age five years old and under. With regards to the kingdom of Saudi Arabia there are three clear signs reflecting the progress to achieve the fourth goal. The first sign is the changing in the proportion of kids deaths in age five years old and under between 1990 and 2010 from 44 per 1000 to 19.5 per 1000 (which means reduced 56%). The second sign is the changing in the proportion of baby’s deaths between 1990 and 2010 from 34 per 1000 to 16.9 per 1000 (which means reduced 51%). The third sign is the change in the proportion of babies one year old that take the vaccination for the measles has
increase between 1990 and 2010 from 88.2% to 98.2% (which means increase 10%). (UNDP, 2009)

The fifth goal is to "Improve Maternal Health" which has a target to reduce 75% from the proportion of mother’s deaths. With regards to the kingdom of Saudi Arabia there are two clear signs reflecting the progress to achieve the fifth goal. The first sign is the changing in the proportion of mother’s deaths between 1990 and 2010 from 48 per 100,000 live births to 14 per 100,000 live births (which means reduced 71%). The second sign is the changing in the proportion of "births attended by skilled health professionals" between 1990 and 2010 from 88% to 97% (which means increase 9%). (UNDP, 2009)

The sixth goal is "Combat HIV/AIDS, Malaria and other Diseases". This target aims to wage war against serious diseases like the AIDS (HIV), malaria and other serious diseases. With regards to the kingdom of Saudi Arabia there are three clear signs showing the progress to achieve the sixth goal. The first sign is the Saudi governments efforts in fighting the diseases, but with regards to the AIDS (HIV) the MDGs report shows in 2010 there were 16,334 reported cases in Saudi Arabia. The second sign is the change in the proportion of people infected with Malaria between 1990 and 2010 from 125 cases per 100,000 people to 0.20 per 100,000 people (which means reduced 99.84%). And, by 2015 Saudi Arabia aims to be without Malaria. The third sign is the changing in the proportion of people infected with Tuberculosis between 1990 and 2010 from 18.6 cases per 100,000 people to 11.4 per 100,000 people (which means reduced 38.71%). (UNDP, 2009)

The seventh goal is "Ensure Environmental Sustainability" which has three targets. The first target is interaction the government laws and policies with the sustainable development principles of any country in the United Nation which will help to protect the natural resources.
Second target is reducing the proportion of the citizens who do not have the way to reach a clean drinking water to halve from the total citizens of the member countries in the United Nations. The third target is doing a serious implementation work to at least 100 million poor people in the United Nations who live in unplanned settlements to improve their life by 2020. With regards to the kingdom of Saudi Arabia there are three clear signs reflecting the progress to achieve the eighth goal. The first sign is the changing in the percentage of the protected areas. Maintaining biological diversity on surface areas in Saudi Arabia changed between 1990 and 2010 from 3.3% to 4.26%. The second sign is the percentage of the people who live in urban and rural areas and at the same time have a sustainable access to clean drinking water through water distribution system and water tanker services. This changed between 1990 and 2010 from 75% to 96% (which means increase 21%). (UNDP, 2009)

The last but not least, the eighth goal is 'Develop a Global Partnership for Development" which has seven targets to be achieved across the United Nations. The first target is building a financial system that promotes open trading to reduce the poverty and development on the level of local and on the world level. The second target is handling the serious needs for the developed countries’. The third target is handling the serious needs of landlocked and small island developing States. The fourth target is helping the developing countries’ to debt problems on the level of local and on the world level to make debt sustainable in the long term. The fifth target is creating a combination between the developing countries; develop decent and productive work for produces new jobs to youth. The sixth target is communication with pharmaceutical companies to provide the drugs in the developing countries by an affordable price. The seventh target is providing the benefits of new technologies like information and communications technologies by the private sector. On other hand, the kingdom of Saudi Arabia is one of greatest
countries that donate to developing countries and that shows through of ratio of aid to GDP. Also, there are 75 developing countries who benefited from the 451 agreements that Saudi Arabia loaned them between 1975 and 2010. And, that loan was to fund 451 development projects and development programs with a value of SR 31 billion. (UNDP, 2009)

Saudi Arabia is also a signature nation on the Montreal Protocol, and has made progress in achieving reductions in the greenhouse gas emissions (chlorofluorocarbons emissions). (UNEP/OS, 2010)

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<td>2009</td>
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Table 2. Reduction in Level of Greenhouse Gas Emissions reported by Saudi Arabia.
CHAPTER TWO

Definition of Sustainable Development

Sustainable development is commonly understood to be development that meets with the current needs of people without impeding the ability of future generations to meet their own needs. (Adrich, 2005) The common definition concept of sustainable development is development that is not destructive to the environment, and that increase the capacity of a city to continue to develop in a balanced way economically and socially. (Adrich, 2005) Sustainable development is associated with three main fields economic, environmental, and socio-cultural. Although we can defined the sustainable development from point of view of each fields but the difficulty lies in how we can define it by find the similarity and the relations among them all. Social sustainable development aims to influence people through the evolution of communities by a way that ensures they achieve justice, improved living conditions and health. Environmental sustainable development has a main objective, which protects natural patterns and conservation of natural resources. Economic sustainable development reflects increased interests in development of economic infrastructure, and furthermore the efficient management for the natural and social resources. To achieve a state of sustainable developments we have to do one of the two options either reduce the demand for the Earths resources or increase the available volume of resources. Ideally to makes the gap smaller between the supply and demand in the Earth resources." (Al-Ghamdi, 2007, p.10).

I think the sustainable development is a compromise solution between the nature conservation and development of the society and the economy. This is embodied in the definition of sustainability adopted by the United Nations in its Agenda for Development: “Development is
a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development and environmental protection are interdependent and mutually reinforcing components of sustainable development” (UN/GA, 1997, p.1). Simon Dresner defines sustainable development as “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- The concept of ‘need’ in particular the essential needs of the world’s poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.” (Dresner, 2002, p. 67).

A key concept of sustainable development is the Ecological Footprint, which compares humanity’s rising demands with changing levels of ecological goods and services. With the Arab region hosting one of the most ecologically fragile and water scarce environments, pressures on carrying capacity are of particular importance in sustaining poverty reduction efforts. While achieving some of the world’s fastest rates of progress on human development over the past decades, this has also resulted in escalating ecological footprints and decreased carrying ecological capacities. This will place the kingdom of Saudi Arabia at greater risks for the future sustainability of development.

The UNDP Arab Development Challenges Report Background Paper 2011 highlights recent estimates showing a dramatic rise in humanity’s ecological footprint over recent years, with global society now overshooting ecological capacity by 40%. This is equivalent to using the ecological goods and services of 1.3 Earths. The report suggests that by 2030, we will be using
the equivalent of 2 planets, creating greater pressures on equity and sustainability of human
development. (UNDP, 2011) Human development could face a number of climate-induced
tipping points in coming years - decreased agricultural productivity, heightened water insecurity,
increased fragility of ecosystems, increased health risks and increased exposure to extreme
events. (UNEP/OS, 2010)

Siemens is a pioneer company in the field of sustainability and they build their vision on
principles that guide them. These principles focus on three key areas which are the business
opportunities, walk the talk, and stakeholder engagement. Siemens, a leader in sustainable
technologies, divides the concept of sustainable development into three key areas which are;
environment, business and society. Of course there are some conflicting interests among the
three areas, but here lies the difficulty to find the best solutions possible. Which will be the
compatible solutions among the three areas environment, business and society. Siemens depends
on some factors help them to lead progress in sustainable development and to lay the basis for
Siemens corporate successful future. One of the most important of these factors is the
conservation of natural resources through responsible use. Seimens engages in “targeted
investments in future-oriented technologies that support profitable growth while offering
customers competitive advantages and a company ethic that goes beyond mere compliance with
the law and places integrity at the center of business operations”.

"If you wish to fly and want to successfully construct an aircraft in order to do so, you need to
understand the basic principles of aerodynamics. Similarly, if we are serious about ensuring a
sustainable future, we need to be guided by a set of principles which underlie sustainability as an
enduring state." (Ben-Eli, 2006).
The term sustainability is a broad concept which has gained popularity in recent years. This term is widely used in conjunction with sustainable development. The overwhelming use of these two terms interchangeably has created ambiguity in meaning and widened the scope. To reduce ambiguity in meaning, a set of sustainability principles were developed. These include,

- The Material Domain
- The Economic Domain
- The Domain of Life
- The Social Domain
- The Spiritual Domain

Combining these five principles and the policies, operational implications associated with these has given rise to a generalized definition of sustainability. The main concept of sustainability involves a proper balance between all these five principles outlined above. An overarching definition is as follows, “A dynamic equilibrium in the processes of interaction between a population and the carrying capacity of an environment such, that the population develops to express its full potential without adversely and irreversibly affecting the carrying capacity of the environment upon which it depends” (Ben-Eli, 2006). Here we will summarize the five core principles of sustainability.

The material domain is based on the principle that entropy in all physical resources should be contained and the flow of these resources through and within the economy should be non-declining or to the least permitted by the law of physics. The underlying idea about physical resources has been based on two laws of thermodynamics, fundamental conservation of energy in universe and the direction of energy. These laws undermine certain disorder in energy and matter, even in inorganic mechanisms. The current industrial infrastructure is based on these two
laws that ignores this inherent entropy and is tremendously wasteful, fragmented and inefficient. To counteract these, higher resource productivity, better cyclical performance involving chemical elements, avoid stagnation etc. are required immediately (Ben-Eli, 2006).

The economic domain states that the economic framework is distorted and biased as it’s a human construct involving individual interests and concerns. It also states the accounting framework to be “grossly distorted”, as it ignores certain important cost-components such as depletion of the resources and the cost of pollution on the ecology. Both the economic and accounting, especially the accounting domain requires radical change in order to promote better practices. The underlying principle for this type of intervention requires adoption of an appropriate accounting system which is fully aligned with the planet’s ecological processes and reflects the true and comprehensive environmental pricing to guide the economy. This also includes redesigning the environment friendly regulation and taxation, transparency, measure human development and wellbeing etc. (Ben-Eli, 2006).

The main idea of the Ecological domain is to ensure the diversity of all forms of life in the ecology is maintained. It generally means that the diversity is important for the mere existence and sustainability of all living mechanisms. The destruction of habitats of diverse living systems has reached an ominous proportion which is the root cause of potential extinction of certain species. For lasting stability and sustainability we have to maintain the biological diversity, enable regeneration capacity to harvest other species, reduce land grabbing etc. (Ben-Eli, 2006).

Societies can be compared with ecologies. It has inherent diversity which is a crucial component in longevity and health. This diversity should be respected for a balanced coexistence. On the other hand modern genetics indicated through human genome sequencing that the differences between different ethnic groups in insignificantly small, which undermine
the arguments of domination and inherent superiority of one group over the other. The idea of domination hampers the effective coexistence. In order to reinforce equality and peaceful existence we need to foster tolerance, establish universal rights, ensure democracy, access to equitable resources, outlaw war and trade in weapon technologies, include concepts of sustainability in all legislative frameworks (Ben-Eli, 2006).

It’s in human nature to consistently seek to surpass all limitations. This approach initiates the development and evolution of individuals and societies. It helps us identify the differences between power hungry, predatory orientation and shared, coexisted livelihood. This sense of spiritualism acts as one of the guiding force behind human actions based on mystery wisdom, love that links the outer reaches of the cosmos with the solar systems, planets and existing technologies. It is through inner transformation of individual and collective bodies that the elaborate ecology of the earth is fully understood and fostered. This domain evokes the focused integration of mind and heart in realization of the essential oneness at the center of being (Ben-Eli, 2006).

In summary, all five principles described above are interrelated and intertwined intricately. These build the foundation of sustainability. A complete understanding of these principles are necessary to grasp the true essence of sustainability, which otherwise is difficult to comprehend and thus almost impossible to implement in the society. In the next chapter I will examine the spatial fabric of the historic area (Ben-Eli, 2006).
In the preceding chapter, I talked about the definition of sustainability, the concept of sustainable development and the achievement of millennium development goals and principles of sustainability in Saudi Arabia. In this section I will introduce recent sustainable development projects in the historic area of Riyadh according to the categories of economic vitality, green spaces in the historic central city, urban public transportation, and historic buildings and monuments.
Economic Vitality

The economic vitality in the "Al-Dirah" area is in a delicate situation because the situation of the whole area is unclear. There are some economic vitality elements but they are not that sturdy. This is a result of the high percentage of the residents in the area who are foreigners, and the corresponding high percentage who are workers. However, there are indicators of economic movement in Al-Dirah district, especially in the northwest side and the south side. There are many commercial activities take place in Al-Dirah district, for example fabrics shops, furniture shops, shops for antiques and gifts, games shops and restaurants.

This economic activity is specific to Al-Dirah district, but in the historic Riyadh commercial center economic vitality has a better position due to the presence of many markets in the area. These are both historical markets and modern markets, for example Souq AlZal (AlZal market), Souk Tamir (Tamir market), Wshaiger Souq (Wshaiger market), Batha Market, Souika market, the Almaakulaih market and G-MART
Hypermarket. These markets significantly support commercial activity at the level of the city of Riyadh (Latoksa, 2011).

Figure 8. Temporary urban market in the Al Hokulm Justic Palace Area
Green Space in the Historic Central City

Figure 9. Salam Park (above) and King AbdulAziz Historic Center and park (below)

Clearly Al-Dirah district lacks on green space except on the west side. This is due to a barrier of trees that separates Al-Dirah district and the King Fahad road. As for the surrounding area there is interest to develop the green spaces to link to and develop parks like Salam Park, the KAHC Nations Park and Al Fotah Park. These parks are distributed in two locations in the north side and the south side of the Al-Dirah district. The historic district creates a separation between these landscaping elements which demands we link them to integrate sustainable development in the historic area.
Urban Transportation and Parking

Figure 10. Pedestrian and traffic congestion on Friday along the boundary streets in Al Batha district.

Urban transportation and parking are the two important factors that concern Riyadh’s urban planners and developers. This is because the high population density and poor types of transportation. What make this a problem is the limiting types of the transportation options which are the private cars, taxi cabs and private buses. The three options of transportation appear in the above picture which shows the pedestrian and traffic congestion on Friday along the boundary streets in Al Batha district. A new metro system plan is currently being implemented to provide rapid mass transit from the historic central city area to modern developments in Riyadh.
Figure 11. Plan of the Riyadh metro project
Historic Monuments and Buildings

The Masmak Fort

Figure 12. Exterior of Masmak Fort.

The Masmak Palace is located in the center of Riyadh. It was a fort constructed of local timbers and mud. The Masmak fort was built in 1895 and is located in the northeast corner of old Riyadh near the old fence, now called the Al-Dirah district. Nowadays, the Masmak Fort contains a museum that is specified to present the exhibits of the unification of the kingdom of Saudi Arabia by King Abdul Aziz Al Saud. In 1979 Riyadh Municipality undertook a renovation the Masmak Palace, and in 1995 the museum was established by the Ministry of Education and the High Commission for the Development of Arriyadh (Safari, 2010).
King Abdulaziz Historical Center (National Museum of Saudi Arabia)

Figure 13. The original palace of King Abdulalaziz.

King Abdulaziz Historical Center is one of the most important development project with the role of civilizational and cultural landmark in the capital of Saudi Arabia "Riyadh". The inauguration for the King Abdulaziz Historical Center was in January 1999, and the developer was the High Commission for the Development of Arriyadh. The total area for the center is 440,000 square meters, and the total area for the National Museum of Saudi Arabia is 17,000 square meters. The center include seven gardens, eight squares, King Abdul Aziz Mosque serve 4,200 prayers, Lecture Halls serve 500 people and more than 1,100 car parking spaces are provided. The museum consists of eight main exhibition halls arranged within a steady chronology. Moreover, the center include a branch of King Abdulaziz Public Library, Almuraba Palace, Red Palace, mud houses, Almdi mosque and the Water Tower (ADA, 2013).
Souq AlZal – The Carpet Market

Souq AlZal is one of the most important markets reflecting Riyadh’s interface of commercial and historical spaces. (Alyahya, 2012)

Figure 14. Souq AlZal Historic Photo (Courtesy of Arriyadh Development Authority)

The Souq AlZal has maintained its urban character after the High Commission for the Development of Arriyadh developed the urban level for the market. The development include pedestrian paths, shading, lighting, restoration of the facades of buildings and organize the parking lots. The improvements give the market life again while retaining the historic architectural styles. The total area of the market is 38,580 square meters and it has a variety of activities, for example Besht (a traditional gown for men), swords, unique antiques, carpet, men's clothing and shoes. The development in the market included the removal of dilapidated

Figure 15. Historic photo of the Riyadh Souk
mud buildings, reorganize the infrastructure, and projects to undertake the retiling, the lighting and organizing paintings, facades and ceilings in a uniform manner. The integration of the market with The Justice Palace area creates a distinctive architectural character. (Alyahya, 2012)

Justice Palace (Alhekm Palace)

Justice Palace is the center or the nucleus for the development projects that aims to redevelop the downtown of Riyadh. This is because of the high historical and cultural value of the Justice Palace. The total area for the Justice Palace is 11,500 square meters and the total areas of the palace buildings is 35,000 square meters. This design of the palace was inspired from the traditional features of the surrounding buildings area. Many international companies and major local companies participated in the design and construction of the palace. The most prominent participants in the project was the architect Rasem Badran. The Justice Palace area contain Al-Thumairi Gate, Souika Commercial Complex (260 commercial shop), Masmak Square, Justice Square and Imam Turki bin Abdullah Mosque. Moreover, the Justice Palace area contain Safat Square, Al-Dirah market, Almaakulaih Center and Souq AlZal the old city wall and historic gates. Also, it contain some of
the most important headquarters like the Headquarters of the Emirate of Riyadh, the Riyadh
Municipality, the police of the Riyadh region, the General Court, the headquarter of firefighters
Design Proposals for the Historic Al-Dirah

The High Commission for the Development of Riyadh and the Supreme Executive Committee of the projects and planning for the city of Riyadh continue to develop the historic area of Riyadh. The Al-Dirah district (that my project about it) is located between two important areas that they developed in the historical Riyadh. Currently there is a proposal to connect the two areas, which contains King Abdulaziz Historical Center and the Nations Park in the north side and the Justice Palace and Salam Park in the south side. This connection will be through Al-Dirah district.

This early proposal is to link and develop the area between the Adh Dhahirah street and Al Suwailim street, which is the center area for the Al-Dirah district by a corridor of development.

However, this proposal does not achieve all desired goals for the Al-Dirah district. The proposal does not achieve sustainable development of the historic areas with several points needing to be addressed. First point,
proposal divides the area into three areas (one developed area between two undeveloped areas). This dividing will help the north and south side elements but will not effectively revitalize or sustainably develop the Al-Dirah district. Also, the proposal develops just 20% from the total area for Al-Dirah district which will limit the impact of the development project. Also the project does not solve the problem of the west interface overlooking King Fahd road. (Ghawi, 2013)

The desired goal is to transform the whole area into a tourist area, a heritage area and integrated human environment, and vibrant commercial and residential area. The aim to create an integrated human environment is valuable and contains a range of activities (residential, commercial, investment and recreational activities). This will help to conservative the area and recovery an appropriate activities to the nature and history of the area. This requires the rehabilitation of historic buildings and preparing these buildings for reuse in the activities that preserve the historic identity and the elements that characterize the area. Also, providing some factors attracting the visitors such as establishment heritage hotels, heritage restaurants, coffee shops and heritage markets and shops devoted to the sale of traditional products and folk craft. In developing the area we need to encourage also the organizing of events and festivals to attract visitors into the Al-Dirah district and influence the revival of the area (Ghawi, 2013).

Second design proposal is by the Arriyadh Development Corporation who undertook the project studies with the design created by Urbis JHD Company. Thess companies are experts in several areas like property and retail economics, urban and strategic planning, consumer and market research, property investment and advisory, valuations, urban design and master planning, heritage planning, public policy and landscape architecture. Urbis JHD has created many similar complex projects, so Urbis JHD is one of the most qualified companies to do this mission. On other hand, Urbis JHD design proposal has what distinguishes it and what
There are several points distinguishes the Urbis JHD design proposal, with the most important of these the high density land use and mixed use. Notes from the design proposal suggest that there are more than one type of land use such as green spaces, offices, residential, commercial and mixed use. Also, there are more than one shape for the buildings in the design proposal. The plan combines high-rise towers, medium-rise buildings and the residential villas. The second point is the traffic shaping which noted in the design proposal is a significant change, adding new streets and expansion of the old streets. The third point is creating new gateways for area which will increase the connection between the site and the surrounding areas. In addition, this will allow the area to be a part of the surrounding development projects. The fourth point is the pedestrian connectivity in the middle of the design, this allow the movement of the pedestrian easily. The most important idea that distinguishes the Urbis JHD design proposal is the plaza over the Imam Turki bin Abdullah bin Mohammed road. This plaza creates a pedestrian link between the Al-Dirah district and the Justice Palace without confluence of pedestrians and vehicles. The last but not the least, the Urbis JHD design proposal creates a new identity for the whole area because the modern character dominates the design proposed. (Arriyadh Development Corporation, 2013)

On the other side there are several points disadvantage the Urbis JHD design proposal, and the most important of these points is the sustainability potentials in the area. Thus the main idea for my research, which is activating the role of sustainability to transition the are towards future redevelopment. Therefore, comparing the design proposal with the five principles of
sustainability will give us a clear vision about the design proposal by Urbis JHD. With regard to the material domain the system used in the Urbis JHD design proposal adversely affects the flow of natural and sustainable materials in the project. In regards to the economic domain the design proposal has changed the economic situation for the whole area. This is because economic activities were limited to a few activities. Many of the local shops will be removed. In regards to the domain of life the design proposal changes the behavior for the users and the level of life in the whole area. As for the social domain, it is the most dramatically affected point by the design proposal, because the people who live in this area in general are worker and low-income people. There is a need to introduce socio-economic mixing of classes of people to prevent the formation of slums. However the design proposal is mainly created for the middle income and the rich people, which will create a gap between the existing residents for social interactions. Also opportunities to expand education and training in the area are not activated in the proposal. With regard to the spiritual domain, the plan affects the social domain and variation levels of society. This will create some problems. The high density, and discrete towers will fill with employees who will work in the area but will not come into contact to the surrounding social cultural environment of the everyday spaces. On the other hand, the second point that disadvantages the Urbis JHD design proposal is the pedestrian scale is missing. This is because the proposal design does not contain pedestrian separate ways. The transportation planning has reduced the fine grain hierarchy of movement flows, concentrating on high volume, high speed pass throughs in the areas. These are difficult for pedestrians to cross. The third point that disadvantages the Urbis JHD design proposal is that the conservation of historic fabric is minimal. This is because the only thing that still exists from the historic district is the cemetery in the southeast side. There are many valuable mud buildings in good condition and concentration in specific parts of the
district that are worthy of intensive conservation. The fourth point is a more hierarchical redistribution of green spaces is needed throughout area. The plan only accommodates large open spaces, but does not create interest for families or recreational activities for a range of users. The green spaces are primarily stationed in the west side. The fifth point is the risk of towers creating silos with minimal urban fabric integration. This represents a problem for whole area. Last but not the least, there is imbalance in the design approach to the area evident in the massing of the buildings and absence of hardscaped open spaces. As for the social domain it is the most affected point by the design proposal, because the people who live in this area in general are worker and low-income people. However the design proposal created for the middle income and the rich people, which will create a gap between the two levels for social interactios.

Figure 18. Plan of the Al-Dirah Master Redevelopment Scheme 2013.
Figure 19. The western facade of the Al-Dirah Master Redevelopment scheme 2013.

Figure 20. Perspective of northwestside of the Al-Dirah Master Redevelopment scheme 2013
Spatial Analysis of the Area of Al-Dirah.

Now I will discuss the neighborhood morphology of the area of Al-Dirah in Riyadh’s historic city. The analysis includes; a space syntax study of the road network of the area, map of the distribution of green parks and current open spaces, map of unbuilt lands in the historic district.

In general there is a few of green spaces in Riyadh city, but the High Commission for the Development of Riyadh is undertaking a great effort to add more green spaces. The most important of these green spaces are Salam Park, the KAHC Nations Park and Al Fotah Park, which give to the Riyadh Downtown improved livability by add the green spaces and the water which is considered a valuable asset in a desert city like Riyadh. Therefore, the Nations Park, which is a part of King Abdulaziz Historical Center, is one of the most important projects in Riyadh. The park contain local plants and herbs that fit the region, and through these gardens
there is a network of paved walkways that allow the movement for the people through the gardens among the trees and shrub. On the other side of Al-Dirah district is Salam Park, with a total area of 312,000 square meters. The park contains a palace, a number of service buildings and a mosque which exceeds seventy year old. The park also contains several types of trees and the most important type of these trees are Palm trees because the Salam Park contain more than 1,000 Palm tree (ADA, 2013).

Figure 22. Area of analysis in the historic city
The site of the Al-Dirah district is bounded by Imam Faisal bin Turki bin Abdullah street from the north, Imam Turki bin Abdullah bin Mohammed street to the south, King Faisal Road from the east, and King Fahad Road to the west. Medium speed streets permeates Al-Dirah district with three streets, Al-Dahira Street, Al-Saweilim Street, and Al-Atayef Street. There are several places of interest in the Al-Dirah district beside the historic buildings. For example, there is an Al-Dirah Cemetery in the southeast part in the Al-Dirah district, and many interesting shops. Also, the Mena Grand Khalidia hotel is one of the places of interest in the Al-Dirah district, which located in the northeast part. On other hand, with regards to the land use we find two main types which are residential use and commercial use. Moreover, we have some uses but with a percentage not great like religion use, educational use and public uses. With regards to existing road network has a good shape, but we need to find a way increase its effectiveness and increase the flow of vehicular traffic. Access to a new metro station being constructed in the area will provide sustainable transportation to residents and future workers coming to the area.
In this section I will use spatial analysis methods to investigate how the new proposal adjusts urban movement structures at the local and global scales. Specifically, the al-Durah district will be analyzed in order to understand how the new planning of the spatial structure affects transportation networks across the urban fabric. Space Syntax theory suggests that by generating improvements in the connectivity and integration of urban areas, improvements and impacts will also occur in social life of the city. (Hillier, 2004) Space syntax methods are used to reveal the change in spatial morphology, primarily the issue of physical connectivity and integration in the spatial fabric. Research has shown that the critical thing about urban sub-areas is how their internal structures relate to the larger-scale system in which they are embedded.

Figure 23. Google Earth Image of Al-Dirah District in Riyadh.
Movement, for example, can be predicted from the axial analysis in which only the longest and fewest lines needed to cover the whole system form the line matrix (Hillier, 2004).

I am using space syntax software to generate an analyzed axial map (the longest and fewest lines that cover the street grid) of a small area around a hypothetical redevelopment site. Connectivity analysis of the urban fabric is facilitated by Depthmap software. This program examines the axial line, which is the longest straight line that can be constructed in any given urban space with unbroken visibility and accessibility. The graph displays the degree of integration in colors from dark to light. The choice of a radius-3 integration value has been shown to presents a localized picture of integration and in urban systems (Hillier, 2004). This has been found to be the best predictor of smaller-scale movement - that usually means pedestrian movement because pedestrian trips tend to be shorter and read the grid in a relatively localized. While global integration is significantly found to be the best predictor of larger-scale movement, including vehicular movement. This demonstrates patterns affecting people on longer trips in a more globalized way (Hillier, 2004).
Figure 24. Space syntax analysis of integration of bounded Al-Dirah district

Figure 25. Space Syntax Analysis of integration of unbounded district of Al-Dirah.
With regards to analysis the roads network in the Al-Dirah district, I chose special technique to do the analysis which is the space syntax study which cares by study the spatial configurations. This what I did to analysis the Al-Dirah district roads network, I did the Axial Line Analysis by using Depthmap program as shown in the diagrams below (Figures 23 and 24). The Axial Line analysis shows there are a small percentage of problems that affect on the connectivity inside the district. That cause by the frequent turns which leads to a closed road. The solution is simple for like this problems which is linking these road with each other.

Analysis of the case segment of the historic district of Riyadh using space syntax methods shows three clearly bounded areas divided by long streets shown in red. The form of street network in the historic city is a combination of small traditional dead end streets with limited passage width, and a connective street network that bridges different neighborhood areas in the district. Neighborhoods are bounded by longer busier streets. There is no unifying street that brings together the area as a whole.

After a precise look at the area I reached an preliminary map for the whole area shows the locations of vacant spaces and collapsed buildings. And, the vacant spaces shows in a black color and the collapsed buildings shows in a gray color. On other hand, the vacant lands and the collapsed buildings spread on the whole study area. However, there is a large proportion of these the vacant lands and the collapsed buildings located in the southern part and the center of the study area. Also, there are some of them in the eastern part which connect with the green space that separating between our site and the King Fahad road. What distinguishes the southern part is making easy the connectivity between our site and the development area that located in the south side. Also, What distinguishes the spreading of the vacant lands and the collapsed buildings in
the whole study area is the ability from the distribution of development projects on the whole area.

The vacant lands and collapsed buildings after clean them up that will provide a large percentage of open areas which will contains the sustainable development projects. As we can see in the diagram below (Figure 27) the open spaces that formed from clean up the collapsed buildings and the vacant lands which showed by the yellow color. also, in the global distribution for the open spaces inside the Al-Dirah district we can see the percentage the yellow color which represents the open spaces comparing with the black color which represents the rest area of the Al-Dirah district.

Figure 26. Map of fallen and demolished buildings in Al-Dirah
Figure 27. Map of open spaces in the Al-Dirah district.

Recommendations for Sustainable Improvements for the Al-Dirah District

This study aims to highlight the problems of Downtown Riyadh which afflict the city, special strategies to guidance the future development for Riyadh Downtown. That will give us the opportunity to avoid some of the expected problems in the future. The main objective of this study is to develop a policy and a general framework for the sustainable planning in a balanced and fair form for the land uses and the transportation system in Riyadh city in general. And, apply some of concepts in the study area in particular and develop some concepts and proposals that help to develop in this direction in the future. The areas that have been identified for sustainable design interventions are the following. These areas were chosen as the street network reflects the presence of a small local community center in the area. At an urban scale four strategies will be employed in the redevelopment of this district.
1) Focus of development on nodes – this strategy will create a design concept for commercial/social centers to attract visitors and provide economic visibility to local merchants.

2) Development of an exploratory pedestrian walking area within the district to showcase the traditional Najdi architecture in the old city of Riyadh,

3) Sustainable redevelopment of unused /vacant lands as small urban parks for residents and visitors;

4) Development of high density parking within the historic city to relieve the congestion of parked cars

Having considered the area and the sustainability give me a clear vision for the area. Moreover, this study seeks to achieve a number of other goals, including:

- Achieving sustainable of the built environment.
- Focus on the importance of preserving the environment and resources and reduce pollution.
- Work on the development of land use in the city and find out of related problems and find appropriate solutions.
- Identify problems related to transportation network and analyzed as congestion and pollution problems, parking and pedestrian problems and work on the development of such a network.
- Try to develop standards for designing external spaces and the movement of residents and visitors.

Addressing the five principles of sustainability that I have outlined in chapter one, the recommendations are as follows:

- The Material Domain
Most of the vacant and demolished areas are going to turn into open spaces. As we can see in the diagram below (Figure 28, the spread of the open spaces are represented in zones to be as centers. The open spaces and collapsed areas after clean them up that will provide centers which will contains the services. For example it will contains parks, parking garages and modern developments with historical design touch. The uses for the open spaces (the centers) includes several ideas like the food streets, gateways, recreation areas, play grounds and parks. The centers are connected by pedestrian paths with different levels. In the proposal, there are two major pedestrian paths that connect the east with the west and the north with the south to connect the whole site elements. Also, there are different minor pedestrian paths that branching from the two major pedestrian paths. And, the diagram below (Figure 28) shows two pedestrian direction levels, the open space gatherings and the pedestrian paths.
The Movement

With regard to the movement within the area, I will use the existing road network and the vacant and demolished buildings with modifications to achieve sustainability in the historic area. Therefore, we need to modify the existing road network and the vacant and demolished buildings by doing some actions. First we need to turn all the small roads (alleys) to pedestrian paths most the day time. And, we need to equip the pedestrian paths by trees, restaurants, exhibited articles, shops, etc. These will encourage the people to walking and biking in the area and will increase the flow of the pedestrian movement. Second, we need to create coaxial roads for the cars in the main three roads inside the Al-Dirah district which are Al-Dahira Street, Al-Saweilim Street and Al-Atayef Street. Third, we need to create roads
loop for the cars in the internal roads by turning the internal roads to be one way roads and without side parking.

![Network Diagram](image)

Figure 29 Plan of traffic and pedestrian movement hierarchy

Parking

With regard with parking in the site we will create parking garages in each center to meet the demand by the residents of the area and the utilization the open spaces. Also, the system that will be used in our site for the parking will be a new system that achieves the principles of sustainability. There are several systems that can be used on the Riyadh case, for example the Smart Parking which is a vertical rotating parking system. This system can help us to extend the
numbers of the parking lots in the area until eight times. In other words, we can extended parking lot can accommodate two cars to be accommodate 16 cars. (Gobiz, 2011)

Figure 30. Smart Parking

Figure 31. Example for covering the smart parking by different materials

Also, we can cover the parking by different ways to give it appropriate form, for example we can cover it to be look like a modern building or a historic modern as we want. Also, we can cover it by the solar power strips (solar cells) (Figure 31) to provide electricity for the smart parking and for the whole centers as shown in Figure 32 (NREL, 2013).
Food Street

This notion makes the area more active as a pedestrian street to connect the north side with the south side of the district. That is because in the north side and the south side of the site there are many elements and attractions for example King Abdul Aziz Historic Center, Salam Park and Qasr Al- Hokm area. In addition several markets like Maaklia Mall, Alzal Market, G-MART Hypermarket, Batha Shopping Center, Suwaiqa Market, Al Tameer Wholsales Centre and Almaiqilh Market. Since the site located amid this assembly of development projects that makes our mission to transform the whole area from an undeveloped area to development area. Also, we can transform the site to be a hub for the attractions elements. The food street will work to take advantage from the high value of the historic buildings in the area. That will happen by transform the historic buildings from regular historic buildings to useable buildings. The food street will include many sections the most important of these sections are shops to sell food, popular market for the sale of historical materials and section of historical hotels and apartments. These sections have been proposed to possess the ability to transform the area to the better. The street food and the shops for sell food a new idea for the Saudi people but we can see it some countries like The Food Street in Lahore- Pakistan.
CHAPTER FIVE

Conclusion

After having considered the area and the options for its redevelopment, it is clear that sustainability must be considered one of the best solutions nowadays to lead the development forward. Therefore we need to add a new principles to develop the historic city of Riyadh. These principles should to provide all what the district need continuously. Therefore, developing strategies to add clean energy and green technologies to the historical area in turn will conserve the existing settlements to mitigate the increase in developments that negatively affect the historic value of the area. Clean energy and green technologies will conserve the related ecological footprint as well. By taking advantage of the characteristics of the area without harming natural resources is important. For example utilizing the solar radiation and wind to provide locally used energy.

The present research focused on how the historical City of Riyadh and specifically the Al-Dirah district may transition to become a sustainable district. The aim was to develop the area by targeted actions that add many of green areas, link the development elements in the surrounding area through Al-Dirah district, and solve the transportation, traffic and parking problems of the district. This thesis has presented a few of the many of the ideas that will transfer the historic city areas towards a developed and sustainable city.
Summary of Study Results

The study results have different forms because the study is a flexible study and multiple options for development are possible. This because of the sustainability, which give you multiple options to address your problems. In this thesis I tried to chose some of these options to add into Al-Dirah district without harming its high historical value. The most important ideas that I chose are the Smart Parking, the opportunity to create vibrant centers inside Al-Dirah district, and traffic shaping to solve the road network problems. The Smart parking is an idea that enables the multiplication of the numbers of cars parking in small footprint. For example we can park 16 cars in an area fit for just two cars. At the same time the parking solution generates electricity when we cover these smart parking with solar power strips. With regard to creating centers inside the Al-Dirah district, I have choosen a strategy to to replace the vacant land and the demolished buildings areas by green open spaces, the smart parking and other public services. The same thing I did to the road network, I decided to use the existing road network with some directional regulation. This is will result in the improvement of the movement inside the site for pedestrians and for the cars.

Future Recommendations

The subject of the case is so wide to cover in one research paper but I have aimed to do the best to deliver sustainable ideas to develop my country and the capital city of Riyadh. Therefore, the future recommendations are important to complete the development way. When I analyzed the Urbis JHD design proposal a number of challenges became apparent in my opinion that affect on the historic district. For example, the scale of the road network in the Urbis JHD design proposal. There is a huge shift between the existing road network and the the Urbis JHD design proposal road network (as shown in the figures 17 & 24 & 27). The existing road network
has a gradation in the levels of the streets (Figure 25). The proposal that I present utilizes the existing road network with classification for the streets (Figure 28). We have three different levels of roads which are the pedestrian road, low traffic road and high traffic road. On other side, the Urbis JHD design proposal road network has a different position because just one kind of roads which is the high traffic roads (Figure 18), and this makes it difficult for pedestrian traffic in the area. The Urbis JHD design proposal also is a poor solution for the transition between history and modern condition. This is because there is nothing in it about the historical value. As this is the center of the capital city and in which the kingdom of Saudi Arabia is formed, it is essential that the memory of these spaces be preserved for future generations. The loss of this memory will occur with the demolition of everything even if it a historic building or a new building. In the new design proposals there is nothing that highlights the historic value of the existing urban fabric. However, in my proposal I respected the historical value and I built my proposal on this point. Therefore, you can find in my proposal a developed historic district which has the development and modernity while at the same time has high value of historical style. In essence I present a transitional strategy towards modern redevelopment of the area.

What Needs to be Addressed by Citizens, Developers and the City Government.

To ensure the success of any public project we need to work in cooperation among the three parts of the society which are the citizens, developers and the city government. We need many things be addressed to help the Al-Dirah district to return again to life. Therefor, if we want to get this cooperation we need from each one of them something to do. We need from citizens to comeback to live the area which will help to achive the heritage conservation. With regard to the developers we need from them projects that help the area with conserve the high value of the historic area. Also, we need more jobs to atract more people to come to work and
live there. On other hand, we need from the city government two main things which are help the developers to work in the area by creating a partnership between the private and public sector. Second thing is develop the historic district in order to conserve the historic buildings, not develop the area and remove the whole historical value in the area as proposed the Urbis JHD design proposal.

What are the Priorities for Development

The priorities for development are many but there are two main priorities I consider it as the most important priorities for development. First priority is develop the society which I consider it number one in my priorities because if we develop the society every thing would developed. This is because everything in life geared to serve the society. The second priority is develop the surrounding area which constitute the environment that the society live. And, when we develop the the surrounding area that will reflected on the society which will improve the life style and the productivity of the society. Therefore, we need to try to care of all the parties and try to do not to neglect any part. These because parties of our life are connected to each other.

Directions for Further Study.

The study is a river inexhaustible which means it is always come after a study another study. Therefore, we need to directions for further study in a specific points that we discovered that we need to know about it when we were writing first study. The study of Al-Dirah district case and the historic district of Riyadh they important subjects need more than a study to cover it. Therefore, we need to highlight tje problems we need to address. That which I did not talked about it in this thesis or some points were addressed need more research in the future to be solved sustainably. In the subject of Al-Dirah district case and the historic district of Riyadh we
need to highlight on some points include: the security situation in the Al-Dirah district and the difference between situation before and after the development projects. The social situation in the Al-Dirah district is also fragile requiring efforts to retain existing Saudi residents and bring new Saudi Arabian families into the area. The social and the security are two important points that pose a problem in the existing situation. The second point that I suggest for directions for further study is a study on the Public Transport system and its impact on the area after my proposal. This is because the main station of the Metro of Riyadh will be located next to our district which will have a direct impact on our site.

May Allah, help the government of Kingdom of Saudi Arabia to lead the kingdoms sustainable development, and become one of the leaders in the world. May Allah, help King Abdullah Bin abdulaziz for the good of Islam and Muslims. May Allah, guide Prince Salman and the governor of Riyadh the Prince Khalid bin Bandar bin Abdulaziz to develop the capital Riyadh today and for future generations.
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