Doctoral Thesis

Design Method for Contemporary Neighborhood and Architecture in Saudi Arabian Society and Environment

（サウジアラビアの社会・環境における現代的住区と建築の設計手法に関する研究）

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SUMMARY

The research highlights the issues of planned neighborhoods in Saudi Arabia. Nowadays, in the urbanization process, planned neighborhoods in Saudi Arabia are sprawling rapidly in parallel with decreasing the informal settlements that were grown as a result of lacking of a city structure plans. It this research, I hypothesized that the unsuitability and unreality of residential building design standards, street related standards, and open spaces related standards to the Saudi Arabian society and environment have resulted decreasing the usage of open spaces in planned neighborhoods. In addition, a low population density in villa-type neighborhoods that were set up via city structure plan, and residential lot minimum area standards were the main factors behind housing shortage the city has been experiencing. If the growth and expansion of planned neighborhoods would continue without taking into consideration the economic factors, spatial factors, open spaces, and user's activities factors, more unneeded open spaces and increasing in housing shortage would be practiced in the future. Based on that, three sub-hypotheses are developed.

1) The conflict between the lifestyle and residential building standards, and street-related standards have created an adverse effect on the walkability in planned neighborhoods.

2) The minimum standards for the villa-type lot are the primary factors in the housing shortage crisis nowadays.

3) The WHO recommendation area for parks per person is unsuitable for the Saudi Arabian society and environment.

Based on that, the research aims to clarify a design method for contemporary neighborhood and architecture that is suitable and fits the Saudi Arabian society and environment. To achieve this aim, the dissertation has five main objectives:

1) To make arrangement for the population growth of the regions and governorates, administrative division, the concentration of population in important governorates, characteristics of residential areas and housing in Saudi Arabia, and population growth and urbanization for important cities in Saudi Arabia (chapter two);

2) To make arrangement for historical transition, chronological urban growth, housing shortage, and future demand of Jeddah City. Afterward, make arrangements for the transition of a) residential areas-related standards, b) open spaces-related standards, c) decision-making flow, d) structure plans, and e) urbanized area (chapter two);
3) To clarify the trend and diversification of villa-type neighborhoods in Jeddah, housing shortage problem and related factors, population density in residential districts, villa-type neighborhood patterns, and methods to decrease the vacant lots in these neighborhoods (chapter three);
4) To make spatial configuration arrangements in design standards and open spaces, including streets in planned neighborhoods. Define the combinations of patterns in the spatial configuration of streets and residential buildings. To clarify street use characteristics, based on the spatial configuration patterns and to identify issues for existing streets and suggest future neighborhood planning issues for Jeddah City (Chapter Four); and
5) To clarify the pattern of open spaces in planned neighborhoods, the frequency of use, and the users' activities throughout the year (Chapter Five).

To accomplish the above objectives, the research will consist of six chapters as follows:
Chapter One explains the research background, objectives, hypotheses, and questions. It also outlines the research methodology, its significance, and the expected outputs.

Chapter Two makes up the beginning of the research work and is presented in three sections. The first section is an overview of the geographic, historic, economic, and social characteristics of Saudi Arabia. The second section outlines the historic population growth, the annual population growth rate, and the characteristics of the important cities in Saudi Arabia. The third section analyzes the profile, the chronological growth, and the characteristics of a residential area in Jeddah City. In addition to that, the section makes an arrangement of the changing city growth, physical plan, vision plan, decision-making in both the national and local levels, the role of the private sector, the residential areas that have related standards and organizations, the housing crisis, including its shortage, the future projected demand and finally, the population growth, in addition to the projected population.

This chapter summarizes that 1) the internal immigration from small cities to main important cities is notable in Saudi Arabia, which causes pressure on these cities, which is reflected in the rapid city growth. 2) The typography plays an important role in the type of housing in each governorate, as is notable by the increase of traditional housing in the western part of Saudi Arabia, where the Al-Sarawat mountain chain crosses Saudi Arabia from the southern to the northern part. 3) In parallel with the movement of the internal immigration the country is facing, the population is projected to increase till 2080 to approximately 48,720,000 people, which is a strong indication that more pressure is predicted for these main cities. 4) Based on a religious, conservative, traditional, and family oriented background society, the most likable and favorable type of housing is villa type housing (detached housing), where Saudi Arabians can find their privacy protected in this type of housing.

From the above summary, it is clear to say that, 5) Jeddah City is characterized by its historical background in Saudi Arabia due to its location that is close to the most important religious cities of Makkah and Madinah city, and that it is struggling with a problem of a low amount of the likable villa type housing. 6) In addition, Jeddah City is facing a high rate of shortage in housing, which is reflected in the actions that have been taken in changing, several times, the design standards in residential buildings as an initiative to fulfill this shortage. Moreover, the city is putting a lot of effort in responding to this shortage by conducting new housing projects that can be owned by a long-term loan for Saudis. 7) Indeed, the city is unusually experiencing a movement of owning apartment units instead of villas, and this is because of the high prices of villas. Villas have become difficult to own, especially in the low- and middle-income class. 8) From the above, it is clear to say that there is a need to take Jeddah City as a case study for this research as a) it is the most traditional city in the country, b) it is located along the Red Sea and is close to the most religious cities, and it is the second most important city, economically and commercially, next to the capital, c) Although it has the largest urbanized area in Saudi Arabia, it is experiencing housing shortage.

From the above, it can be concluded that it is necessary to:

1) Clarify the reasons behind the low ratio of villa type neighborhood and its relation to housing shortage (planning level).

2) Reevaluate the residential and street related standards (architectural level).
3) Clarify to what extent the open spaces in a neighborhood are suitable to the society (open space level).

Chapter three describes and makes an arrangement of the prime factors that resulted in the housing shortage. Then it makes arrangement for the regulation that must be complied with in the process of a new residential development in Saudi Arabia, the so-called Procedure Manual for the Preparation of Residential Land Subdivision. Then it draws a villa type pattern (based on analyzing 103 locations in Jeddah City). Then it analyzes all locations via regression analysis, cluster analysis, and principal component analysis. This study was applied to all villa type neighborhoods (total of 103 locations). Via several surveys as mentioned in chapter three followed by several analyses from correlation analysis, multi-regression analysis, to cluster analysis, it was clarified that a combination of 6 criteria (out of 27) have a correlation in the growth of villa type neighborhoods in Jeddah City. These are 1) Ratio of vacant lot (net), 2) ratio of villa lots that range between 300m2 and 400m2, 3) ratio of villa lots that range between 1,000m^2 and 1,400m^2, 4) average of land price, 5) total area of vacant lot, and 6) distance between a mosque and a park, the total length of roads. Via cluster analysis, the 103 were grouped into six groups, with a different suggestion and recommendation for each group. From the above, it was concluded that the villa-type neighborhood contributes in today's housing shortage problem via four factors: 1) residential new development law and standards, 2) villa lot area, 3) street total area, and 4) land price.

Chapter four attempts to make spatial configuration arrangements in design standards and open spaces, including streets in planned neighborhoods. Define the combinations of patterns in the spatial configuration of streets and residential buildings. Clarify street use characteristics based on the spatial configuration patterns; identify issues for existing streets; and suggest future neighborhood planning issues for Jeddah City. It was clarified that the Jeddah City pedestrian environment is influenced by three main factors:
1) the mismatch of design standard dimensions with the reality, 2) motor vehicle-oriented neighborhood planning, and 3) using sidewalks for semiprivate purposes, which originate from the historical and cultural background of the city. It is necessary to consider these three factors in planning future pedestrian-oriented neighborhoods in Jeddah City. 1) This

chapter emphasizes a periodical revising for the spatial configuration related design standards such as residential building floor limitation, setback area, sidewalk, and street composition to be after examining the previous design standards on the real world, taking into consideration the factor of safety between motorization and pedestrianization. 2) Set up a new article to clarify the extent of the use of the sidewalk space in the villa-type neighborhood. Create a design guideline for sidewalk space to be maintained and managed under the authority of the local government.

Chapter Five arranges the residential hierarchies and open spaces system in Saudi Arabia. Then, it analyzes the usage of open spaces and the frequency of use in a villa-type neighborhood and an apartment-type neighborhood three times a year (the month of Ramadan, winter, and summer). Two case studies were conducted: an apartment-type neighborhood and a villa-type neighborhood, in Jeddah City, within three seasons throughout the year.

The key findings from the survey in the villa-type neighborhood are as follows:

In Ramadan season, 1) the sidewalk users annoy the pedestrians and the mosque-goers, 2) football teams use the vacant lots for playing, 3) the majority of open-space users use the spaces from 21:00 until approximately 02:00, 4) the parents of 4- to 15-year-old children do not allow them to use the parks because the adults use the sidewalk until late in the evening, and 5) only two parks, out of 8, were used throughout the survey period.

Regarding winter season, only three main parks were used, and the children between 4-15 appeared with their parents in these parks between 16:30 till 18:00. Some park users usually come every weekend to a barbeque from a distant neighborhood 5 kilometers away. Sidewalk users appear on time between 18:00 and 22:00.

In summer, despite the hot weather, the open space was more active than winter; this was due to an increase in the number of joggers along streets, and the playground users.

Moreover, the key findings from the survey in the apartment-type neighborhoods are as follows:

In Ramadan season, using the only playground in the neighborhood by the adult (age between 14-29) made some of children (age between 4-15) to 1) use the front of mosque

space for gathering, which annoyed the prayers in mosque. 2) and some of them use the parking area of some mosques as a football playground.
In winter, the most frequently used open spaces are vacant lots, and sidewalks. The vacant lots were used by football team player between 16:00 and 18:00. Sidewalks were frequently used in two ways. 1) Sidewalks that surrounded vacant lots were used by joggers as the sidewalks along inner streets in neighborhood were not available. 2) Sidewalks that were isolated (usually located at the edge of the neighborhood) were used by adults (age between 15-29) for gathering, smoking, and playing card games.
The usage of open spaces *in the summer* season is similar to the winter season, with a noticeable increase in the park users (children) during the time between 16:00 and 19:00.

From the above, it was concluded that the factors that play an important role in the increased attractiveness of open spaces (including parks, path for jogging, etc.) are different between the villa type and apartment type neighborhood with regard to both the site planning and design levels. For instance, parks are the most used open space in a villa type neighborhood; however, some certain factors cause these parks to be used frequently, such as their location (center of the neighborhood), scale (more than 0.7 hectare), setting (the so-called quality), openness, and a place to gather with friends. In contrast, three types of open spaces are the most frequently used in an apartment type neighborhood: parks, football playgrounds (vacant lot), and sidewalks (as a jogging path). The parks users do not mind regarding the location and the scale of the parks; however, they consider distance to their houses as an important factor, which is reflected in the number of parks. Regarding the football players, the location of "a vacant lot" is important as they prefer to be isolated so that they do not bother the residents. Finally, joggers (women) prefer to be isolated in another "continued Sidewalk" due to the factor of privacy.

Finally, *Chapter Six* concludes the dissertation by discussing its key findings and its contribution to the existing literature, particularly the planned neighborhoods, and the growth and sprawl in Jeddah City and its adverse effect on the housing shortage. It also concludes the dissertation proposal for the design method for the existing and future planned contemporary neighborhoods and architecture in the Saudi Arabian society and environment. In addition to that, it suggests a recommendation for a future topic regarding planned neighborhoods and architecture.

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Chapter One
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Chapter One

Introduction

1.1 Background and Problem Statement

Without controversy, it is known that urban growth is a continues process for responding to population growth in both developed and developing countries. In 1950, more than two-third of people worldwide lived in rural settlements; however, in 2014, 54 percent of the world's population was urban. Moreover, it is expected that by 2050, the world will be one-third rural and two-thirds urban (approximately 66%), 90 per cent of the increase concentrated in Asia and Africa (United Nations, Department of Economic and Social Affairs, 2015, p.7).

The high rate of population growth that Asia has been experiencing (53 per cent of world's total population) makes its urban area increase rapidly, from 32 per cent of a proportion of urban in 1990, 48 per cent in 2014, to 64 per cent as an expected proportion in 2050. With 1.5 per cent as an average annual rate of change between 2010-2015 (United Nations, Department of Economic and Social Affairs, 2015, p.21).

A review of literature shows that several models have been raised up to respond to the increasing of urban settlements. For instance, "Garden City" which is one of an urban method that was initiated by Sir Ebenezer Howard in 1898. It is self-contained communities surrounded by greenbelts, containing proportionate areas of residences, industry, and agriculture. "Neighborhood Unit" which was initiated by Clarence Perry in 1929 as part of the regional plan of New York. The enduring parts of the diagram include

its quarter-mile "pedestrian shed," its ideal size of 160 acres, a neighborhood center surrounded by civic buildings, clearly delimited edges, commercial uses at the edge, a network of narrow street, small walk to parks throughout, and the population needed to support an elementary school (Douglas, F, 2008, p.125). "An Urban Neighborhood: DPZ" which was an update of the previous Neighborhood Unit, in 1980 the Duany Plater-Zybrek (DPZ) initiated it. "Sustainable Urbanist Neighborhood" which was initiated in 2008 by Doug Farr, Leslie Oberholtzer and Christian Schaller based on the previous two models (Douglas, F, 2008, p.126).

Furthermore, in the process of increasing urban settlements, several terminologies have been raised up such as "Urban Growth" which used when cities and suburbs experience a growth in the population. "Urban Sprawl" which is known as "Suburb Sprawl". Which is a spreading out horizontally through sprawl instead of urban agglomeration (Donald, Alan and Robert, 2001, p.1.1-6). "Smart Growth" has its roots in the environmental movement of the 1970s. "*Smart growth means building urban, suburban and rural communities with housing and transportation choices near jobs, shops and schools" (Smart Growth America, 2016). "Urban Growth Boundary (UGB)"* is a boundary to control the sprawl of a city and beyond the boundary land development is not permitted (Douglas, F, 2008, p.29). As it is expected that by 2050, 70 per cent of the world's population will live in urban which will have an environmental and economic impacts, so that *"Compact City"* which is characterized by a dense and proximate development patterns, urban areas linked by public transport system, and accessibility to local service and job (OECD, 2016)

In the process of urban growth, Kingdom of Saudi Arabia (Fig. 1-1) the largest country in western Asia with an approximate total area of 2,000,000 km^2 (Saudi Geological Survey, 2012, p.28) is facing urban growth challenges to respond to the increasing of population that was estimated in 2010 by 27,136,977 people (Central Department of Statics & Information, 2010) with an annual population growth rate of 1.9 per cent between 2010 and 2015 (United Nation Data, 2016). This was reflected on increasing the urban settlement ratio to became in the year 2000 as 80 per cent of total built-up area and decreasing the rural settlement to became 20 per cent (United Nations, 2014).

Fig. 1-1 Saudi Arabia Location (Google Maps, 2016)

Based on 1) the basic four concepts of living environment that were summarized by World Health Organization in the first report of Expert Committee on the Public Health Aspects of Housing,1961, p.17, which are ***safety***, ***health***, ***convenience***, and ***comfort***. (fig. 1-2) And 2) Results of Urban Indicators for Jeddah Governorate Report (RUIJGR) that was issued by Jeddah Municipality in 2010, which summarized that main three problems the planned neighborhoods are facing which are the ***housing shortage***, ***lacking of safety between pedestrianization and motorization***, ***Unsuitable open spaces*** (Fig.1-2). By taken the factors of 1) and 2) into consideration as a base, the research summarized the research main problems as following. 1) The trend of city growth and the diversification of residential type neighborhoods in growing cities and its effect on housing shortage problem that Saudi Arabia has been experiencing (Convenience Factor). 2) The conflict between motorization and pedestrianization and its effect on the pedestrian causality rate, and finally (Safety Factor) 3) open spaces related standards and its effect on the usage and frequency of use of open spaces (Health and Comfort Factors).

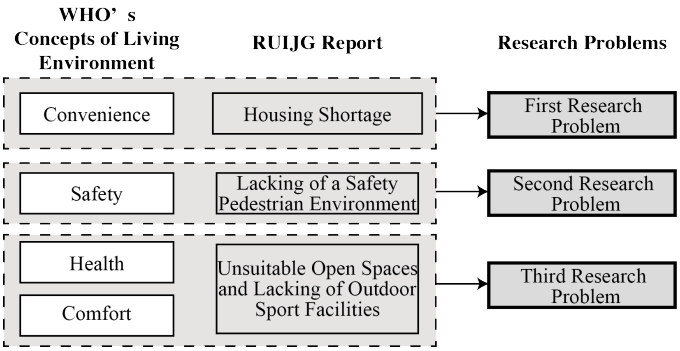


Fig. 1-2 The Backgrounds of Each Research Problem

The backgrounds behind the above mentioned were as following (Fig. 1-3, 1-4, and 1-5): Although Saudi Arabia has a huge land of area with a strong economy, and the availability of vacant lots within urban growth boundary, Saudi Arabia has been facing a housing shortage problem and this problem is will be exacerbated especially with population increase. **The first problem** was occurred mainly due to 1) the limitation of villa type neighborhood for high income resident and this was resulted from the minimum lot area ($300m^2$) standards that was enacted by the MOMRA, and 2) the tax free system for vacant lot has resulted reluctance of owner of vacant lots in selling them.

The second problem was appeared due to 1) the conflict between street related standards and the movement of predestines, and 2) the conflict between building standards and the car ratio of car ownership per household.

The third problem was resulted from attempting to apply the World Health Organization (WHO) parks recommendation area per person (8 m^2 per person) without taking into consideration the culture aspect, and climate aspect.

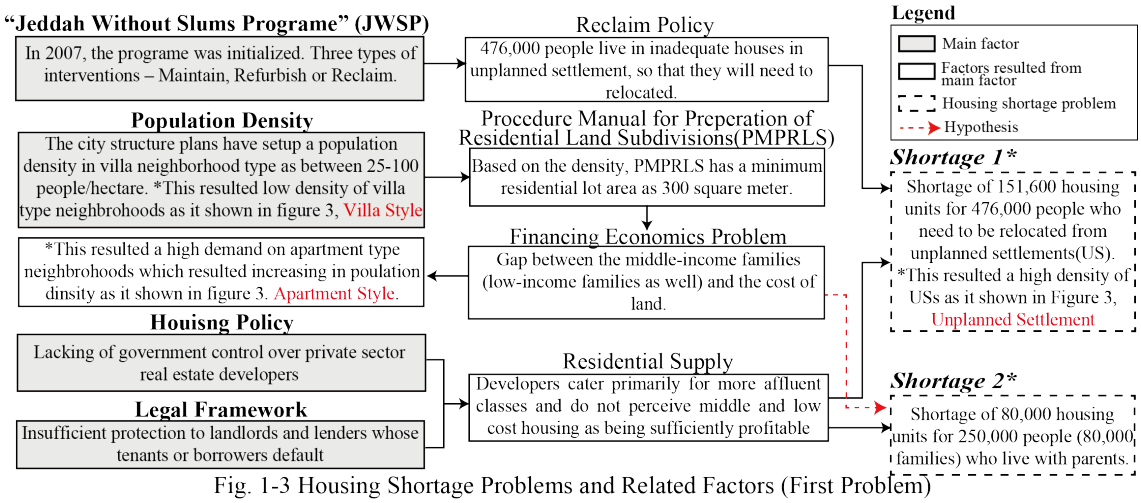


Fig. 1-3 Housing Shortage Problems and Related Factors (First Problem)

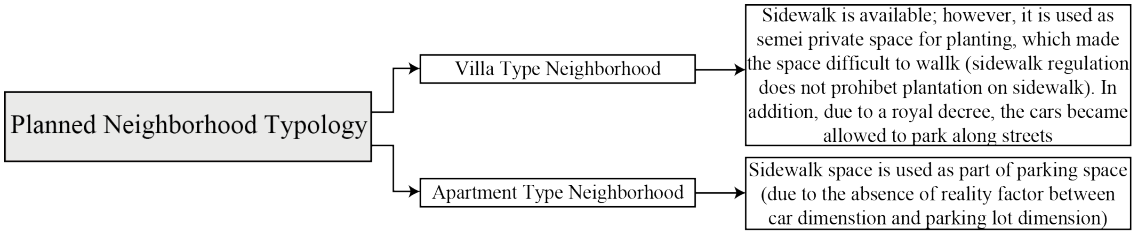


Fig. 1-4 Pedestrian Environment Issues in Planned Neighborhood and related Factors (Second Problem)

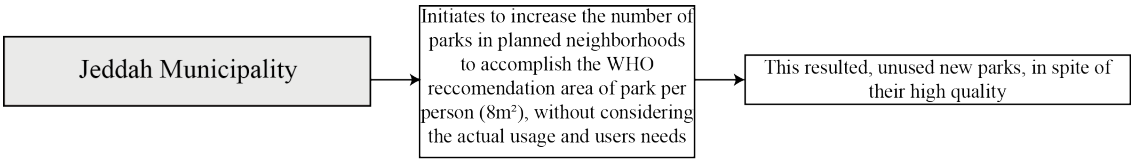


Fig. 1-5 Open Space Issues in Planned Neighborhood and related Factors (Third Problem)

1.2 Research Objectives

As planned neighborhoods have been expanding with several problems as mentioned above, this dissertation aims to clarify a design method for contemporary neighborhood and architecture that suitable and fits to Saudi Arabian society and environment for 1) the existing residential planned neighborhood, and 2) future residential planned neighborhoods. To achieve this aim, the dissertation has five main objectives:

1) To make arrangement for the population growth of the regions and governorates, administrative division, the concentration of population in important governorates, characteristic of residential areas and housing in Saudi Arabia, population growth and urbanization for important cities in Saudi Arabia (Chapter Two).

2) To make arrangement for historical transition, chronological urban growth, housing shortage and future demand of Jeddah City. Afterword, make arrangement for the transition of 1) residential areas related standards, 2) open spaces related standards, 3) decision making flow, 4) structure plans, and 5) urbanized area (Chapter Two).

3) To make arrangement for the amount of housing shortage and related factors, projected demand, population density and its transition in all districts of Jeddah City, and to clarify to what extend all villa type neighborhoods could be a part of solving housing shortage problem and to propose a solution for each pattern of villa type neighborhood to decrease the ratio of vacant lot (Chapter Three).

4) To make spatial configuration arrangements in design standards and open spaces, including streets in planned neighborhoods. Define the combinations of patterns in the spatial configuration of streets and residential buildings. Clarify street use characteristics based on the spatial configuration patterns; identify issues for existing streets; and suggest future neighborhood planning issues for Jeddah City (Chapter Four).

5) To clarify the pattern of open spaces in planned neighborhoods, frequency of use, user's activities through whole year, and to propose a solution regarding the unused open spaces in both villa type and apartment type neighborhoods and policy to avoid these to happen in the future planned neighborhood (Chapter five).

1.3 Research Scope

In Saudi Arabia residential areas are divided into planned and unplanned settlement. The central government of Saudi Arabia is attempting to decrease the area of unplanned settlements by moving out the occupants to new planned neighborhoods. Which has led

this research to deal with the existing planned neighborhoods to solve the existing problems and avoiding them in the future planned neighborhoods by create a new design method for "Contemporary Neighborhood and Architecture" in Saudi Arabia (Fig. 1-6).

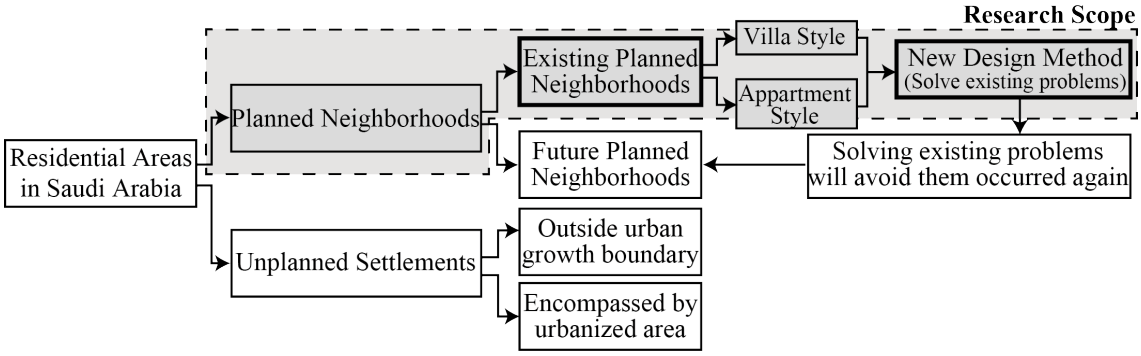


Fig. 1-6 Research Scope

In Saudi Arabia, using the concept of vernacular architecture in modern planned neighborhood is difficult due to today's architecture standards. For instance, in Jeddah City, which is the second important city in Saudi Arabia, traditional housing does not consist a fence that surround the house; however, in today's villa type neighborhood, building a fence that surround a villa is an obligation due to the safety factor.

1.4 Research Hypothesis and Question

Uma Sekaran (2013) defined hypothesis as a logically conjectured relationship between two or more variables expressed in the form of a testable statement. Based on the above-mentioned problem statement, and the factors and variables that have interrelationship with it, the dissertation adopts the main hypothesis as shown below:

The unsuitability and unreality of residential building design standards, street related standards, and open spaces related standards to the Saudi Arabian society and environment have resulted decreasing the usage of open spaces in planned neighborhoods. In addition, a low population density in villa type neighborhoods that was set up via city structure plan, and residential lot minimum area standards were the main factors behind housing shortage the city has been experiencing. If the growth and expand of planned neighborhood would continue without taken into consideration the spatial factors, economic factors, and open spaces user's activities factors, more unneeded open spaces and increasing in housing shortage would be practiced in the future. Based on that, three sub-hypotheses are developed.

1) The minimum standards for the villa type lot is the primary factors in nowadays housing shortage problem.
2) The conflict between the life style and residential building standards, and street related standards have created an adverse effect on the walkability of in planned neighborhoods.
3) The WHO recommendation area for parks per person is unsuitable for Saudi Arabian society and environment.

To test these hypothesis, the dissertation tries to respond to the following questions.
1) What is the characteristics of the residential districts in the important cities of Saudi Arabia? And what is ratio of population of regions are concentrated in these cities?
2) what are the types of buildings related standards, street related standards, and open spaces related standards and have these standards been revised?
3) Are there any adverse effects from the residential building standards, or street related standards to the pedestrianization in villa type and apartment type neighborhoods?
4) Are the sidewalks within the all planned neighborhoods used by pedestrian? If not, what they are used for?
5) What is the amount of housing shortage has Jeddah City been experiencing? And what is the amount of projected demand. And what is the ratio of the shortage amount for the low and middle income people?
6) What is the residential building type that expected to increase in planned neighborhoods for the future urban sprawl? And if the growth continuous in the same trend (sequence), to what extend will respond to the housing shortage?
7) How far today's villa type neighborhoods are responding to the demands of low and medium income people?
8) To what extent today's parks in planned neighborhoods are effectively used? And are there other undefined-yet open spaces are used?
9) Are today's parks system effective in the summer, winter, and the holy month of Ramadan (as the life style in Ramadan is changed)? What is the frequency of use of open spaces?
10) Is the park area that was recommended by the World Health Organization (WHO) suitable for Saudi Arabian society and environment?

1.5 Research Methodology

1.5.1 Approaches and Methods

In researches, two broad methods of reasoning are used as the ***deductive*** and ***inductive*** approaches (Trochim, 2006). Deductive reasoning works from the more general to the more specific. Sometimes this is informally called “top-down” approach. It begins with a theory then narrow that down into more specific hypotheses. Then with an observation the result will make a confirmation (or not) of the original theory. Inductive reasoning works from specific observations to broader generalizations and theories. Informally, it is called a "bottom up" approach (Trochim, 2006). This desecration uses the two approaches combine with the qualitative quantitative research methods (Fig.1-7 and 1-8).

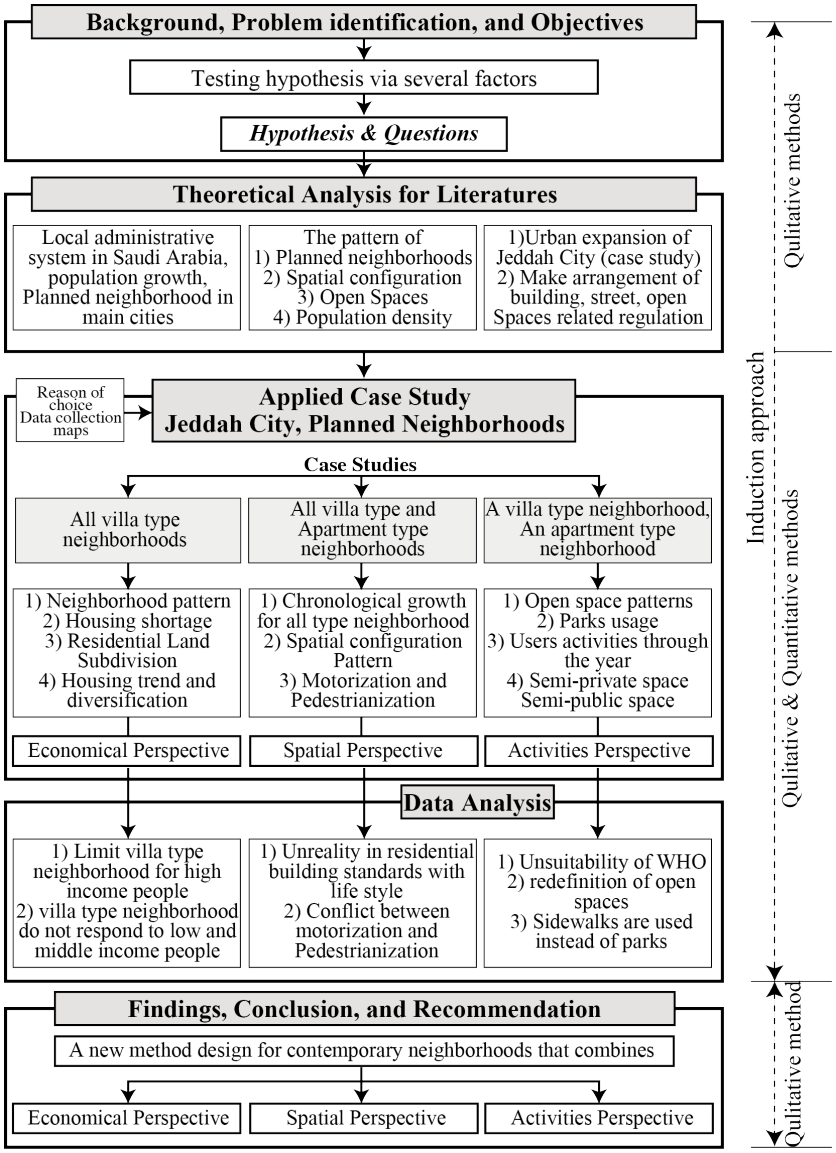


Fig. 1-7 Conceptual Diagram for Research Approaches and Methods

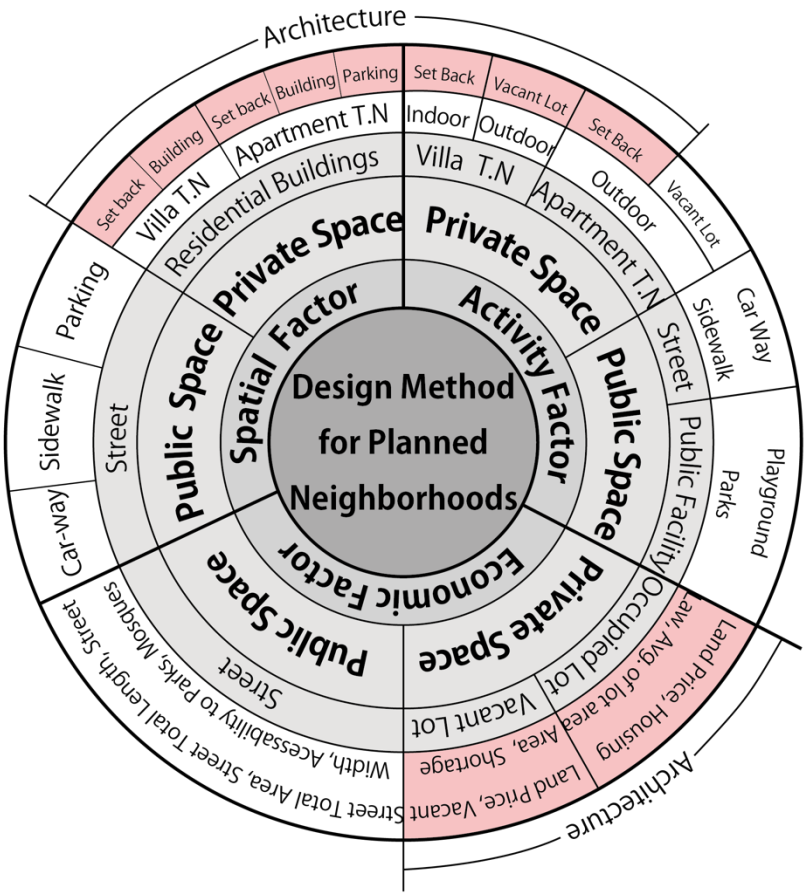


Fig. 1-8 Conceptual Diagram Shows the Content of Analysis of Design Method in Planned Neighborhoods from Neighborhood, Street, to Architecture level

Note: T.N (Type Neighborhood)

1.5.2 Site Selection

As this research deals with planned neighborhoods, Jeddah city was selected for the following reasons (Fig. 1-9):

1) Jeddah city is the second important city in Saudi Arabia from a cultural and economic perspective.

2) The city has an important position in Saudi Arabia, partly based on its origin 2,500 years ago as the oldest fishing settlement in the region and its location on the shore of the Red Sea. This has made the city being used as a gate city for pilgrims for the holy city Makkah since Khalif Ottoman period.

3) The city has been experiencing housing shortage since 1992 with an amount of 238,000 units, in addition to a high amount projected demands which is 668,000 units that must be provided by the year 2029.

4) As shown in table 1-1 that although Jeddah is the second city in population, the city has the largest urban area in the kingdom, which is an indication to an insufficient control in urban sprawl system.

Fig. 1-9 Map of Saudi Arabia shows main cities (right), including the Jeddah Governorate area (left)
(source: Ministry of Economy and Planning, Central department of Statistics and Information, 2004)
(Redrawn by the author)

Table 1-1 Profile of Main Important and Growing Cities in Saudi Arabia
Source of annual population, population, projected population (CDSI, 2010)
Source of urban area (RM, 2016), (JM, 2016), (MM, 2016), (MM,2016), (DM, 2016), (TM, 2016)

Profile / Cities	Annual Population Growth Rate (%)		Urban Area (km^2)	Population		Projected Population	
	1974-1992	1992-2004		1992	2006	2016	2025
Riyadh	7.1	3.2	1785	2,776,096	4,600,000	6,299,158	7,357,981
Jeddah	7.2	2.3	2500	2,046,251	2,400,000	4,183,427	4,894,775
Makkah	5.4	2.4	850	965,697	1,675,000	2,017,793	2,358,867
Madinah	Unknown	3.4	702	608,295	1,110,800	1,406,576	1,641,189
Dammam	7.5	4	800	482,321	903,597	1,082,438	1,264,227
Taif	Unknown	1.9	1036	416,121	884,597	1,160,244	1,350,372

1.5.3 Data Collection

In this research, both ***primary*** and ***secondary*** data were acquired for analyze the planned neighborhoods in Jeddah City. Secondary data were mainly gathered from number of planning documents on websites, government publication, cadastral maps, academic researches, and interviews. The data can be classified into seven categories support different chapters of the dissertation (Table 1-2).

However, not all data were available in these secondary data. Specifically, the cadastral maps of the case studies of Jeddah City were not update; hence, primary data resources were conducted using:

1) Pilot surveys to update all planned neighborhoods in Jeddah City. The update consists of the land use, floor number of existing residential building.
2) Photography to document the real world (activities and physical) in all planned neighborhoods in Jeddah City. Such as the actual condition of open spaces, parks, street, sidewalk, and how these elements are used and what kind of activities.
3) Constructed interviews using face-to-face questionnaire survey, and observational survey in two case studies; villa type neighborhood (Al-Basateen 3 Neighborhood), and apartment type neighborhood (Al-Haramain Neighborhood) in Jeddah city. This method was used three times in the same case studies through the whole year. Starts from the the holy month of Ramadan (15-25 July 2014), winter (6-17 February 2015), and summer (7-18 Jun 2015). One hundred samples of questionnaire were distributed in each of case study in each period (holy month of Ramadan, Winter, and Summer) with a total of 600 samples were distributed through whole year (Fig. 1-10).
4) Actual condition survey in all planned neighborhoods in Jeddah city in March 2015. This was conducted to analyze the type of design standards each neighborhood has been created.

Table 1-2 Secondary Resource Classification

Data Category	**Source**						**Keywords**
	Planning document on website	Government publication	Cadastral maps	Satellite image history (Google Earth Pro)	Academic researches	Interviews	
Urban Growth	●	●	●				Cities profile, urban area, annual population growth rate, characteristic of residential areas
Street related laws	●	●					Street wide, sidewalk, transition in street law,
Building related laws	●	●				●	Floor number limitation, set-back, transition in building law,
Residential new development	●	●					Residential lot subdivision laws, distance to mosque and elementary school
Case Study	●	●	●	●			Villa type neighborhood, apartment type neighborhood, neighborhood GIS data
Residential area composition	●	●					Neighborhood composition, Park composition,
Urban crisis	●				●		Housing shortage, infrastructure problems

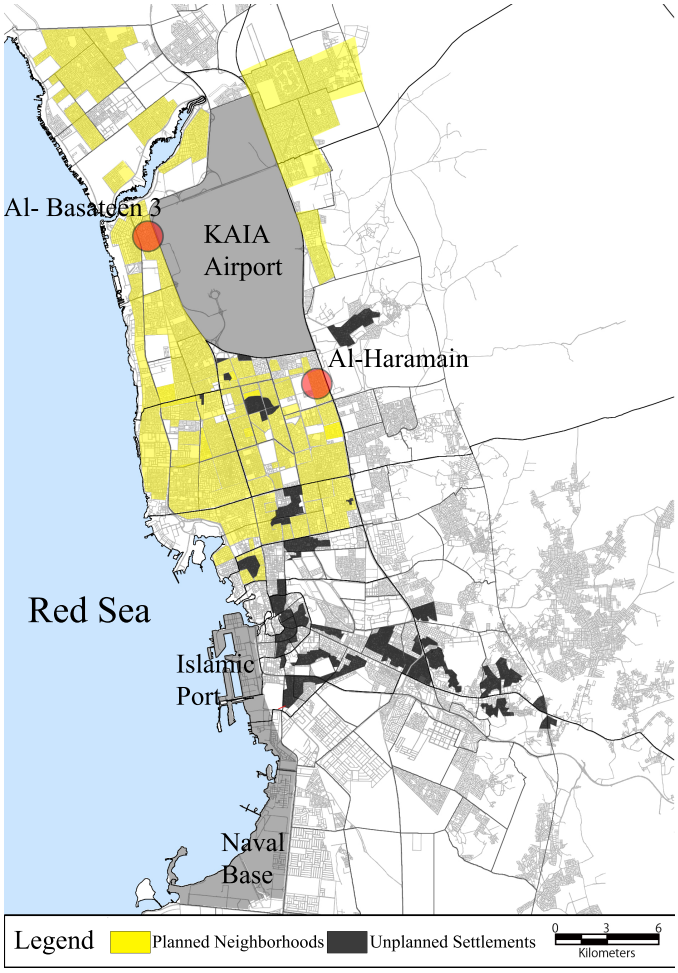


Fig. 1-10 Map of Jeddah City shows Important Landmarks, Unplanned Settlements, Case Studies of Planned Neighborhoods, and two more case studies
(Source: Dept. of GIS. Jeddah Municipality. Colored planned neighborhoods based on a survey done by the author)

1.5.4 Data Analysis

Two types of data analysis method were used. ***Qualitative Method, and Quantitative Method***. These categories were based on the term of research questions the mentioned above.

Qualitative method was used in analyzing the literature review, through ***descriptive*** and ***inferential*** statistics. Qualitative method responded to question number one, two and five in research questions, used statistical analysis for main cities in Saudi Arabia and the urban growth. ***Descriptive statistic*** was used in analyzing the administrative divisions of Saudi Arabia and regions, population, annual growth rate, total urban area for main cities,

and the ratio of population concentrating in these main cities. ***Inferential statistic*** was used to find the effects of housing shortage and population growth the city has been experiencing with projected population on the urban growth, frequent of transition of city structure plans, open space related standards, street related standards, residential subdivision standards, decision makers, and engaging of private sector.

On the other hand, four types of *Quantitative data analysis* were conducted to analyze the result of field survey that was conducted in all planned neighborhoods (Fig. 1-10), all case studies in villa type neighborhoods (103 locations), observational investigations that were conducted in two case studies (Fig. 1-10), and finally the face-to-face questionnaire survey that was conducted in the two case studies as well.

The first is the analysis for spatial configuration arrangement in design standards, and spatial configuration patterns for the all planned neighborhoods in Jeddah city (Fig. 1-5). This analysis was based on 1) an interview with department heads of the local planning and regulation of residential buildings departments at the Jeddah City municipality. 2) Using the available AutoCAD (Computer Aided Design) file for map of Jeddah City that was given by the Jeddah Municipality, and the chronological map of Jeddah City. Via overlapping the chronological map on the map of AutoCAD file, the urban area of each stage of urban sprawl was clarified. In the same context, based on the above mentioned interview, and via a field survey in all planned neighborhoods, the pattern of spatial configuration for each planned neighborhood was clarified. Finally, by the clarifying both above mentioned factors, the total area of each pattern chronologically was clarified.

The Second is the analysis for an area of radius of 200 meter for all mosques in all planned neighborhoods in Jeddah City (total of 103 case studies). The analysis was based on 1) A GIS (geographical information software) file of Jeddah City that was given by the municipality of Jeddah City, 2) exporting the GIS data to AutoCAD software to clarify the total street area, the total length of streets, streets width, mosque lot area, and the average and median of existing villa lot area, 3) using google earth pro software to update the GIS data file in order to define the changing in these case studies in the number of an already built villas and vacant lots between 2008 and 2016. 4) using the data of land price for each neighborhood from the Ministry of Justice of Saudi Arabia. Finally using the

excel software and SPSS Statistics (Software Package for the Social Sciences) for regression analysis, cluster analysis, and principle component analysis.

The third is the analysis for the activities of open space users in two case study as shown in figure 1-6. All parks users' activities, the time each user reached to the park, and leaving time were monitored every 30 minutes in the two case studies. These data were filled into the excel software to analyze the using frequency for parks and undefined-yet open spaces.

The fourth is the analysis for the questioners the was distributed face-to-face (in three periods through the year as mentioned in the research methodology) to the park users in the same period of the above mentioned observational investigations. The whole data were filled into the excel for the analysis.

1.6 Research Organization

Generally, the dissertation skeleton can be divided into four parts (Fig. 1-11)

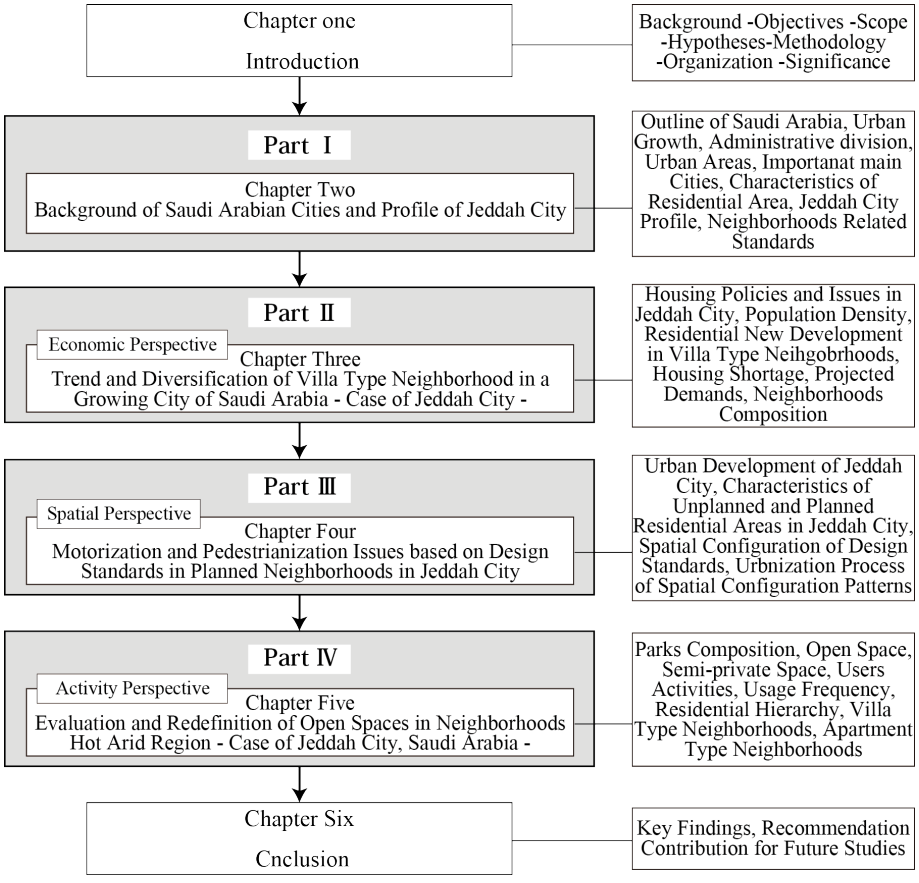


Fig. 1-11 Dissertation Organization

Regarding this skeleton, the dissertation is organized into six chapters as following:

Chapter one (Introduction) explains the research topic background, objectives, hypothesis, and methodology.

Chapter two (Background of Saudi Arabian Cities and Profile of Jeddah City) is presented in three sections. First section overviews the geographic, historic, economic, social characteristic of Saudi Arabia. Second outlines the historic, population growth, annual population growth rate, and characteristic of the important cities in Saudi Arabia. Third section analyzes the profile, and chronological growth and characteristic of residential area of Jeddah City. In addition to that, the section makes arrangement of the changing in city growth, physical plan, vision plan, decision making in the national and local level, the role of the private sector, residential areas related standards and organizations, housing crisis including the shortage and the future projected demand, and finally the population growth in addition to the projected population.

Chapter three (Trend and Diversification of Villa Type Neighborhood in a Growing City of Saudi Arabia - Case of Jeddah City -) describes and makes arrangement of the prime factors that resulted the housing shortage. Then it makes arrangement for the regulation that must be complied in the process of residential new development in Saudi Arabia, so called Procedure Manual for the Preparation of Residential Land Subdivision. Then it draws villa type pattern (based on analyzing 103 locations in Jeddah City). Then it analyzes the all locations via regression analysis, cluster analysis, and principle component analysis.

Chapter four (Motorization and Pedestrianization Issues based on Design Standards in Planned Neighborhoods in Jeddah City, Saudi Arabia) conducts a field survey in all planned neighborhoods in Jeddah City. The chapter discusses the characteristics of both unplanned and planned residential areas. It makes arrangements of changes in design standards and related factors. Then it makes arrangements and draws all patterns of spatial configuration based on the design standards that have not been clarified previously. In addition, it makes arrangement of the elements of spatial configuration of planned neighborhoods streets. Then it calculates the planned neighborhoods areas in the city

urbanization process. After that, it draws the real-world spatial configuration, and their patterns in all planned neighborhoods in Jeddah City.

Chapter five (Evaluation and Redefinition of Open Spaces in Neighborhoods of Hot Arid Region - Case of Jeddah City, Kingdom of Saudi Arabia -) (MADDAH, R. & DEGUCHI, A. 2015) makes arrangement of the residential hierarchies and open spaces system in Saudi Arabia. Then it analyzes the usage of open spaces and the frequency use in Al-Basateen 2 case study, and Al-Haramain Case study three times a year (Month of Ramadan, Winter, and Summer).

Chapter Six (Conclusion), finally concludes the dissertation by discussing its key findings, its contribution to the existing literatures, particularly the planned neighborhoods and its growth and sprawl in Jeddah City and its adverse effect on housing shortage. It also concludes the dissertation proposal for the design method for the existing and future planned contemporary neighborhoods and architecture in Saudi Arabian society and environment.

1.7 Previous Studies

Several studies of Jeddah City have been performed previously. Some were based on specific locations, such as Al-Balad (ABU-GHAZZEH, T. M.), (SOLIMAN, M.), and (SEVCENKO, M. B.), the waterfront (SOLIMAN, M., Amin, M.), and commercial areas (MURAD, A. A.). Some were based on urban processes, such as urban growth (ABDU, M. S., SALAGOOR, J. Y., AL-HARIGI, F. A.), (AL-SHAFIE, M.), and (MANDELI, K. N.), and city planning implementation ʿDAGHISTANI, A. I.). Some were based on housing, such as the housing shortage crisis ʿAL-OTAIBI, A.), affordable housing (SALAMA, A. M), and residential locations from a city-scale perspective (MOUSALLI, M. S.). Some are related to disasters, such as flooding (MOMANI, N. M., FADIL, A. S.) and environmental problems (VINCENT, P.). However, there is a lack of research that considers the 1) spatial configuration of design standards and their effects on street uses. 2) Economics factors in planned neighborhoods. and 3) Activity factors in open spaces of planned neighborhood. Design standards directly influence peoples' lifestyles and needs; therefore, it is necessary to verify to what extent the design standards, lifestyles, and residents' needs match each other using the methodology described earlier.

1.8 Case Studies of Design Guideline for Housing Neighborhoods

1.8.1 Apartment Type (Makuhari Bay Town- Japan)

1.8.1.1 Location, Frame, and Land Use

Makuhari Bay Town is the residential part of Makuhari Shintoshin. Located in western part of Chiba prefecture (10km from the Chiba city center). The town was established in 1995 under a design guideline. Regarding the distance from the main hub, it takes by train almost 30 minutes from Tokyo Station, 10 minutes from the Chiba Seaport, and 60 minutes from Haneda Airport (via monorail) (Fig. 1-12)

The total area of Makuhari Bay Town is approximately 84 hectares, with a planned population of 26,000 people, and number of housing of an approximately 8,900 units (Last Update: 1992). As other towns, the town consists of housing, public facilities, Commercial facilities, streets, parks, green space, and squares. As shown in table 1-3, housing area occupies approximately 46.37%, public facilities 9.7%, street occupies 21.05%, parks 10.05%, green space with 4.04%.

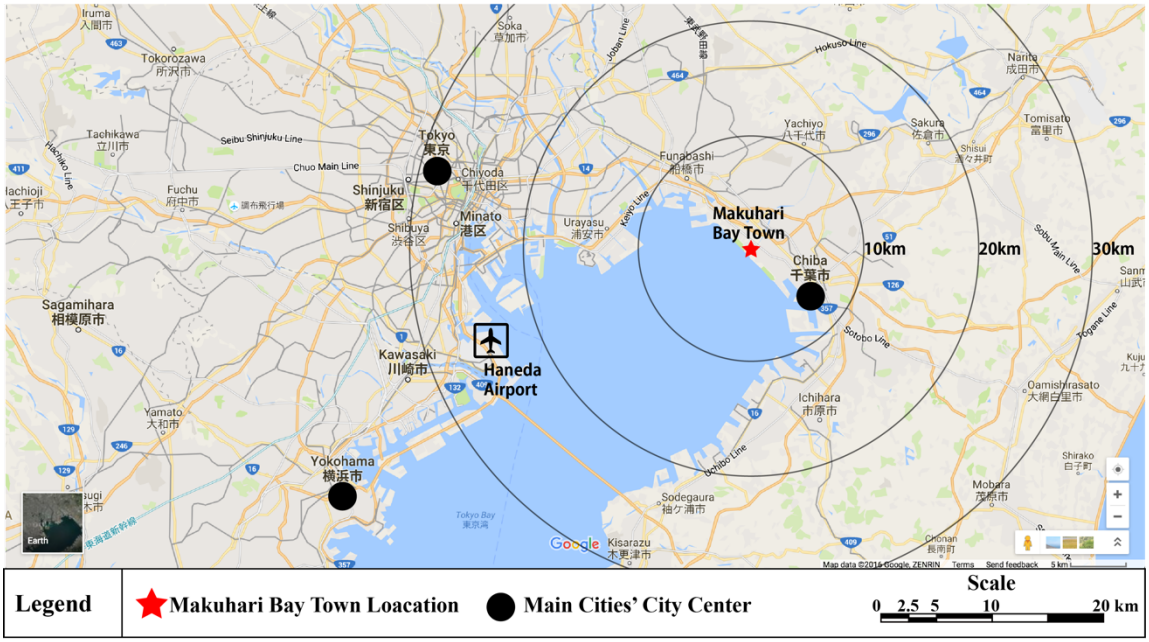


Fig. 1-12 Location Map of Makuhari Bay Town

(Source: Google Map, 2016. Redrawn by the author)

Table 1-3 Land Use Total Area

Source (Original Data in Japanese): 千葉県企業庁、幕張新都心住宅地都市デザインガイドライン、平成 13 年度改改訂版、P.2.

(Translated by the author): Chiba Prefecture, enterprise department, Makuhari Shin Toshin Jutakuchi, 2001, P.2)

Land Use				Area (ha)	Ratio (%)	Remarks
Residential Land	Housing		Supper High rise	9.47	11.31	3 blocks
			High-rise	10.92	13.04	6 blocks
			Medium-rise	13.71	16.37	22 blocks
			Reserved Areas (by Enterprise Agencies)	4.73	5.65	1 block
			Subtotal	**38.83**	**46.37**	
	Public Facilities		Elementary school lands	3.36	4.01	2 sites
			Intermediate school lands	2.40	2.87	
			Kindergarten Land	0.20	0.24	
			Childcare Center	0.32	0.28	
				0.37	0.44	
			Fire Station Land	0.30	0.36	
			Cultural Facilities	1.06	1.27	
			Petrol Station	0.20	0.24	2 sites
			Gas Governor	0.01	0.01	4 sites
			Subtotal	**8.13**	**9.72**	
	Reserved Lands			7.28	8.69	
	Total			**54.24**	**64.78**	
Land for Public Use	**Street**			**17.62**	**21.05**	
	Park & Green Space	Parks	Neighborhood Park	4.55	5.43	3 sites
			Block Park	3.87	4.62	7 sites
			Subtotal	8.42	10.05	
		Green Space	Buffer Green Zone	2.25	2.69	
			Green Square	0.20	0.24	
			Others	1.00	1.19	
			Subtotal	**3.45**	**4.14**	
		Subtotal		**11.87**	**14.17**	
	Total			**29.49**	**25.22**	
Sum Total				**83.73**	**100**	

1.8.1.2 Concept of Urban Design

The town is relying on three main cores starts form function, elements, and environment. Via urban design, the town aims to create a town that 1) precedent for 21th century, 2) characterized by its urbanity (urban space), 3) supports an international exchange, 4) utilizes the feature of waterfront, and 5) communicates with the nature. Three perspectives were taken into consideration in the process of urban design that are 1) **Contact**, 2) **Urbanity**, and 3) **Impression** (remembrance).

Contact considers human contact with each other, and contact with the nature. ***Urbanity*** considers the crowdedness of open spaces with various people, and ***Impression*** (remembrance) considers the relation between the waterfront and the human scale and design a place to be remain in the memory of the residents.

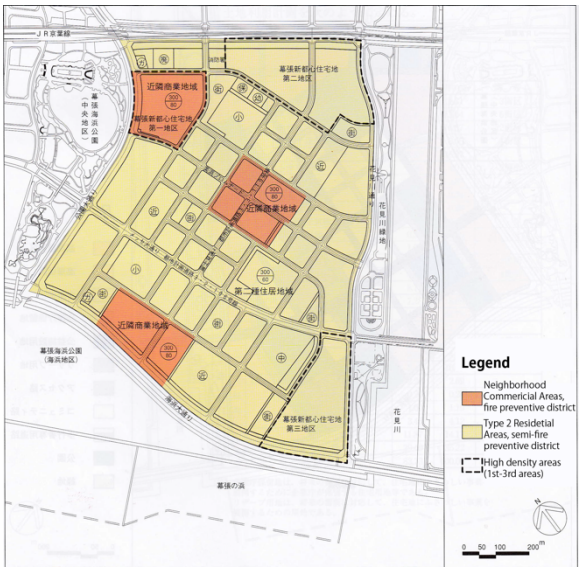


Fig. 1-13 Land Use Map (left), Fig. 1-14 Zoning System (Right)

Source (Original Data in Japanese): 千葉県企業庁、幕張新都心住宅地都市デザインガイドライン、平成 13 年度改改訂版、P.3-4. (Translated by the author): Chiba Prefecture, enterprise department, Makuhari Shin Toshin Jutakuchi, 2001, P.3-4

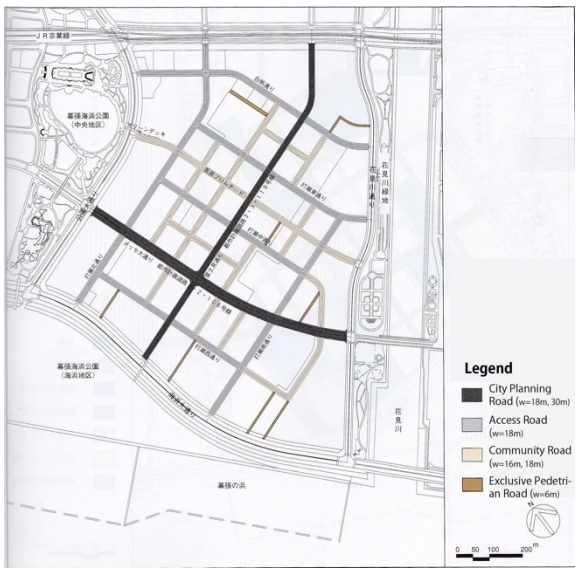


Fig. 1-15 Road Network Map (left), Fig. 1-16 Open Space Map

Source (Original Data in Japanese): 千葉県企業庁、幕張新都心住宅地都市デザインガイドライン、
平成 13 年度改改訂版、P.3-4. (Translated by the author): Chiba Prefecture, enterprise department, Makuhari Shin Toshin Jutakuchi, 2001, P.3-4

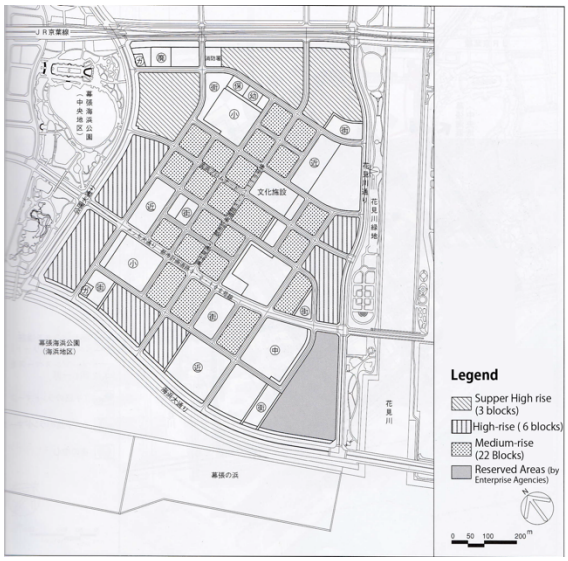


Fig. 1-17 Housing Location Map (left), Fig. 1-18 Attractive Town Scape Map (Right)
Source (Original Data in Japanese): 千葉県企業庁、幕張新都心住宅地都市デザインガイドライン、
平成 13 年度改改訂版、P.3-4. (Translated by the author): Chiba Prefecture, enterprise department, Makuhari Shin Toshin Jutakuchi, 2001, P.3-4

1.8.1.3 Concept of Landscape Design

The framework of landscape design was based on four perspectives. 1) Skyline, 2) Open Space, 3) Harmony of architecture and streets, and 4) Town Scape.

Regarding the **1) Skyline**, to create an attractive silhouette of town, following configurations were setup.

1) For clarity between the appearance of residential areas and super high rise building, high rise office building, and surrounding area (harmony in the skyline), super high rise residential building, and high rise office building were located in the periphery area. And in the middle of the town, the medium rise residential buildings were located.

2) To ensure an effective view toward the sea side, the height of buildings that located close the seaside were lowest buildings.

Regarding the **2) Open Spaces,** the idea of **"Community Belt"** was the main idea in creating a contact between the rich natural environment and community of the town. This was done by connect the parks, green space, and the ground of schools. Three community belts were setup with a width of approximately 100 meter for each community belt oriented toward Mr.Fuji. Boulevards were located between the community belts.

Furthermore, regarding the harmony of architecture and streets, in order to accomplish the objective of **3) Urbanity** (livability) in town center, the two main elements were important to be taken into consideration. 1) Building, and 2) Street and the harmony between them. The center was enhanced by commercial facilities in addition to a smaller distance between the commercial buildings (private) and the street (public). The town was divided into seven areas, each area has its characteristic Side town that divided into 1) city side town, 2) park side town, 3) Bay side town, 4) river side town, 5) roadside town, and Inner town that divided into 6) inner town, and 7) town core.

Finally, regarding **4) Town Scape**, maturity of planned town takes long time; however, even to the inhabitants of 1st stage, or comers from outside, the town should be attractive enough to make them enjoy it. Old traditional towns have a number of intensity elements and spaces. However, in this town, consequently, some artificial and intended "primarily designed elements" was setup.

1.8.1.4 Buildings

As mentioned above, **residential buildings** in the town are divided into super high rise, high rise, and medium rise buildings. In order to create a community, it is necessary to create a livable space for gathering them. **"Inner Space"** so called **"Inner Court"** was provided for within the buildings.

Floor Area Ratio (FAR) for the super high rise buildings is 400% with a limitation of 40 floors, and 300% for both high rise medium rise buildings with a limitation of 20 floors for high rise buildings and 5 floors for the medium rise buildings.

Regarding the location **public facilities**, they were decided in the master plan design process. It consists of educational facilities, daycare centers, medical facilities, and so on.

1.8.1.5 Primarily-Designed Elements Spaces

In order to create a town that surprises, and attracts the residents, several factors must be taken into consideration. Designing a good looking building is not enough to create this kind of towns. Shared public spaces is necessary to be taken into consideration by designing them respond to the people's needs. This was done by creating elements and

spaces called "**Primarily-Designed Elements Spaces"**. These spaces have resulted 1) surprise, and story reflected on the users, 2) attractive open spaces, and human contact, and 3) physical harmony between street, parks, housing, and commercial facilities.

Primarily-Designed Elements Spaces is categorized into five categories: 1) Gates, and Margins of the town, 2) Important Paths (route), 3) Corners, 4) Eye Stops, and 5) Important Areas. Some examples of these spaces are as following:
1) Corner with fire department, 2) Path through school ground, 3) Promenade, 4) Corner with School, 5) City gate, 6) Path-side street, 7) Corner with galleries, 8) Esplanade, 9) City tower, 10) Sign tower, 11) Green field, 12) Square, 13) Observatory, 14) City corner, 15) Corner with pick-up point, 16) "Community Belt with hill, 17) Bay-Side street, 18) Bay-Side bridge, and 19) River-side street.

1.8.1.6 Strategy of Urban Design

This town was created based on 1) Master Plan & Design, 2) Guidelines, and 3) Systems (management, schedules, and planning bodies). The master plan considers the harmony between the buildings and streets. The guidelines are divided into three levels breaks down from the design guideline for ***streetscape***, design guideline for ***block***, to design guideline for ***buildings***. Each design guideline consists of details based on the its level. For instance, the ***Streetscape Design Guideline*** has specific themes and characters for corners, axises, and streets. ***Block Design Guidelines*** considers the factors that related directly to the whole buildings design. ***Buildings Design Guidelines*** considers the quality of the buildings and it performance in relation to the living condition (life style), it consists of the materials, façade design (division), roof design, and so. However, the city was flexible enough to change the design guideline when much plans and designs were submitted.

1.8.2 Detached-Housing Type (Sea Side Momochi Housing Project- Fukuoka City, Japan)

The starts point of creating this area was based on the factor that in today's housing areas, there is a missing of a comprehensive perspective that consists the architecture and the exterior of the buildings (outdoor public space). Thus, creating housing and exterior facilities individually will create a lacking of harmony between them, which will obstruct

the street scape, lighting, ventilation, visibility, and so on. So, to avoid these problem to happen, it is necessary for creating a design guideline that covers comprehensive perspectives that guides to design an area with a high quality of an indoor and outdoor space.

1.8.2.1 Sea Side Momochi Housing Area

In Momochi housing area, three types of design guidelines (so called manual) were setup and distributed through different stages. 1) Detached Housing Lot Manual (used in the construction stage), 2) Urban Design Manual (used in the development stage), 3) Townscape Planning Manual (used in the maintenance stage).

Detached Housing Lot Manual (used in the Construction Stage)

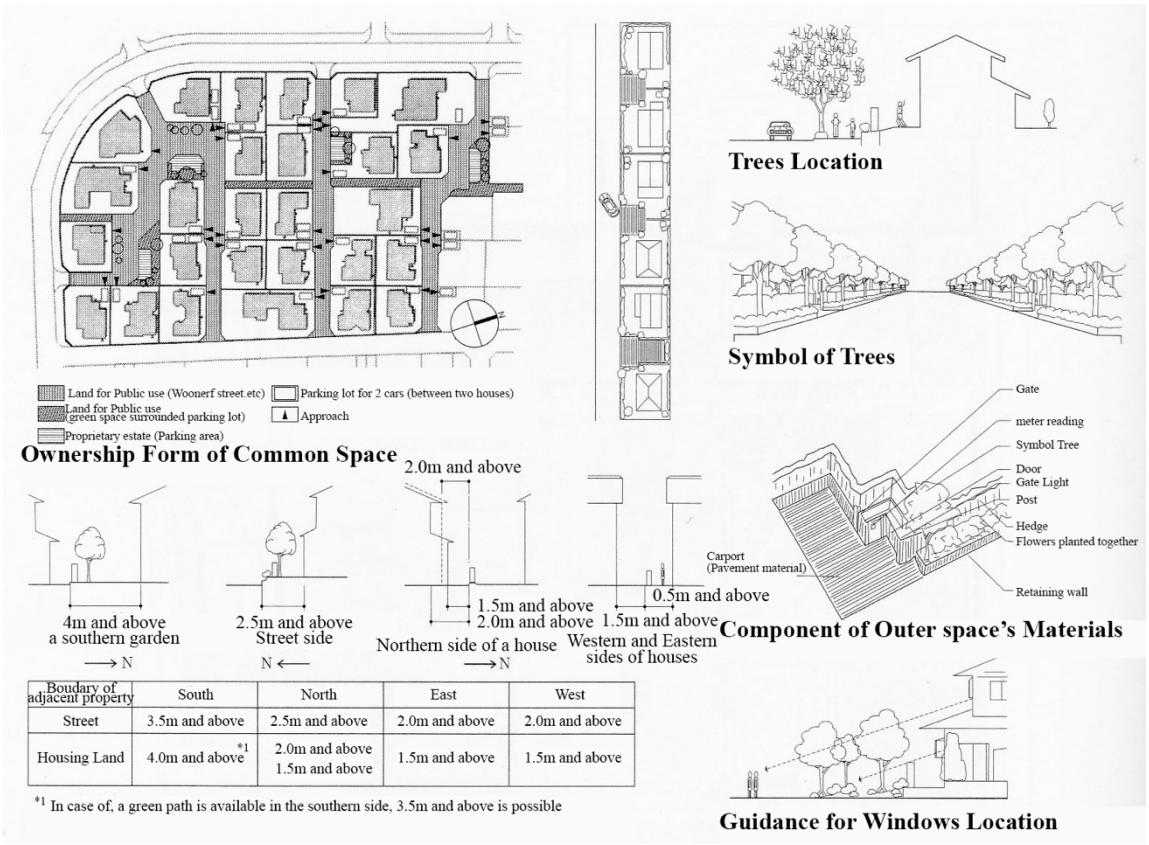
At the first, creating living streets that characterized by shared space, traffic calming, and low speed limits (as case study of Woonerf) was the main fundamental policy in creating Momochi housing area. In addition to that, parking spaces of housing were setup to be one parking space joint between two detached-housing (between two neighboring houses), and in case of not owning a car, the space could be designed as a pocket-park. In order to assure a good townscape space, and space between housing, a setback rule was setup. Furthermore, space for planting, and gate fence were installed. At the time of planning, 1) the interrelation between each house, and 2) townscape were checked and studied via a ground floor plan and elevation of the whole area.

Urban Design Manual (used in the Development Stage)

The points that should be noted and taken into consideration even within Momochi housing area, and outside Momochi housing area were coordinated. Such as roofing, green path, boundaries, planting, garbage collection point, height of roof, parking, harmony between housing and outside space, and so on.

Townscape Planning Manual (used in the maintenance stage)

After the area was built, and in order to keep the atmosphere as it was planned to, the Detached Housing Lot Manual (used in the construction stage), and 2) Urban Design Manual (used in the development stage) were added a regulation in Fukuoka City to be followed in the process of any maintenance or redevelopment.

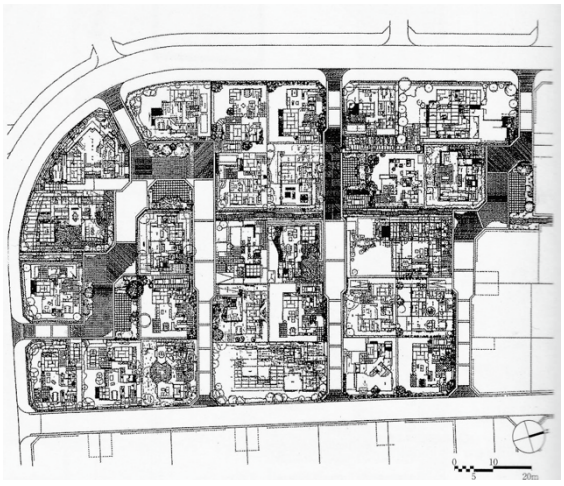


Boudary of adjacent property	South	North	East	West
Street	3.5m and above	2.5m and above	2.0m and above	2.0m and above
Housing Land	4.0m and above *1	2.0m and above 1.5m and above	1.5m and above	1.5m and above

*1 In case of, a green path is available in the southern side, 3.5m and above is possible

Fig. 1-19 Momochi Housing Area (Detached Housing Lot Manual) [1), and 2)]

1）宮脇檀建築研究室：シーサイドももち戸建住宅マニュアル（1989）．2）宮脇檀建築研究室：コモンで街をつくる　宮脇檀の住宅地設計、丸善プラネット（1999）．(The contents of the figures was translated by the author)



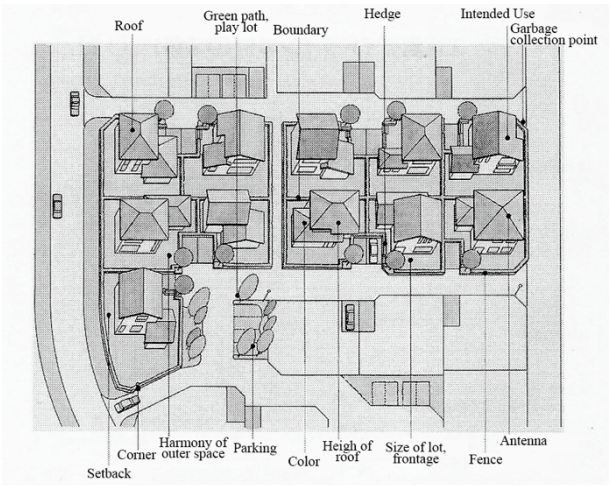


Fig. 1-20 Map of Connected Ground Floor plan (left) 2)　Fig. 1-21 Urban Design Manual Map (right) 3)

2）宮脇檀建築研究室：コモンで街をつくる　宮脇檀の住宅地設計、丸善プラネット（1999）．3）福岡市：シーサイドももちアーバンデザインマニュアル（1993）．(The contents of the figures were translated by the author)

1.8.3 Guidelines of New Urbanism

1.8.3.1 The Concepts and Types of the Spatial Structures Elements of Neighborhood unit

Through the process of urbanism and new development in U.S, the term of new urbanism was born, in parallel with that, the idea of "neighborhood Unit" was created with several types and regulations for the design guidelines.

1.8.3.2 The Concept of Transect and Zooning

The term of transect was defined by Duany Plater-Zybrek in his book (The Lexicon of New Urbanism (2002)) as "The classification of zoning patterns based on a correlation of the various elements of a landscape to the common rural to urban Transect. Six segments calibrate the Transect to the neighborhood structure. These are the Rural Preserve, Rural Reserve, Suburban, General, Center, and Core Zones. There is an additional category, Civic, that is an overlay zone applicable anywhere on the six standard zones." (see Fig. 1-22).

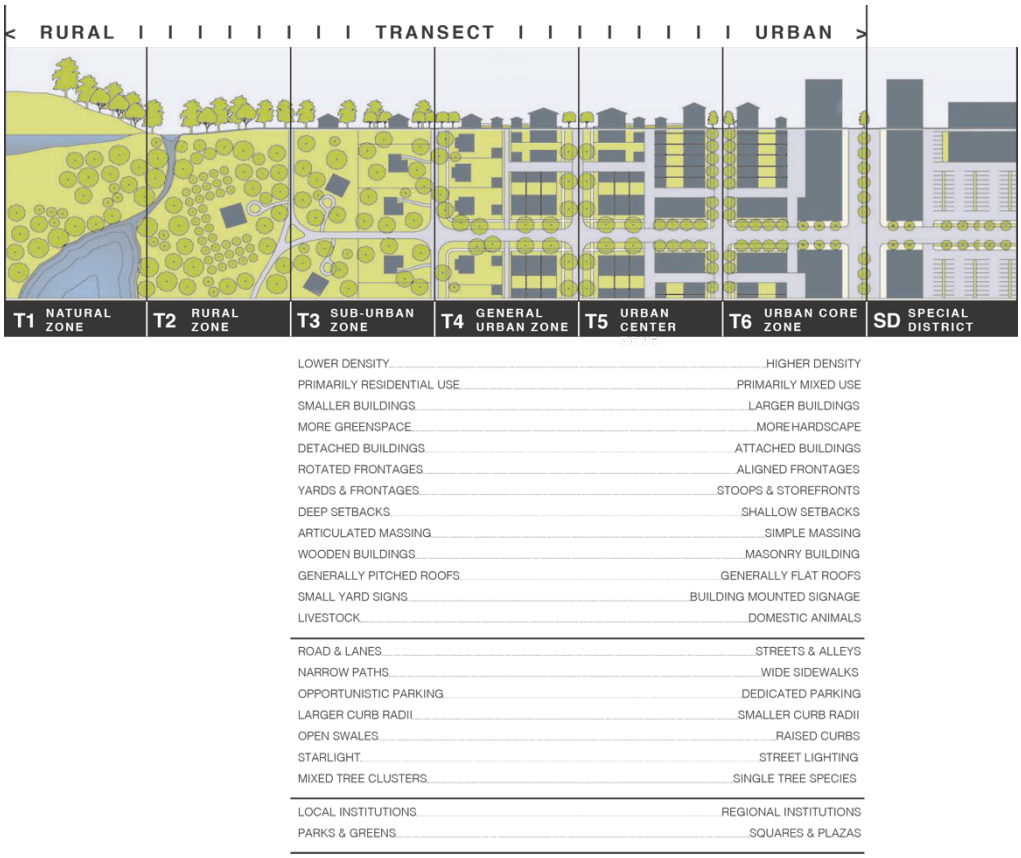


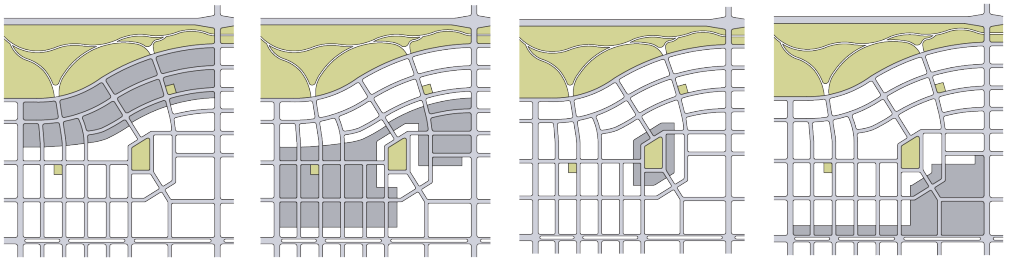
Fig. 1-22 Concept of Transect and Zooning

(Source: Duany Plater-Zybrek & Co.: THE LEXICON OF NEW URBANISM, 2002)

1.8.3.3 Types of Spatial Structure for Each Zone

As it shown in figure 1-23, generally, urban areas are divided gradually from the urban core zone to sub-urban zone. Each zone is different in several factors, which are land use, buildings, frontage, streetscape, thoroughfare, and open spaces. For instance, regarding the land use in the urban core zone is open with encouraging the combination between residential use and other uses. However, in the sub-urban zone, the land use is restricted, combining residential with certain other uses. As the sub-urban zone area is characterized by its low density, this is reflected on the streetscape that consists of parkway, road, and lane that support to increase the safety factor that combined between motorization and pedestrianization. Which is different to the urban core zone that characterized by its commercial streets, avenue, and boulevard. As a result, each zone is characterized by different characteristics from several factors perspective.

< RURAL I I I I I I I I I I TRANSECT I I I I I I I I I I URBAN >



	T3 SUB-URBAN ZONE	T4 GENERAL URBAN ZONE	T5 URBAN CENTER ZONE	T6 URBAN CORE ZONE
	Sub-Urban: the least dense, most purely residential sector of the neighborhood. The size varies in proportion depending on whether the model is more rural (village-like) or more urban (town-like).	General Urban: the sector that is mixed in function, but principally residential. It has a generalized character, and is usually the largest area of the neighborhood.	Urban Center: the dense multifunctional social condenser of a neighborhood. It is usually at a central location, within walking distance of the surrounding, primarily residential areas.	Urban Core: the most dense business, service, and institutional center. It is usually shared by several neighborhoods. It always straddles thoroughfares at their most active intersection. It is usually within walking distance of a large residential catchment.
LAND USE	Land use is restricted, combining residential with certain other uses.	Land use is limited, permitting the controlled combination of residential with other uses.	Land use is open, encouraging the combination of residential and other uses.	Land use is open, encouraging the combination of residential and other uses.
BUILDING	Buildings of the low-density freestanding edgeyard type.	Buildings of the medium-density freestanding sideyard and edgeyard types.	Buildings of the higher-density attached courtyard, rearyard, and also sideyard types.	Buildings only of the high-density attached courtyard and rearyard types.
FRONTAGE	Frontages that weakly define the public space with deep setbacks: common lawn and porch & fence.	Frontages that are variegated with medium setbacks: dooryard, and porch & fence.	Frontages that define continuous streetwalls with shallow setbacks: arcade, shopfront, stoop, and forecourt.	Frontages that define continuous streetwalls with shallow setbacks: arcade, shopfront, stoop, and forecourt.
STREETSCAPE	Streetscapes that create the most rural conditions: parkway, road, and lane.	Streetscapes that create a variety of conditions: road, residential street, and avenue.	Streetscapes that create urban conditions: residential street, commercial street, avenue, and boulevard.	Streetscapes that create the most urban conditions: commercial street, avenue, and boulevard.
THOROUGHFARE	Thoroughfares are roads and drives. Buildings may be served by rear lanes, though wider lots may dispense with them.	Thoroughfares are avenues, streets, and roads. Most buildings are served by rear lanes.	Thoroughfares are avenues and streets. All buildings are served by rear alleys.	Thoroughfares are streets and boulevards. All buildings are served by rear alleys.
OPEN SPACE	Open space may be parks within the proximate greenbelt.	Open space is organized as parks and greens.	Open space is organized as plazas or squares.	Open space is organized as plazas or squares.

Fig. 1-23 Neighborhood Structure (zooning categories)

(Source: Duany Plater-Zybrek & Co.: THE LEXICON OF NEW URBANISM (2002))

1.8.3.4 Guideline of Street and Transportation Facilities

The transect makes arrangement through each zone (from the rural preserve zone to urban core zone) of several elements such as 1) configuration of street space, 2) types of street width, 3) plantation along streets, 4) curve of intersection portion, and so on. Based on the combination of these criteria, the transect shows a street space that safe and suitable for pedestrians in each zone.

Furthermore, the concept of TND (Traditional Neighborhood Development) that takes the radius of 1/4 mile (approximately 400m) as a standard for creating a walkable neighborhood has a lacking of guidelines regarding the safety between the motorization and pedestrianization that includes the relation between the pedestrians and street and transportation facilities such as the curve of intersection portion.

1.9 Significance and Expected Output

Despite many researchers have done several researches about Jeddah City as mentioned above in the previous studies. However, there have been no studies done yet regarding the planned neighborhoods looked from ***economic, spatial***, and ***open space activities*** perspectives. As these three perspectives are the prime factors in creating a suitable neighborhood for a society and an environment.

Moreover, there have been no studies done regarding making an arrangement for one chronological table about Jeddah City starts from the 1509s until 2016 consists of 1) the process of growth of unplanned and planned residential areas, 2) all structure plans that have been applied to the city and their contents, 3) the flow of decision making from the national, local, to private sector level, 4) residential area related standard, on both public space and private space levels, 5) housing crisis, the amount of shortage and the future demand, and the initiatives to solve the crisis, and finally 6) the population growth and projected population until 2029. This chronological will gives the opportunity for researchers as a data base for more research in the future regarding Jeddah City.

Regarding all of that, the dissertation has two major expected output. The first reevaluate the spatial configuration from motorization and predestination perspectives, redefine open spaces in all planned neighborhoods from activities perspective, and reintroduce the

housing shortage from the perspective of trend and diversification of villa type neighborhoods in Jeddah City and its relation to the economic factor. The second output is a proposed of a design method for contemporary neighborhoods and architecture in Saudi Arabian society and environment.

1.10 Glossary of Terms and Abbreviation

1.10.1 Main Terms

1) Planned Neighborhood: the planned neighborhood that discussed in this dissertation refers to a planned residential area that was created based on a new residential development planning standard. Usually, this area consists of at least one mosque which usually located in the center of the area, and there is at least one highway from a side of the area.

2) Unplanned Settlements: areas were created whether 1) spontaneously in the process of urban sprawl in an era where there were no city structure plan, master plan, or residential land subdivision regulations. This type was appeared in Jeddah City after the city was removed by the central government in the period between 1947s and 1964s (Jeddah Municipality, Department of Strategic Plan, 2009, p.352). Or 2) illegally outside an urban growth boundary of an era, and in the process of urban sprawl, these areas have become surrounded by an urbanized and planned areas. This type was appeared in Jeddah City in the period between 1971s and 1980s (Jeddah Municipality, Department of Strategic Plan, 2009, p.352).

3) Design Standards: design standards that are discussed in this dissertation include items such as some articles in the Jeddah City residential building regulations that define the design of residential buildings, e.g., floor number limitation, building-to-land area ratio, building-to-roof area, setback lines, fences, or car parking.

4) Villa Type Neighborhoods: areas which originally was decided in the process of a structure plan to be only built by villas (detached house).

5) Apartment Type Neighborhoods: areas which originally was decided in the process of a structure plan to be only built by apartments.

1.10.2 Main Abbreviation

1) MOMRA: Ministry of Municipals and Rural Affair

2) JWSP: "Jeddah Without Slum Program"

3) PMPRLS: Procedure Manual for the Preparation of Residential Land Subdivision

4) MEP: Ministry of Economy and Planning

5) CDSI: Central Department of Statistics and Information

6) SGS: Saudi Geological Survey

7) FAR: Floor Area Ratio

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Chapter Two
Background of Saudi Arabian Cities and Profile of Jeddah City

Chapter Two

Background of Saudi Arabian Cities and Profile of Jeddah City

2.1 Outline of Kingdom of Saudi Arabia

2.1.1 Geography and Climate

Saudi Arabia officially known as Kingdom of Saudi Arabia, is located in southwest of Asia, and it is the largest country of Arabia with an estimate total area of approximately 2,000,000 km^2 (200,000,000 hectares) (Saudi Geological Survey, 2012, p.14). The kingdom occupies approximately 70% of Arabian Peninsula that its area is estimated by 2,800,000 km^2 (280,000,000 hectares). Regarding the external boundaries, the kingdom is surrounded by seven countries that are Jordan, Iraq, Kuwait, Qatar, United Arab Emirates, Oman, and Yemen with a total length of land boundary of 4,531 km (Saudi Geological Survey, 2012, p.20).

Due to its large area, the Kingdom is characterized by a variation in its topographical structure. **Tihama coastal plain** lies along the Red Sea with 1100 kilometers long, 60 kilometers wide in the southern part of Saudi Arabia. Tihama coastal plain gradually narrows to the north (until the Aqaba Gulf). In the east of this plain, the plain lies along a chain mountain called **Sarawat**; that rise to 3000 meters in the southern part of Saudi Arabia and it gradually falls to 1000 meter in the north. Jazan Valley, Najran Valley, Tathleeth Valley, Bisha Valley, Himdh Valley, Rumah Valley, Yanbu Valley and Fatima Valley are valleys that sloped from the eastward and westward of the Sarawat Chain. **Najd Plateau** is stood to the east part of the chain, and it extends westward to **Samman**

Desert and **Dahnaa Dunes**. Moreover, southward to a region penetrated by **Wadi Al-Dawaser** and bordered by the **Empty Quarter**. **Najd Plain** extends northward up to Great Nefud Desert, the borders of Iraq and Jordan. The plateau is consisted of some mountains such as Tuwaiq, Al Aridh, Aja and Salmah. In the southeastern part of Saudi Arabia, the **empty Quarter**; that occupies an estimated area of 640,00,000 hectares is located. It is composed of sand hills and lava field. Finally, the length of the coastal plain that located in the eastern part is approximately 610 kilometers long and consists of large sand areas and Salinas (CDSI, 2016). (Fig.2-1, 2-2). (Country Studies, 1992).

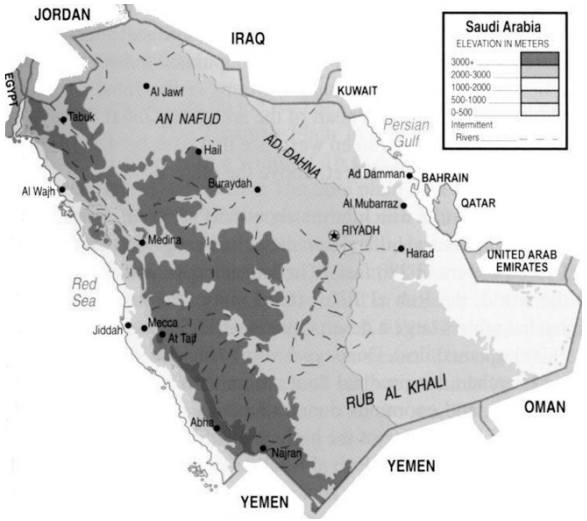


Fig. 2-1 Map of Saudi Arabia

Fig. 2-2 Topographic Map of Saudi Arabia

Source: (Left map, SUSRIS, 2016)

(Right Map, Global Security, 2000-2016)

In general, the climate of Saudi Arabia can be classified as BWh climate; a dry desert climate (based on Koeppen-Geiger classification), however, it is varying from one region to another because of its various topographical features. Being under the influence of a subtropical high pressure system, Saudi Arabia is generally hot in summer and cold in winter, and its rainfall is often in winter. In the west and southwestern part of Saudi Arabia, the climate is characterized by its Moderate climate. That is dry hot in the summer, and cold in the winter season, especially in the interior parts. In contrast, the weather in coastal areas is characterized by high temperature and humidity (KSU. 2007). The major parts of the Kingdom often witness modest amounts of rain in winter and spring. However, Rainfall is of significant amounts in the south western mountains in summer. Humidity

is high on the western coasts and mountains almost all year, and it gets lower, the more we go inland.

2.1.2 Social Characteristics

The society of Saudi Arabia is deeply religious, conservative, traditional, and family oriented, which have been derived from Arab civilization. These elements have been reflected on Saudi Arabian life style, which have been reflected on urbanization and usage of open spaces as well (Maddah, R. Deguchi, A. 2014). For instance, the factor of **religion** has been reflected on neighborhoods by support them by locate a mosque the services an area of radius of 200m. **Conservativeness** has been reflected on 1) private space such as the popularity of villa type house (detached house) that surrounded by fences, which became a type of neighborhood that consists only of villas that is called villa type neighborhood. This type of housing protects family's privacy by using their property freely and safely. 2) public open space, where the males prefer to avoid using places females use such as park and vice versa (Maddah, R. Deguchi, A. 2014). **Family** oriented factor such was derived from the religion factor as Islam asks Muslims for honoring one's parents by live with them, and visiting them periodically after marriage, which has been reflected on architectural design scale.

2.1.3 Demographic Characteristics

As shown in table 2-1 that, Saudi Arabian population has been increasing with a highest growth rate of 6.29 the country was experienced in 1980. "The population is expected to rise in the future. It is likely to reach 36.73 million by 2030, and is predicted to reach 44.76 million by 2060. The growth rate, though, is expected to decrease. According to the united nation's forecast, the growth rate of Saudi Arabia's population is likely to decrease to 1.09 by the year 2030, and further fall to 0.277 during the next 30 years, by the year 2060" (World population review. 2016).

Since 1950, in parallel with increasing of population growth, some main cities in Saudi Arabia setup structure plans for urbanization to control sprawling of unplanned settlements. In addition, in 1972, based on a royal decree, Saudi Arabia was officially divided into 118 governorates as mentioned in section 2.2.

Table 2-1 Saudi Arabian Population History and Projections

(Source: United Nations, global demographic estimates and projections, 2015)

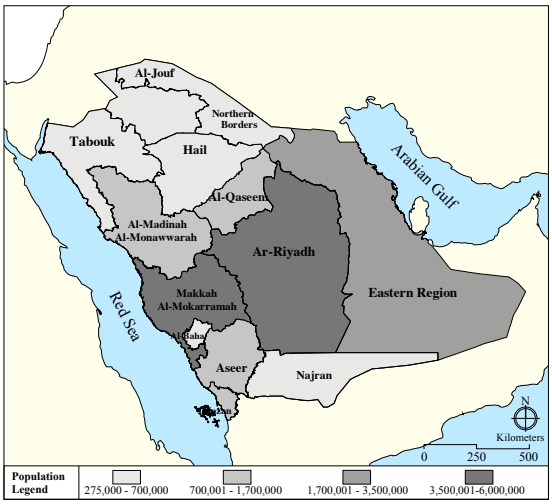
Year	Population	Male	Female	Growth rate	Year	Projected Population	Male	Female	Growth rate
1950	3,121,336	50.8%	49.2%	2.44%	**2020**	34,366,240	56.1%	43.9%	1.49%
1955	3,558,164	50.4%	49.6%	2.65%	**2025**	36,846,750	55.7%	44.3%	1.27%
1960	4,086,539	50.2%	49.8%	3.19%	**2030**	39,132,369	55.3%	44.7%	1.11%
1965	4,843,635	50.5%	49.5%	3.49%	**2035**	41,235,387	54.8%	45.2%	0.96%
1979	5,836,394	50.9%	49.1%	4.35%	**2040**	43,135,740	54.3%	45.7%	0.81%
1975	7,428,705	52.0%	48.0%	5.46%	**2045**	44,762,954	53.9%	46.1%	0.64%
1980	9,912,917	53.5%	46.5%	6.29%	**2050**	46,059,398	53.4%	46.6%	0.47%
1985	13,361,284	54.8%	45.2%	4.79%	**2055**	47,021,282	53.0%	47.0%	0.33%
1990	16,361,453	56.0%	44.0%	3.18%	**2060**	47,685,554	52.7%	47.3%	0.22%
1995	18,853,670	55.7%	44.3%	2.50%	**2065**	48,143,599	52.5%	47.5%	0.15%
2000	21,392,272	55.1%	44.9%	2.84%	**2070**	48,453,085	52.3%	47.7%	0.10%
2005	24,745,230	55.8%	44.2%	2.69%	**2075**	48,649,138	52.1%	47.9%	0.05%
2010	28,090,647	56.3%	43.7%	2.45%	**2080**	48,721,759	52.0%	48.0%	0%
2015	31,540,372	56.5%	43.5%	1.94%	**2085**	48,653,762	51.9%	48.1%	-0.07%
2016	32,157,974	56.5%	43.5%	1.80%	**2090**	48,427,356	51.9%	48.1%	-0.13%

2.2 Outline of Important Cities in Saudi Arabia and Residential Characteristics

2.2.1 Regions and Administrative Divisions of Saudi Arabia

As shown in figure 2-2, the Kingdom of Saudi Arabia is divided into 13 regions., each region is divided into governorates (total of 118 governorates) and the region capital, which has the statues of municipality headed by mayor. (fig. 2-4) (table 2-3).

Due to the progress of urbanization that main cities are experiencing, Saudi Arabia is experiencing an internal migration from yet not urbanized areas to more modern, urbanized, and important cities, which has resulted a concentration of population in the main cities in each region. As shown in table 2-2 that, more than half of population of 8 regions are concentrated in the capital of each region.



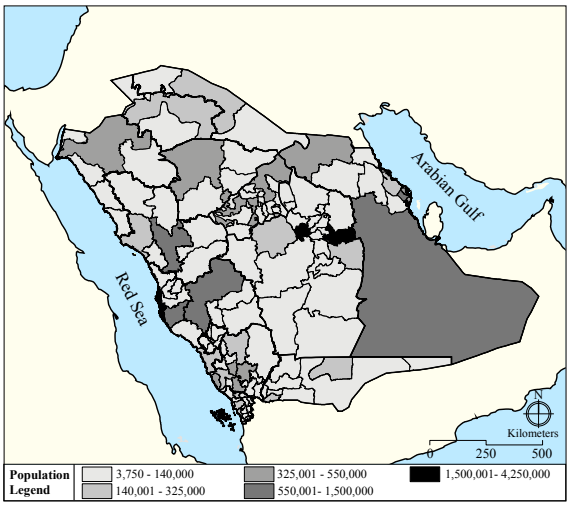


Fig. 2-3 Map shows Regions of Saudi Arabia with Each Region's Population (Left)
Fig. 2-4 Map shows Governorates of Saudi Arabia with Each Governorate's Population (Right)
(Source: Central Department of Statics & Information, 2010, p.27. Redrawn by the author)

Table 2-2 Regions and Administrative Division of Saudi Arabia

(Source: Central Department of Statics & Information, 2010)

Region	Capital	Number of Governorates	The most Concentrated two governorates by population and Ratio of population of total region population			
			1st Governorate	Population ratio	2nd Governorate	Population ratio
Ar-Riyadh	Riyadh	19	Riyadh	67%	Al-Kharj	6%
Makkah	Makkah	11	Jeddah	50%	Makkah	23%
Madinah	Madinah	6	Madinah	66%	Yanbu	17%
Qaseem	Buraidah	10	Buraidah	60%	Onaizah	14%
Eastern Region	Dammam	10	Al-Ahsa	27%	Dammam	22%
Aseer	Abha	11	Khames Mushait	26%	Abha	21%
Tabouk	Tabouk	5	Tabouk	71%	Omloj	8%
Hail	Hail	3	Hail	68%	Al-Gazala	18%
Northern Borders	Arar	2	Arar	60%	Rafha	26%
Jazan	Jazan	13	Jazan	21%	Sabya	17%
Najran	Najran	7	Najran	63%	Sharora	17%
Al-Baha	Al-Baha	6	Al-Baha	24%	Baljurashi	16%
Al-Jouf	Skakah	2	Skakah	54%	Alqurayat	35%

Regarding the role of municipalities, they can by summarized in 1) organizing its area according to an endorsed plan. 2) Issuing permits for construction of buildings and infrastructure. 3) Preserving cleanness and city appearance, arranges parks and open spaces, tourist places, organizes and monitor them directly or indirectly, protects public health and clear all swamps, avoid flood hazards and establish green belts around cities. 4) Monitoring and inspecting foods and consumer goods including supply and prices, scaling, and standards with participation with concerned agencies. 5) Building and organizing slaughter houses. 6) Building markets and determines shopping areas. 7) Permitting crafts and premises. 8) Preserving safety and comfort. 9) Determining locations of roaming sellers. 10) Organizing transportation in coordination with concerned agencies. 11) Determining and collecting penalty charges. 12) Supervises election of crafts' leaders. 13) Promoting cultural, sport and social activities. 14) Cooperating with other agencies to stop begging, and builds special houses for the disabled. 15) Building and operates cemeteries. 16) Protecting citizens from wild animals. 17) Stopping and eradicating any encroachment.

2.2.2 Population Growth and Urbanization of Important Cities

In addition to the mentioned above progress of urbanization as the main factor for the internal immigration, some cities, their important have derived historically. Such as the two holy cities Makkah City, and Madinah city (Prophet Mohammed City). Makkah City where the prophet Mohammed was born, and pilgrims from all over the world go to do pilgrimage yearly, and visit Madinah as well. As Jeddah is located along the Red Sea, and close to Makkah City, it has been used as a gate for pilgrims to go to Makkah City via its Islamic port since the era of Khalif Othman, which gave the city the potential to be the second important city(table2-3)

Table 2-3 Profile of Main Important and Growing Cities in Saudi Arabia
Source of annual population, population, projected population (CDSI, 2010)
Source of urban area (RM, 2016), (JM, 2016), (MM, 2016), (MM,2016), (DM, 2016), (TM, 2016)

Profile / Cities	Annual Population Growth Rate (%)		Urban Area (km^2)	Population		Projected Population	
	1974-1992	1992-2004		1992	2006	2016	2025
Riyadh	7.1	3.2	1785	2,776,096	4,600,000	6,299,158	7,357,981
Jeddah	7.2	2.3	2500	2,046,251	2,400,000	4,183,427	4,894,775
Makkah	5.4	2.4	850	965,697	1,675,000	2,017,793	2,358,867
Madinah	Unknown	3.4	702	608,295	1,110,800	1,406,576	1,641,189
Dammam	7.5	4	800	482,321	903,597	1,082,438	1,264,227
Taif	Unknown	1.9	1036	416,121	884,597	1,160,244	1,350,372

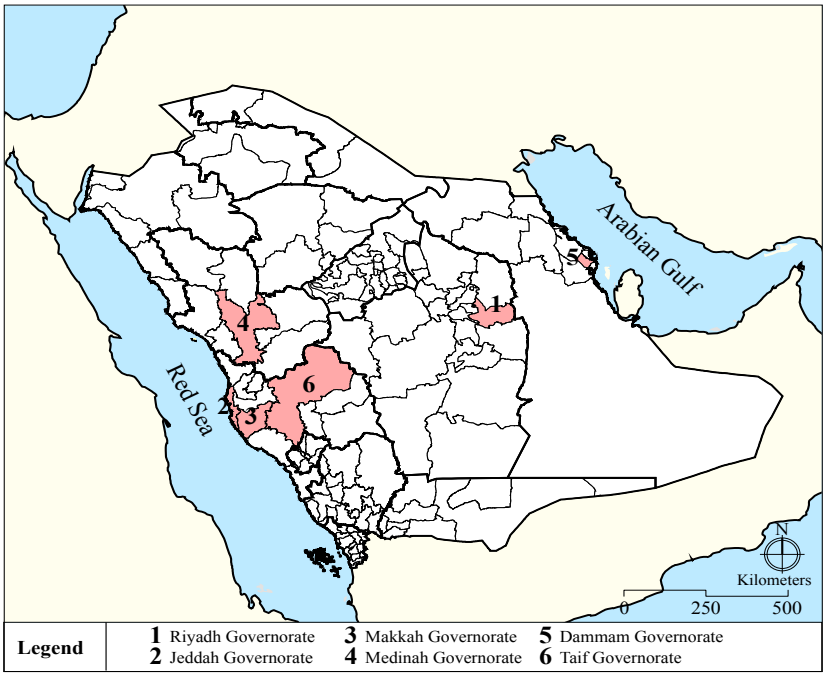


Fig. 2-5 Important and Urbanized Governorates in Saudi Arabia
(Source: Central Department of Statics & Information, 2010, p.27, Redrawn by the author)

2.2.3 Characteristic of Residential Areas and Housing in Saudi Arabia

As Islam is the state religion in Saudi Arabia, and it strongly recommends Muslims for pray all prays in mosques. So this has effected the composition of residential areas. For instance, the sprawl of housing in unplanned settlements used to be started from around a mosque radically; however, in planned modern neighborhoods, the priority is for the service distance to mosques (maximum 200m in length) not the location itself.

As mentioned above in the section of **social characteristic** that, due to several factors such as religion, and conservativeness, villa type housing is much popular than apartment type housing. The government has the initials and the goals for supports families by villas as this type is the most suitable type of housing for Saudis to solve the housing shortage problem the country has been experiencing since 1992 (Jeddah Municipality, 2008, p.329). On the other hand, in Saudi Arabia, the is a lacking of the system of 1) apartment management association, and 2) maintenance fee for those who own units in apartment.

Regarding the characteristics of housing in Saudi Arabia, housing can be divided into three types as traditional housing, villa, and apartment. Traditional housing

can be translated into today's terminology as villa type housing (detached housing); however, they were built by natural materials. Due to the variety of typography the land of Saudi Arabia consists, the characteristic of traditional housings is different from area to area. As seen in Fig. 2-6 that traditional house is increased in governorate that rich by mountains. Villa are concentrated in some main cities such as the capital and some low population governorate. However, some important governorate such as Jeddah, Makkah, Madinah are experiencing a lack of ratio of villa with a high rate of apartment type of housing. This was resulted from the pressure of the internal immigration. So the government are putting lots of effort to increase the ratio of villa in these cities.

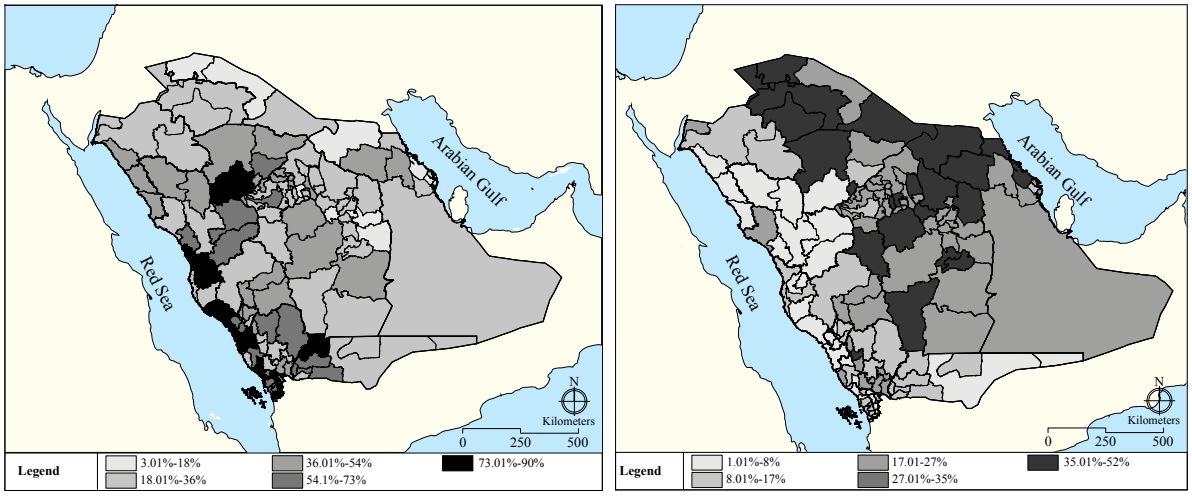


Fig. 2-6 Ratio of Traditional Housing by Governorate (left)
Fig. 2-7 Ratio of Villas by Governorate (right)
(Source: Central Department of Statics & Information, 2010, p.27. Redrawn by the author)

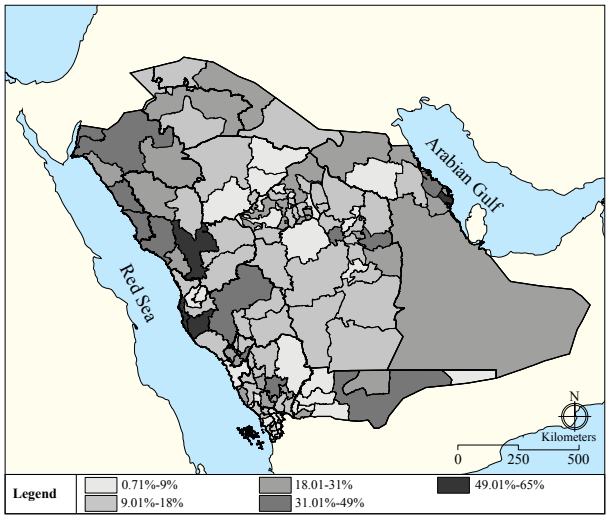


Fig. 2-8 Ratio of Apartment by Governorate
(Source: Central Department of Statics & Information, 2010, p.27. Redrawn by the author)

2.3 Jeddah City Profile

2.3.1 History of Jeddah City and Characteristics of Old Jeddah

"Jeddah was first inhabited about 2,500 years ago as a small fishing settlement and has long been a center for traders and sailors. The city was already an established port with a history of spice trading when Caliph Osman Ibn Affan declared it the official port for Muslim pilgrims making their way to the Holy Cities of Makkah and Madinah in 647. This marked a turning point in Jeddah's future, not only because of the increased possibilities for commerce but also because the arrival of pilgrims from all over the world, some of whom stayed in the city and laid the foundations for a cosmopolitan Jeddah." (Jeddah Municipality. 2009)

"The Ottomans conquered Jeddah during their expansion into the Middle East in the early 1500's and built a stone wall around the city in order to fortify it against attacks from the Portuguese. It remained a fortified city until it was released from Turkish rule. Following the removal of the city walls in 1947, the city's population, fueled by immigration, grew rapidly. In the period between 1947 and 1987 population growth averaged 9.5 per cent annually." (Jeddah Municipality. 2009)

Fig. 2-9 Map of Saudi Arabia (right), including the Jeddah Governorate area (left) (source: Ministry of Economy and Planning, Central department of Statistics and Information, 2004) (Redrawn by the author)

Fig. 2-10 Arial Photo from the South Showing walled Jeddah and the Gates in 1938

(Photographed by William Facey)

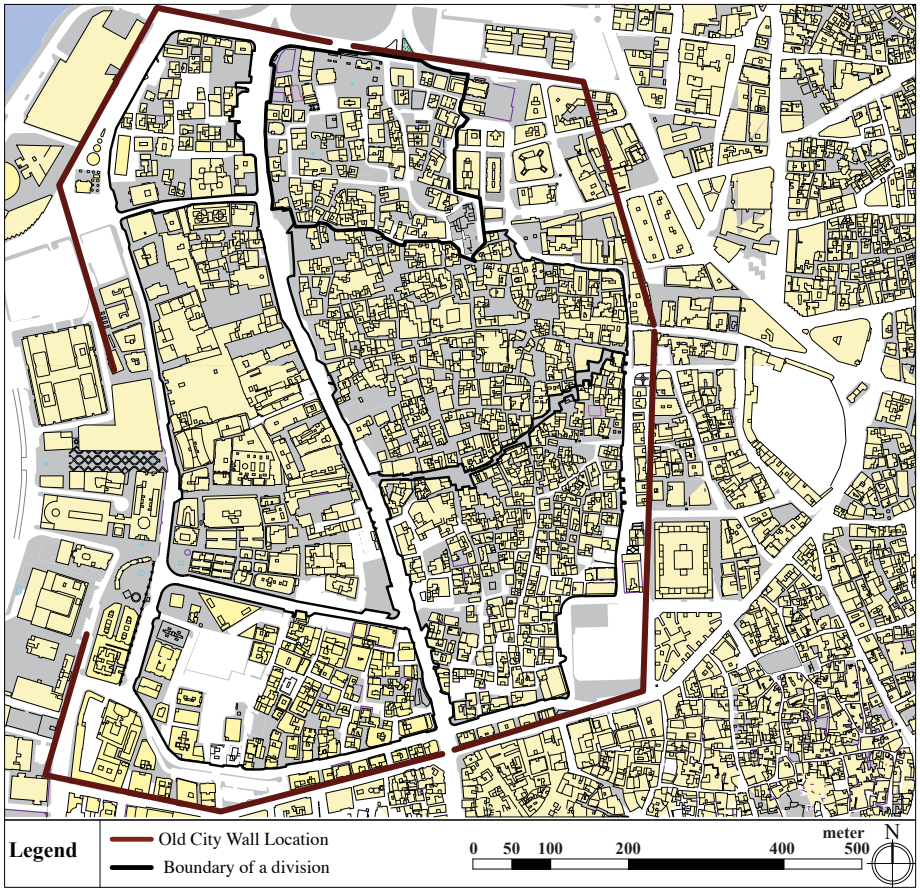


Fig. 2-11 Map of Old Jeddah

(Source: Jeddah Municipality, 2014. Redrawn by the author)

Fig. 2-12 A place Used to be as square between Residential Buildings (Photographed by the author)

Fig. 2-13 A blind alley

Fig. 2-14 An inner Street

(Photographed by the author)

The urban fabric of Al-Balad is characterized by its spontaneous form that derived originally from the people needs at that period. For instance, as shown in figure 2-13, blind alleys were resulted from the need for more security, toward the strange people who inter the walled city. Furthermore, narrow alley and street were resulted from the need of shadow and to create a nice wind that resulted from the different in level of building.

2.3.2 Population and Chronological Growth

Jeddah's total population is estimated at around 3,400,000 and by 2029 it is expected to have grown to over 5,000,000 (Fig. 2-15). The total population is currently made up of 52% Saudi nationals and 48% Non-Saudi nationals, which demonstrates the city's demographic diversity. "Jeddah's Saudi population is roughly equally split between males and females, but the Non-Saudi population is heavily weighted towards males – reflecting the large number of expatriates working here without their families."(Jeddah Municipality. 2009).

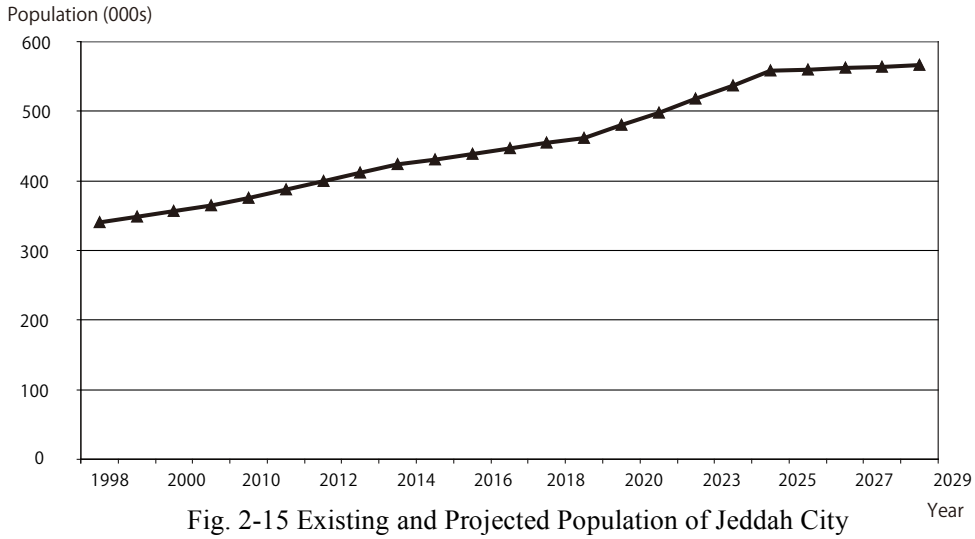


Fig. 2-15 Existing and Projected Population of Jeddah City
Source: Central Department of Statics & Information. (2010)

"In the period between 1948 – 1956 as KSA's principal port, Jeddah benefits from a boost in imports. Significant growth of city to the north and east after walls removed increasing city area from 300 to 3,300 hectares. Between the years 1957 – 1963 growth static due to downturn in value of oil and slow economic growth. From 1964 to 1971 improved economic conditions lead to city area growing by 50 per cent. The majority (95 per cent) of growth is concentrated to the north, with a small amount of growth to the east and south. 1976 Jeddah Islamic Port is established, altering Jeddah's coastline and the relationship between Al Balad and southern areas of city with the coast and city center. 1981King Abdul Aziz International Airport opens including the new Hajj Terminal." (Jeddah Municipality. 2009). In the period after removing the city wall, the population was increased rapidly due to an internal immigration so called social increase; however, since then the city population has been increasing naturally so called natural increase.

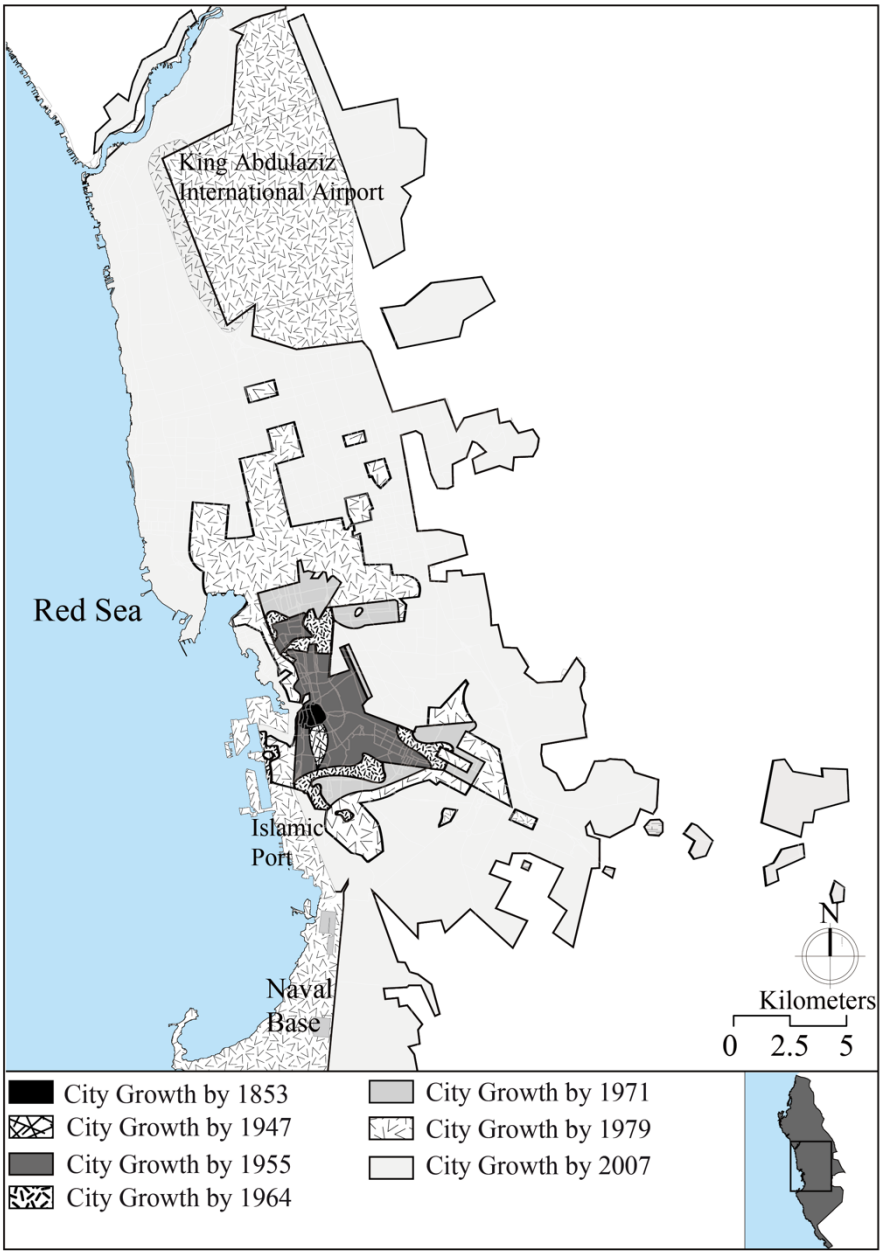


Fig. 2-16 Chronological Map of Jeddah
(source: Jeddah Municipality, 2008) (Redrawn by the author)

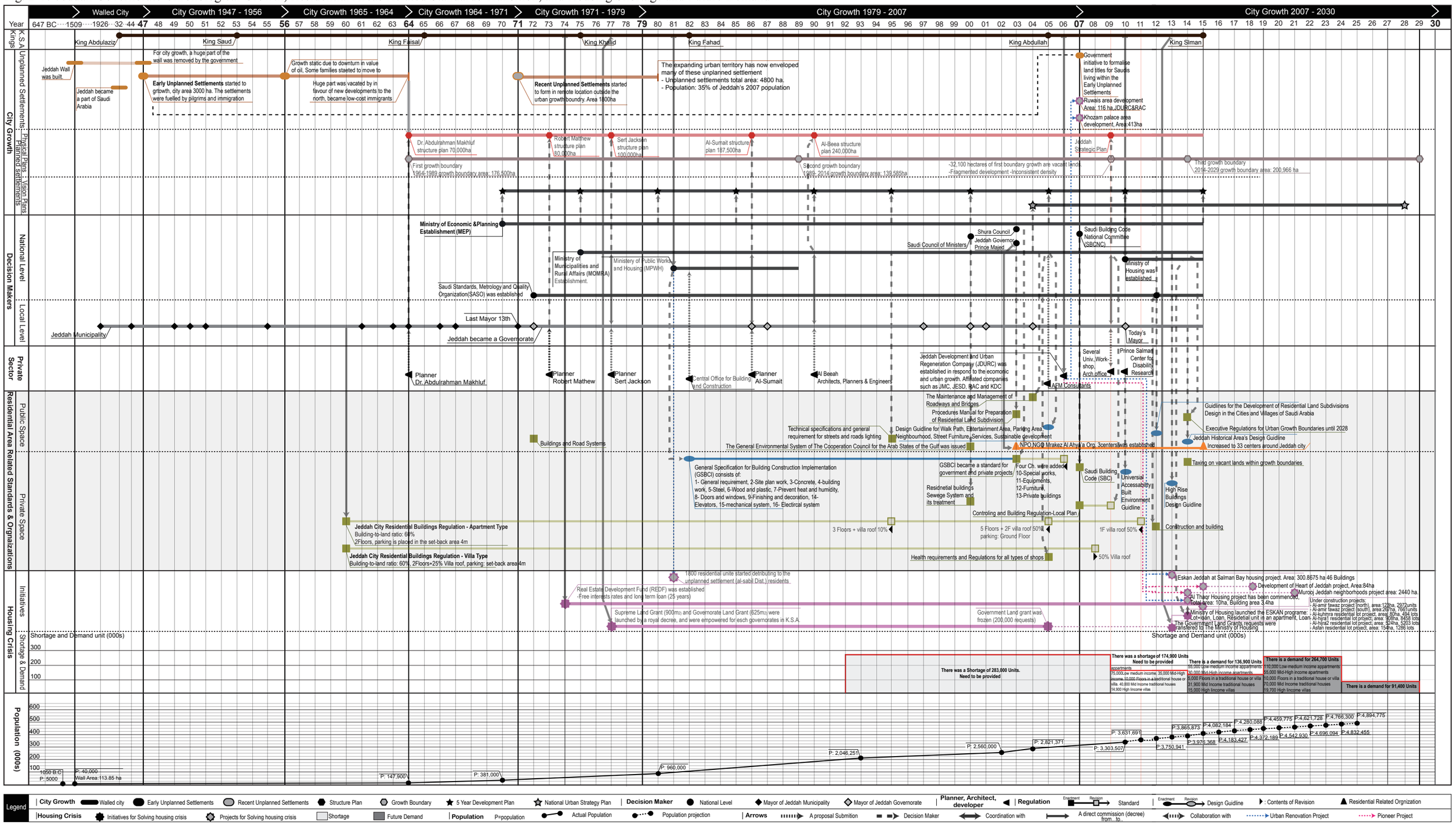
2.3.3 Jeddah Governorate Chronological Growth, Residential Areas Related Standards Transition, and Housing Shortage and Future Demand

Through the urbanization process that Jeddah City has been experiencing, several changes and events were occurred in different levels with several factors (figure 2-17). These changes had effects on the progress of the urbanization, increasing and decreasing unplanned settlements, spatial space in residential areas, diversity in population density, and so on.

In 1932, Jeddah (walled city) became a part of Kingdom of Saudi Arabia, after while in 1947 the city wall was removed by the central government due to the city expansion. After the remove of the city wall and due to lacking of city structure plan, unplanned settlements (so called informal settlements) were appeared in the period between 1947 till 1964. However, the first structure plan that was applied in 1964 had limited sprawling unplanned settlements. Jeddah City has experienced six structure plans. Each structure plan supposes to respond to the population growth, thus each one has its characteristic, this is reflected on private space section of residential area related standards in figure 2-17, where the limitation of floors number of residential building has been changed several times, from two floors, three floors, up to five floors. These increasing were mainly for responding to population growth the city has been experiencing.

In 1971, unplanned settlements started again to appeared out the city growth boundary of that period and they had been growing till 1980. Since 1992, Jeddah city has been experiencing housing shortage problem, this shortage was resulted from several factors that are 1) internal immigration, 2) population increase, 3) relocating people who lives in inadequate houses in unplanned settlements that was under the program called "Jeddah Without Slum". So, as one of the initiatives to solve this problem, in 2006 Jeddah Development and Urban Regeneration Company was established by a royal decree. This explains that due to "Jeddah Without Slum" program which was decided by a royal decree (as a top-down decision making system), expanding unplanned settlements has become more difficult, which resulted increasing in population density in apartment type neighborhood in Jeddah City. The company (Jeddah Development and Urban Regeneration Company) collaborates with the private sectors for building appropriate housing for the middle and low income people as shown in figure 2-18 in collaboration with Real Estate Development Fund: however, due to lacking of information, the fulfillment of today's housing needs and the shortage is unknown. However, the shortage problem is still being occurred.

Fig. 2-17 Jeddah Governorate Chronological Growth, Residential Areas Related Standards Transition, and Housing Shortage and Future Demand



2.3.4 Procedure Flow of New Development of Residential Neighborhood in Saudi Arabia

As this research discusses a new design guideline to be suitable for Saudi Arabian environment and society, it was necessary clarify how today's planned neighborhoods were created in term of procedure. This was done by making arrangement for the procedure flor of new development of residential neighborhood in Saudi Arabia as it shown in figure 2-18.

As it shown in figure 2-18 that, Government sector, and private sector are involved. Three main government institutions are involved in the procedures flow. Starts from top to down as Ministry of Municipals and Rural Affairs (MOMRA), Jeddah Governorate, and Jeddah Sub-Municipalities. Regarding the private sector, only the certified engineer offices are included in this procedure. Eight stages are necessary to get the implementation plan approved from the MOMRA. Starts from 1) Site Study and Documentation Procedures, 2) Preparation the Initial Scheme for the Site, 3) Detailed Plan Procedures, 4) Coordination with Electricity Company, 5) Inspection, 6) Review, 7) Ratification, and 8) Scheme Implementation.

Regarding the Cadastral preparation **(criteria [1])**, it is as shown below:

1.The dimension and angel for each side of the land must be shown. And the last close point of the land as well.

2. Choose as reference point in the land. Use it in case to resurvey that land.

3. The survey map must be based on the NGN and UTM map survey system.

4. Link the site to a fix sign close to it. (e.g. road, buildings etc.)

The final survey map must be consisting of:

a) The site topographical situation, floodplains, corals, flumes, mountains, the site's surrounded buildings, farms, fences, cemeteries, wells, marsh and soft land, the roads that mentioned in the land instrument, existing and confirmed public utility (e.g. Electricity, water, telephone, sewer etc.)
b) Owner ship of the land whether private or government.
c) Print out the final survey map in the size of (A2, A1 or A0) with map scale 1:100, 1:500 or 1:2500, with the north direction with the date of survey.

d) Must be conformed and ratified by a JM surveyor and the head of department of survey of the Sub –municipality the land belongs to or Jeddah municipality.
e) Prepare a report about the soil condition and must be confirmed whether by one of the certified Eng. Offices or Jeddah municipality.

Furthermore, Regarding the PMPRLS **(criteria [2])**, it is as shown below:

Residential Area Design Policies:

1. The design must be integrated with the surrounding existing residential area and roads.
2. It must promote the citizen by the feeling of belonging and responsibility toward the neighborhood.
3. The land use must be design to promote the privacy.
4. The design must encourage the walkability in a safely and enjoyably.
5. The design must be designed to prevent cars to cross the neighborhoods.
6. The citizen must be divided into blocks.
7. Reduce the length of road.
8. All cars must be able to reach to each lot.
9. The design must be appropriate to the location typology.
10. The services area must be available to the citizen needs.
11. The design must consist of parking system (belong to the Parking System Planning Standards)
12. The local heritage architecture must be taken into consideration.
13. For the social integration, the design must consist of verities of lot

Residential Area Planning Standards (criteria):

1. Public Land

A. Children Playground: it must be provided within an area of 400m^2, it serves 20 unites. And it must be designed in a place where children must not cross a local road.
B. Public Park: 5.6m^2 of parks area per person must be provided. On the district scale the park must not be below 5000m^2. the Park must be designed in a way its users must not across a main road. It must be appropriate to the land typology.

C. Roads and Parking System:

- The total area of the road must not exceed 20% of land total area.
- The total area of the public land (which are road, parking area, squares, sidewalk, children playground, public parks must not exceed 33% of the land total area (with note, the unsuitable areas for development such as mountains, valleys, steep slops do not include in this percentage)
- The design of the parking area and parking system must be matched with the contour line.
- The road design must contribute to reduce the cost of collection and transport of waste in the urban scale.

2. Public Services

A. Local Mosque: A mosque must be provided for a residential block with a service distance of 200m.

B. Schools for Boys and Girls: provide an elementary school within a service distance of 550m. and provide an Intermediate school within a service distance of 800m

C. Service Center.

D. Social Center: must be provided within an area of $200m^2+13m^2$ for person.

Residential Area Planning Standards (criteria):

3. Residential Lot:

A. The Length of residential area's road:

B. A lot area must not to be below $300m^2$.

C. The front side of a lot (face the road) must not be below $15m^2$.

D. The type of resident must be determined (villas, apartment, palace, attached building), Notes that the owner can choose all of them in neighborhood however, there is a need to follow the design for each type of them specially the park system.

4. Attached Residential Units

A. The road width in front of the main elevation of the unties must not be below 12m. In case of the road width 10m, in the design process, a vehicle park must be design inside the unit boundary.

B. A unit lot area must not be below $200m^3$.

C. The Width of a villa or attached building must not be below 10m (includes the

both side setback). In case of separated a villa into two levels, the width must not be below 15m.

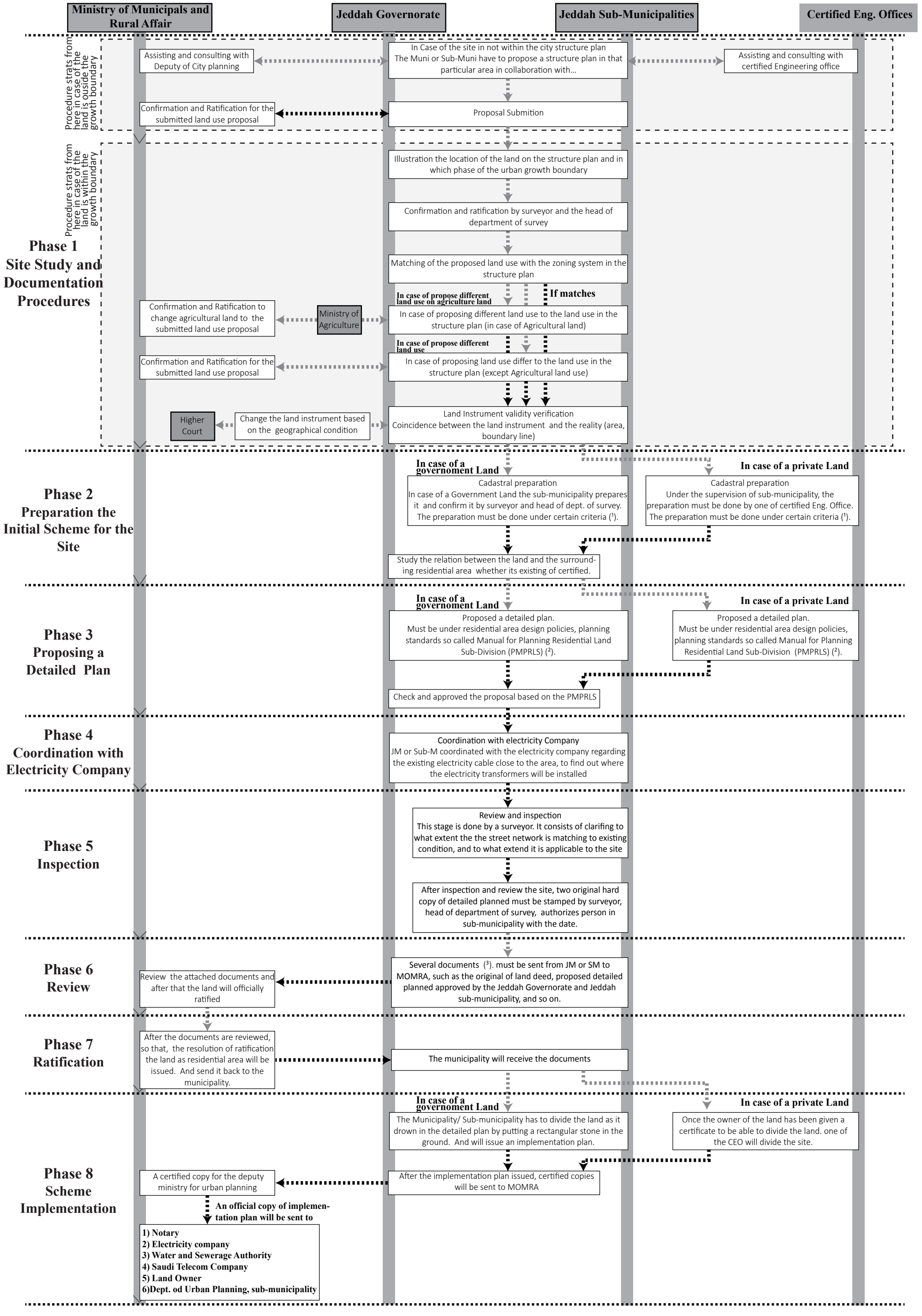
D. The architecture standard such as setback, building height, build-to-land ratio and so on must be implemented.
E. Separation of villas must be in a liner line.

Regarding the **several documents** [3] that must be sent from Jeddah Municipality or Sub-Municipality to MOMRA

The documents consist of:

1. A hard copy of structure plan shows the location of the land, and shows in what phase the growth of the city is in relation with land.
2. Two copies of survey map that approved by the municipality.
3. A hard copy of land instrument (in case of private land)
4. Two hard copies of the detailed plan.
5. Two hard copy of the land map want to be ratified shows the way flood water is discharged by contours map.
6. Two hard copies of the land map show the place the garbage are collected and shows the course path.

Fig. 2-18 Procedure Flow of New Developemt of Residential Neighborhood in Saudi Arabia



2.4 Conclusion

This chapter summarizes that, 1) internal immigration from small cities to main important cities is notable in Saudi Arabia, which make a pressure on these cities reflected by a rapid city growth. 2) The typography plays an important role in the type of housing in each governorate, as notable the increasing of traditional housing in western part of Saudi Arabia where the Al-Sarawat mountain chain is crossing Saudi Arabia from southern to northern part. 3) In parallel with the movement of internal immigration the country is facing, the population is projected to increase till 2080 to be approximately 48,720,000 people, which is a strong indication for more pressure is predicted to be occurred in these main cities. 4) Based on a religious, conservative, traditional, and family oriented background society, the most likable and favorable type of housing is villa type housing (detached housing), where Saudi Arabian can find their privacy protected in this type of housing.

From the above summery, it is clear to say, 5) Jeddah City that is characterized by its historical background it had in Saudi Arabia due to its location that close to the most important religious cities that are Makkah and Madinah city, is struggling with a problem of a low amount of the likable villa type housing. 6) In addition to that, Jeddah City is facing a high amount of housing shortage that is reflected on the actions the have been taken in changing the residential building related design standards several times as an initials to fulfill this shortage, in addition to that, the city is putting lot of efforts in responding to this shortage by conducting new housing project that can be owned by a long-period-loan for Saudis. 7) Indeed, the city is unusually experiencing a movement of owing units in apartment instead of having one's own villas, this is due to the high value of villas, it became difficult-to-get especially by the low and middle income people.

Moreover, 8) From the above, it is clear to say that there is a need to take Jeddah City as a case study for this research as a) it is the most traditional city in the country, b) its location along the Red Sea and closeness to the most religious cities, and historical background gave the city the advantage to be the gate city for Makkah and Madinah city, and to be the second important city economically and commercially after capital of Saudi Arabia (Al-Riyadh), c) Although it has the largest urbanized area in Saudi Arabia, it is experiencing housing shortage.

From the above, it can be concluded that it is necessary to:

1) Clarify the reasons behind the low ratio of villa type neighborhood and its relation to housing shortage (planning level).

2) Reevaluate the residential and street related standards (spatial and architectural level).

3) Clarify to what extent the open spaces in neighborhood are suitable to the society (open space level).

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Chapter Three

Trend and Diversification of Villa Type Neighborhood in a Growing City of Saudi Arabia

Chapter Three

Trend and Diversification of Villa Type Neighborhood in a Growing City of Saudi Arabia

3.1 Introduction

3.1.1 Research Background

One of the most traditional and rapidly growing cities in Saudi Arabia, Jeddah City was first inhabited 2,500 years ago as a fishing settlement. Between the year of 1509 and 1947 Jeddah was a walled city. Due to the city location as a gate for the holy two cities Makkah and Madinah, following the removal of the city walls in 1947, the city's population, fuelled by immigration from all around the country, grew rapidly. In the period between 1947 and 1987 population growth averaged 9.5 percent annually (Jeddah Municipality, 2009). As it was reported in the strategic plan that was issued in 2007, Jeddah is expected to grow by around 2.25 million between 2007 and 2029.

Through the urbanization process, between 1947 and 1980, unplanned settlements had been appearing within two stages due to the lacking of adequate housing for low income and middle income residents (Jeddah Municipality, 2009). Then, between 1992 and 2007, Jeddah city had a serious housing shortage problem, which has resulted in increasing 1) the number of two generations houses (families who live with their parents) with an amount of 80,000 families, and 2) the number of families who live in a reclaim-needed houses in unplanned settlement with an amount of 151,600 families. As the Jeddah mayor has declared in the strategic plan in 2009 that, Jeddah City is facing two main issues. First,

to fulfill the housing shortage by providing a new adequate houses, and second, to respond to the housing projected demand between 2009 and 2029, which is approximately 667,900 units. Two-third of them will be required for low- and middle-income residents.

In Saudi Arabian culture, living in one's own villa is fundamental and basic in Saudis' life style. This is appeared in the high number of villas comparing to apartments in Saudi Arabian cities. For instance, in 2004, the capital Al-Riyadh, villas constitute approximately 59% of residential building; however, villas in Jeddah City constitute approximately 17% of residential buildings. In contrast, unlike other cities in Saudi Arabia, apartments in Jeddah City constitute 65% of total housing units, which make Jeddah city the most city in Saudi Arabia consists of apartments units (Central Department of Statics & Information, 2004). Increasing apartment ratio was resulted due to the gap between the low- and middle-income residents and the villa type's land value. One of the main reasons behind the increasing of land value is the lacking of diversity of villa type lot area, which is around $500m^2$-$600m^2$. The lacking of diversity of land lot area was as a result of the limitation of population density in villa type neighborhood (50-100 person/hectare) which was setup in the Jeddah master plans.

The Procedure Manual for Preparation of Residential Land Subdivision that was issued by Ministry of Municipal and Rural Affair that consists of several articles under land readjustment law have had the effect on the abovementioned lacking of diversity of villa land lot area which are between $500m^2$-$600m^2$.

3.1.2 Research Objectives

In the light of the abovementioned housing shortage, trend of increasing population with two-third of housing projected demand for low- and middle-income residents, and the trend of city growth toward apartment building and its relation to land lot area, it is necessary to improve the following issues: 1) population density in villa type neighborhoods, and 2) land readjustment law.

The specific objectives for this study are: 1) to make arrangement for the population growth in Jeddah city, total housing shortage and projected demand, the factors that caused the housing shortage problem, the policy and strategy the local government (top-

down approach) has taken to solve the housing shortage problem and future housing demand, and the actual condition for population density and its change in each district in Jeddah City (section 2); 2) to make arrangement for the residential new development related laws, and to define to what extent they create diversity of land lot area in villa type neighborhood (section 3); 3) to clarify to what extent the residential new development related laws are applied to the existing neighborhood, and to what extent today's neighborhoods can be a part of housing shortage problem (section 4). 4) to clarify the characteristic of the composition of existing villa type neighborhoods, issues for each pattern, and suggest a proposal as an initiative for housing shortage problem (section 5).

3.1.3 Research Methods

To accomplish the abovementioned objectives, data collected from several competent authorities. The methodology was sequentially performed as shown below.

1) Housing Shortage and Projected Demand Related Tables and Figures

These tables and figures show the amount of housing shortage the city is experiencing, projected housing demand with the amount for each category of housing, population census, future projected population, the factors behind the housing shortage, and the changes in population density for each district in Jeddah City through the year 2007, 2008, 2009, and 2012. The tables and figures was produced by using data collected from Jeddah Municipality, and the Saudi Arabian Ministry of Municipal and Rural Affairs (section 2).

2) Planned Neighborhood Composition

This is to make arrangement of the composition of planned neighborhood based on several articles in the land readjustment law of Saudi Arabia. With showing the criterial and limitation ratio for each components of the neighborhoods. and define what extent the law could create diversity of land lot area in villa type neighborhood. The map was produced by using data collected from the Saudi Arabian Ministry of Municipal and Rural Affairs (section 3).

3) Existing Planned Neighborhoods and Residential New Development Law

This is to examine 1) to what extend the existing villa type neighborhoods are matched to the laws that were based on in create them. This was done by take all villa type neighborhoods (103 location) in the Jeddah City and setup several index and analyze them

via scatter diagram. In addition to that, 2) to what extent today's villa type neighborhoods can respond to the housing shortage if the neighborhoods full capacitated in same tendency of each neighborhood. (section 4)

4) Existing Villa Type Neighborhoods and Related Analysis
This is to clarify dependent factors in neighborhood that have relation to each other via correlation analysis, and then make a prediction regarding how the villa type neighborhoods has been grown between the period 2008 and 2016, this was done by multiple regression analysis. Finally, via these two analysis, today's villa type neighborhoods were grouped and proposed a suggestion for each group (section 5).

3.2 Housing Policies and Issues in Jeddah City

3.2.1 Housing Shortage and Projected Demand

In 2009, Jeddah municipality issued a strategic plan shows the problems Jeddah City is experiencing regarding housing shortage and the projected demand. Based on the strategic plan, figure 4-1 shows that, Jeddah city has a severe housing shortage since 1992 with total amount of 231,600 units that was needed to be fulfilled in 2009. In addition to 51,500 units that were not fulfilled as respond to the population growth between 2007 and 2009. Furthermore, in responding to projected future population, between 2009 and 2029, the housing demand is varied every half-decade. In average, there is a need to provide 33,500 units per year till 2029 (Fig.3-1). However, due to lacking of data, the fulfillment of a) shortage housing units (1992-2009), and b) projected demand at that period (2009-2016) are unconfirmed.

3.2.2 Housing Shortage Problem and Related Factors

Housing shortage problems in Jeddah City were resulted from a complex web of issues including the Jeddah Without Slums Program (JWSP), financing and economic problem, master plan related problem, housing policy problem, and legal framework as they are shown in figure 3-2.

3.2.2.1 "Jeddah Without Slums Program" (JWSP)
This program was established in 2007 by a royal decree. It aims for reclaiming the unplanned settlements. Jeddah Municipality did a survey and the result was announced

in 2007 as building in unplanned settlements are divided into three types. Buildings need to maintain, refurbish, and reclaim. Jeddah Municipality announced that 476,000 people (approximately 151,600 households) need to be relocated from unplanned settlements to dangerous condition house (Jeddah Municipality, 2009).

3.2.2.2 Financing Economics Problem

In 2008, the average cost of one hundred square meters of raw (unserviced) land in Jeddah was 2.24 times the average family income, while one hundred square meters of serviced land (land with electricity, roads and water) cost on average 19.4 times (Jeddah Municipality, 2009). This is one of the main factors that increase the number of two generation houses (approximately 80,000 households).

3.2.2.3 Housing Policy

The lack of government control over private sector real estate developers, but also due to the developers themselves, who cater primarily for the more affluent classes and do not perceive middle and low cost housing projects as being sufficiently profitable.

3.2.2.4 Legal Framework

The under-supply of housing is also linked to the legal framework, which provides insufficient protection to landlords and lenders whose tenants or borrowers default.

3.2.2.5 Population Density

Jeddah City has grown via five different master plans in different period by different planners. Each planner setup different population density for neighborhoods (table. 3-1).

3.2.3 Population Density in Residential Districts

Due to the low population density that was setup in Jeddah structure planes (table 3-1) which has resulted an average of 500m^2 for the villa type lot area, so that it caused 1) a limitation in increasing rate of villas in villa type neighborhoods comparing to apartment type neighborhoods as it shown in figures 3-2, and 3-3) difficulties in owing a villa for medium-low and low income people.

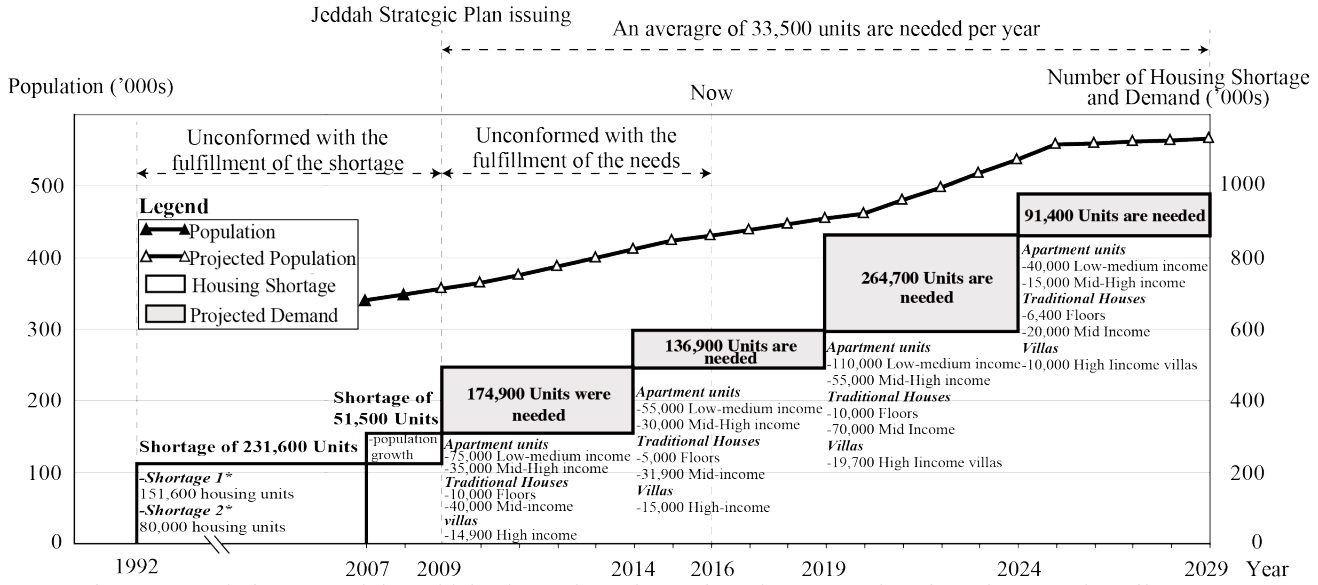


Fig. 3-1 Population Growth in Jeddah City and Total Housing Shortage and Projected Demand Until 2029

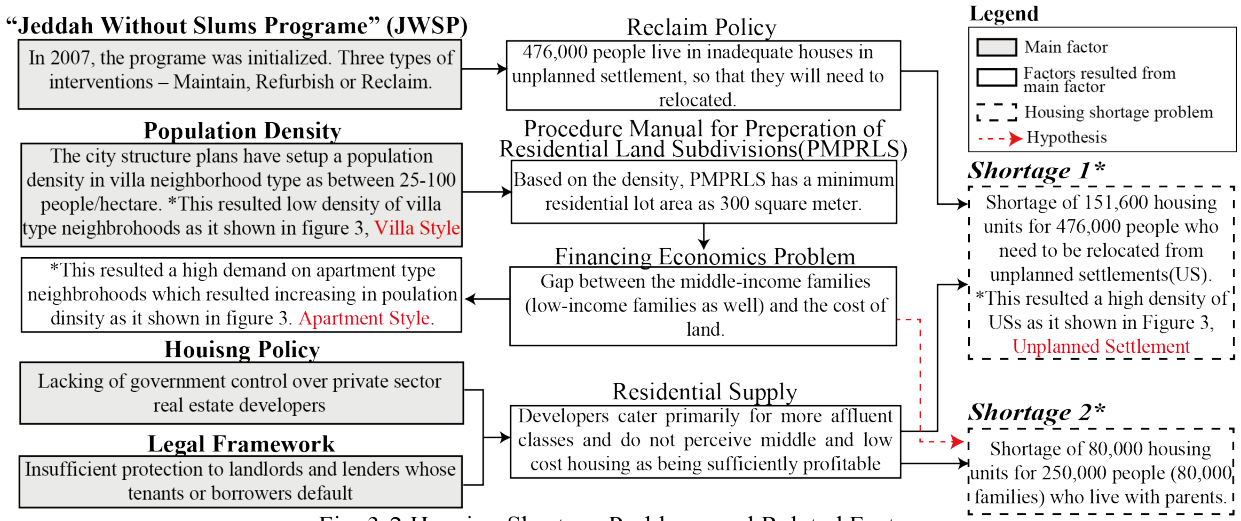


Fig. 3-2 Housing Shortage Problems and Related Factors

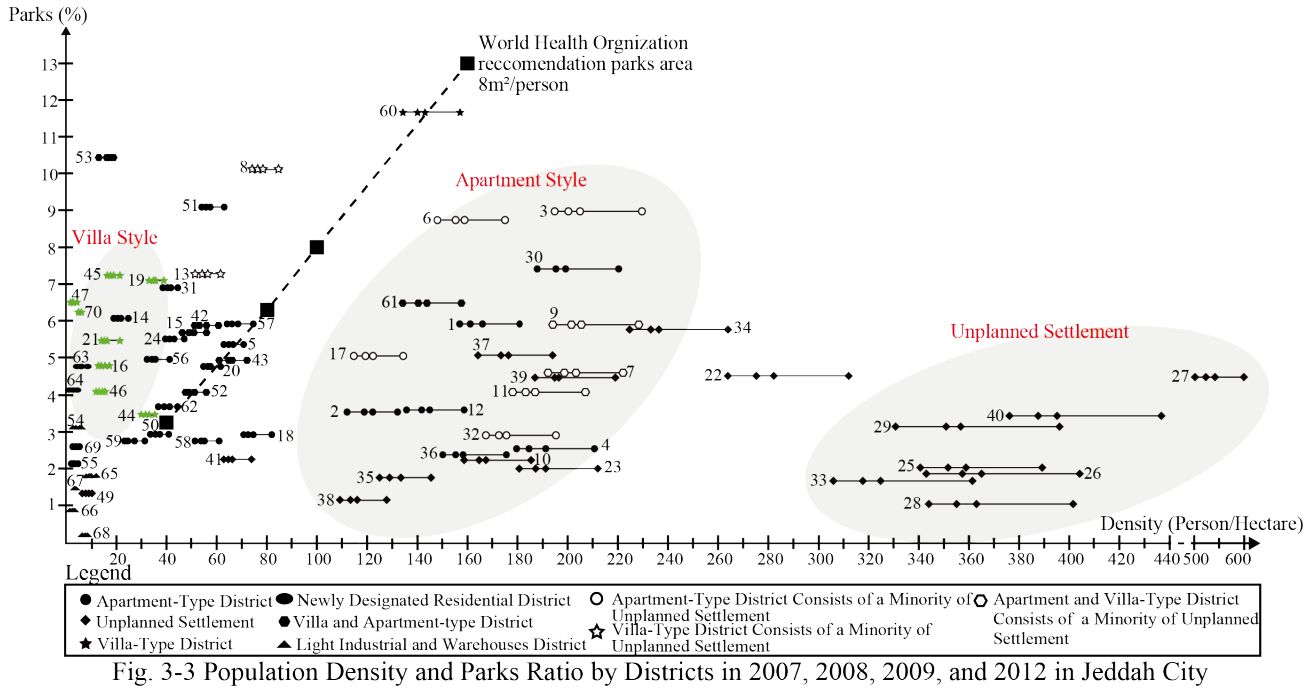


Fig. 3-3 Population Density and Parks Ratio by Districts in 2007, 2008, 2009, and 2012 in Jeddah City

3.3 Villa Type Neighborhoods New Development

3.3.1 Procedure Manual for Preparation of Residential Land Subdivision

During the urbanization process in Jeddah city, the area outside each urbanized boundary was a good investment opportunity for businesspeople, who bought and sold large areas of land and subdivided into residential lots to create neighborhoods, this was done based on procedure manual for preparation of residential land subdivision (PMPRLS).

The PMPRLS consists of several regulations regarding public space such as street, parks, mosques, parking area, and private space such as residential lot area and dimension. Public space related regulation are 1) a land for local mosque with a service distance that must not exceed 200m, 2) lands for elementary and intermediate schools must be provided with a service distance that must not exceed 550m (the ratio is not mentioned), 3) streets with a total area that must not exceed 20% of total area, 4) street total length as it shown in table 3-2, 5) one children playground for each 20 villas with a minimum area of 400m^2, and 5) parks, amenities' parking area, pedestrian corridor, and square must not exceed 13% of total area. Private space related regulations are 1) 300m^2 as the minimum land lot area for villa area, or 200m^2 after subdivided a lot, and 2) 15 meter as a minimum residential lot width. As it is mentioned in the manual that to calculate the population and population density, an average of 5 people for household size. Figure 3-4 shows the composition of villa type neighborhood based on the PMPRLS.

Table. 3-1: Characteristic of Population Densities for Each Type of Residential Area in Each Structure Plan in Jeddah City

Structure plans / Districts Type	1st Structure Plan	2nd Structure Plan	3rd Structure Plan	4th Structure Plan	5th Structure Plan
	Unit: People/Hectare				
Within urbanized area	100-150				
Outside urbanized area	50-100				
Large villa		15			
Villa		50	75	25	40-70
Apartment		15	175	150-200	90-200

Table. 3-2: Average of Lot Area and Total Length of Street in New Development of Villa Type Neighborhoods

Average of Villa Lot Area ($m^{2)}$	Maximum Street Total Length (m) in 1 hectare (MSTL)	Maximum Street Total Length in an Area with a Radius of 200 meter
300	130	1633
400	120	1507
600	110	1382
800	100	1256
1000	95	1193
2000	80	1005
2500	75	942

3.3.2 Application of Procedure Manual for Preparation of Residential Land Subdivision (PMPRLS) on an area with a radius of 200 meter

Table 3-3 shows street total area (STA), the number of villas (NoV), population density (PD), number of children playground (NoCP) based on the percentage of street total area (20% of total area), public facilities total area (PFTA) (13% of total area), and total street length (TSL) that discussed above in PMPRLS in case of an area with a radius of 200 m (12.56 hectare) that centered by a mosque. In contrast, table 5-4 shows the application of the PMRPLS to the same land area as mentioned above with difference in street width as a minimum street width as 10 m.

Table. 3-3: Applying the PMPRLS to an area with a radius of 200 m (12.56 hectare in total area) in a maximum capacity of streets

AoVLA	STA	PFTA	TSL	NoV	PD	NoCP
0.03($300m^2$)	2.56 (20%)	1.63 (13%)	1633	279	111	14
0.04($400m^2$)			1507	210	84	11
0.06($600m^2$)			1382	140	56	7
0.08($800m^2$)			1256	105	42	5
0.1($1000m^2$)			1193	84	34	4
0.2($2000m^2$)			1005	42	17	2
0.25($2500m^2$)			942	34	13	2

Note; AoVLA: Average of Villa Lot Area (hectare), STA: street total area (hectare)= 12.56*0.2, STA%: street total area (percentage)= STA*100/12.56, PFTA: public facilities total area (hectare)= 12.56*0.13, TSL: total of street length (m)= MSTL(table2)*12.56, NoV: number of villas= 12.56*(1-STA-0.13)/AoVLA, PD: population density (people /hecare)=NoV*5/12.56, NoCP: number of children playground=NoV/20

Table. 3-4: Applying the PMPRLS to an area with a radius of 200 m (12.56 hectare in total area) in a minimum 10m wide streets

AoVLA	STA	PFTA	TSL	NoV	PD	NoCP
0.03(300m^2)	1.63(13%)	1.63 (13%)	1633	310	123	15
0.04(400m^2)	1.51(12%		1507	236	94	12
0.06(600m^2)	1.38(11%		1382	159	63	8
0.08(800m^2)	1.26(10%)		1256	121	48	6
0.1(1000m^2)	1.13(9%)		1193	97	39	5
0.2(2000m^2)	1.00(8%)		1005	50	20	2
0.25(2500m^2)	1.00(8%)		942	40	16	2

Note; Note; AoVLA: Average of Villa Lot Area (hectare), STA: street total area (hectare)= STA= TSL*0.001ha (=10m street minimum width)/12.56, PFTA: public facilities total area (hectare)= 12.56*0.13, TSL: total of street length (m)= MSTL(table5-2)*12.56, NoV: number of villas= 12.56*(1-STA-0.13)/AoVLA, PD: population density (people /hecare)=NoV*5/12.56, NoCP: number of children playground=NoV/20

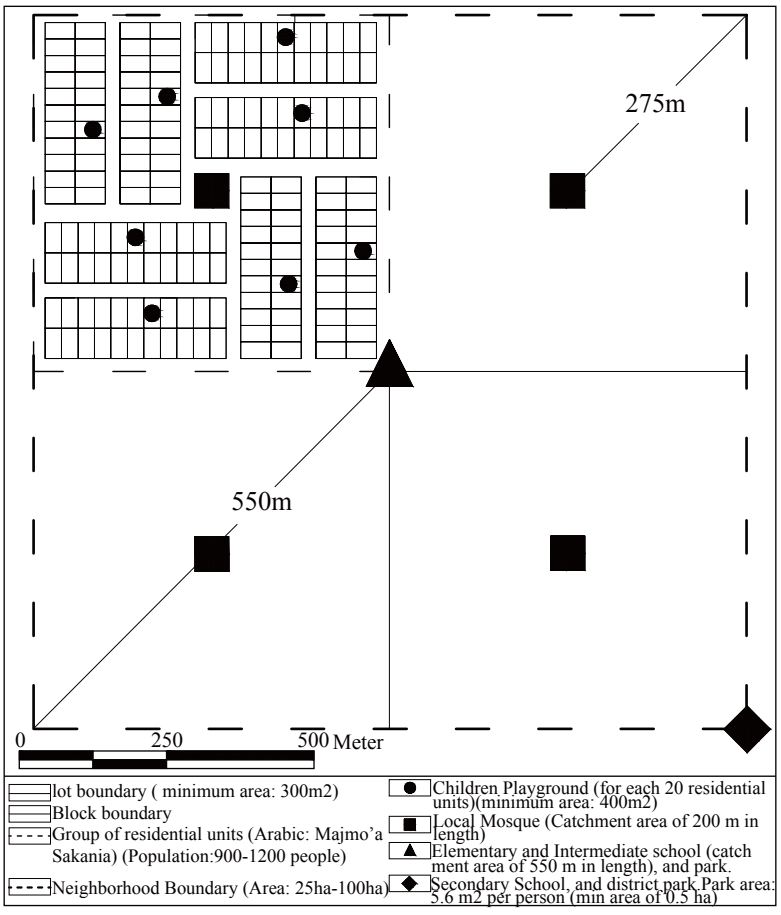


Fig. 3-4 Neighborhood Conceptual Composition Based on PMPRLS

3.4 Existing Condition of Villa Type Neighborhood and PMPRLS

3.4.1 Index Analysis

This analysis was produced by using the Jeddah City's geographic information system (GIS) data that was given from Jeddah Municipality and exporting the data to an AutoCAD file. The analysis consists of analyzing areas within a radius of 200-meter (approximately 12.56 hectare) for whole mosques in villa type neighborhoods (103 case studies in total) in Jeddah city (Fig.3-5). The index is divided into private space and public space. Private space such as villas, commercial facilities, and office buildings. Public space consists of mosque, elementary school, street, parks. Six barometers were setup in analyzing villas such as 1) number of villas in 2008 and 2016, 2) total area of villas (average value, median value, minimum and maximum value and the difference between them), 3) the minimum, maximum, and median value of the distance of existing villas' lot frontage and their proportion to the lot length, 4) number of villas that face 1,2,3 and 4 streets, 5) average of land value (per square meter in SAR), and finally 6) total area for commercial facilities and office buildings. Nine barometers were setup in analyzing public space such as 1) total area of streets, 2) total road length, 3) road width (maximum and minimum value, the difference between them, and the median value), 4) the distance from a mosque to the nearest mosque, 5) mosque land area, 6) distance to the nearest elementary school, 7) number of parks, distance to the nearest park, and the park lot area, 8) total area of the vacant lot, 9) total area for public facilities, and public parking.

3.4.2 The PMPRLS and Actual Condition

The scatterplot was used to analyze and clarify 1) to what extend the PMPRLS is applied, and 2) the typology of villa type neighborhoods, in addition to clarify to what extent the PMPRLS is applied, coefficient of correlation between several factors of the PMPRLS via the regression line are clarified based on the existing condition as it shown in figure 3-6, 3-7, 3-8, and 3-9. Figure 3-6 shows that 1) only 32% of case studies are within the standard of the STA (street total area), and 68% are exceeded the maximum standards, 2) 73% of AoVLA (average of villa land lot area) are between 500m^2 and 1000m^2, and 3) the existing condition shows that the correlation between the STA and AoVLA is weak as it shown in the value of R which is 0.00815, while the perfect correlation= 1.

Figure 3-7 shows that only 1) 11.5% of case studies are within the standard of STA and STL, and 88.5% are exceeded the maximum standard, and 2) the TSL of 77.7% of case studies are between 1500 and 2500 meter. As it shown in table 3-3 that there is a perfect correlation between the AoVLA and the TSL; however, as it shown in figure 3-8 that 94% of case studies are exceeded the standards curve.

Figure 3-9 is shown the last factor in the PMPRLS which is the correlation between number of villas and distance to nearest parks. Based on the PMPRLS, one children playground must be provided per 20 villas; however, the result of the investigation shows that NoCP (table 3-2) is not seen in the reality, so that the authors decided to investigate for the distance for nearest park instead. Two criteria were setup, first, parks within the 200m, and second, 500m based on the WHO (World Health Organization) recommendation distance. The distance to park of 24% of case studies are between 500 and 1000 meter. 18% of the case studies consists of a capacity of vacant lot between 30% and 60%.

Fig. 3-5 Case Studies Map

Source: (Jeddah Municipality, Selected case study based on the survey)

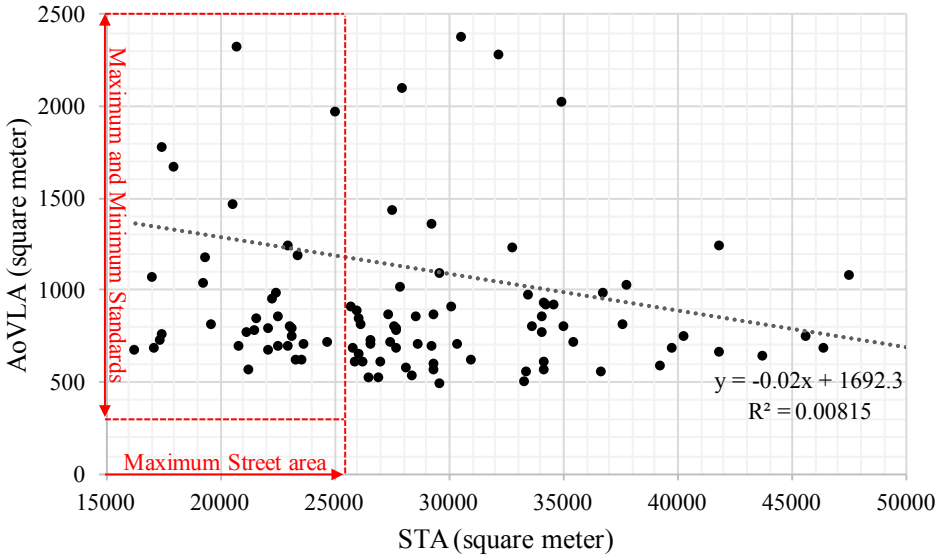


Fig. 3-6. Street Total Area and Average of Land Lot Area

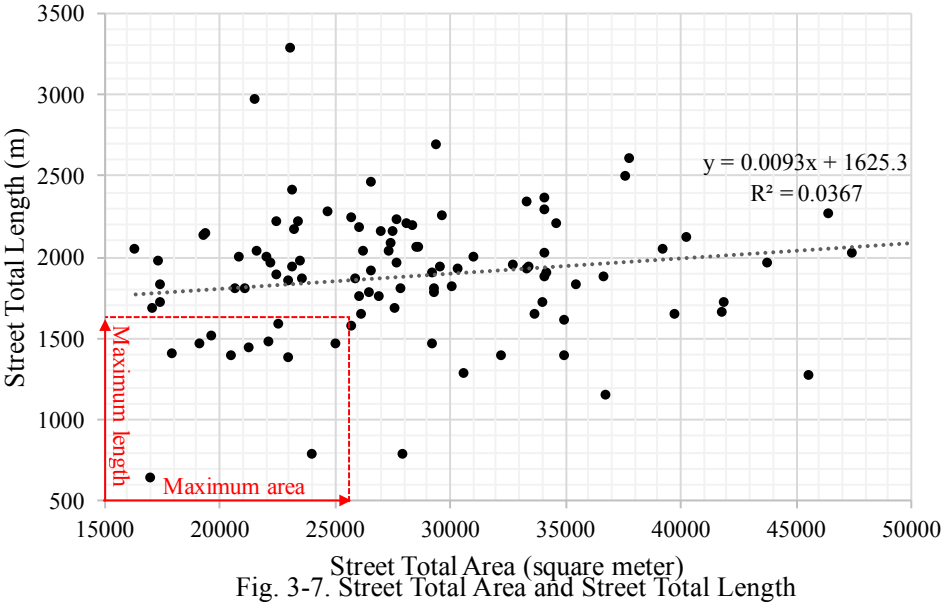


Fig. 3-7. Street Total Area and Street Total Length

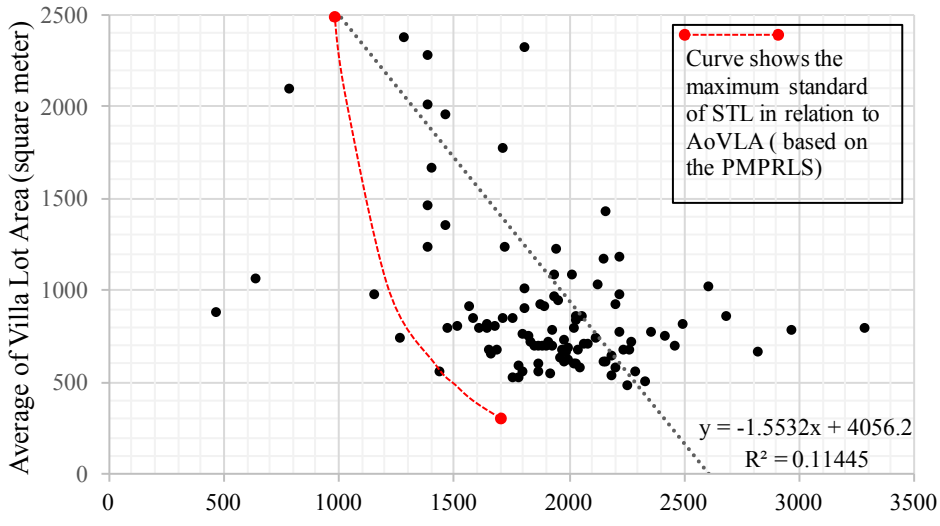


Fig. 3-8. Street Total Length and Average Villa Lot Area

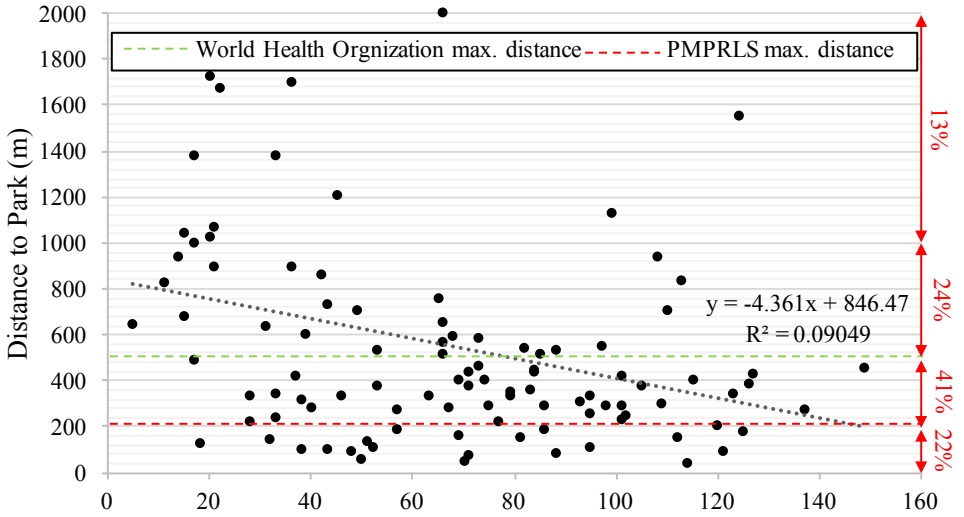


Fig. 3-9. Case studies and Distance to Park

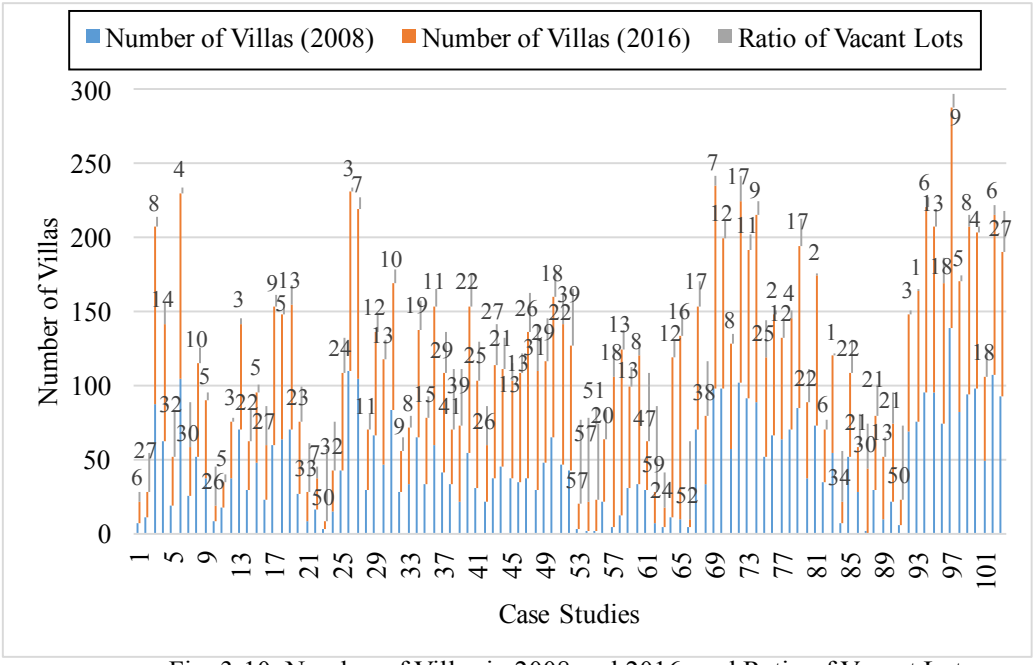


Fig. 3-10. Number of Villas in 2008 and 2016, and Ratio of Vacant Lots

3.4.3 Today's Villa Type Neighborhoods and Housing Shortage

As shown in fig. 3-10 that, number of villas was increased in all case studies with different in increasing rate. From this, it can be said that there is a necessity for examining to what extend today's neighborhoods can respond to the problem of housing shortage which is 80,000 units (as mentioned in Fig. 3-3). This was examining by assume that vacant total area in each case study will be fulfilled in the same trend it has been grown. The calculation was done by clarifying the 1) vacant total area (m^2), 2) the average of already built villa's lot area for each case study (Fig. 3-11 - 3-22) The following formula was applied for each case study with results shown in table 3-5.

$$f = \frac{TVA}{AVLA}$$

f =Total Number of Villas can be added in total vacant area in the same tendency

TVA = Total Vacant Area (m^2)

AVLA = Average of Villa Lot Area (m^2)

Table. 3-5: Number of Villas can be added to vacant lot area in each case study in case of fulfilled in the same tendency

CSN	f	CSN	f	CSN	f	CSN	f	CSN	f
1	3.7	**22**	4.0	**43**	49.7	**64**	23.8	**85**	24.0
2	16.8	**23**	3.1	**44**	39.4	**65**	36.1	**86**	21.9
3	17.5	**24**	28.1	**45**	20.0	**66**	29.0	**87**	55.0
4	23.5	**25**	29.4	**46**	22.9	**67**	36.4	**88**	31.4
5	24.3	**26**	5.9	**47**	49.0	**68**	56.1	**89**	19.7
6	10.3	**27**	12.8	**48**	56.7	**69**	13.8	**90**	24.6
7	51.0	**28**	19.8	**49**	48.3	**70**	22.0	**91**	79.3
8	15.2	**29**	22.4	**50**	31.6	**71**	15.1	**92**	6.7
9	6.8	**30**	20.9	**51**	45.1	**72**	35.8	**93**	1.6
10	7.1	**31**	17.3	**52**	87.3	**73**	19.2	**94**	14.8
11	3.0	**32**	10.4	**53**	48.8	**74**	15.2	**95**	27.2
12	2.0	**33**	8.7	**54**	67.0	**75**	39.9	**96**	40.6
13	4.4	**34**	34.2	**55**	51.5	**76**	3.6	**97**	22.2
14	27.3	**35**	15.4	**56**	42.8	**77**	16.9	**98**	9.1
15	7.1	**36**	15.8	**57**	38.6	**78**	6.3	**99**	14.7
16	36.3	**37**	37.8	**58**	31.4	**79**	27.8	**100**	7.5
17	13.9	**38**	54.4	**59**	20.2	**80**	32.1	**101**	29.2
18	7.7	**39**	79.2	**60**	15.4	**81**	2.9	**102**	9.8
19	19.5	**40**	41.8	**61**	112.6	**82**	10.4	**103**	49.8
20	29.5	**41**	44.2	**62**	54.7	**83**	1.0		
21	21.2	**42**	36.6	**63**	40.3	**84**	47.0		
Total Number of Villas can be added in total vacant area in all case studies in case of growing in same tendency								**2,843 units**	

CSN= Case Study Number

f =Total Number of Villas can be added in total vacant area in case of same tendency

From the above calculation, it is clear to say that, in case of today's villa type neighborhood will be fully occupied by villas in the same tendency each case study has, neighborhoods will only respond to 3.5% of total shortage housing. So, from this perspective and as the condition of case studies are different from each other in the several aspects such as land price, average of lot area, the net of total vacant lot and so on, it was necessary to clarify the indicators (mentioned above in index analysis) that have a strong correlation via correlation analysis, then typologies them into groups as a result from multiple linear regression analysis and scatter plot as shown in the following section.

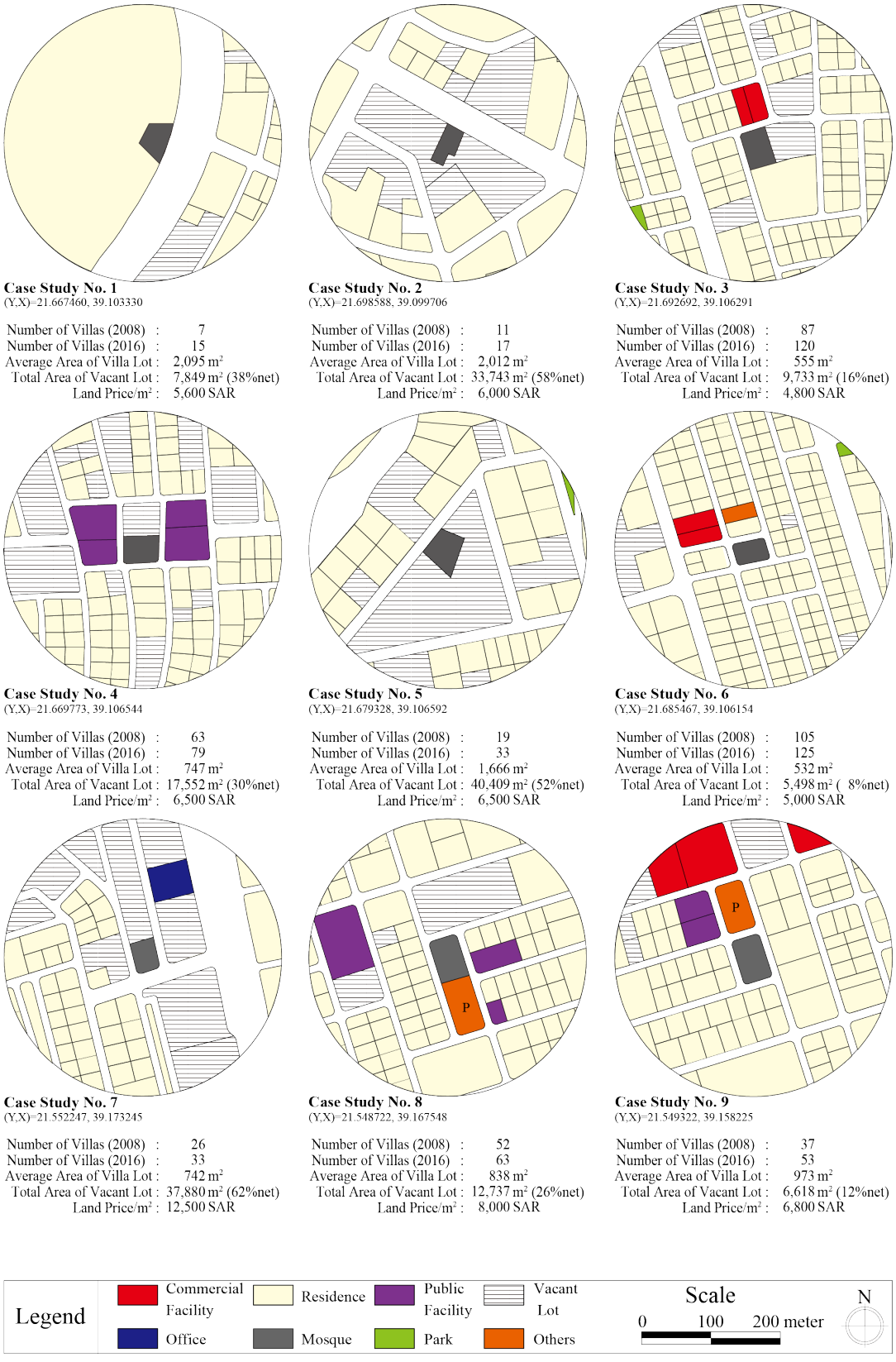


Fig. 3-11 Case Studies Maps with Main Criteria (sites 1-9)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

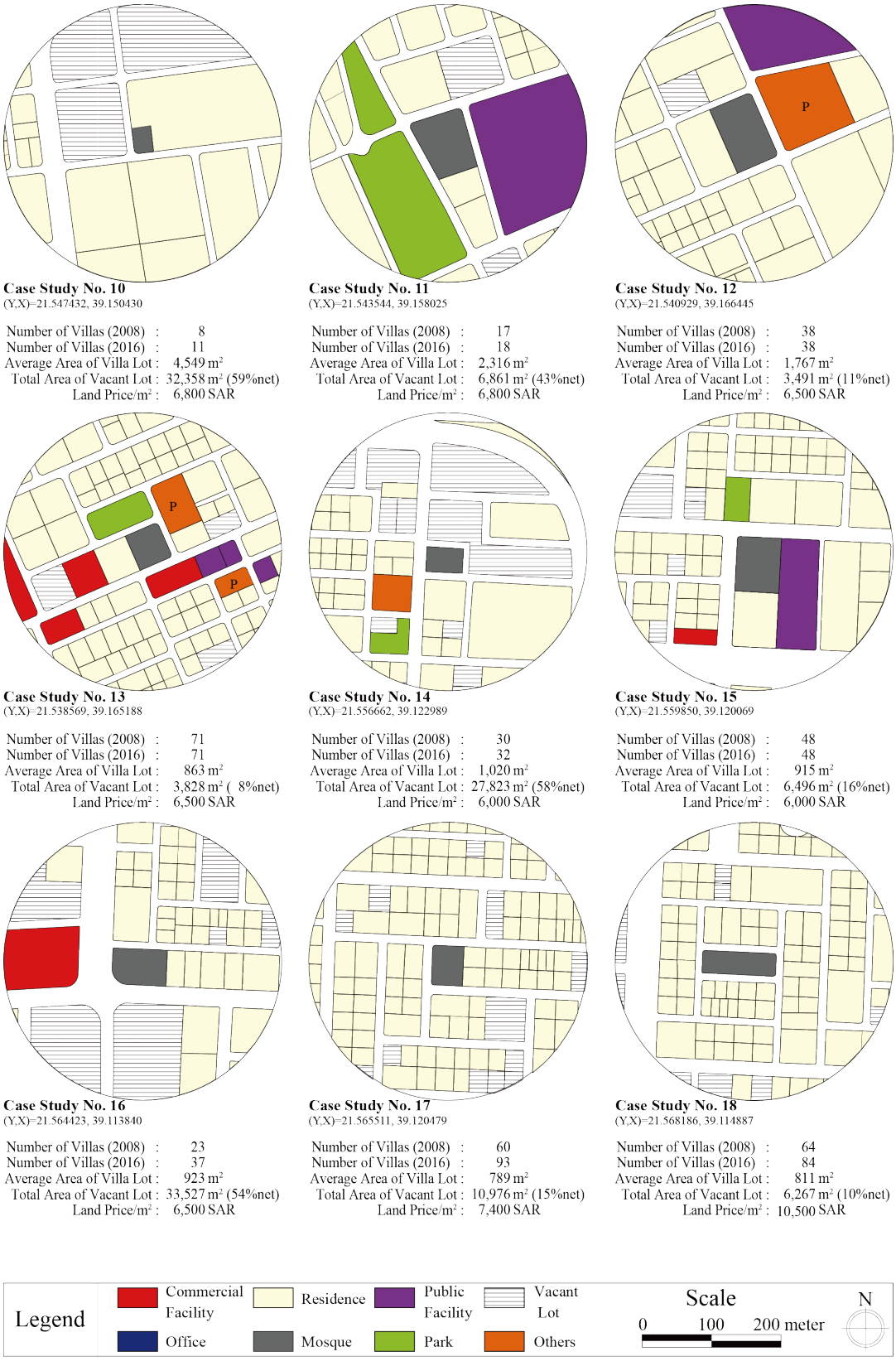


Fig. 3-12 Case Studies Maps with Main Criteria (sites 10-18)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

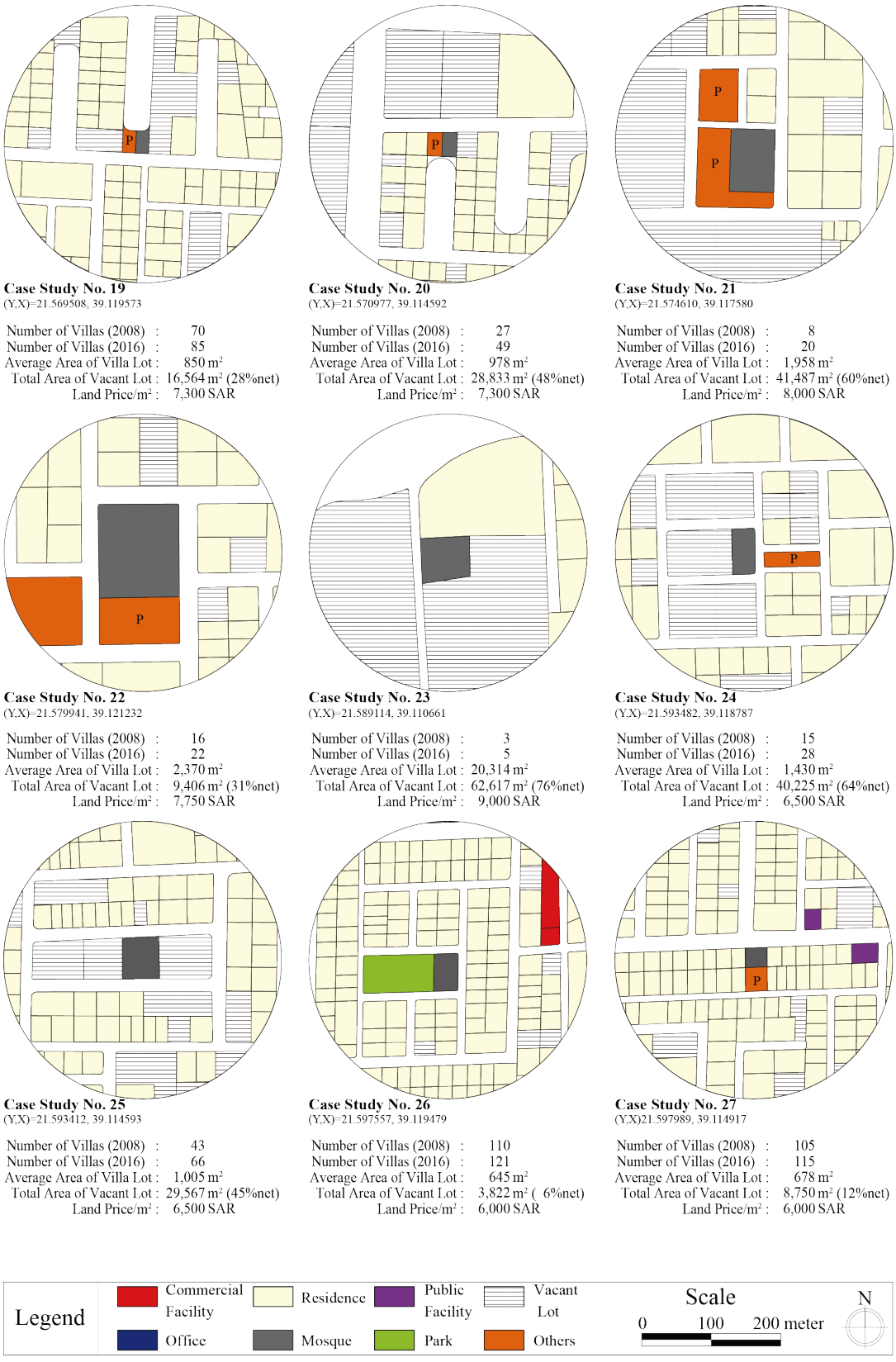


Fig. 3-13 Case Studies Maps with Main Criteria (sites 19-27)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

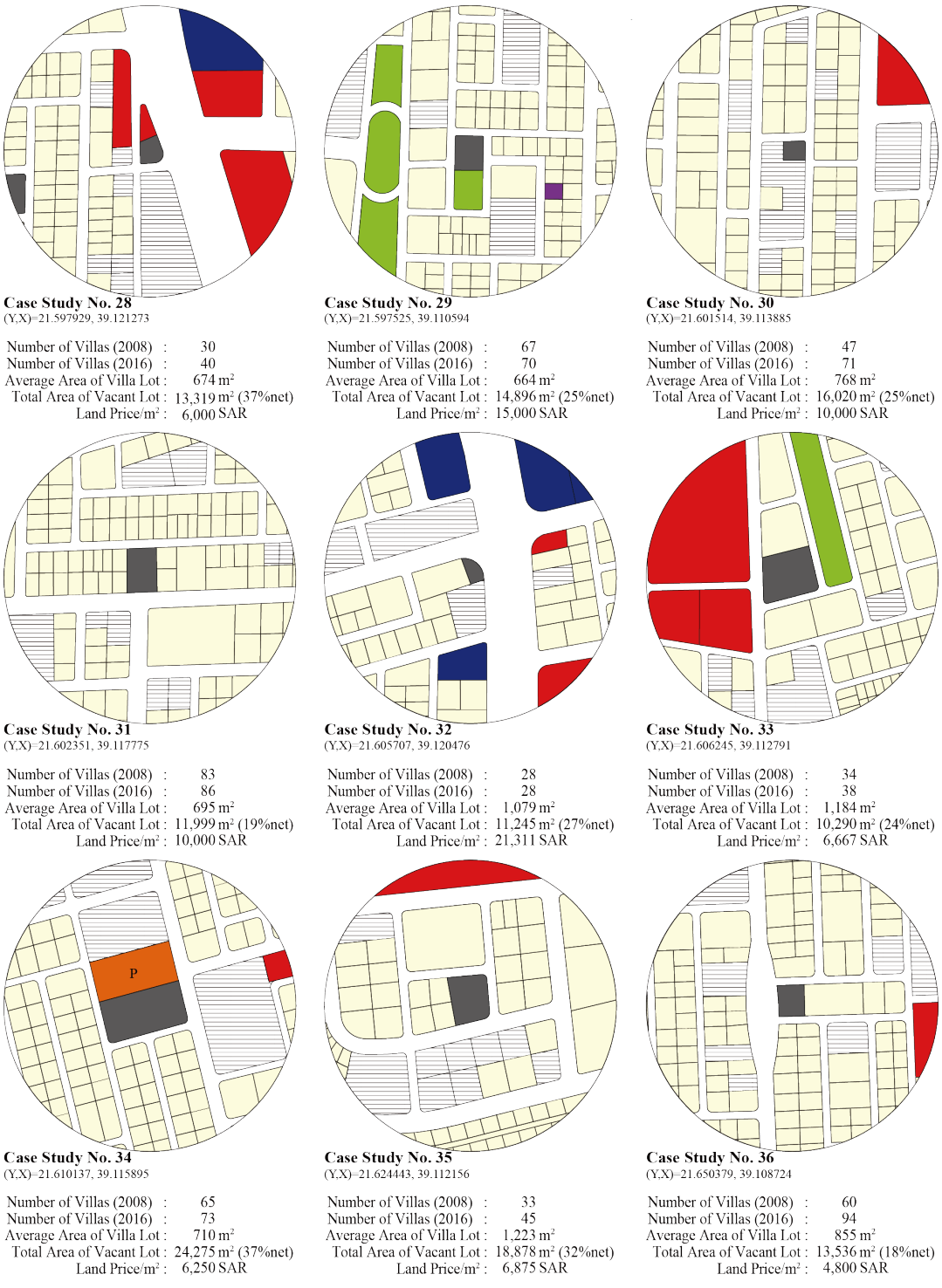


Fig. 3-14 Case Studies Maps with Main Criteria (sites 28-36)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

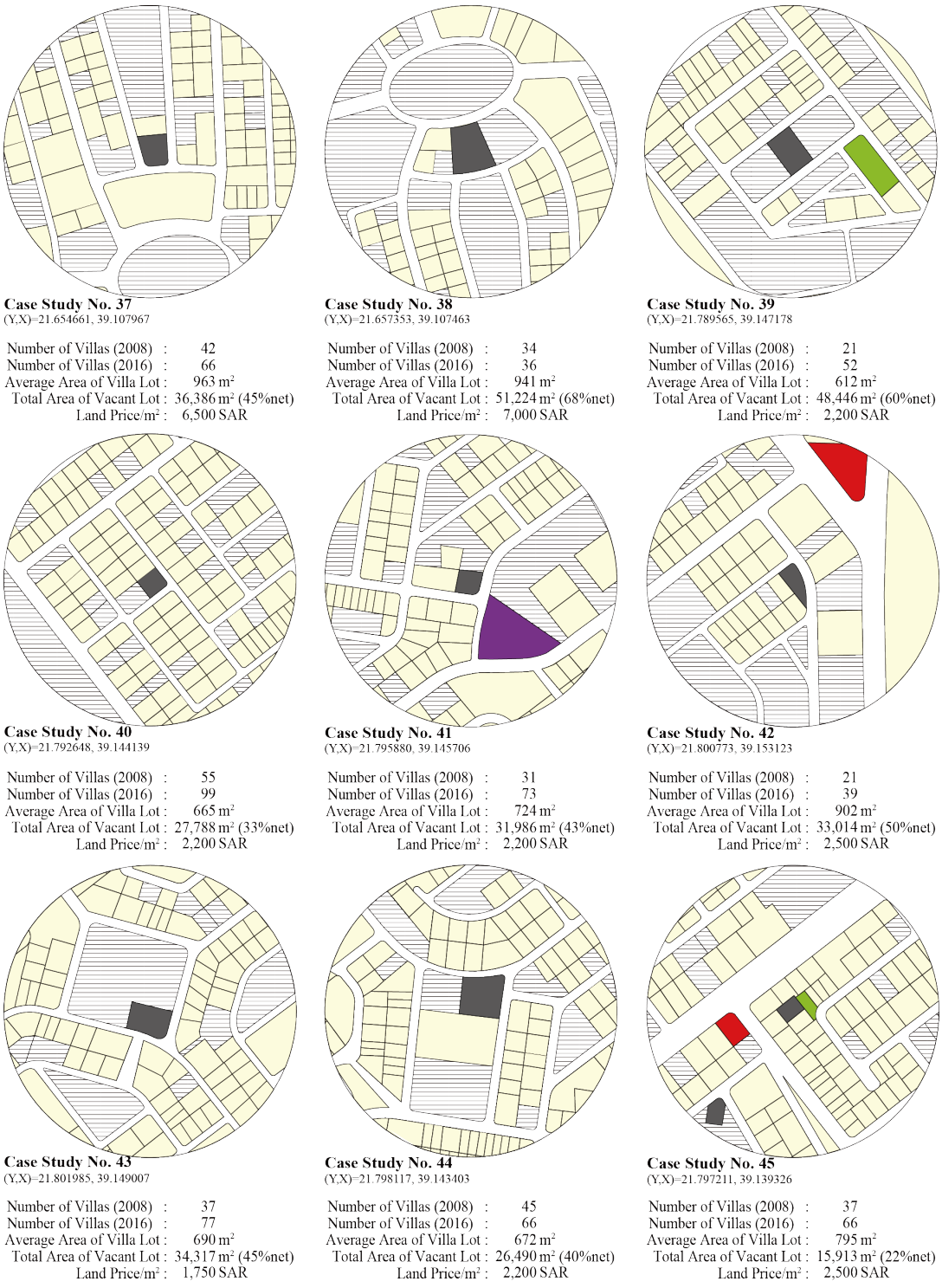


Fig. 3-15 Case Studies Maps with Main Criteria (sites 37-45)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

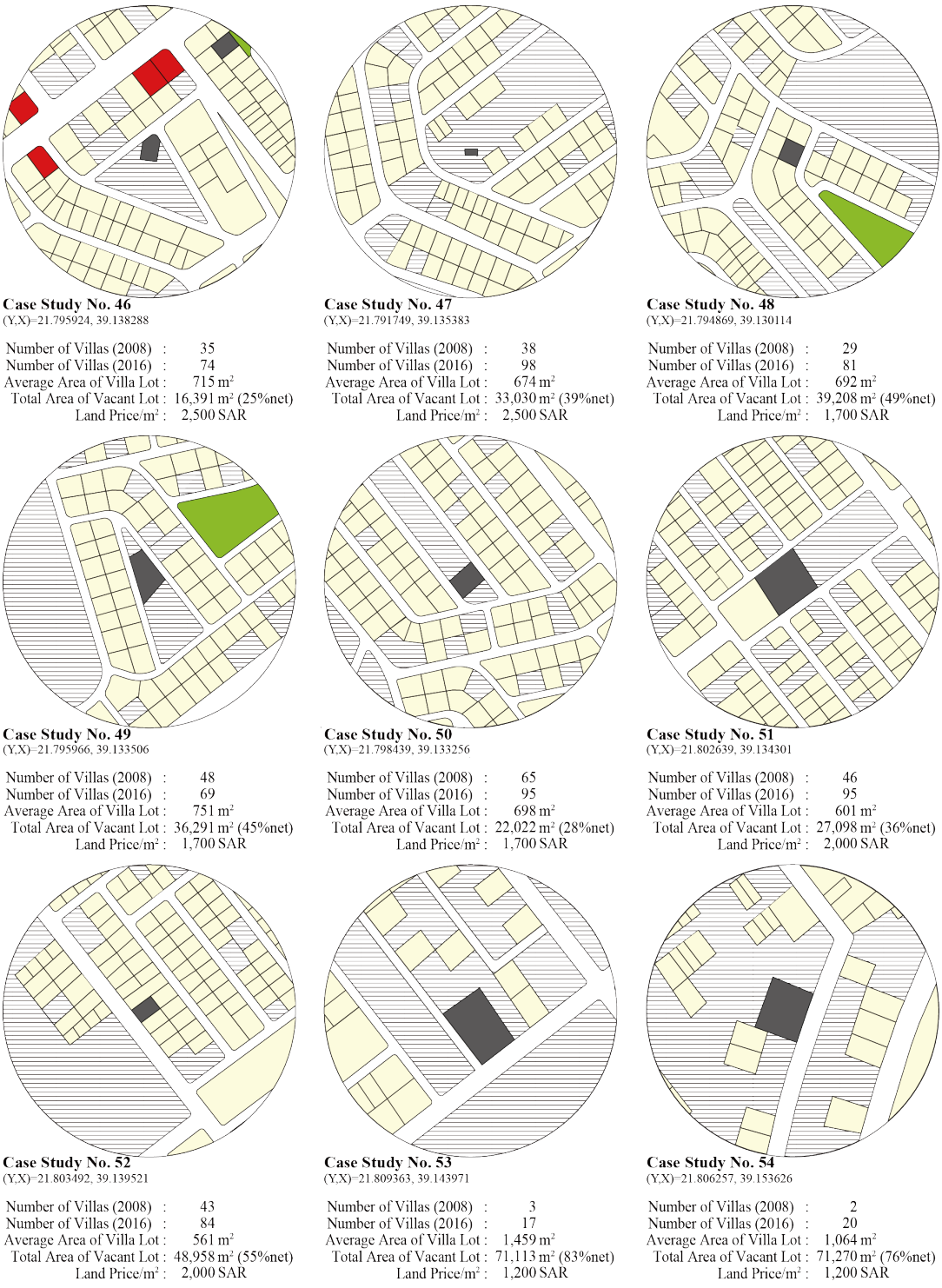


Fig. 3-16 Case Studies Maps with Main Criteria (sites 46-54)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

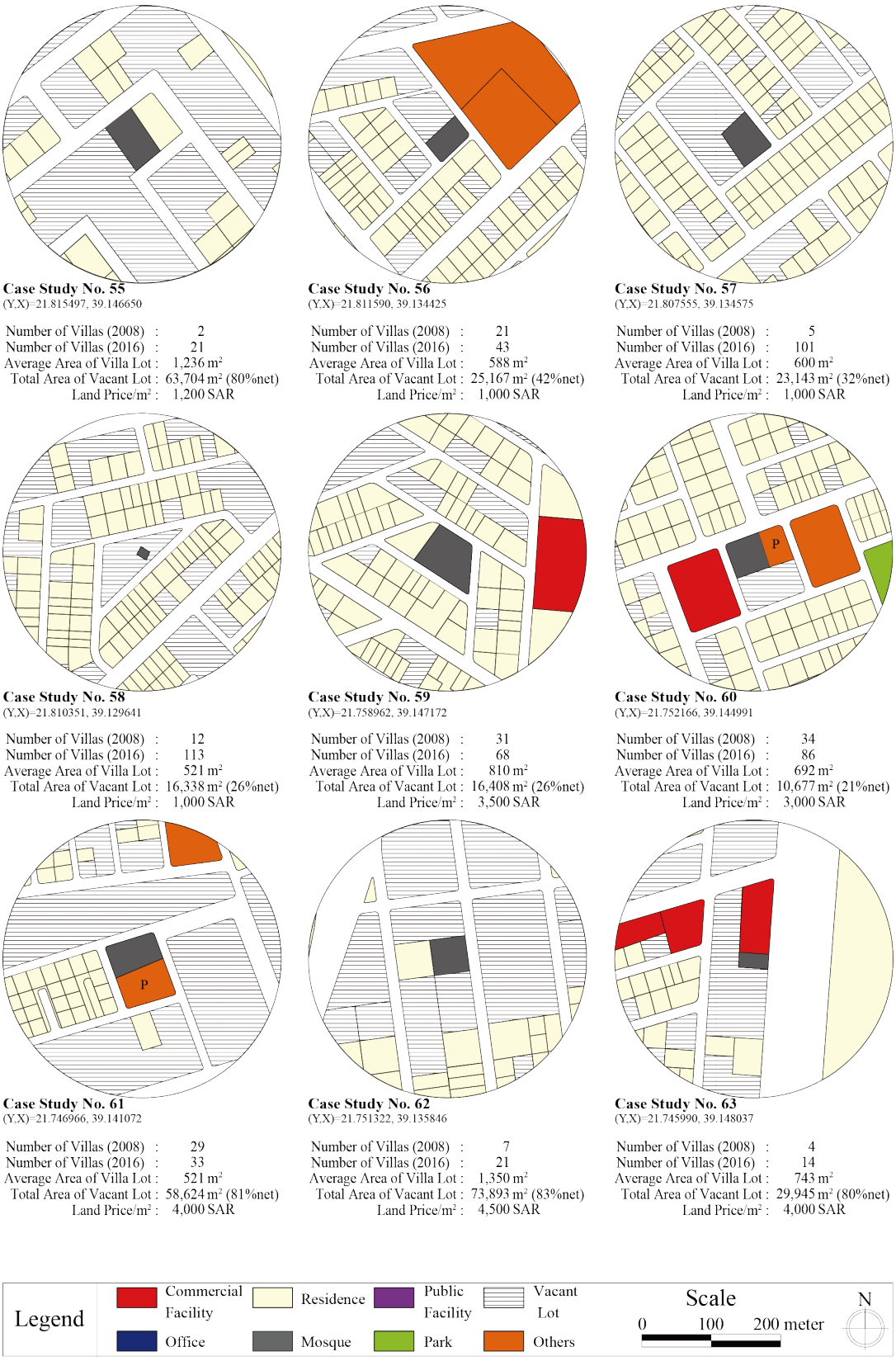
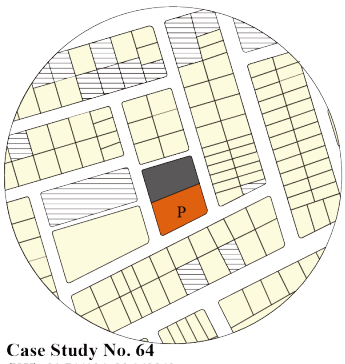


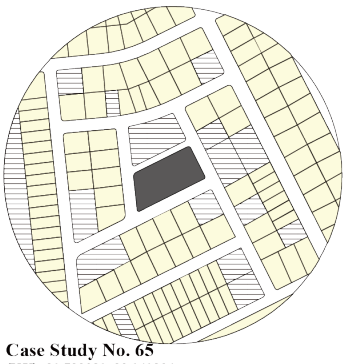
Fig. 3-17 Case Studies Maps with Main Criteria (sites 55-63)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)



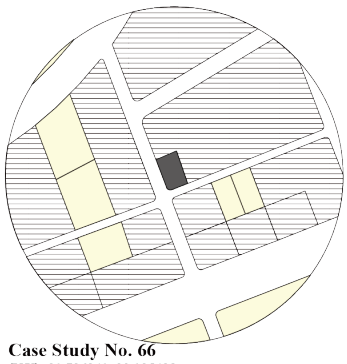
Case Study No. 64
(Y,X)=21.744124, 39.143849

Number of Villas (2008) : 11
Number of Villas (2016) : 108
Average Area of Villa Lot : 616 m²
Total Area of Vacant Lot : 14,672 m² (21%net)
Land Price/m² : 4,000 SAR



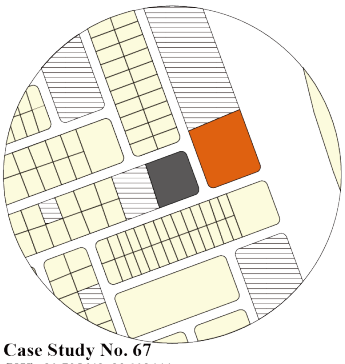
Case Study No. 65
(Y,X)=21.739081, 39.141204

Number of Villas (2008) : 10
Number of Villas (2016) : 124
Average Area of Villa Lot : 573 m²
Total Area of Vacant Lot : 20,669 m² (27%net)
Land Price/m² : 3,500 SAR



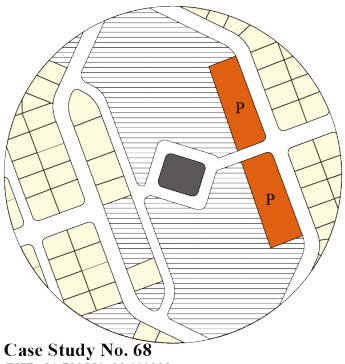
Case Study No. 66
(Y,X)=21.736241, 39.125428

Number of Villas (2008) : 4
Number of Villas (2016) : 6
Average Area of Villa Lot : 2,273 m²
Total Area of Vacant Lot : 65,908 m² (85%net)
Land Price/m² : 5,000 SAR



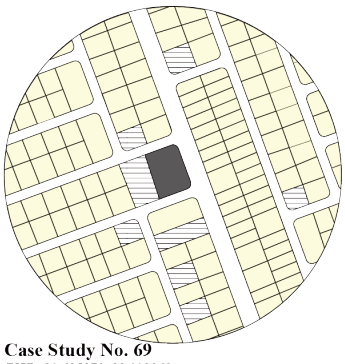
Case Study No. 67
(Y,X)=21.705649, 39.113444

Number of Villas (2008) : 71
Number of Villas (2016) : 83
Average Area of Villa Lot : 580 m²
Total Area of Vacant Lot : 21,097 m² (34%net)
Land Price/m² : 6,000 SAR



Case Study No. 68
(Y,X)=21.700551, 39.111399

Number of Villas (2008) : 33
Number of Villas (2016) : 46
Average Area of Villa Lot : 843 m²
Total Area of Vacant Lot : 47,350 m² (68%net)
Land Price/m² : 5,800 SAR

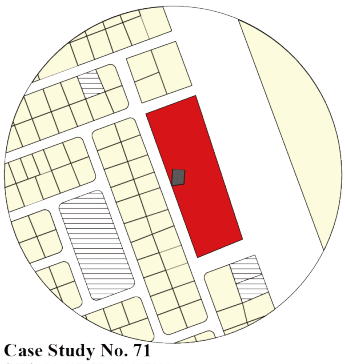


Case Study No. 69
(Y,X)=21.695970, 39.113060

Number of Villas (2008) : 95
Number of Villas (2016) : 137
Average Area of Villa Lot : 608 m²
Total Area of Vacant Lot : 8,392 m² (11%net)
Land Price/m² : 5,000 SAR

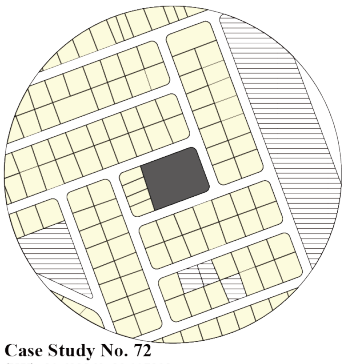
Case Study No. 70
(Y,X)=21.694288, 39.111435

Number of Villas (2008) : 98
Number of Villas (2016) : 102
Average Area of Villa Lot : 678 m²
Total Area of Vacant Lot : 14,900 m² (19%net)
Land Price/m² : 5,000 SAR



Case Study No. 71
(Y,X)=21.697555, 39.117091

Number of Villas (2008) : 57
Number of Villas (2016) : 71
Average Area of Villa Lot : 636 m²
Total Area of Vacant Lot : 9,630 m² (22%net)
Land Price/m² : 5,000 SAR



Case Study No. 72
(Y,X)=21.692260, 39.117903

Number of Villas (2008) : 102
Number of Villas (2016) : 123
Average Area of Villa Lot : 614 m²
Total Area of Vacant Lot : 21,943 m² (28%net)
Land Price/m² : 5,000 SAR

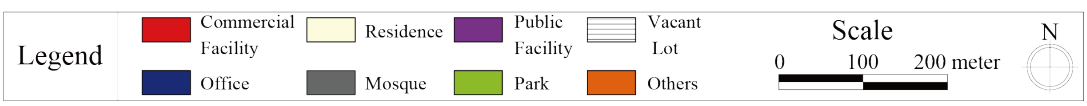
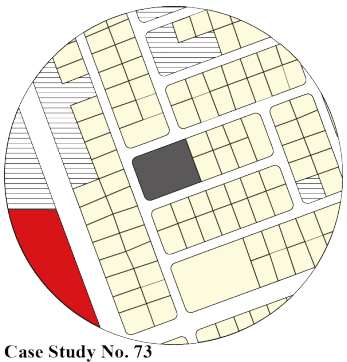


Fig. 3-18 Case Studies Maps with Main Criteria (sites 64-72)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

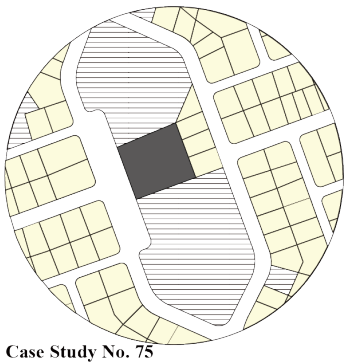


Case Study No. 73
(Y,X)=21.689522, 39.112192

Number of Villas (2008) : 91
Number of Villas (2016) : 101
Average Area of Villa Lot : 703 m²
Total Area of Vacant Lot : 13,524 m² (19%net)
Land Price/m² : 5,000 SAR

Case Study No. 74
(Y,X)=21.686646, 39.119173

Number of Villas (2008) : 89
Number of Villas (2016) : 127
Average Area of Villa Lot : 714 m²
Total Area of Vacant Lot : 10,819 m² (15%net)
Land Price/m² : 5,600 SAR



Case Study No. 75
(Y,X)=21.676864, 39.122833

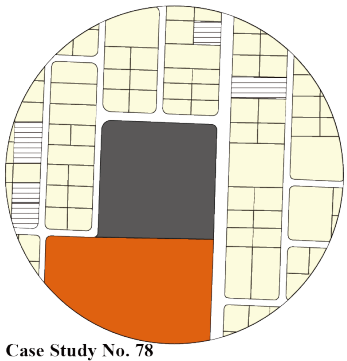
Number of Villas (2008) : 52
Number of Villas (2016) : 67
Average Area of Villa Lot : 800 m²
Total Area of Vacant Lot : 31,912 m² (45%net)
Land Price/m² : 5,500 SAR

Case Study No. 76
(Y,X)=21.670401, 39.123313

Number of Villas (2008) : 66
Number of Villas (2016) : 82
Average Area of Villa Lot : 790 m²
Total Area of Vacant Lot : 2,844 m² (5%net)
Land Price/m² : 5,000 SAR

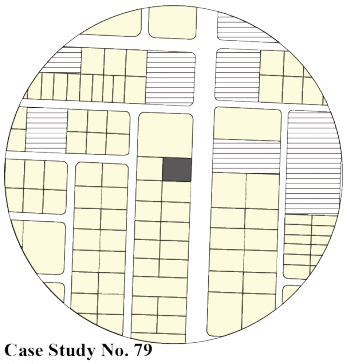
Case Study No. 77
(Y,X)=21.572833, 39.140490

Number of Villas (2008) : 64
Number of Villas (2016) : 69
Average Area of Villa Lot : 918 m²
Total Area of Vacant Lot : 15,505 m² (28%net)
Land Price/m² : 5,657 SAR



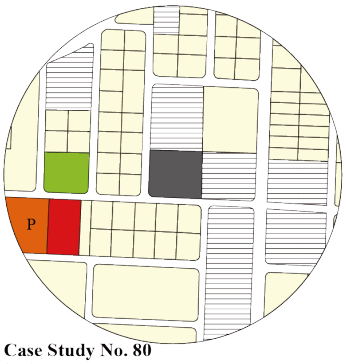
Case Study No. 78
(Y,X)=21.566109, 39.138304

Number of Villas (2008) : 71
Number of Villas (2016) : 75
Average Area of Villa Lot : 880 m²
Total Area of Vacant Lot : 5,527 m² (12%net)
Land Price/m² : 5,600 SAR



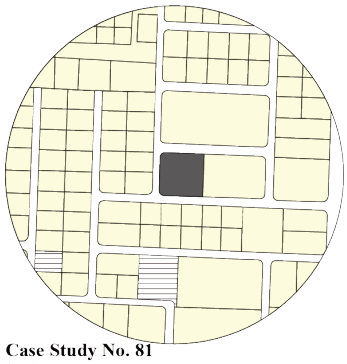
Case Study No. 79
(Y,X)=21.566697, 39.134209

Number of Villas (2008) : 85
Number of Villas (2016) : 110
Average Area of Villa Lot : 783 m²
Total Area of Vacant Lot : 21,722 m² (28%net)
Land Price/m² : 5,600 SAR



Case Study No. 80
(Y,X)=21.566036, 39.129212

Number of Villas (2008) : 38
Number of Villas (2016) : 51
Average Area of Villa Lot : 854 m²
Total Area of Vacant Lot : 27,390 m² (38%net)
Land Price/m² : 5,600 SAR



Case Study No. 81
(Y,X)=21.562053, 39.132470

Number of Villas (2008) : 73
Number of Villas (2016) : 101
Average Area of Villa Lot : 1,034 m²
Total Area of Vacant Lot : 3,046 m² (4%net)
Land Price/m² : 5,600 SAR

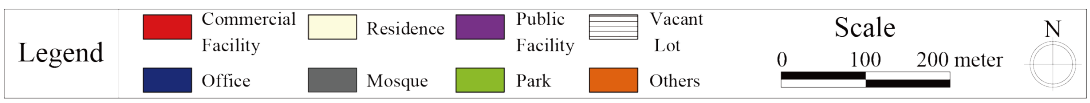
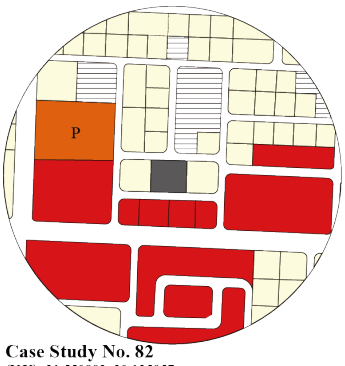


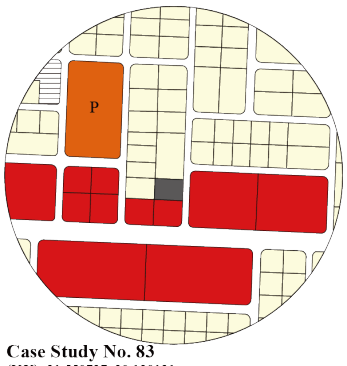
Fig. 3-19 Case Studies Maps with Main Criteria (sites 73-81)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)



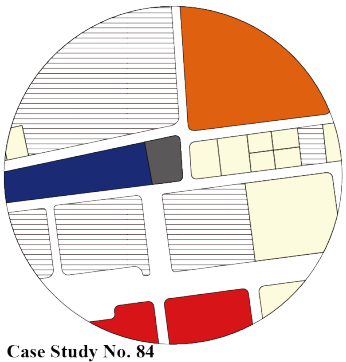
Case Study No. 82
(Y,X)=21.559883, 39.135957

Number of Villas (2008) : 35
Number of Villas (2016) : 36
Average Area of Villa Lot : 772 m²
Total Area of Vacant Lot : 8,007 m² (25%net)
Land Price/m² : 5,600 SAR



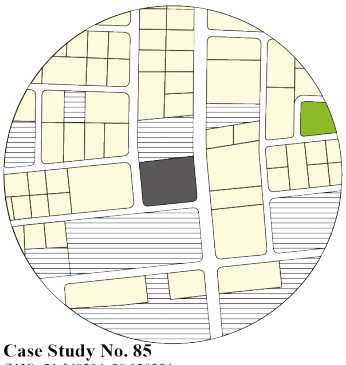
Case Study No. 83
(Y,X)=21.559737, 39.139131

Number of Villas (2008) : 55
Number of Villas (2016) : 65
Average Area of Villa Lot : 778 m²
Total Area of Vacant Lot : 783 m² (2%net)
Land Price/m² : 5,600 SAR



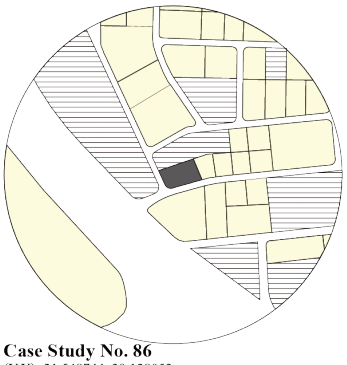
Case Study No. 84
(Y,X)=21.549156, 39.139215

Number of Villas (2008) : 7
Number of Villas (2016) : 15
Average Area of Villa Lot : 907 m²
Total Area of Vacant Lot : 42,572 m² (89%net)
Land Price/m² : 6,000 SAR



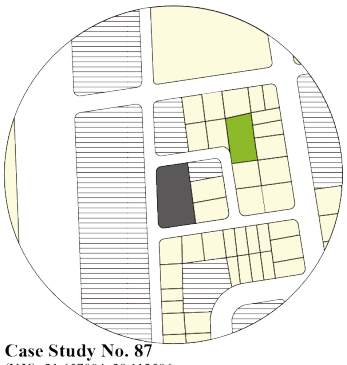
Case Study No. 85
(Y,X)=21.549204, 39.130354

Number of Villas (2008) : 52
Number of Villas (2016) : 57
Average Area of Villa Lot : 1,165 m²
Total Area of Vacant Lot : 27,990 m² (36%net)
Land Price/m² : 6,000 SAR



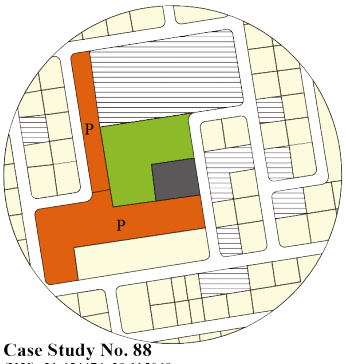
Case Study No. 86
(Y,X)=21.548744, 39.128053

Number of Villas (2008) : 28
Number of Villas (2016) : 31
Average Area of Villa Lot : 1,234 m²
Total Area of Vacant Lot : 26,981 m² (53%net)
Land Price/m² : 6,000 SAR



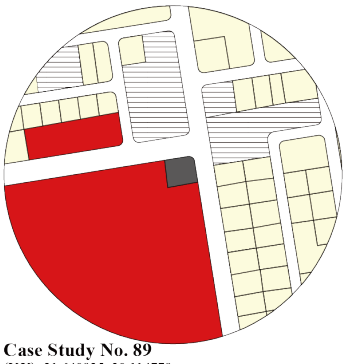
Case Study No. 87
(Y,X)=21.657004, 39.112506

Number of Villas (2008) : 1
Number of Villas (2016) : 43
Average Area of Villa Lot : 680 m²
Total Area of Vacant Lot : 37,377 m² (62%net)
Land Price/m² : 5,000 SAR



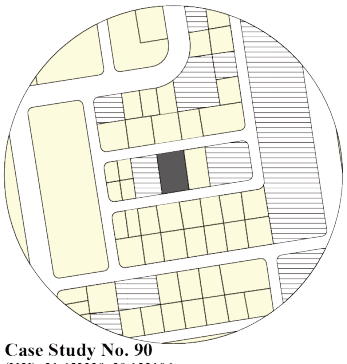
Case Study No. 88
(Y,X)=21.654474, 39.115069

Number of Villas (2008) : 29
Number of Villas (2016) : 50
Average Area of Villa Lot : 845 m²
Total Area of Vacant Lot : 26,555 m² (50%net)
Land Price/m² : 5,000 SAR



Case Study No. 89
(Y,X)=21.649935, 39.114779

Number of Villas (2008) : 10
Number of Villas (2016) : 42
Average Area of Villa Lot : 807 m²
Total Area of Vacant Lot : 15,912 m² (39%net)
Land Price/m² : 5,000 SAR



Case Study No. 90
(Y,X)=21.652329, 39.122196

Number of Villas (2008) : 21
Number of Villas (2016) : 53
Average Area of Villa Lot : 1,083 m²
Total Area of Vacant Lot : 26,628 m² (37%net)
Land Price/m² : 6,000 SAR

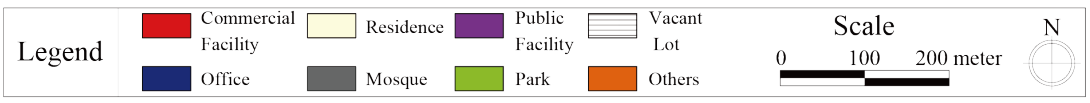


Fig. 3-20 Case Studies Maps with Main Criteria (sites 82-90)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

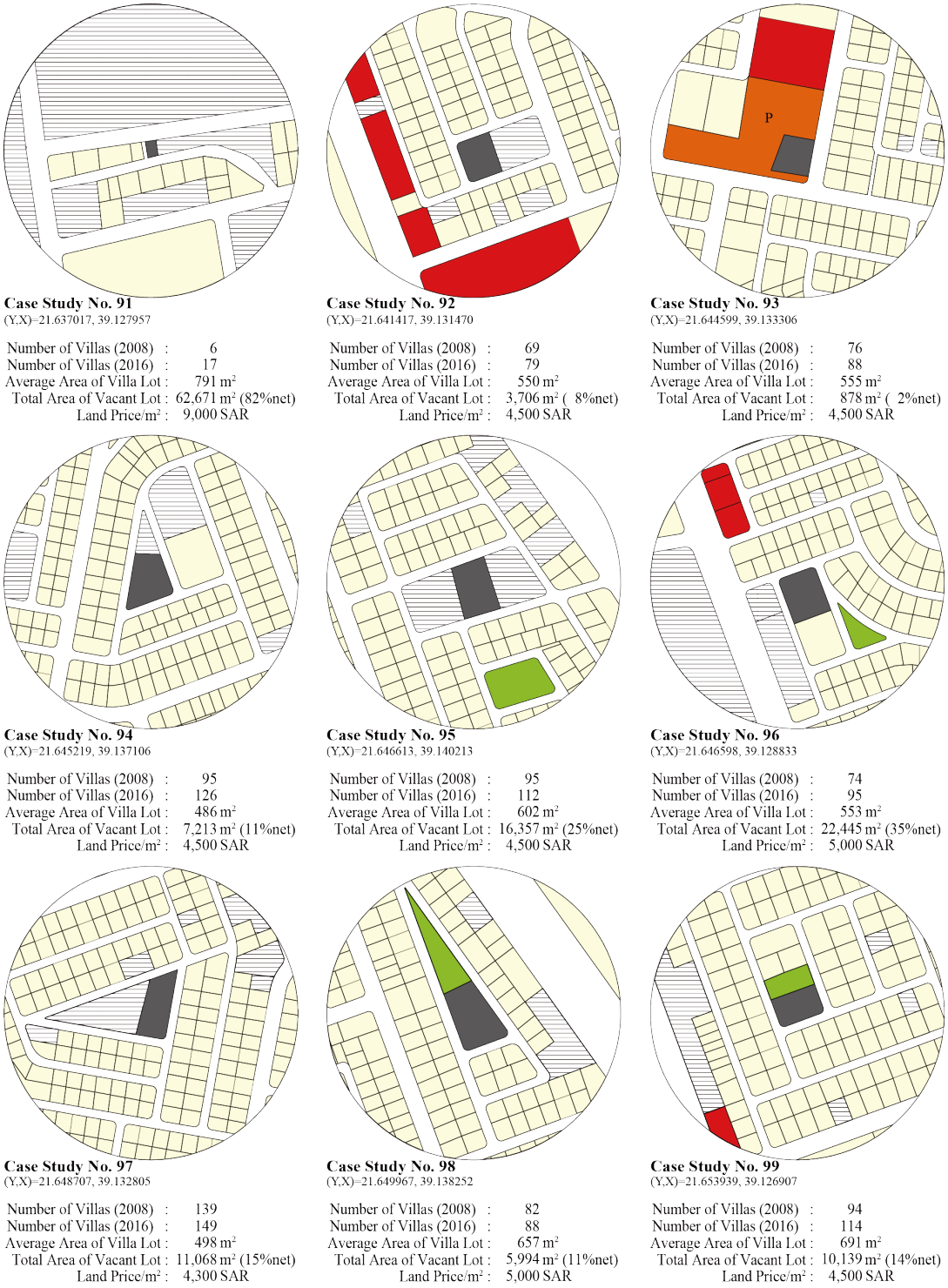
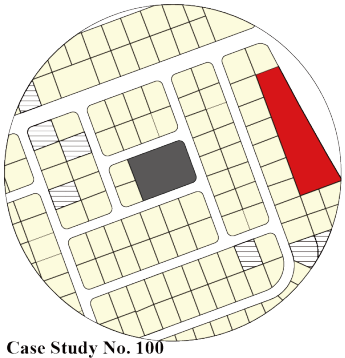


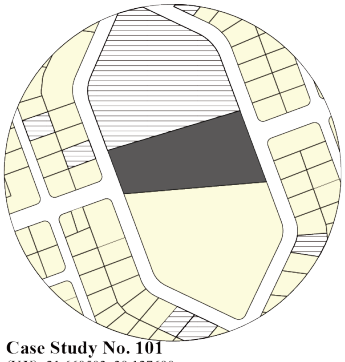
Fig. 3-21 Case Studies Maps with Main Criteria (sites 91-99)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)



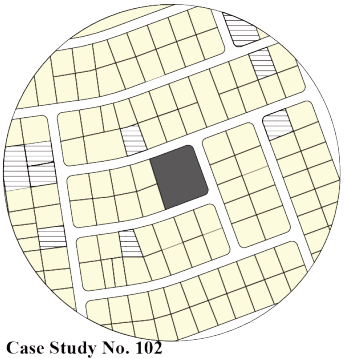
Case Study No. 100
(Y,X)=21.656680, 39.132537

Number of Villas (2008)	:	98
Number of Villas (2016)	:	105
Average Area of Villa Lot	:	718 m²
Total Area of Vacant Lot	:	5,389 m² (8%net)
Land Price/m²	:	5,000 SAR



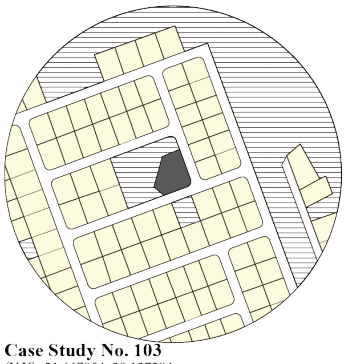
Case Study No. 101
(Y,X)=21.660503, 39.127690

Number of Villas (2008)	:	49
Number of Villas (2016)	:	57
Average Area of Villa Lot	:	790 m²
Total Area of Vacant Lot	:	23,025 m² (47%net)
Land Price/m²	:	4,500 SAR



Case Study No. 102
(Y,X)=21.664904, 39.124144

Number of Villas (2008)	:	107
Number of Villas (2016)	:	764
Average Area of Villa Lot	:	790 m²
Total Area of Vacant Lot	:	7,507 m² (9%net)
Land Price/m²	:	4,500 SAR



Case Study No. 103
(Y,X)=21.667954, 39.127284

Number of Villas (2008)	:	93
Number of Villas (2016)	:	97
Average Area of Villa Lot	:	694 m²
Total Area of Vacant Lot	:	34,546 m² (40%net)
Land Price/m²	:	4,500 SAR

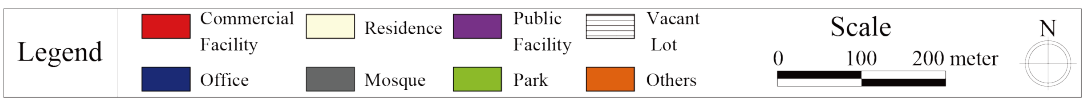


Fig. 3-22 Case Studies Maps with Main Criteria (sites 100-103)

(Source of Base Map: Jeddah Municipality, Department of GIS, 2015)

3.5 Elements of Neighborhoods and the Correlation

3.5.1 Correlation Analysis

In order to solve the housing shortage problem, it is necessary to predict the growth possibilities of the villa type neighborhood from now on. This was based on analyzing the characteristics and the composition of today's villa type neighborhoods. Via correlation analysis, we figured out a relationship among several factors such as 1) the number of villas that was increased between 2008-2016 (8 years). 2) The average of land price. 3) Average of villa lot area. 4) Vacant ratio.

Regarding the number of villas that was increased within the 8 years, the results showed that there is a minus correlation of -0.447 between the land price and the increased number of villas, which means that that case studies with lower land price, the higher increase ratio of number of villas. However, the correlation became stronger with a plus correlation of 0.548 with the lot area that ranges between 300m^2 and 400m^2. This means that, the narrow villa lot area, the higher possibility for growth that related to a strong relationship of possibility for purchasing. In addition, lots area that range between 300m^2 and 400m^2 with a proportion of more than 2:1 for lot's frontage and depth has a plus correlation of 0.468 (Table 3-6)

Table 3-6 Correlation among the related criteria

		Number of villa for 8 years(2008-2016)	Average of land price	Ratio of lot that range between 300m2 and 400m2	Ratio of lot that range between 500m2 and 600m2	Proportion of lot's frontage and depth that over than 2:1	Ratio of lots that facing one road	Distance between mosque and highway	Total area of roads	Number of lots in 2008	Number of lots in 2016
Number of villa for 8 years(2008-2016)	Pearson Correlation	1									
	Sig. (2-tailed)										
Average of land price	Pearson Correlation	-.447**	1								
	Sig. (2-tailed)	.000									
Ratio of lot that range between 300m2 and 400m2	Pearson Correlation	.548**	-.252*	1							
	Sig. (2-tailed)	.000	.010								
Ratio of lot that range between 500m2 and 600m2	Pearson Correlation	.009	-.072	-.049	1						
	Sig. (2-tailed)	.463	.471	.620							
Proportion of lot's frontage and depth that over than 2:1	Pearson Correlation	.404**	-.161	.468**	-.219*	1					
	Sig. (2-tailed)	.000	.104	.000	.026						
Ratio of lots that facing one road	Pearson Correlation	.428**	-.389**	.350**	.244*	.112	1				
	Sig. (2-tailed)	.000	.000	.000	.013	.258					
Distance between mosque and highway	Pearson Correlation	.480**	-.501**	.279**	.058	.154	.265**	1			
	Sig. (2-tailed)	.000	.000	.004	.562	.121	.007				
Total area of roads	Pearson Correlation	-.147	.481**	.140	.135	-.075	.030	-.293**	1		
	Sig. (2-tailed)	.069	.000	.159	.173	.451	.762	.003			
Number of lots in 2008	Pearson Correlation	-.188*	.052	-.053	.495**	-.360**	.285**	-.160	.063	1	
	Sig. (2-tailed)	.028	.599	.596	.000	.000	.003	.106	.528		
Number of lots in 2016	Pearson Correlation	.441**	-.226*	.288**	.458**	-.081	.523**	.148	-.033	.798**	1
	Sig. (2-tailed)	.000	.022	.003	.000	.414	.000	.136	.743	.000	

Note. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). N = 103

Furthermore, the number of villa for 8 years has a plus correlation of 0.480 with the distance between mosque and highway. However, there is a minus correlation (-0.501) between the distance between mosque and highway and the average of land price, which means that distance between highway and mosque has an effect on increasing the land price. The much closer the highway the higher land price. In addition, there is a plus correlation of 0.481 between the average of land price and the road total area; however, among the growth within the 8 years, villas were increased highly in case studies with a low street area and low price as well.

In addition, the results of analysis show that there is a plus correlation with an amount of 0.458 between the number of villas that has increased in 2016 and the lot ratio of the lots that range between $500m^2$-$600m^2$. However, this correlation is lower than the amount in 2008 by an amount of 0.037 to be 0.495. Furthermore, the analysis shows that there is notable relationship between lots that face one road and the number of villas that has increased between 2008 and 2016 by an amount of plus correlation of 0.523. As mentioned above that the majority of the increased villas between 2008 and 2016 was lots between $300m^2$ – $400m^2$, and by decreasing the correlation amount of lots between $500m^2$-$600m^2$ between 2008 and 2016, so that it is clear to say that the most of today's lots between $500m^2$-$600m^2$ were built before 2008.

3.5.2 Multiple Regression Analysis

In order to create a predict formula for villa development, we conducted a multiple regression analysis. We set up the changing of rate in number of villa increased for 8 years as a dependent variable and related 27 criteria as a dependent variable as shown in table 3-7. We figured out the regression formula via repeating the parallel implementation between a stepwise selection method and a forward selection method.

Table 3-7 Related Criteria for Multiple Regression Analysis

Ratio of lot related factors	1.under 300m2	2. 300m2~400m2	3. 400m2~500m2	4. 500m2~600m2
	5. 600m2~700m2	6. 700m2~800m2	7. 800m2~1,000m2	8.1,000m2~1,400m2
	9. 1,400m2~1,800m2	10. 1,800m2~2,200m2	11. 2,200m2~3,000m2	12. over than 3,000m2
Proportion of lot's frontage and depth related factors	1. under 1	2. 1~1.5	3. 1.5~2	4. over than 2
Villa Growth related factor	1. number of villa increased between 2008-2016 (8 years)			
Land price related factor	1. Average of land price			
vacant lot related factor	1.total area of villa lot		2. ratio of vacant lot net	
Park related factors	1. number of park	2. distance between mosque and park		3. total area of parks
Mosque related factors	1. distance between mosques		2. distance between mosque and highway	
road related factors	1. total area of roads	2. total length of roads		
Total				27 critera

First, the predict formula of villa development based on the number of increased villa for 8 years as following:

Number of increased villa for 8 years = 27.724 − 0.02 ×(Land price) + 1.296 ×(Ratio of lot that range between 300m^2 and 400m^2)

The Coefficients are significant at the 0.01 level, and VIFs among two criteria are all under 1.068 satisfied under 10. The Durbin-Watson is 1.750 that keeps the independence among the criteria (table 3-8). The adjusted R Square is 0.391 that explain 39.1% of the number of increased villa for 8 years (table 3-9). The standardized coefficients of these two criteria are each -0.330 and 0.465, so that the ratio of lot that range between 300m^2 and 400m^2 has more amount of significance than the land price. It is clarified that the villa development for 8 years was occurred in the villa lots between 300m^2 and 400m^2 and lower land price, mainly. Thus, we can say that villa lots between 300m^2 and 400m^2 optimal size for the villa development under the purchasing ability.

Table 3-8 Model Summary for the number increased villas as a dependent variable

R	R Square	Adjusted R Square	Change Statistics					Durbin-Watson
			R Square Change	F Change	df1	df2	Sig. F Change	
.634	.403	.391	.403	33.688	2	100	.000	1.750

Predictors: (Constant), Land price, Ratio of lot that range between 300m^2 and 400m^2

Table 3-9 Coefficients for the change rate of number of villa as a dependent variable

model		Unstandardized Coefficients		Coefficients			Coilinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	27.724	3.961		6.999	.000		
	Land price	-.002	.001	-.330	-4.132	.000	.937	1.068
	Ratio of lot that range between 300m2 and 400m2	1.298	.223	.465	5.823	.000	.937	1.068

Secondly, the predict formula of the ratio of vacant lot net as following.

Ratio of vacant lot(net) = 53.368 + 0.011 ×(Distance between mosque and park) − 0.015 ×(Total length of roads) + 0.517 ×(Ratio of lot that range between 1,000m^2 and 1,400m^2)

The coefficients are significant at the 0.01 level, and VIFs among three criteria are all under 1.154 satisfied under 10. The Durbin-Watson is 1.821 that keeps the independence among the criteria. The adjusted R Square is 0.281. The standardized coefficients of these three criteria are each 0.243, -0.288 and 0.269, so that these three criteria have almost same amount of significance. In order to reduce the ratio of vacant lot based on the above predict formula, it is necessary to plan the parks near a mosque and to make the roads longer not the total area of roads and to reduce the villa lot that range between 1,000m^2 and 1,400m^2

Table 3-10 Model Summary for the ratio of vacant lot(net)

R	R Square	Adjusted R Square	Change Statistics					Durbin-Watson
			R Square Change	F Change	df1	df2	Sig. F Change	
.549	.302	.281	.065	9.252	1	99	.003	1.821

Predictors: (Constant), Distance between mosque and park, Total length of roads, Ratio of lot that range between 1,000m^2 and 1,400m^2

Table 3-11 Coefficients for the ratio of vacant lot(net) as a dependent variable

model		Unstandardized Coefficients		Coefficients	t	Sig.	Coilinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	53.368	9.359		5.703	.000		
	Distance between mosque and park	.011	.004	.243	2.689	.008	.867	1.154
	Total length of roads	-.015	.004	-.288	-3.346	.001	.951	1.052
	Ratio of lot that range between 1,000m2 and 1,400m2	.517	.170	.269	3.042	.003	.901	1.110

3.5.3 Grouping and Suggestions

I conducted the cluster analysis (ward's method) based on the standardized scores of 6 criteria related to the tendency of villa development and the Ratio of vacant lot (net); ratio of villa lots that range between 300m^2 and 400m^2, ratio of villa lots that range between 1,000m^2 and 1,400m^2, average of land price, total area of vacant lot, distance between a mosque and a park, total length of roads. 103 target areas were classified into 6 groups (Fig.3-26). The characteristics and suggestion for reducing the ratio of vacant lot (net).

(1) Group A (26 sites)

The neighborhoods that include in this group are characterized by 1) a few number of lots range between 300m^2 and 400 m^2. 2) the total area of vacant lot is somewhat large. 3) a high land price. 4) a short length of roads comparing to other groups. As, it was clarified that the total area vacant lot is somewhat large; thence, in order to reduce the ratio of vacant lot, it is necessary to divide existing lots to be ranged between 300m^2-400m^2 with increasing the length of road for improving the street environment. In addition to that, increasing the number of parks to respond to the increasing of population density. This will increase the possibility for the consumer to be able to purchase lots.

(2) Group B (38 sites)

The neighborhoods that include in this group are characterized by 1) a certain amount of villas that built in lots that range between 300m^2 and 400 m^2. 2) a few vacant areas. 3) a high amount of street total length. 4) a short distance between mosque and park. As the majority of lots in this group have already been developed; thus, it recommended to remain these locations without any suggestions.

(3) Group C (22 sites)

This group is distinguished by 1) a high amount of lots that range between 300m^2 and 400 m^2. 2) An average of low land price comparatively to other groups. 3) A high amount of street total length. 4) A short distance between mosques and parks. Based on the above results, it was clarified that today's villas have been constructed actively for 8 years, and it is clear to say that the villas with lots that range between 300m^2 and 400 m^2 will increase spontaneously for some year ahead.

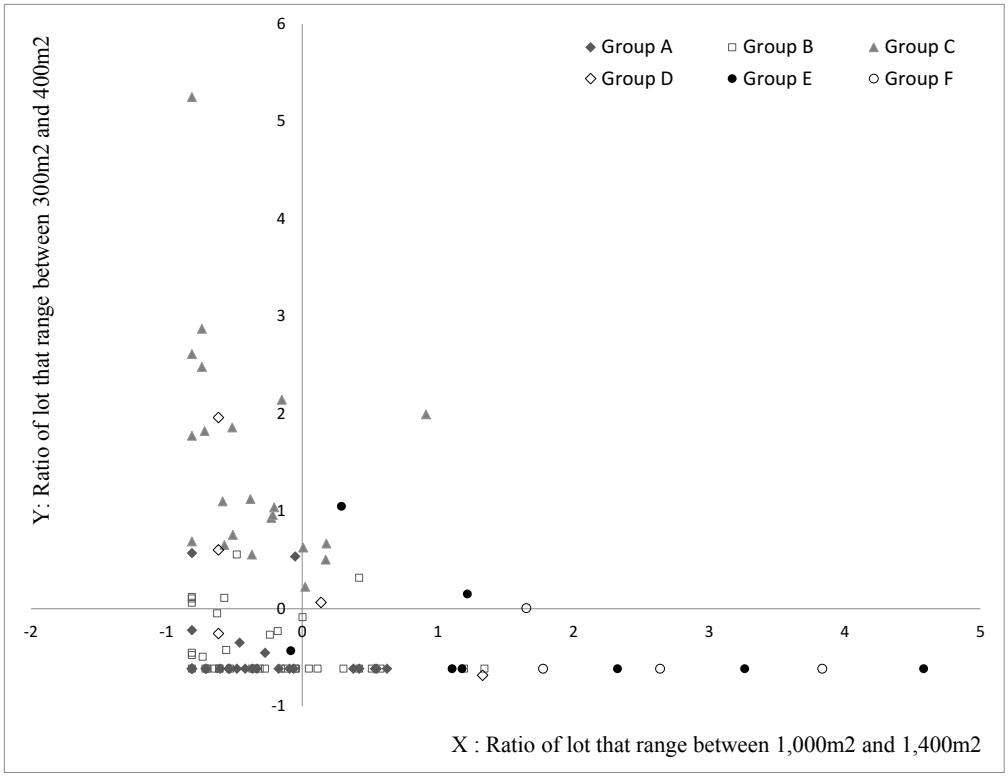


Fig. 3-23 Scatter Diagram 1

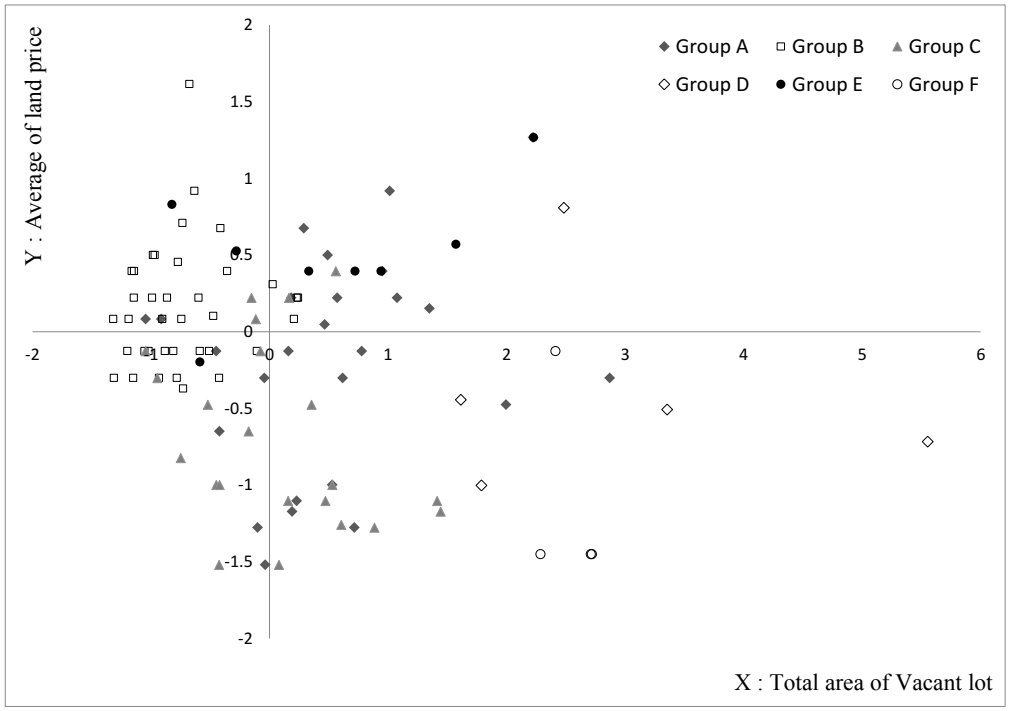


Fig. 3-24 Scatter Diagram 2

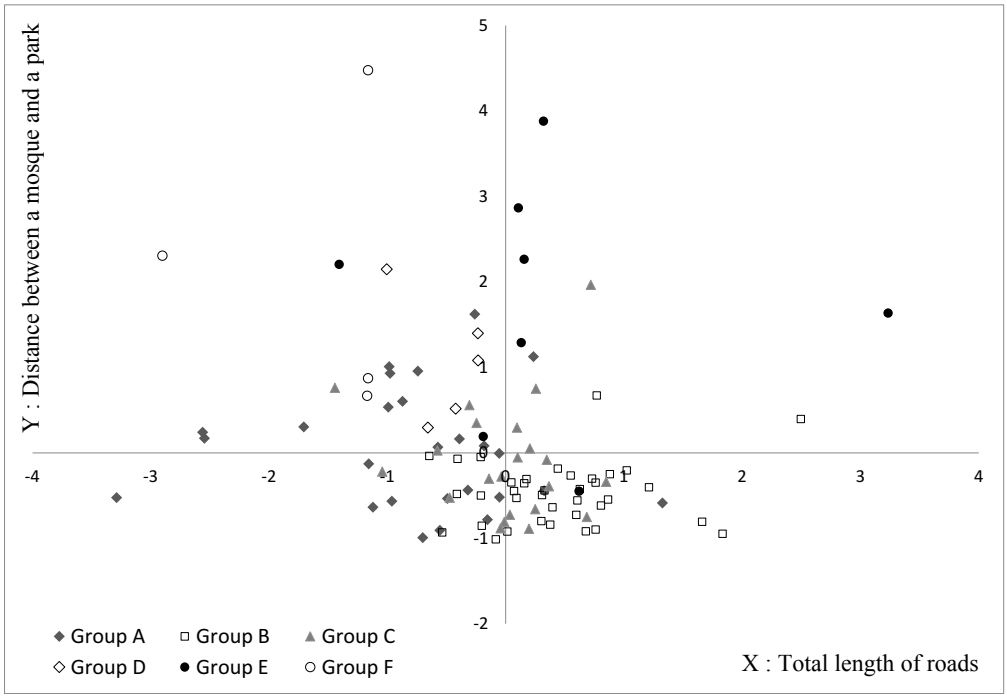


Fig. 3-25 Scatter Diagram 3

(4) Group D (5 sites)

This group is characterized by 1) a few amount of villa lot that range between 300m^2 and 400 m^2, and between 1,000m^2 and 1,400 m^2 as well. 2) in spite of a low amount of land price, the total area of vacant lot is high. 3) a high distance between a mosque and a park comparatively to other groups. It was clear from the analysis of the location of case studies that lots of this group are not attractive for live due to the geographical characteristic. Thus, it is necessary to divide the lots into small sized-lots, and to improve the environment by supporting the neighborhoods by parks.

(5) Group E (7 sites)

The villa lot that range between 1,000m^2 and 1,400 m^2 is considerably high. There are not only an average of high land price, but also a long distance between a mosque and a park. It was clarified that there is a high tendency of villa growth in large sized-lots. Thus, it is necessary to 1) make a method for matching the purchase ability through dividing the existing villa lots which are in a high land price, 2) locate parks near to mosques

(6) Group F (4 sites)

Although, the ratio of villa lot that range between 1,000m^2 and 1,400 m^2 is high, the average of land price is low. Somewhat, the vacant lots are existed. However, the total length of roads is very short and the park is so far from mosque. It is clear to say that areas of this group is unsuitable in terms of residential environment. Thus, it is necessary for a special district planning for this type of neighborhood to increase the length of road and reduce the villa lot area.

Fig. 3-26 Grouping Map

Source of base map: Jeddah Municipality, Department of GIS

3.6 Conclusion

Section 2 discussed the amount of housing shortage problem the city has been experiencing, future projection need in relation to population growth, reasons behind today's housing shortage problem, and the existing condition for population density in relation to parks in all districts in the Jeddah City. Then section 3 made arrangement for the residential new development related law to be aware how today's neighborhoods were created. And a simulation for these laws regarding population density, street total area and length, number parks, number of villas and so on. Section 4 analyzed and examined to what extent residential new development law is applied in to today's neighborhoods. In addition to that, the section clarified that to what extent today's neighborhoods can respond to housing shortage problem from the amount perspective. Section 5 used correlation analysis, and multiple regression analysis to clarify dependent factors that have correlation to each other, and it looked to the existing neighborhoods from six factors perspectives. Finally, this section grouped today's all villa type neighborhoods into six groups with suggestions for each group as a part of housing shortage problem.

Villa type neighborhood contributes in today's housing shortage problem via four factors. 1) The most notable factor that residential new development law. 2) villa lot area. 3) street total area. and 4) land price.

Finally, as this chapter analyzed neighborhood from economic and policies perspective. In addition, it suggests different proposal for each group. However, the contents of the proposals are limited in the total area and length of street, villa lot minimum area, and land price, so it is necessary to look at the pedestrianization and its relation to motorization within planned neighborhood.

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Chapter Four

Motorization and Pedestrianization Issues based on Design Standards in Planned Neighborhoods

Chapter Four

Motorization and Pedestrianization Issues based on Design Standards in Planned Neighborhoods

4.1 Introduction

4.1.1 Research Background

Saudi Arabia is an Islamic country. Muslims pray five times a day as part of their daily religious activity, in addition to their daily activities such as working, shopping, going to school, and jogging. Most of these prayers are performed in a mosque, which means that they are one of the main elements of each residential district. These activities increase the importance of the pedestrian environment; however, because of the lack of a safe pedestrian environment, pedestrian casualty rates have increased in some Saudi Arabian cities. Most of these cities have experienced motorization and have been transformed into car-oriented urbanized cities. Nowadays, the car ownership ratio in Saudi Arabia is 0.349 motor vehicles per capita (by comparison, Japan has 0.559 motor vehicles per capita (Joyce, D.; Dermot, G.; Martin, S., 2007, p.143-170)), which is expected to increase significantly over the next 20 years in parallel with population and economic growth (Jeddah Municipality, Department of Strategic Plan, 2009, p.227).

Jeddah City plays an important role, not only as part of the Makkah region, but also as the second biggest city in Saudi Arabia from a cultural and economic perspective. The city has an important position in Saudi Arabia, partly based on its origin 2,500 years ago as the oldest fishing settlement in the region and its location on the shore of the Red Sea. Jeddah City has become a gateway for pilgrims to Makkah and Medina via Jeddah Port. The city is distinguished from other Saudi Arabian cities by its historic area (Al-Balad;

Fig. 4-1, left map). This area is characterized by its pedestrian-oriented and organic urban fabric, a response to social needs, and its unique building elements, a response to residents' needs (Fig. 4-1).

Fig. 4-1 Map of Saudi Arabia (right), including the Jeddah Governorate area (left)
(source: Ministry of Economy and Planning, Central department of Statistics and Information, 2004)
(Redrawn by the author)

4.1.2 Urban Development History of Jeddah City

Al-Balad was a walled settlement between 1509 and 1947 (Jeddah Municipality, 2015). In 1947, the central government removed the wall so that the city could be expanded. The growth of the city was restricted to the northern and southeastern areas by geographical constraints: the Al-Sarawat mountain chain in the east, the Red Sea in the west, and the naval base in the south. Since the city wall was removed, the population of the city increased from an approximate population of 35,000 in 1947 to 3.3 million in 2010, and it is projected to grow to 5 million in 2029. Urbanized areas have increased from 300 hectares in 1947 to 176,500 hectares in 2009 (Jeddah Municipality, Department of Strategic Plan, 2009, p.7). Jeddah City transformed from a pedestrian-oriented walled settlement into a car-oriented urbanized modern city, which led to an increase in the rate of car ownership. Recently, the Jeddah municipality has begun following the world trend in creating pedestrian-oriented cities and this is reflected in its policies and strategies;

however, there are several issues involved in the application of these policies (Jeddah Municipality, Department of Strategic Plan, 2009, p.234).

Mosques are important elements in the neighborhoods that are divided into villa or apartment neighborhoods. However, the existing pedestrian environment in Jeddah City does not support convenient and safe movement according to the Jeddah municipality; this is reflected in its high pedestrian casualty rates. Around 1,165 pedestrian causalities were reported in 2006, of which around 139 were fatal. In 2007, the number of fatal car accidents increased by 6.4% to 170. In addition, Jeddah City faces a shortage of parking areas in neighborhoods, which led to an increase in illegal parking (Jeddah Municipality, Department of Strategic Plan, 2009, p.235).

4.1.3 Research Objectives

In the light of the abovementioned trends of increasing population, rates of car ownership, and the rate of fatal car accidents caused by the coexistence of motorists and pedestrians, it is necessary to improve the following issues: 1) spatial configuration of design standards, and 2) defining street use, such as parking on pedestrian sidewalks.

This chapter aims to clarify street uses between residential buildings in neighborhoods in Jeddah City that were planned and designed based on design standards, identify their characteristics, and suggest the related issues for future neighborhood planning. The spatial configuration of design standards that are discussed in this study include items such as some articles in the Jeddah City residential building regulations that define the design of residential buildings, e.g., floor number limitation, building-to-land area ratio, building-to-roof area, setback lines, fences, or car parking.

The specific objectives of this chapter are: 1) to make spatial configuration arrangements in design standards and open spaces, including streets in planned neighborhoods, by chronologically analyzing design changes since the 1960s (sections 2 and 3); and 2) to define the combinations of patterns in the spatial configuration of streets and residential buildings by analyzing the expanding urbanization process. This research intends to clarify the process of construction for each planned neighborhood following the spatial configuration patterns of the design standards (section 4). 3); clarify street use

characteristics based on the spatial configuration patterns; identify issues for existing streets; and suggest future neighborhood planning issues for in Jeddah City (section 5).

4.1.4 Research Methods

To accomplish the abovementioned objectives, interviews were conducted and data collected from several competent authorities. The methodology was sequentially performed as shown below.

4.1.4.1 Chronological Table

This chronological table shows the historical transition of design standards, open space-related standards and design guidelines, population census, future projected population, the housing shortage faced by the city, and the projected future housing demand. The table was produced using data collected from the Jeddah City municipality, the Saudi Arabian Ministry of Municipal and Rural Affairs, and the Central Department of Statistics & Information. In addition, to identify the changes in spatial configuration arrangements in design standards, which have not been identified previously, it was necessary to interview the department heads of the Local Planning and Regulation of Residential Buildings departments at the Jeddah City municipality (sections 2 and 3).

4.1.4.2 Map of Chronological Growth of Neighborhoods

A map of the chronological growth of planned neighborhoods and typology of residential buildings was created by overlapping the results of the field investigation in Jeddah City to clarify the planned neighborhoods and typologies, which were based on the spatial configuration of the design standards to which each neighborhood was built. The investigation was performed between 21 and 28 March 2015. These results were added to a chronological city growth map supplied by the Jeddah municipality as a base map, which shows the expanding city boundaries from 1955, 1964, 1971, 1979, and 2007. In addition, the area of each type of planned neighborhood in each period was calculated based on the AutoCAD drawing map of Jeddah City supplied by the Jeddah municipality (section 4).

4.1.4.3 Field Survey

A field survey was performed for each planned neighborhood to clarify the real-world uses for each type of spatial configuration (section 5).

Based on these items (1–3), this study suggests that the pedestrian environment issues are due to trends in motorization.

4.2 Jeddah City Residential Areas

4.2.1 Characteristics of Unplanned Settlements

Jeddah City residential areas are divided into unplanned settlements and planned neighborhoods. Regarding Jeddah Municipality, the term of 'Unplanned Settlement' refers to areas that grown illegally in a period that characterized by a lacking of city structure and master plan (Jeddah Municipality, 2009). The unplanned settlements occupy over 4,800 hectares (16% of the urban area) and they appeared over two stages. The first stage was from 1947 until 1964 around the Al-Balad area after the city wall was removed. This area is characterized by a dense population of 300–500 people per hectare, a pedestrian-oriented organic urban fabric, and it is inhabited by low-income Saudi people and foreign workers. The crime rate is notably high in the unplanned settlements compared with the urbanized city areas. The second stage was from 1971 until 1980 in areas outside the city boundary, which led to the original city districts to become surrounded by urbanized areas in the process of urbanization2). However, expanding unplanned settlement became difficult due to "Jeddah Without Slum" program that was established by a royal decree (Jeddah Municipality, 2009)

4.2.2 Characteristics of Planned Neighborhoods

Planned neighborhoods began to form after the first city structure plan was applied in 1964. Jeddah City neighborhoods are divided clearly into villa neighborhoods with a population density of 50–100 people per hectare, and apartment neighborhoods with a population density of 100–300 people per hectare. However, these density variations were a result of changes in floors limit regulation in response to an increasing population. I focused on studying planned neighborhoods because of the current high crime rate in unplanned settlements.

4.2.2.1 Changes in Villa Design Standards

The head of the Local Planning Department of Jeddah municipality noted in an interview that villa neighborhoods were originally extended from Al-Balad, where each family used to live in their own building. Thus, this type of building became popular in the Jeddah City culture. In 1960, after the first villa design standard (VT1) was established, rich families living in unplanned settlements moved to the new northern planned neighborhoods (Fig. 4-2). The villas in these planned neighborhoods used a simple two-floor design on 60% of building-to-land ratio, and some included a third-floor addition

using a 25% building-to-floor ratio. The head of the Residential Building Regulation Department at Jeddah municipality noted in an interview that the Jeddah municipality increased the ratio of the third floor building-to-roof area to 50% (VT2) in 2008 as part of a solution to the housing shortage problem. Therefore, villa buildings could house two generations (Fig. 4-3).

4.2.2.2 Changes in Apartment Design Standards

Based on an interview with the head of Department of Local Plan at Jeddah Municipality (the interview was conducted on 24th March 2015), in 1960, apartment buildings (AT1) were constructed for people with a limited income. They were two-floor buildings with an average of four units for four families. Since 1992, Jeddah City has experienced a shortage of housing because of the population increase (Fig. 4-2). In 1995, the Jeddah municipality modified their building floor limitations to add another floor to allow three-floor apartment buildings (AT2). In 2005, the demand for apartment residential units increased because of the increase in land prices in villa neighborhoods located in the northern part of the city, which was a result of a bid-rigging scheme between real estate companies. This demand led the Jeddah municipality to modify the floor limitations up to four floors in addition to two villa rooftop floors (AT3). The residential building regulation required that the apartment owner should occupy the villa rooftop. However, the Jeddah municipality changed this regulation to limit the floor space to four and a half floors (AT4) in 2012 because of an increase in apartment owners who rented their rooftops illegally (Fig. 4-3).

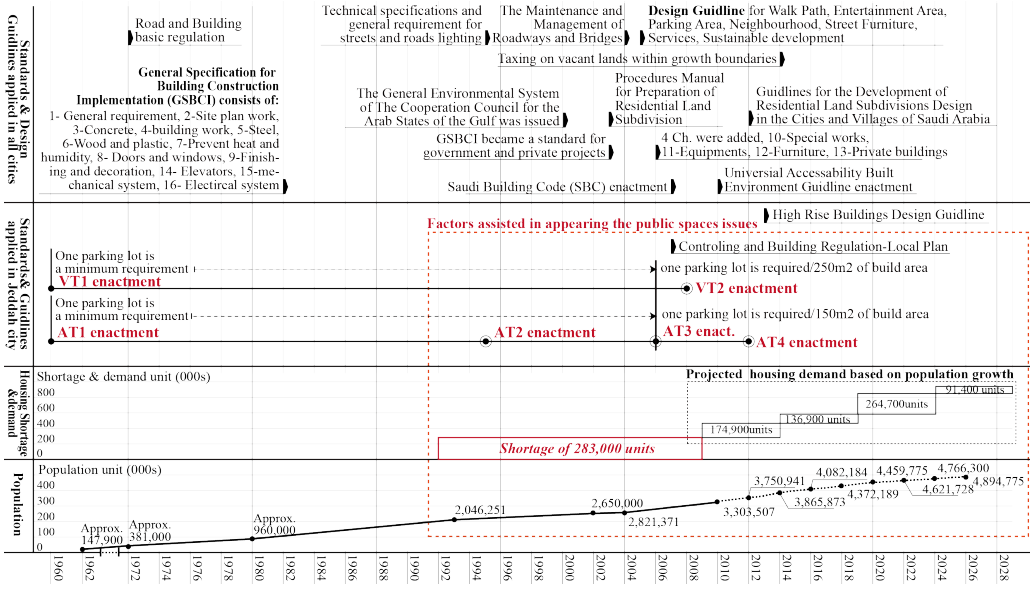

Fig. 4-2 Changes in design standards and related

4.2.3 Changes in Design Standards and Related Factors

In 2009, the Jeddah municipality performed a study to clarify the extent of the housing shortage that the city has experienced since 1992. The study also projected the future housing demand in relation to an increasing population (Fig. 4-2). However, the lack of revision of the AT1 design standards over 35 years was one of the main reasons for the housing shortage that emerged in 1992. In 1995, AT2 was designed in response to the housing shortage; however, this housing design could not compensate for the housing shortage, which led to the implementation of AT3 and AT4. Because of the increase of the value of land in villa neighborhoods, the Jeddah municipality allowed apartment buildings to be built in these areas. In the process of changing design standards, several street-related standards and guidelines were included to improve the quality of streets (Fig. 4-2).

4.2.4 Spatial Configuration of Design Standards

4.2.4.1 Characteristics of Building Patterns

1) VT1: Villa Type 1 (1960~)

The average lot area in villa neighborhoods is between 500–600 m^2. The villa design (VT1) consists of two floors with a building-to-land ratio of 60% for each floor in addition to an attached building-to-roof ratio of 25% floor space (Fig. 4-3). The parking area for the building is located in a 4-m area behind the setback line. The architectural laws in Jeddah City required that the minimum number of parking spaces from 1960 to 2006 was one space per villa; however, in 2006, the minimum was changed to one parking space per 250 m^2 of total gross floor area. For example, for a 500 m^2 land area, the total gross floor area is 675 m^2 because 600 m^2 is divided between the ground floor and first floor, in addition to 75 m^2 for the attached third floor. Therefore, this requires space for 2.7 cars, which is rounded up to three parking spaces.

2) VT2: Villa Type 2 (2008~)

The only difference between the VT1 and VT2 designs is the increased building-to-roof floor ratio, which became 50% instead of 25% as in the VT1 design. The calculation of the required parking lot size is similar to that described for VT1, requiring three parking spaces (see VT2 in Fig. 4-3).

3) AT1: Apartment Type 1 (1960~)

This type of apartment mainly consists of four units, with each unit occupying an area between 165–210 m^2 because the average area for apartments in Jeddah City is between 550–700 m^2. In this apartment type, one parking lot must be provided for each unit in the area behind the setback line using a perpendicular parking system (see AT1 in Fig. 4-3).

4) AT2: Apartment Type 2 (1996~)

The floor area limitations for apartments increased to three floors with one attached floor with a building-to-roof ratio of 10% in response to Jeddah City's population growth. The average number of units in an apartment building increased to seven units. At least one parking space was required for each unit (see AT2 in Fig. 4-3).

5) AT3: Apartment Design (2006~2012)

Because of a bid-rigging scheme between real estate companies, Jeddah City has experienced a housing crisis since 2005. Therefore, the land prices in the villa neighborhoods located in northern Jeddah City have increased, which subsequently produced a high demand for apartments. The Jeddah municipality increased the number of floors to four floors in addition to two floors of villa rooftop space using 50% of building-to-roof ratio to fulfill the demand for apartments. The villa rooftop space could not be rented or sold and its main purpose was to provide extra space for the owner. The Jeddah municipality changed the parking lot regulations because of the increase in the number of units in this type of building to require: a) one parking space per 150 m^2 building area, or b) parking space for each unit, which means that a large number of parking spaces must be required. The area for parking must take up 60% of the ground floor space (see AT3 in Fig. 4-3).

6) AT4: Apartment Type 4 (2012~)

According to Jeddah municipality, so many apartment owners illegally rented their villa rooftop spaces (AT3) from 2006 until 2011 that the municipality had to update this regulation to a new regulation excluding villa rooftops. The car park requirements were similar to those for the AT3 design (see AT4 in Fig. 4-3).

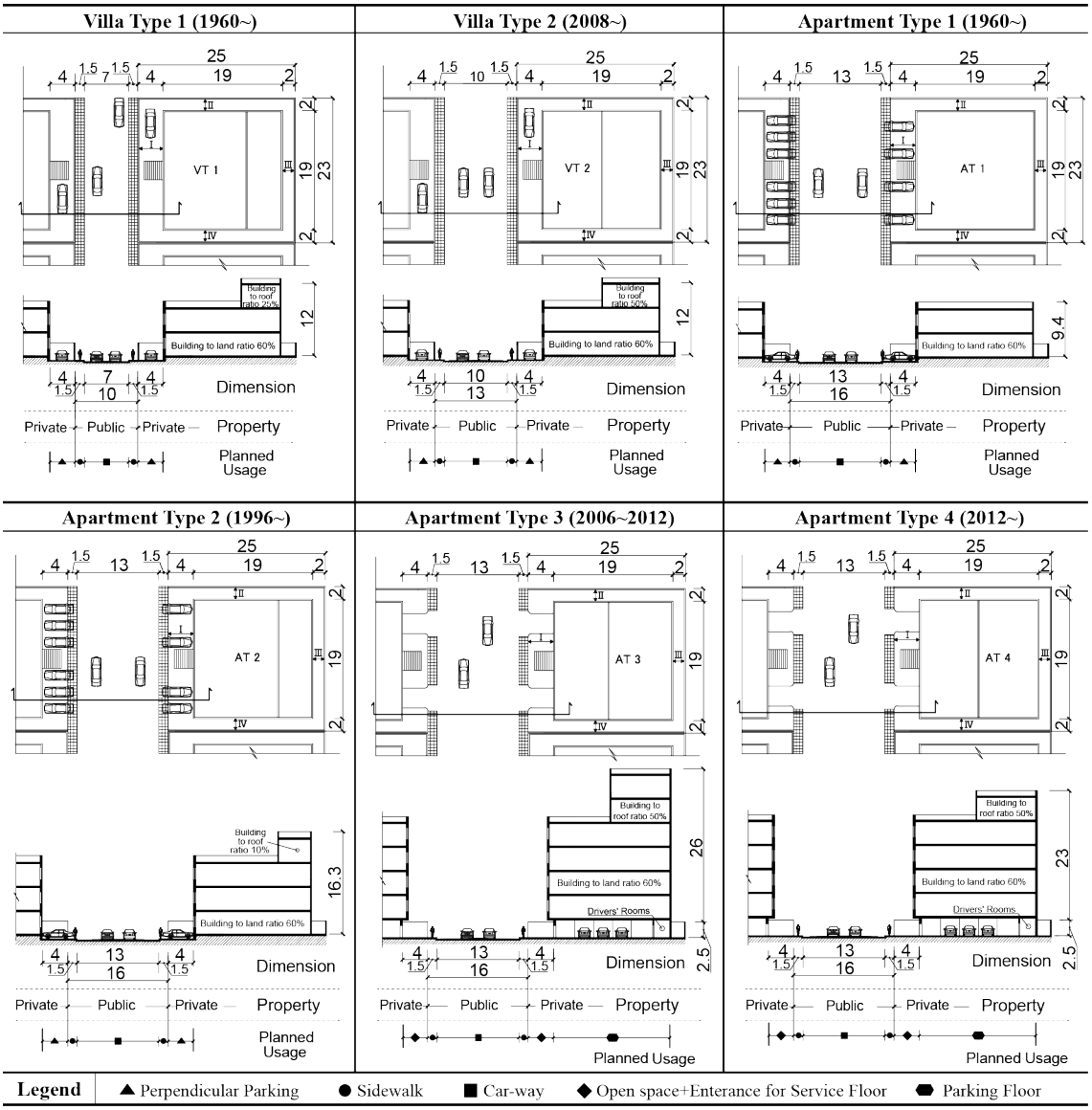

Fig. 4-3 Types of Spatial Configuration based on Design Standards in the case of minimum street width (sections and plans) (Drawn by the author, based on the interview)

4.2.5 Elements of Spatial Configuration of Planned Neighborhood Streets

As shown in Fig. 4-3, the spatial configuration components of design standards were mixed between public and private land. Therefore, it is necessary to analyze the spatial configuration components to analyze these elements (Table 4-1). Floor number limitation, setback lines (whether on land along a one-way street or a corner), concrete fences (whether prohibited or required), parking location, and width of street and sidewalk are the main elements that comprise the spatial configuration of neighborhood streets. For example, based on building standards, building a fence is obligatory in villa

neighborhoods, but is prohibited for apartment buildings to allow the residents to use the space behind the setback line as a parking space. Apartment buildings on corners are supposed to include a setback line 3 m from the second side, which means that they have a decreased building-to-land ratio.

Table 4-1: Elements of spatial configuration of planned neighborhood streets
(Source: based on an interview with the head of Department of Local Plan, Jeddah Municipality)

<table>
<tr><th rowspan="3">Element
Type</th><th rowspan="3">Floor limitation (maximum)</th><th colspan="8">set-backs, minimum (m)</th><th colspan="4">Concrete Fence</th><th rowspan="3">Parking location</th><th colspan="3">Street (Minimum)</th></tr>
<tr><th colspan="4">One way land</th><th colspan="4">Corner land</th><th colspan="4" rowspan="2"></th><th colspan="2">Side walk</th><th rowspan="2">Car-way width(m)</th></tr>
<tr><th>I</th><th>II</th><th>III</th><th>IV</th><th>I</th><th>II</th><th>III</th><th>IV</th><th>I</th><th>II</th><th>III</th><th>IV</th><th>width</th><th>location</th></tr>
<tr><td>VT1</td><td>2F+1F(25% of 2nd F)</td><td rowspan="6">4</td><td colspan="2" rowspan="6">2</td><td rowspan="6">4</td><td colspan="2" rowspan="2">2</td><td colspan="4" rowspan="2">○</td><td>Behind the villa fence at property</td><td rowspan="6">1.5m×2</td><td rowspan="2">Beside the fence</td><td>7</td></tr>
<tr><td>VT2</td><td>2F+1F(50% of 2nd F)</td><td>10</td></tr>
<tr><td>AT1</td><td>2 F</td><td rowspan="3">3</td><td rowspan="3">2</td><td rowspan="3">×</td><td rowspan="3">○</td><td>Perpendicular parking at set-back area</td><td rowspan="3">Beside parking lot</td><td rowspan="4">13</td></tr>
<tr><td>AT2</td><td>3F+1F(25% of 3rd F)</td></tr>
<tr><td>AT3</td><td>5F+2F(50% of 5th F)</td><td>Perpendicular parking at 60% of ground floor</td><td>Along the property line</td></tr>
<tr><td>AT4</td><td>5F+1F(50% of 5th F)</td><td colspan="8"></td><td colspan="4"></td><td colspan="3"></td></tr>
</table>

4.2.6 Street Issues in the Spatial Configuration of Design Standards

This section summarizes the changes in design standards from 1960, 1996, 2006, and 2012. The main goal for these changes was to alleviate the housing shortage that Jeddah City has experienced since 1992. The villa and apartment standards share the common element of a minimum sidewalk width of 1.5 m (3 m total for the sidewalks on both sides of a street). In analyzing the design standards, two issues were identified: 1) the 4-m setback space in AT1 and AT2 is not enough for car parking because the average car length is approximately 5 m, which will negatively impact the pedestrian sidewalk space; 2) The entrance to the parking floor for each building in AT3 and AT4 disrupts the continuity of the sidewalk, which also disrupts the continuity of pedestrian sidewalk space. Both issues do not support the need for walkability in planned neighborhoods.

4.3 Urbanization Process of Spatial Configuration Patterns

4.3.1 Characteristics of Urbanization Process

The shape of Jeddah City is surrounded by several geographical constraints, such as the Al-Sarawat mountain chain to the east, the Red Sea to the west, and the naval base to the south. Pilgrims go on pilgrimages to Makkah City, which is located in southeastern Jeddah City; therefore, Jeddah City mainly expanded towards its northern and southeastern edges.

Until 1947, Jeddah City experienced growth difficulties because of limited tax revenues in the city, which comprised fees collected from commerce and pilgrim services. However, after the Second World War (post-1945), oil was discovered in Saudi Arabia and the Kingdom started receiving oil revenue in 1946. This led the government to remove the city wall and expand the city. Several investments were made in the city's basic infrastructure, such as roads, public hospitals, and the airport. However, until 1964, the lack of a city master plan was the main factor for the appearance of the early unplanned settlements located around the Al-Balad area. These unplanned settlements were physically characterized by their organic urban form, narrow public spaces between buildings, differentiation in floor numbers, lack of land titles, and poor-quality construction materials (Fig. 4-4).

1964 was a turning point for Jeddah City because of the first city master plan. This master plan laid out the characteristics of the existing linear grid pattern of the city and the location of the airport. After the application of the first master plan, illegal unplanned settlements began to appear outside the urbanized area in 1971[2)]. As the city became more urbanized, these unplanned settlements were surrounded by planned districts (Fig. 4-4).

During the urbanization process, the area outside each urbanized boundary was a good investment opportunity for businesspeople, who bought and sold large areas of land. Because the villa was a popular design, most of the businesspeople chose to build villa neighborhoods during the government's process of ruling on land use. As a result, villa neighborhoods comprise approximately 63% of the planned neighborhoods in Jeddah City today (see VT1 in Table 4-2).

In 2006, because of the Saudi Arabian stock market crisis, real estate companies began a bid-rigging scheme, which increased the value of the villa neighborhoods located in northern Jeddah City. Therefore, the growth trend changed gradually to focus on the vacant lots in the urbanized area in the middle of the city, and the demand for apartment units increased.

4.3.2 Expanding Spatial Configuration Patterns

Based on a field survey performed in 2015, planned neighborhoods in the city were sorted into types based on the spatial configuration patterns of their design standards (VT1, VT2,

AT1, AT2, AT3, and AT4). By overlapping the survey results on the Jeddah City chronological growth map created by the Jeddah municipality, the chronological growth of the planned neighborhoods in the city is shown based on the spatial configuration patterns of design standards (Fig. 4-4). The chronological growth map shows the expanding city boundary for 1955, 1964, 1971, 1979, and 2007; therefore, Fig. 4-4 shows just these periods in addition to 2015 when the survey was performed. By applying the survey results to the AutoCAD data supplied by the Jeddah municipality, we calculated the area of each type of planned neighborhood in the city (Table 4-2).

By 1955 and 1964, the city growth was more toward the southeast of Jeddah City because the unplanned settlements were spreading (Fig. 4-4). When Al-Madinah Road was established as the main road leading to the airport, it divided the city into eastern and western parts. As a result, along Al-Madinah road from the south to the north, the types of neighborhoods sequentially changed from AT1, AT2, AT3, to AT4, and combinations of these designs appeared, such as AT1+AT2, AT1+AT3, AT1+AT4, and AT2+AT3. The combination designs usually appear when a new type of design standard is introduced into the building regulations by the municipality and applied to vacant lots in a neighborhood that includes residential buildings already built to an earlier design standard. The majority of apartment neighborhoods were located along Al-Madinah Road toward the eastern part of the city because the value of the land is lower than the western part of the city and it is closer to the corniche that borders the city to the west.

As shown in Fig.4-4, the majority of villa neighborhoods are located in the western part of Al-Madinah Road along the Red Sea. The western part of the city is popular because it is close to the corniche, which is used as a gathering place for leisure and entertainment. This increased the land value so that it was only affordable for mid-high to high income people, who prefer to live in villas. The villa neighborhoods located in northern Jeddah City started to appear in 2007, but they lacked many services. Initially they lacked infrastructure such as sewage disposal and purified water supply systems as well as city-scale resources such as commercial, entertainment, and educational facilities. Despite these deficiencies, the land value is high compared with neighborhoods in the urbanized area, which was because of the bid-rigging scheme between real estate companies.

Recently, Jeddah City's growth has changed gradually from outward to concentrate in the inner city and demand has increased for apartment units as permanent places to live.

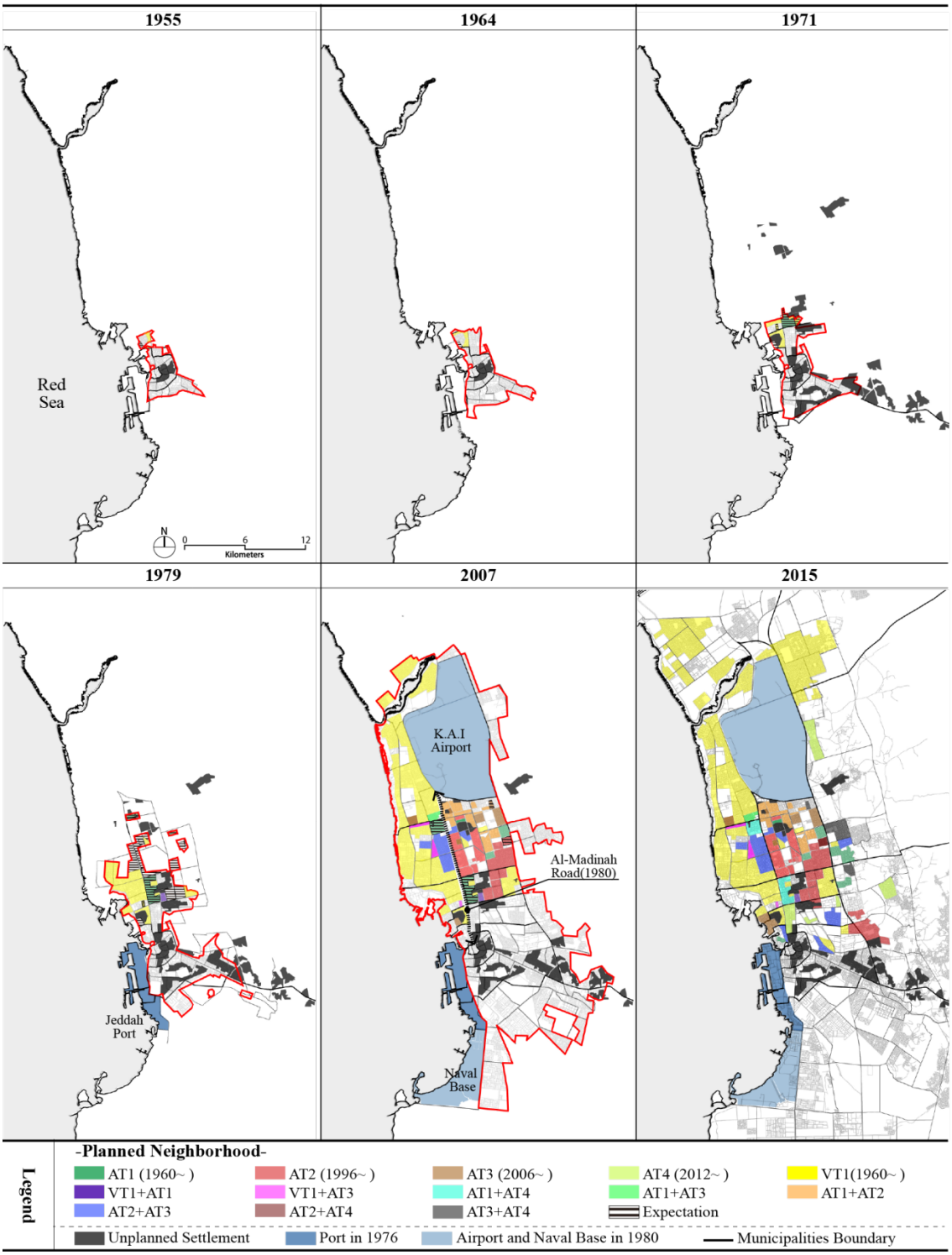

Fig. 4-4 Chronological Growth of Planned Neighborhoods shown with spatial configuration patterns (Source of base map: Department of GIS, Jeddah Municipality. Chronological boundary: Jeddah Strategic Plan 2009. Types Analysis: By the author based on a field survey performed in 2015)

4.3.3 Residential Patterns and Related Streets Future Issues

Table 4-2 shows that 63% of planned neighborhoods are villa-only neighborhoods, 36% are apartment-only neighborhoods, and 1% are neighborhoods that combine villas and apartments. As discussed in section 3, the AT1 and AT2 designs force cars to use the sidewalk space because of the lack of space to accommodate car dimensions in car park spaces. Therefore, no sidewalks are available in 16.4% of planned neighborhoods (total area of AT1, AT2, and AT1+AT2). However, 12.1% of the current planned neighborhoods, appeared after 1996 due to motorization. Furthermore, 9.8% of planned neighborhoods (total area of AT3, AT4, and AT3+AT4) have discontinuous sidewalks because they are interrupted by car park entrances. In addition, 10.3% of planned neighborhoods used a combination of villa and apartment designs (total area of VT1+AT1, VT1+AT3, AT2+AT3, AT1+AT4, and AT2+AT4), so sidewalks were unavailable or discontinuous. In addition to the street-related issues in the abovementioned 10.3% of planned neighborhoods, 0.8% of the 10.3% (total area of VT1+AT3) experiences invasion of privacy because the 4-m setbacks for villa designs mean that apartment buildings overlook these spaces, which reduces their privacy. This type of combination is expected to continue in future neighborhoods.

Table 4-2: Planned neighborhood areas in the city urbanization process (unit: hectare)
(The calculation based on the Fig.4-4 and field survey performed in 2015)

Pattern \ Year	1955	1964	1971	1979	2007	2015	Total Area	Percentage
VT1 (1960〜)	35.8	61.6	166.8	1,205.7	6,410.6	5,804.6	13685.1	63.0%
AT1 (1960〜)				188.5	236.1		424.6	2.0%
AT2 (1996〜)				79	2,179.7	373	2631.7	12.1%
AT3 (2006〜)					526		526	2.4%
VT1+AT1				45.8			45.8	0.2%
VT1+AT3					170.5		170.5	0.8%
AT1+AT2					504.5		504.5	2.3%
AT1+AT3					105.2		105.2	0.5%
AT2+AT3					1,275.6	117	1392.6	6.4%
AT4 (2012〜)						1151	1151	5.3%
AT1+AT4						540.8	540.8	2.5%
AT2+AT4						83.6	83.6	0.4%
AT3+AT4						453.8	453.8	2.1%
Total	35.8	61.6	166.8	1,519	11,408.2	8,523.8	21715.2	100%

4.4 Street Use based on Spatial Configuration Patterns

4.4.1 Analysis of Street Uses

Based on our field investigation, we can clearly see that real-world street use differs from intended use. These differences occur because of several reasons, such as: 1) some design

standards do not fit with the reality; 2) some design standards do not adequately match the residents' lifestyle; and 3) some standards were not applied well because of a shortage in application, and post-design management and inspections (Fig. 4-5a and 4-5b).

4.4.1.1 Villa Type 1

The common aspects of villa neighborhoods are: 1) instead of parking within the property, residents use the street in front of their villa as a parallel-parking area and use the 4-m setback for their private use; 2) although the sidewalks are a public space because they are part of the street, they are used by villa owners as a place for private planation, benches, or a spot for socializing, which means that pedestrians cannot walk on the sidewalks; and 3) pedestrians are forced to walk on the road close to the parked cars (see VT1 in Fig.4-5a).

4.4.1.2 Apartment Type 1 and Apartment Type 2

The real-world uses of AT1 and AT2 are similar because of the similarity of their spatial configuration. The real-world spatial configurations differed from the design standards because of several factors: 1) Although the average length of cars is approximately 5 m, the AT1 and AT2 design standards place the parking lot area in the 4-m setback area, which led the residents to use the sidewalk as a part of their car parking space (see AT1 and AT2 in Fig. 4-5a and 4-5b). 2) Because of a lack of penalty for those who change the original sidewalk pavement, apartment owners change the public pavement to match the pavement on their private setback area. 3) Owing to a) a lack of regulation regarding a height limitation for the car park area level from the street level, or b) a lack of rainwater drainage network and sewage water drainage network systems, some owners level up the ground level of their building from the street level to prevent water from going inside their building. Therefore, there are differentiations in sidewalk height as well as building height.

4.4.1.3 Apartment Type 3 and Apartment Type 4

As the number of AT3 and AT4 units increased, in addition to the car park floor (ground floor), the setback areas are also used as parking areas in response to the shortage of car parks on the ground floor. Therefore, the sidewalk was used as part of parking area. This

caused pedestrians to walk on the street close to the cars (see AT3 and AT4 in Fig. 4-5a and 4-5b).

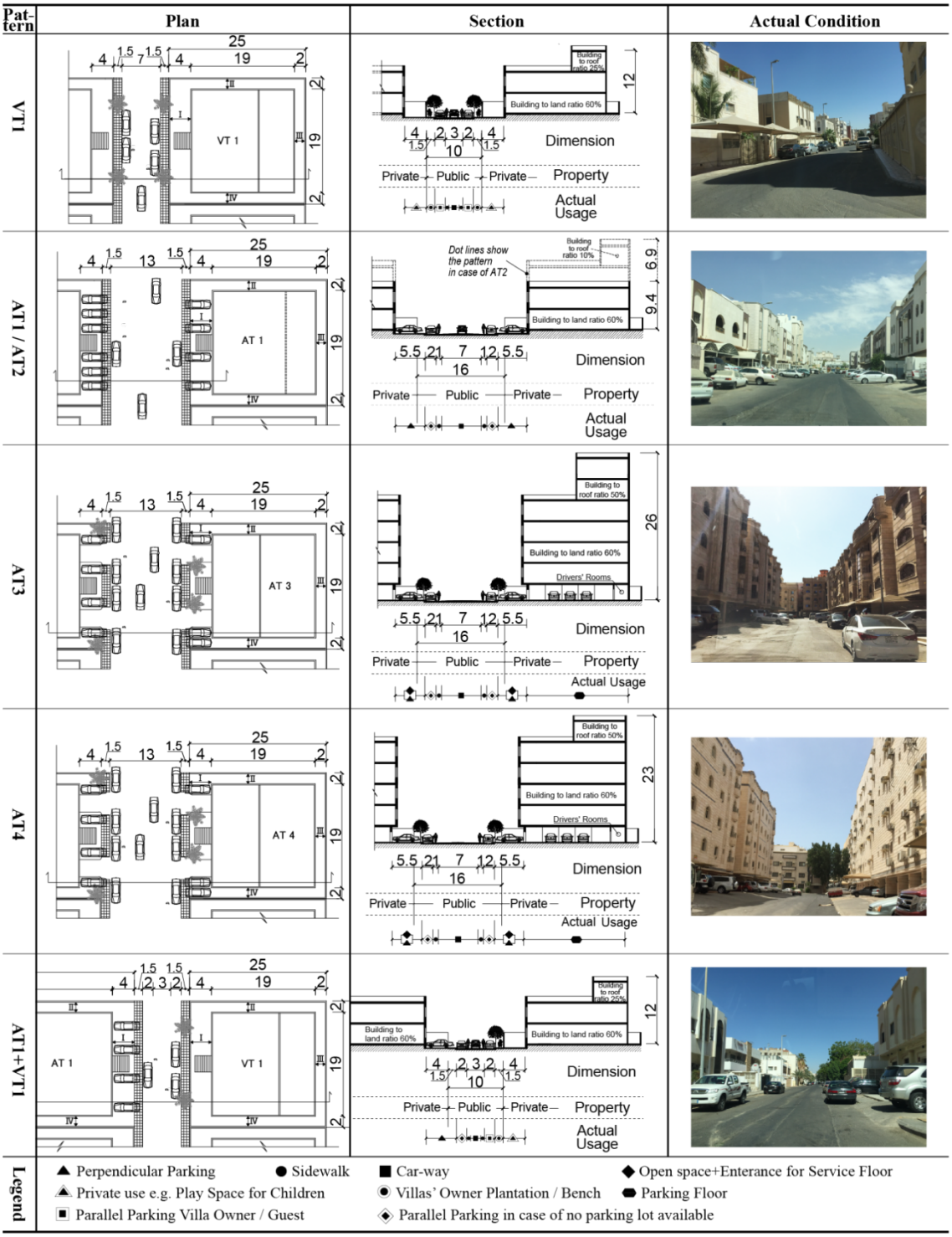

Fig. 4-5a Combination of patterns of spatial configuration designs and real-world street uses (Source: Based on a combination between the interview, and filed survey in all planned neighborhoods in Jeddah City)

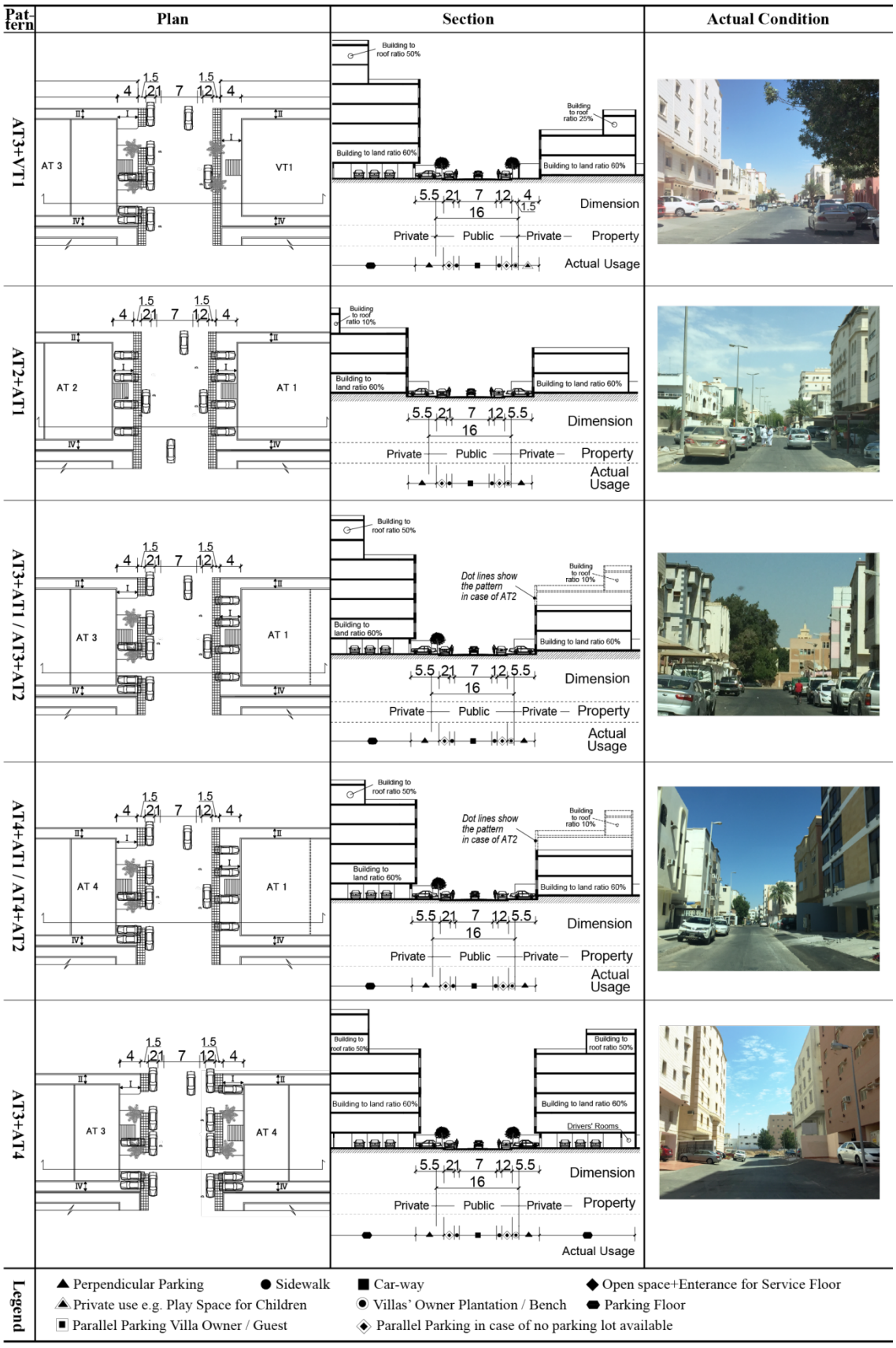

Fig. 4-5b Combination of patterns of spatial configuration designs and real-world street uses

4.4.1.4 Combination Designs

As shown in Fig. 4-5a and 4-5b, the real-world uses of various design types are becoming more complicated. The neighborhoods with combinations of different designs were characterized by a mixture of the previously mentioned real-world uses: using the sidewalks in villa neighborhood for semiprivate purposes, parking on the street in front of one's villa, using the sidewalk as part of the parking area in AT1 and AT2 designs, and parking on sidewalks outside AT3 and AT4 apartment designs.

4.4.2 Future Issues Based on the Real-World Spatial Configurations

Creating a spatial configuration that matches with the design standard, and maintaining it for a long period depends on several factors, such as matching the design to the existing physical dimensions of the location; e.g., the dimensions available for car parking spaces to the cars' actual dimensions. Post-implementation management and inspection are also essential. However, based on the AT1 and AT2 design standards, car parking spaces are located in the 4-m setback area. Therefore, because the average car length is approximately 5 m, and the sidewalks are located beside the parking space, sidewalks have become a part of the parking area. This forces pedestrians to walk on the street, which is dangerous. In AT3 and AT4 apartment neighborhoods, the ground floor space for car parking does not correspond to the existing number of cars; therefore, this results in permanent parallel parking along the inner streets of planned neighborhoods and cars illegally park in the setback area. In villa neighborhoods, some sidewalks are in poor condition because of a lack of post-implementation management and are unsuitable places to walk. In addition, the regulated minimum number of parking spaces is one space per unit and, on average, Saudi Arabians own more than one car per household.

As a result, these two factors have meant that the pedestrian environment has moved from sidewalks to the street in villa neighborhoods because of the absence of a law forbidding parking permanently along the street or using the sidewalk for private purposes. However, the mismatch of the dimension of cars and the parking spaces is the main reason for the unavailability of sidewalks in AT1 and AT2 neighborhoods. In contrast, two factors changed the pedestrian route from being on the sidewalk to sharing the street with cars in AT3 and AT4 neighborhoods: the lack of a law forbidding parking in the 4-m setback

area and along the street and a mismatch of the minimum area requirements of car parking spaces with the existing average cars per household.

4.5 Conclusion

Sections 2 and 3 discussed and analyzed the changes in design standards, their related factors, and the factors that made the design standards difficult to apply in the real world. I conclude that it is necessary to evaluate the design standards regularly in the future to clarify the efficiency of the design standards in response to the housing shortage. It is important to consider the real-world environment in creating design standards. Section 4 analyzed the chronological growth of planned neighborhoods with the application of spatial configuration patterns. For neighborhoods with both villas and apartments, it is necessary to revise the design standards for both by considering the potential invasion of privacy by building apartments next to villas. Section 5 analyzed the actual combination patterns of different spatial configuration designs with the real-world street uses in planned neighborhoods and found that several factors must be considered in the revision of design standards, including 1) the applicability and efficiency of sidewalks, and 2) ensuring that the average car ownership per household matches the minimum requirement for car parks per unit.

The Jeddah City pedestrian environment is influenced by three main factors: 1) the mismatch of design standard dimensions with the reality, 2) motor vehicle-oriented neighborhood planning, and 3) using sidewalks for semiprivate purposes, which originate from the historical and cultural background of the city. It is necessary to consider these three factors in planning future pedestrian-oriented neighborhoods in Jeddah City.

Finally, as sidewalks as used semi privately in planned neighborhood, and some users were seen using these sidewalks for talk and gathering. So there is a necessity to analyze how open spaces including these sidewalks and parks are used (activity perspective) throughout the whole year in both villa type and apartment type neighborhoods in Jeddah City.

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Chapter Five

Evaluation and Redefinition of Open Spaces in Neighborhoods of Hot Arid Region

Chapter Five

Evaluation and Redefinition of Open Spaces in Neighborhoods of Hot Arid Region

5.1 Introduction

5.1.1 Research Background

Throughout the ages, the term neighborhood has been defined in different ways. Lewis Mumford presents the neighborhood as a "fact of nature" that comes into existence whenever a group of people share a place. Mumford notes that ancient cities consisted of a “series of more or less coherent neighborhoods in which smaller shrines and temples serve for the householder” (Mumford, 1961). According to Mumford (1961), the neighborhood was a familiar concept to Greek city planners in the seventh century B.C. Mumford contends that this appears to be the “first historic example of a deliberately fabricated neighborhood unit” (Mumford, 1961).

After that, the idea of Garden City was born, which was proposed by Ebenezer Howard (1902/1945). His goal was to create a self-sufficient village within a city; he placed culture and commerce at the center of the garden city, surrounded by a green belt that led to factories. Finally, in 1929 Clarence Perry began promoting the concept of “the neighborhood unit.” The enduring parts of the diagram include its quarter-mile “pedestrian shed,” its ideal size of 160 acres, a neighborhood center surrounded by civic buildings, clearly delimited edges, commercial uses at the edge, a network of narrow streets, small parks throughout, and an elementary school. From the point of view of sustainable urbanism, the plan has a number of shortcomings. For instance, it includes no reference (Farr, 2008).

5.1.2 The Problem in Saudi Arabia

If the above-mentioned chronological models of residential areas are unsuitable for some societies, then those societies must create their own ideal model. The Saudi Arabian top-down approach to decision-making and unfamiliarity with the citizen's needs regarding open spaces led, unsurprisingly, to the creation of an unsuitable and unhealthy environment.

5.1.3 Problem Statement

In 2010, according to the Central Department of Statistics and Information of Saudi Arabia, Jeddah's total population was at around 3,513,717 and by 2029 it is expected to have grown to over 5,000,000. According to the Jeddah Municipality, as the Jeddah population is increasing, there is a need for new housing. In addition, there is a severe shortage of adequate housing for low-income and middle-income residents. According to the Jeddah Municipality, "future demand will stand at an average of around 33,500 units of housing per year for the next 15 years. In total, around 953,000 units will be needed in Jeddah in the 15 years until 2029" (Jeddah Municipality, 2009).

The World Health Organization recommends 8 square meters of open space per person as a minimum provision. In contrast, the Jeddah Municipality took the WHO recommendation into consideration as a target without looking at its suitability to the Saudi Arabian environment and culture. The municipality conducted a study that shows "an average provision of only 2 square meters of open space per person in most districts and Jeddah currently falls significantly short of this target (Fig.5-2). As Jeddah's population continues to grow, demand will increase for all types of open spaces and leisure facilities in both existing and new areas" (Jeddah Strategic Plan, 2008). In addition, the municipality referenced a lack of quantitative and qualitative data on current and future demand from various user groups and districts, making it difficult to inform priority actions and areas for investment (Jeddah Municipality, 2009).

In the year 2009, and in response to the city's enormous growth and people's contemporary lifestyles, Jeddah Municipality issued the Jeddah Local Plan, which contains a land use system and the latest Saudi building codes. In spite of that, some issues about open spaces, such as abandoned neighborhood parks, unauthorized

parking lots, low-maintenance parks, and so on, have recently appeared in several neighborhoods that were built with the latest Local plan. Thus, it is clear that either this local plan has not been applied well or it is not suitable for the citizens.

As Saudi Arabia is an Islamic country, the month of fasting (Ramadan) has a special character. This month shifts the life cycle of people from daytime to nighttime, so that the open spaces usage form and the types of activities are different from other seasons.

From the above-mentioned shortage of adequate housing--taking the WHO recommendation by the municipality as a target in spite of its lacking of quantitative and qualitative data on current and future demand and its suitability for Saudi Arabian culture-environmental, social, and finally open spaces issues have recently appeared in the contemporary residential neighborhoods. So now it is clear to say that there is a misunderstanding of what citizens need regarding open spaces. So now there is a need to test and explore the question of how far public spaces within Jeddah city are appropriate to its users and context, and how many Saudi citizens request for open spaces in the contemporary residential neighborhood.

5.1.4. Research Objectives

This chapter aims to:

1) Outline the existing conditions and patterns of the contemporary residential neighborhoods in Jeddah city.

2) Clarify to what extent are the actual contemporary open spaces within modern residential areas in Jeddah city appropriate to their users during the fasting month (Ramadan), winter, and summer.

3) Define the actual meaning of open spaces and the patterns of unplanned and planned open spaces in typical contemporary neighborhoods in Jeddah city during the fasting month (Ramadan), winter, and summer.

5.1.5 Research Methodology

5.1.5.1 Case Study

As this research deals with the contemporary residential areas in Jeddah city, two neighborhoods were selected as typical contemporary neighborhoods. The first is Al-Haramain neighborhood (apartment-type), and the second is Al-Basateen 3 neighborhood (villa-type). The reasons for selecting these neighborhoods are:

1) The selected neighborhoods have many patterns of unplanned open spaces where in-front-of a condominium, Supermarket, mosque, and so on and narrow road are used by the citizen in different way of activates such as talking, playing football.
2) Contemporary neighborhoods are divided clearly into apartment neighborhoods and villa neighborhoods. In order to cover the contemporary residential neighborhoods in Jeddah city, both of them were selected.
3) The selected areas are fully occupied, giving a clear, real image for existing, contemporary, residential neighborhoods.

5.1.5.2 Methods

To fulfill the previously discussed objectives, the following methods were followed in 1) the fasting month (Ramadan) in the last ten days of July 2014, 2) Winter season between 6th and 17th February 2015, and 3) Summer season between 7th and 15th Jun 2015. As a descriptive and analytical study, the research constructed here depends mainly on:

1) Literature reviews of Jeddah city's residential area and chronological urbanization expansion.
2) Secondary data collection of Jeddah City's administrative and implementation procedures for the residential area's planning confirmation and planning, population census, geographic location, case study's map, resources, residential area land use system, etc.
3) To explore to what extent open spaces in contemporary residential areas in Jeddah city are appropriate to their users and context, an on-site survey was conducted, which include a face-to-face questionnaire and observation of the users of the area's open spaces throughout the day. In Ramadan, the samples of questionnaires were distributed over

3 days for each site, their distribution divided into two periods, from 13:00 till 17:00 and from 20:00 till 01:00 with a total number of 100 samples for each site. In winter season, the samples of questionnaires were distributed over 6 days for each site (3 days in weekdays, and 3 days in weekend days), their distribution time was between 16:00 till 22:00 with a total number of 100 samples for each site. In summer season, the samples of questionnaires were distributed over 4 days for each site (2 days in weekdays, and 2 days in weekend days), their distribution time was between 16:00 till 22:00 with a total number of 100 samples for each site. The total questionnaires for all sites in whole year was 600 questionnaires.

5.2 Outline of Jeddah City

5.2.1 Location and Geography

The city of Jeddah is located on the west coast of the Kingdom, in the middle of the eastern shore of the Red Sea, south of the Tropic of Cancer. To the east are the plains of Tihama, which are considered to be the low heights of the Hijaz region. To the west, along the beach, there are parallel chains of coral reefs. Jeddah's growth and development have traditionally been shaped by both its geographic location between the mountains and the Red Sea and its history as a major trading port and gateway to Makkah. The urban boundary of Jeddah is 1,765 km², with the total area of the municipality being 5,460 km² (Jeddah Municipality, 2014).

5.2.2 History and City Growth

"Jeddah was first inhabited about 2,500 years ago as a small fishing settlement and has long been a center for traders and sailors. The city was already an established port with a history of spice trading when Caliph Osman Ibn Affan declared it the official port for Muslim pilgrims making their way to the Holy Cities of Makkah and Madinah in the year 647. This occasion marked a turning point in Jeddah's future, not only because of the increased possibilities for commerce but also due to the arrival of pilgrims from all over the world, some of whom stayed in the city and laid the foundations for a cosmopolitan Jeddah" (Fig.5-1) (Jeddah Strategic Plan, 2009).

5.2.3 Population and Demography

In 2009, the population of the municipality of Jeddah was approximately 3.4 million, with a growth rate of 3.5% per annum. “Jeddah is the second largest city in Saudi Arabia, and represents almost 14% of the total population of the kingdom estimated at 25.37 million as the year of 2009.” (Jeddah Municipality, 2014).

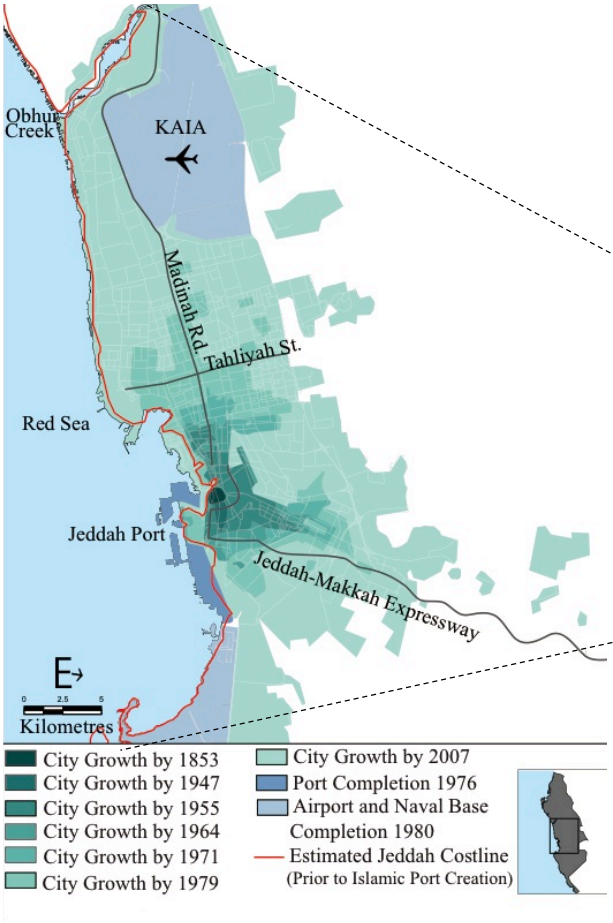


Fig. 5-1 Chronological Urban Growth Map

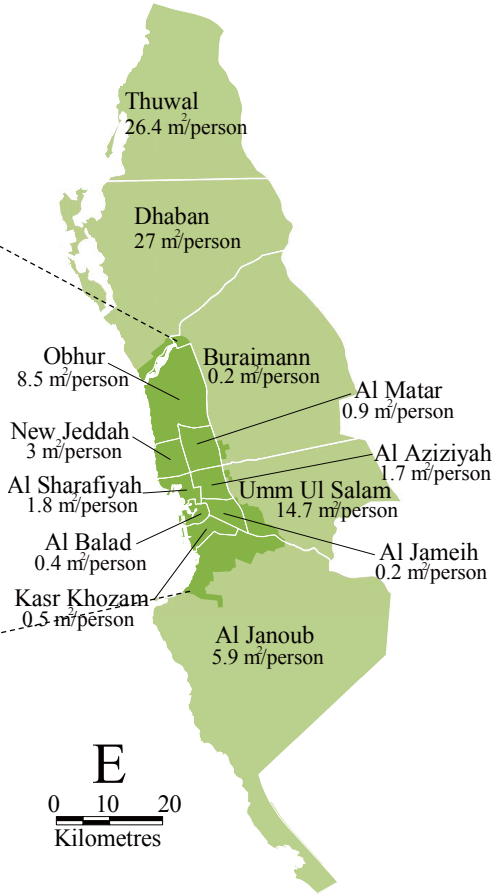


Fig. 5-2 Total Existing Open Spaces By sub-Municipalities Population

(Source: Jeddah Municipality, 2009)

5.3 Residential Hierarchies and Open Spaces System in Saudi Arabia

5.3.1 Residential Hierarchy

Residential areas are divided into 5 levels: (Fig. 5-3) (Ministry of Municipal and Rural Affairs, 2005):

1) Block: contains a population of approximately 900-1200 people. In addition, it has a children's playground and a park.

2) Neighborhood: an area of approximately 25-100 hectares with a population of approximately 3000-5000 people; in other words, it consists of four blocks. In addition, it consists of a neighborhood park and a neighborhood playground. “The idea of the neighborhood unit was originally based on a 500m walk as maximum distance for elementary students to their school which is located in the center of a neighborhood however; this idea is not applied in Saudi Arabia so that, the neighborhood unit could be decided based on its population” (Ministry of Municipal and Rural Affairs, 2005).

3) District: an area of approximately 75-500 hectares with a population of approximately 10,000-15,000 people; in other words, it consists of 3-5 neighborhoods. In addition, it contains a district park, a district playground, movement network, and district amenities such as educational services, healthcare center, cultural center, entertainment center, commercial center, social center, sub-library, police station, and fire station.

4) Sub-municipality: has a population of approximately 30,000-45000 people; in other words, it consists of 3-5 districts. In addition, it also contains a sub-municipality park.

5) City: so-called “municipality”, which depends on its size. For instance, a small city has a population less than 30,000 people, a medium city has a population of approximately 30,000-100,000 people, and a large city has a population of more than 100,000 people. In addition, it contains a recreational center, city parks, and special parks.

5.3.2 Types of Open Spaces

Open spaces in Saudi Arabia are divided into 8 levels, as follows (Fig. 5-4):

1) Children's Playground: This space could be either a part of a park or independent. The playground must be designed in a way that makes children feel safe, and to achieve this, the following design criteria must be met (Ministry of Municipal and Rural Affairs, 2005): a) A children's playground is a place for those who are in the ages of 4–12. b) Depending on the density, the playground space per child is approximately between

0.4 m^2 and 1.67 m^2. c) The playground service distance must not exceed 275 m (Fig. 5-5). d) A safe walkway easily accessible either on foot or by bicycle should be provided. e) The playground location must not be close to a dangerous intersection. f) It is recommended to build it inside a park, instead of separate from it.

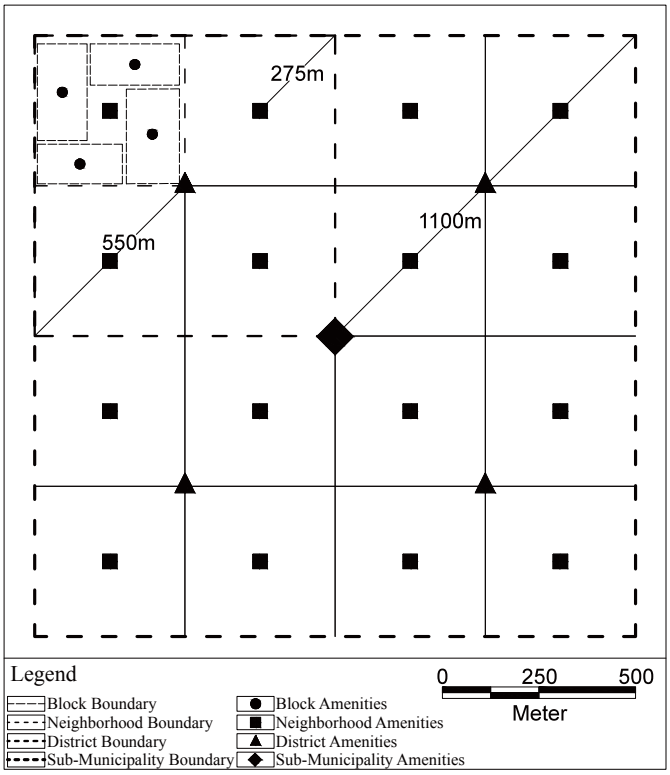


Fig.5-3 Residential Area Hierarchy (Source: MOMARA, 2004)

2) Block Park: This is called a semi-public green area as well, located between a residential area and a public green area. A block park works as a transition zone between a residential area and the surrounding main road. Block park space per person is approximately between 0.08 m^2 and 0.3 m^2.

3) Neighborhood park: This area is decided based upon the area population. The neighborhood park design criteria are as follows: a) the park must be as far as possible from the congestion and car movement; b) it is preferable to be located close to a kindergarten for children to use it; c) the park area must be proportionate to population and density, for instance, the park must be provided to a population of approximately 3000-5000 people; and d) as it is shown in fig.5-5, the service distance must not exceed 350m to be in a walkable distance.

4) Neighborhood playground: This location is within the neighborhood park; however, it is possible to be isolated. It is preferable to be located next to an elementary school.

5) District park: This park plays an important role in greening the city and providing air purification. The design criteria are as follows: a) it must be located in the center of the district in order to be in a walkable distance that is approximately 800 meter; and b) it serves the citizen of the district-- it provides a place for relaxation and sport facilities for both young and old people.

6) Sub-municipality park: This park serves several districts; it is preferable to be located on the edge of a sub-municipality and far away from hospitals, and places that require calm atmosphere.

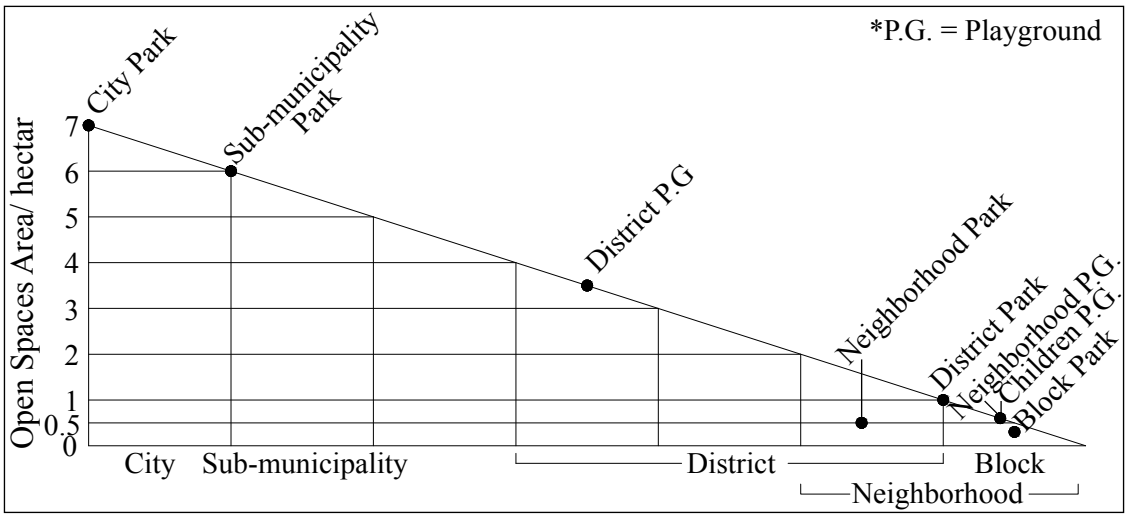


Fig.5-4 Open Space System and Areas (Source: MOMARA, 2004)

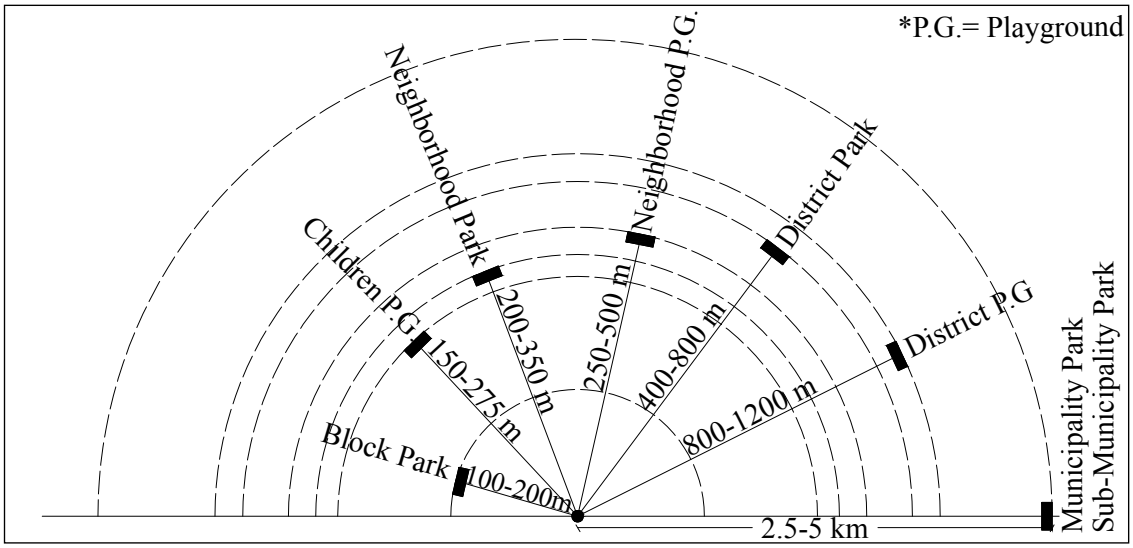


Fig.5-5 Open Space Service Distance (Source: MOMARA, 2004)

5.4 Al-Basateen 3 Case Study

5.4.1 Location and Density

The Al-Basateen district is located in the northwestern part of Jeddah city as a part of the Obhur sub-municipality (fig.5-2) (fig.5-6). It is a modern, villa-type, residential area. It consists of three neighborhoods named al- Basateen 1, al- Basateen 2 and al- Basateen 3. Al- Basateen 3 was taken as a case study. According to the Jeddah municipality, "Most villa type residential areas are low-density area such as al-Basateen district, which is less than 100 hectares/person" (Jeddah Strategic Plan, 2009).

5.4.2 Land Use and Area

As shown in fig.5-7, al-Basateen 3 is divided into northern and southern parts that are separated by a 25-meter width commercial-residential street. Both the northern and southern parts have a mosque at the center and are divided into 4 residential blocks (500mX500m). Each block has a park. In addition, some blocks have a mosque. The area of al-Basateen 3 is approximately 237 hectares^2. The northern part occupies approximately 130 hectares, and the southern part occupies 107 hectares^2. The building height restriction is two stories, and the building-to-land ratio is 60% of the total land area. The parking is placed to the rear of villas.

As shown in fig.5-8, the presence of a main commercial axis on the western edge, local commercial land on the southern edge, and a main commercial road on the eastern edge would meet the citizens' daily needs. The presence of a mosque and a park within a service distance of approximately 500m (6-7 minutes on foot) is supposed to make the neighborhood more walkable.

5.4.3 Open Space Users and Usage During Month of Ramadan

To clarify to what extent the citizens were satisfied with the open spaces, the open spaces users and the passers-by were the targets for a questionnaire. In total, 90 questionnaires were distributed over 3 days. Because of the Saudi culture and habit that men face difficulties talking to a woman that he does not know, the author just distributed the questionnaire to males.

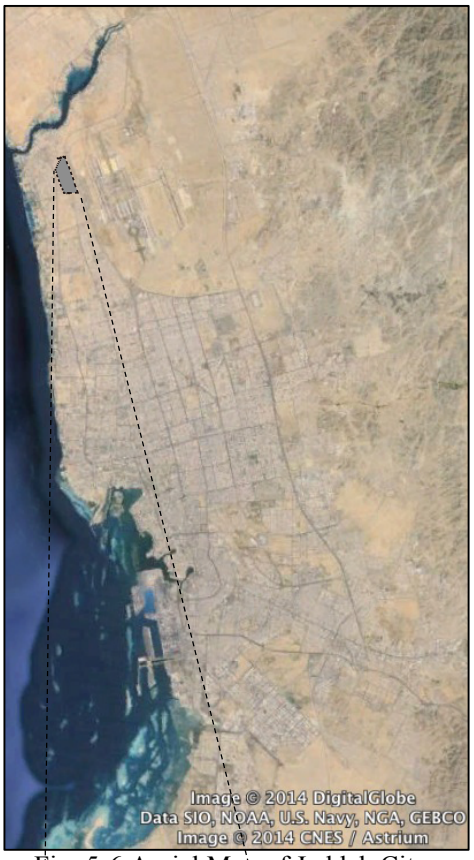


Fig. 5-6 Aerial Map of Jeddah City

(Source: Google, 2014)

Fig. 5-7 Al-Basateen 3 Boundary

(Source: Google, 2014)

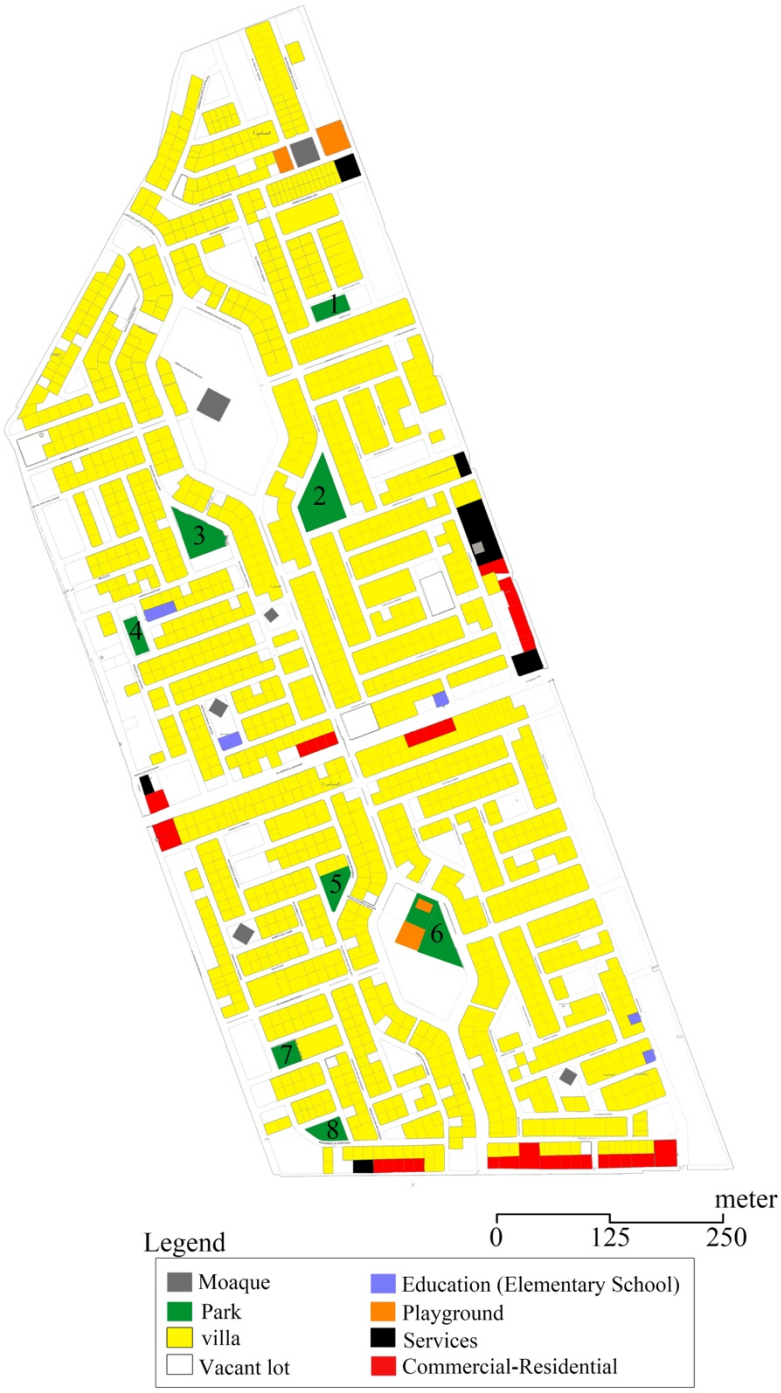


Fig. 5-8 Existing Condition of Land Use

Source (Base map: Jeddah Municipality)

Over the three days of the field survey, the passers-by accounted for 27 persons or 30% of the total distributed questionnaires, and the open spaces users accounted for 63 persons or 70% of the total distributed questionnaires (fig.5-9). 15% of the passers-by were aged 15-29, 29% were aged 30-44, 26% were aged 44-59, and 30% were aged over 60. It was noticed that the consensus of the majority of the passers-by about the most five limiting factors for activities in the local park were: it was used by many young people making noise, there was insufficient street lighting, too much sun and lack of shade, a lack of services such as toilets, and finally there was no choice of activities, especially for children.

Of the spaces' users, 99% are in the age range of 15-29, and 1% are in the age range of 30-44. As Fig. 5-9 shows, 45% of open-space users favor parks both as playgrounds for their children and as places for adult gatherings. A third of open-space users prefer the sidewalk space as a place to spend their time in activities such as talking with friends, playing card games, and smoking. Some 14% of open-space users, mostly aged 15-29, frequent vacant lots to play volleyball. Eight percent of open-space users, usually in the age range of 15-29, make use of football fields in parks.

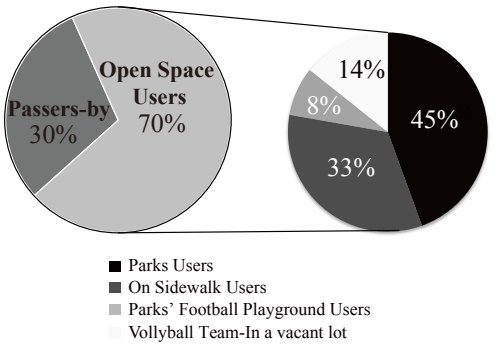


Fig. 5-9 Open Space Usage

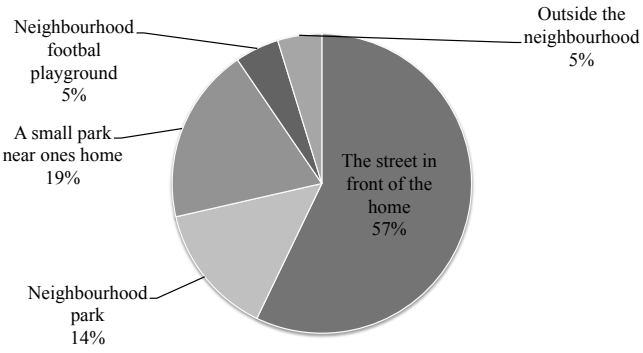


Fig. 5-10 On-sidewalk users Recreational Places

As Fig. 5-10 shows, 57% of sidewalk users hang out in the street in front of their homes; 19% use a small park near their homes, and a small percentage use the neighborhood playground or go beyond the neighborhood's bounds. In addition, the results of the questionnaires reveal a number of facts about sidewalk users.

1) The majority of the activities users engage in are social activities such as talking with friends and playing card games for 1-2 hours every day. Some 48% of the users are high school students, 33% are undergraduate students, 14% are middle school students, and 5% are elementary school students.

2) 57% of those users go to their targets on foot, 33% by car, 5% by bicycle, and 5% by motorcycle.

3) The average of time from one's home to the target is approximately 4 minutes.

4) 68% of the users go with a friend, and 32% go with a group.

5) 50% of the users evaluated parks' condition as good, 22% as fair, 17% as very poor, and 11% as poor.

6) The most important factors for sidewalk users not preferring to use parks are too much sun and lack of shade, lack of light, not safe, and finally, no activities (fig.5-11).

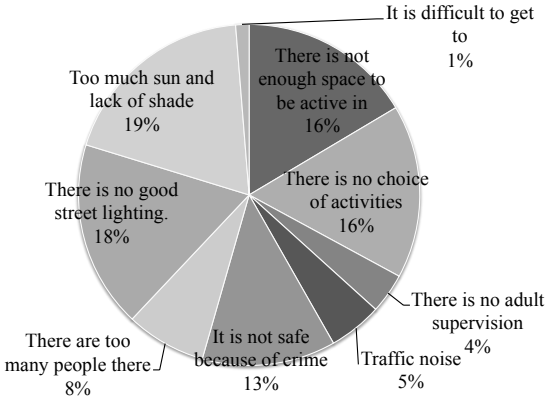


Fig. 5-11 On-Sidewalk Users Opinions about parks

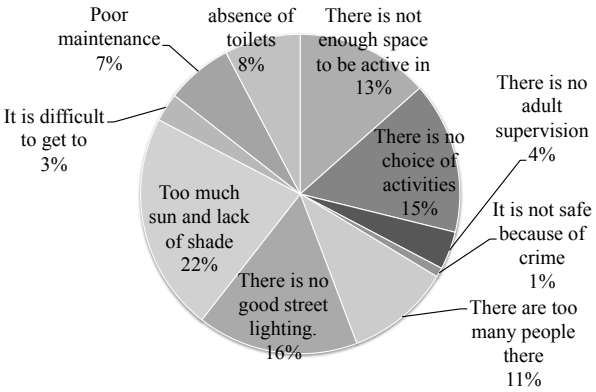


Fig. 5-12 Parks Users Opinions about

Fig. 5-13 Park No. 6

Fig. 5-14 Park No. 5

Fig. 5-15 Park No.7

Fig. 5-16 a Playground

(Photographed by the author)

Table 5-1 Elements Availability of Existing Parks and Parks' Number of Users
(Based on the Observational Investigation, conducted in 21st, 22nd, 23rd July 2014)

Parks	Area (hectare)	Elements Availability					Maintenance Condition	Number of Users		
		Grass	Light	P.G	Chair	Trash		21/7	22/7	23/7
No.1	0.32	×	○	○	○	△	Fair	0	0	0
No.2	0.75	○	○*	○	○	○	Good	0	0	0
No.3	0.75	○	○	○	○	○	Good	1	0	10
No.4	0.23	○	○	○	△	△	Bad	0	0	0
No.5	0.34	○	○	○	○	○	Good	0	0	0
No.6	0.69	○	○	○	○	○	Good	6	6	4
No.7	0.28	○	○	○	×	×	Good	0	0	0
No.8	0.32	○	×	○	×	×	Fair	0	0	0
Total	3.66							7	6	14

○ Available, △ Somehow Available, × Not Available. * Lighting is available; however, at night it was not turned on.

Fig. 5-17 User's Location, Usage, and Appearing Time (left; 21st July 2014)

Fig. 5-18 Users' Location, Usage, and Appearing Time (right 22nd July 2014)

Fig. 5-19 Users' Location, Usage, and Appearing Time (23rd July 2014)

5.4.4 Conclusion of Open Space Users and Usage During Ramadan

By analyzing actual use of open spaces and the land use system in the al-Basateen 3 neighborhood (Fig. 5-17 to 5-19), it can be concluded that: 1) Unplanned open spaces such as the sidewalk and street in front of one's home should also be considered recreational spaces. 2) Sometimes, young sidewalk users annoy passersby, especially older people. 3) Parks don't respond to sidewalk users' needs, who are the majority of open-space users. 4) There is a need to establish design guidelines and create suitable spaces for these users in order to prevent them from annoying passersby and mosque users. 5) the small parks such as 4, 5, 7, and 8 are were not used due to the feeling of closeness they give to the users. 6) A vacant lot is favored by several football group. 7) women were not seen in public space; children were going to park with their fathers.

5.4.5 Open Space Users and Usage During Winter Season

Jeddah City restrains its warm in the winter season as the temperature ranges between 15 °C at dawn to 28 °C in afternoon. The survey was conducted in February as it is characterized by its lowest temperature throughout the year.

Over the six days of the field survey, the pedestrian accounted for 9 persons or 9% of the total distributed questionnaires, park users accounted for 32 persons, sidewalk users accounted for 39 persons, playground users accounted for 16 persons, joggers accounted for 3 persons and the cyclists accounted for one person (fig.5-20).

In fig.5-21 the 76 persons whose ages are between15-29 are divided into 35 persons as sidewalk users, 17 persons as park users, 15 persons as playground users, 5 persons as pedestrian, 2 persons as inside a car, one person as a cyclist and one person as a jogger. The 11 persons whose ages are between 30-44 are divided into 10 persons as park users and one person as a jogger. The 8 persons whose ages are between 5-14 are divided into 4 persons as park users, 3 persons as sidewalk users and one person as playground user. The 3 persons whose ages are between 45-59 are pedestrian. The 2 persons whose ages are above 60 are divided into one person as a jogger and one person as pedestrian.

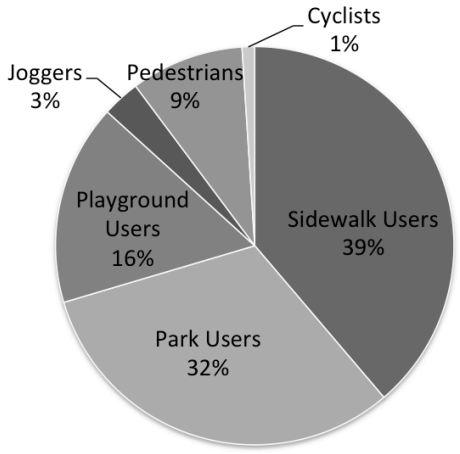


Fig. 5-20 Open Space Users

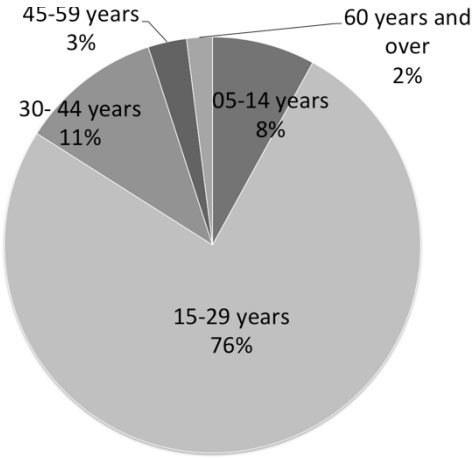


Fig. 5-21 Open Space Users Age

The average distance between park users' house and the park is about 461m, and between playground users' house and the playground is about 416m and between the sidewalk users' house and the sidewalk is about 520m. 44% of the users prefer to go to the neighborhood park, 23% prefer using sidewalk and 13% prefer going outside the neighborhood.

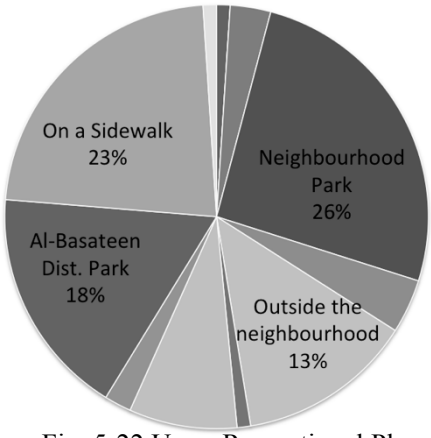


Fig. 5-22 Users Recreational Place

Figs.5-23 to 5-28 clarified that 1) block park no. 1, 4, 7, and 8 were not used. 2) with decreasing in temperature the open spaces users are increased. 3) the neighborhood park and the semi-neighborhood parks are used often. 4) some of playground users are not using playground to play but, they use it as a meeting place. 4) sidewalk users concentrate around the neighborhood park till 22:00.

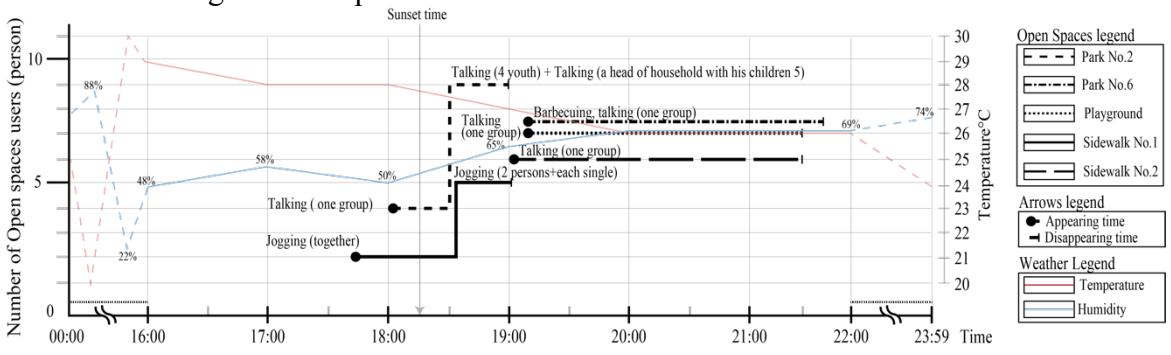


Fig.5-23 Activities of Public Open Spaces Users through a Day (2015 Feb 06-weekend)

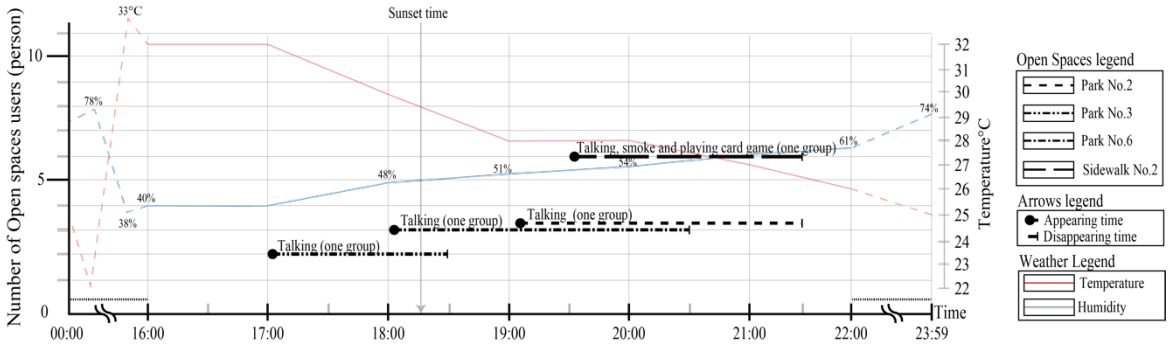


Fig.5-24 Activities of Public Open Spaces Users through a Day (2015 Feb 07-weekend)

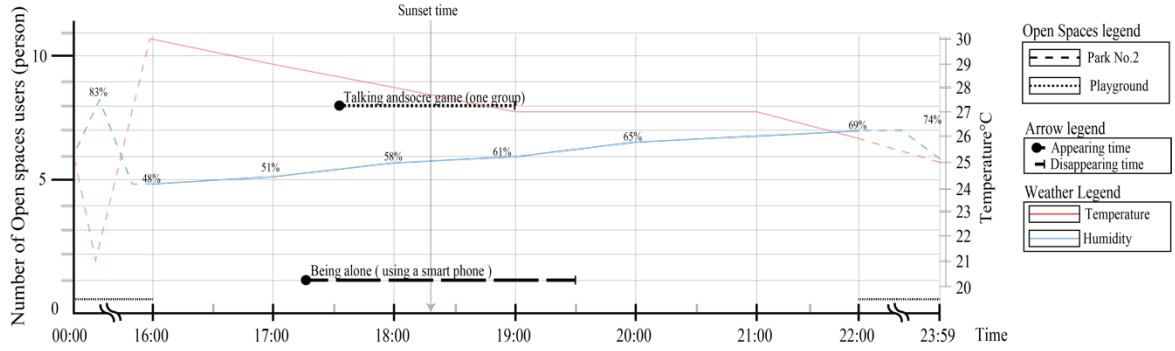


Fig.5-25 Activities of Public Open Spaces Users through a Day (2015 Feb 09-weekday)

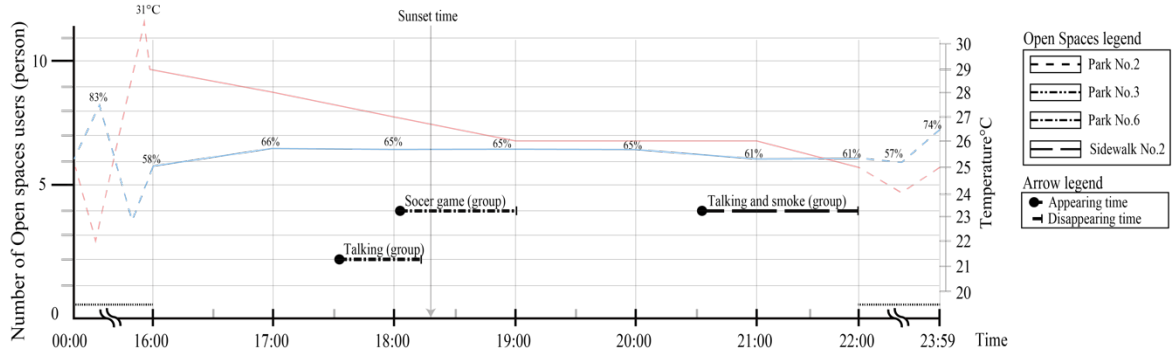


Fig.5-26 Activities of Public Open Spaces Users through a Day (2015 Feb 11-weekday)

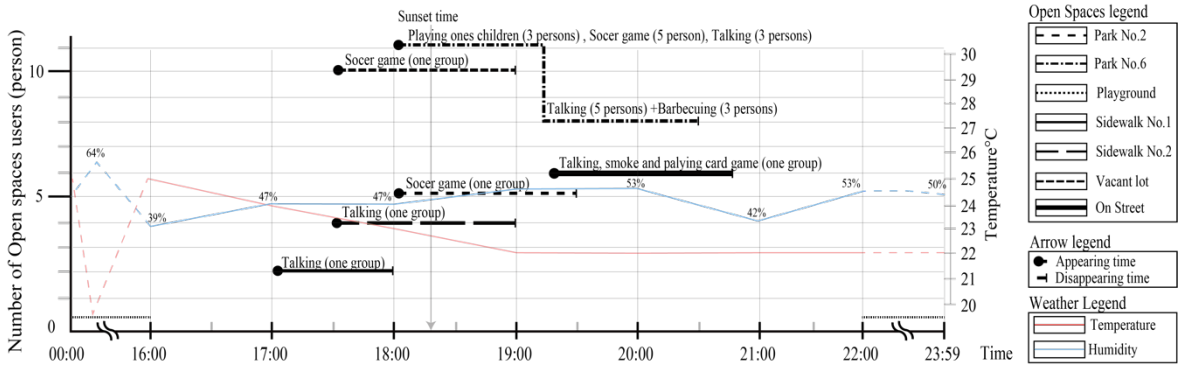


Fig.5-27 Activities of Public Open Spaces Users through a Day (2015 Feb 13-weekend)

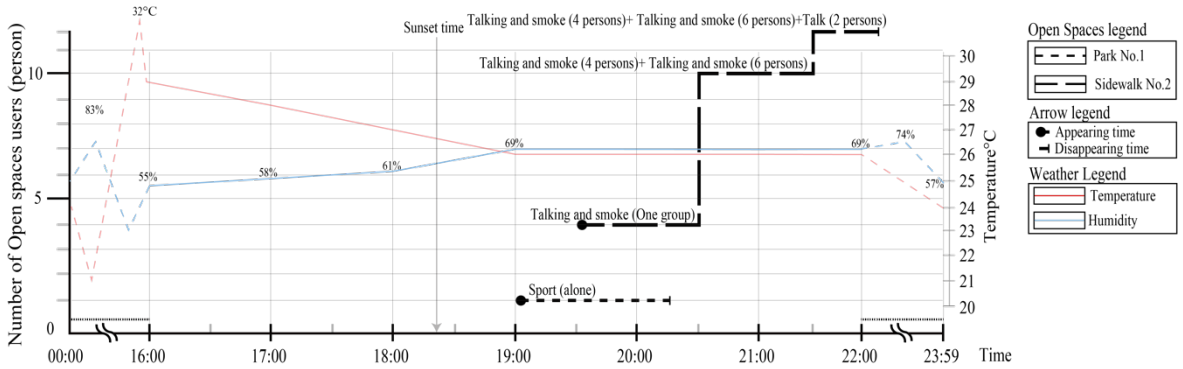


Fig.5-28 Activities of Public Open Spaces Users through a Day (2015 Feb 16-weekday)

Based on the observational survey, open spaces users are mainly divided into four categories: park users, playground users, sidewalk users, and vacant lot users. The southern hub of the neighborhood is the most active place along the day in the neighborhood. It is used by park users, sidewalk users, and playground users. Although the condition of small parks such as no. 1, 4,5,7, and 8 are good, it is noticeable that the they are not used. The vacant lot in the northern hub was used as score playground by people with a range age between 30-44 as the southern playground was used by different group at the same time.

Fig. 5-29 User's Location, Usage, and Appearing Time (left, 6th Jan 2015),

Fig. 5-30 User's Location, Usage, and Appearing Time (right 7th Jan 2015)

Fig. 5-31 User's Location, Usage, and Appearing Time (left, 9th Jan 2015)

Fig. 5-32 User's Location, Usage, and Appearing Time (right 11th Jan 2015)

Fig. 5-33 Playground Users

Fig. 5-34 Sidewalk Users

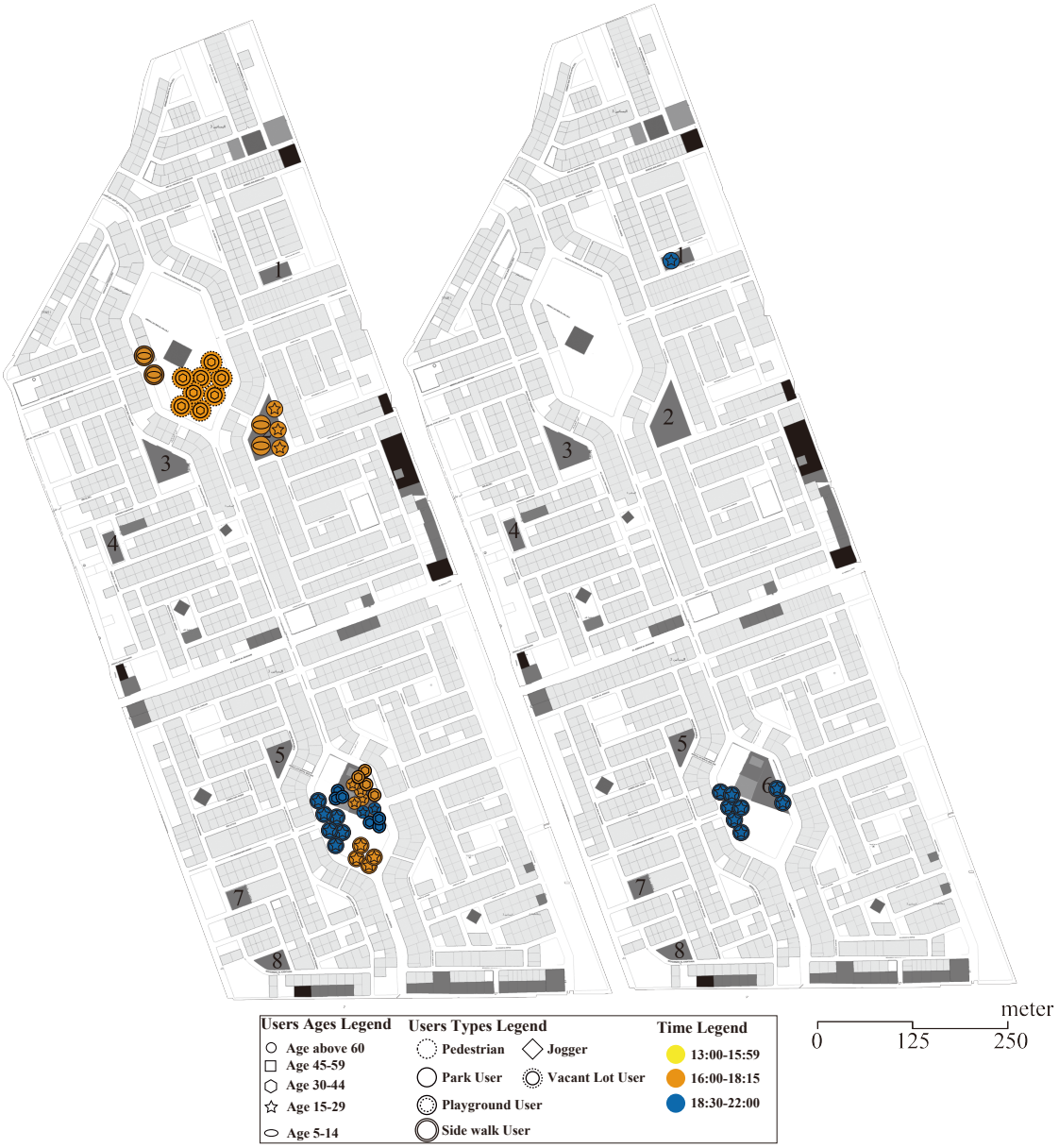


Fig. 5-35 User's Location, Usage, and Appearing Time (left, 13th Jan 2015)

Fig. 5-36 User's Location, Usage, and Appearing Time (right 16th Jan 2015)

Fig. 5-37 Vacant lot Users

Fig. 5-38 Park Users

(Photographed by the author)

Despite of the presence of parks such as park no. 4, 5, 7, and 8 that closer to some users who usually use parks much faraway (Fig. 5-39). By asking these users, they prefer the activities, place gathers group of people, and the sense of openness rather than the distance to the park and they do not prefer the small parks. Figure 5-40 shows that generally the use of open spaces in winter starts from 17:00 till 21:00 in weekdays and till 22:00 in weekend days. Football team groups play between 17:00 and 19:00 in both weekdays and weekend days.

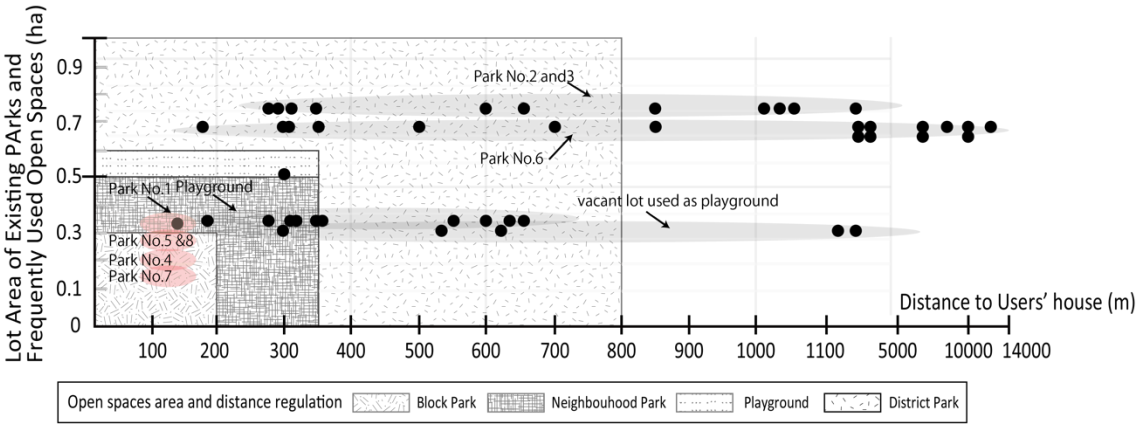


Fig.5-39 Used Open Spaces Area and Users' House Distance

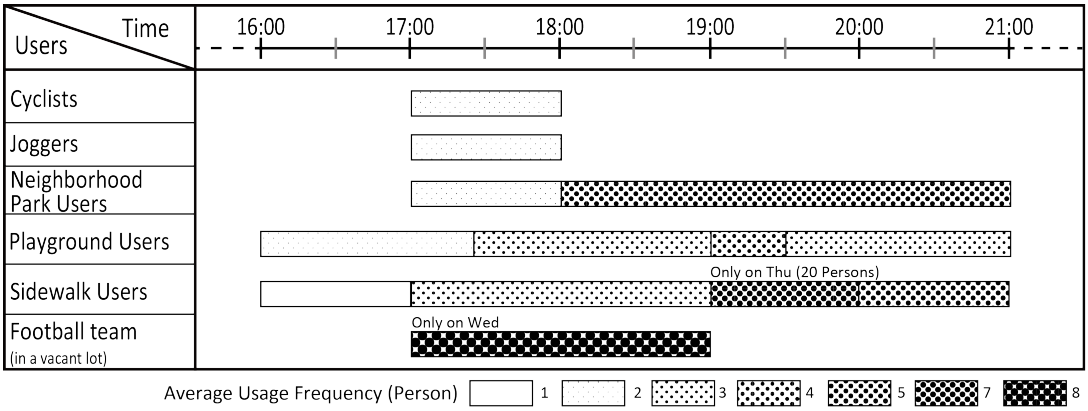


Fig. 5-40 Usage and usage frequency of Public open spaces Users in weekdays during winter

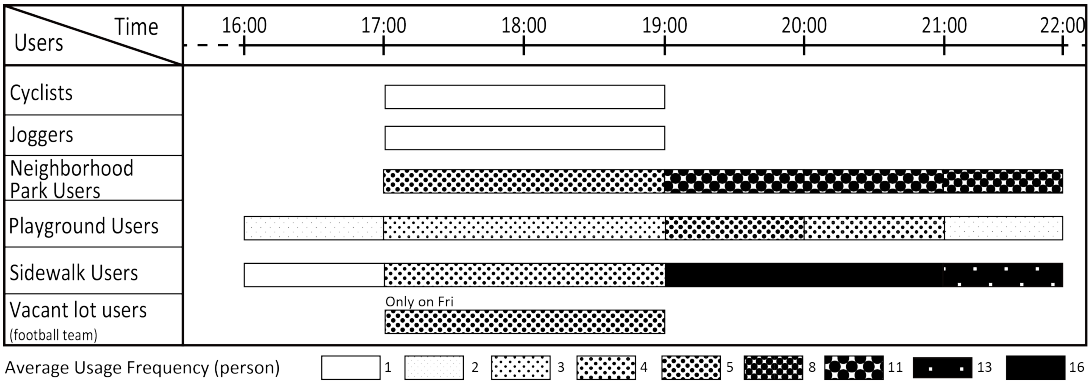


Fig. 5-41 Usage and usage frequency of Public open spaces Users in weekend days during winter

5.4.6 Conclusion of Open Space Users and Usage During Winter

From analyzing the above figures 4-29 to 4-38, it can be concluded that 1) the parks users prefer using the park that consists of sense of openness which they found it in parks with areas of 0.65 hectare and above as shown in park no. 2,3, and 6. 2) Sidewalk users prefer using the sidewalk that easily accessible for gathering, which translated in this case study around park no.6 and around the northern central mosque as they are located in the northern and southern centers of the neighborhood. 3) One of football group prefer playing in a vacant lot instead of using the playground. 4) the small parks are unfavorable by the residence; this is due to the feeling of closeness. 5) the average hours of open spaces usage vary between four and five hours in a day. 6) there is no strong relation between the decreasing of temperature and the increasing of open spaces users. 7) Women were not seen in public space during winter.

5.4.7 Open Space Users and Usage During Summer Season

Summer is extremely hot in Jeddah City especially when the temperature reaches 40 °C and above. This section tries to clarify the open spaces usage during the day. So, similar to the section of winter, nine observational survey assistants were distributed in the neighborhood for the activity observation and face to face questioners.

By analyzing figure 5-42, 5-43, 5-44, 5-45, and 5-46, although the temperature is higher than winter, the joggers number is higher in summer than winter. By asking them, they prefer jogging in summer rather than winter. However, they jogging along streets. By asking the whole users about the temperature and its effect on their usage of open spaces, the majority answered by that they do not care about the temperature. And the sun encourages them to do sports outside. And this is seen in these figures that the changing in temperature does not have effect on the usage frequency of open spaces.

Regarding the type of activities, the majority of the activities between 16:00 and 18:30 are sport related activities. However, the activities at night (between 18:30-22:00) are combined between the social related activities, such as talk on a sidewalk, use parks as gathering place for talk, card game, barbequing and some sport related activates.
By analyzing the following figures, it is not noticeable any relation between the decreasing the temperature along the day and number of users.

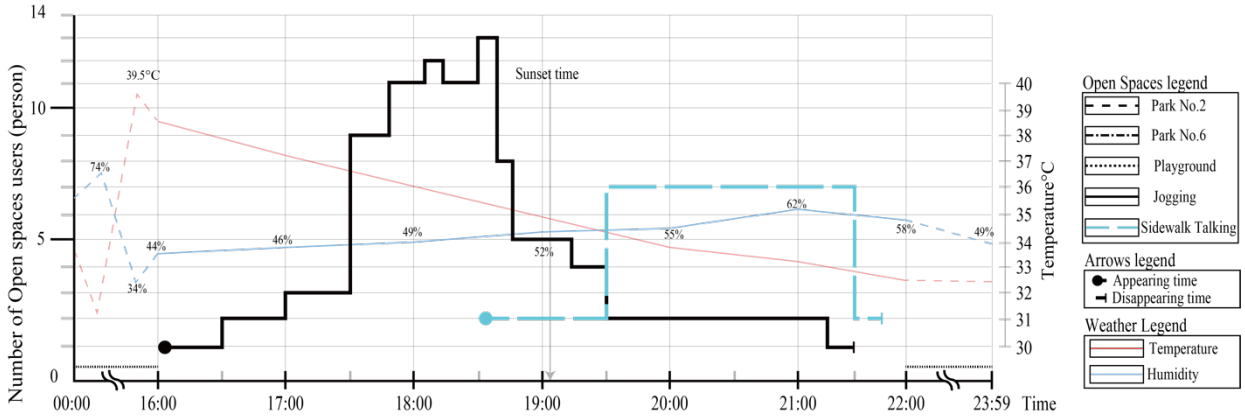


Fig.5-42 Activities of Public Open Spaces Users through a Day (2015 June 11-weekday)

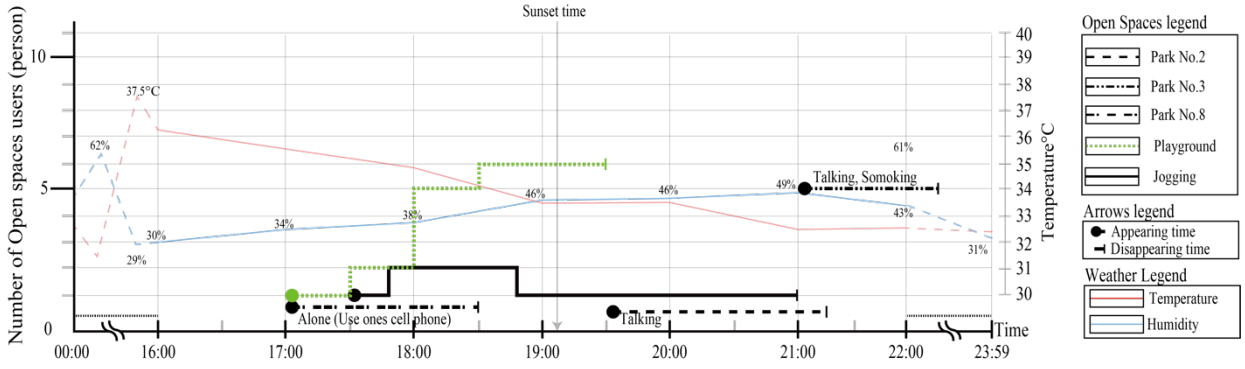


Fig.5-43 Activities of Public Open Spaces Users through a Day (2015 June 12-weekend)

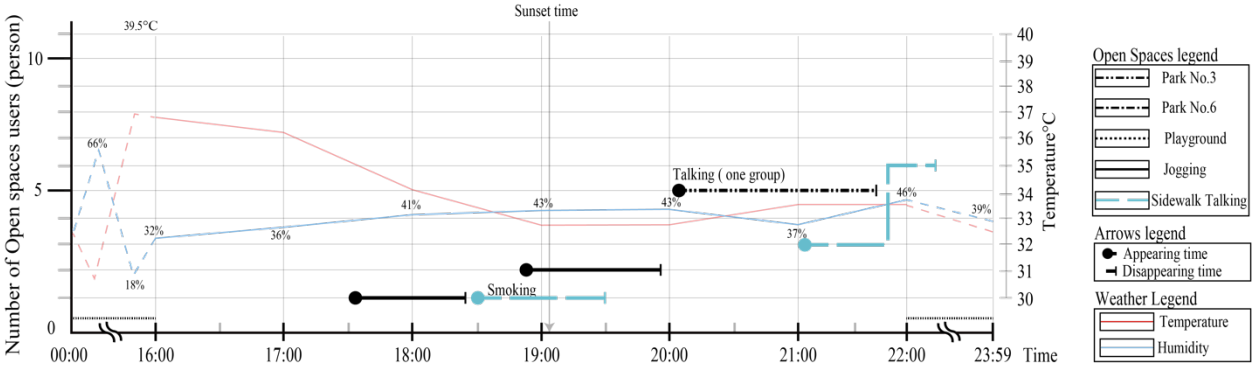


Fig.5-44 Activities of Public Open Spaces Users through a Day (2015 June 13-weekend day)

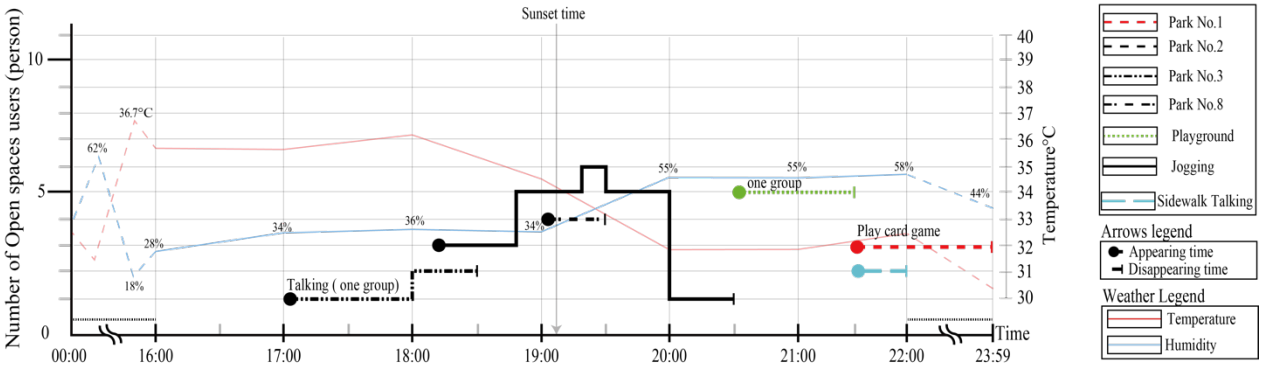


Fig.5-45 Activities of Public Open Spaces Users through a Day (2015 June 14-weekday)

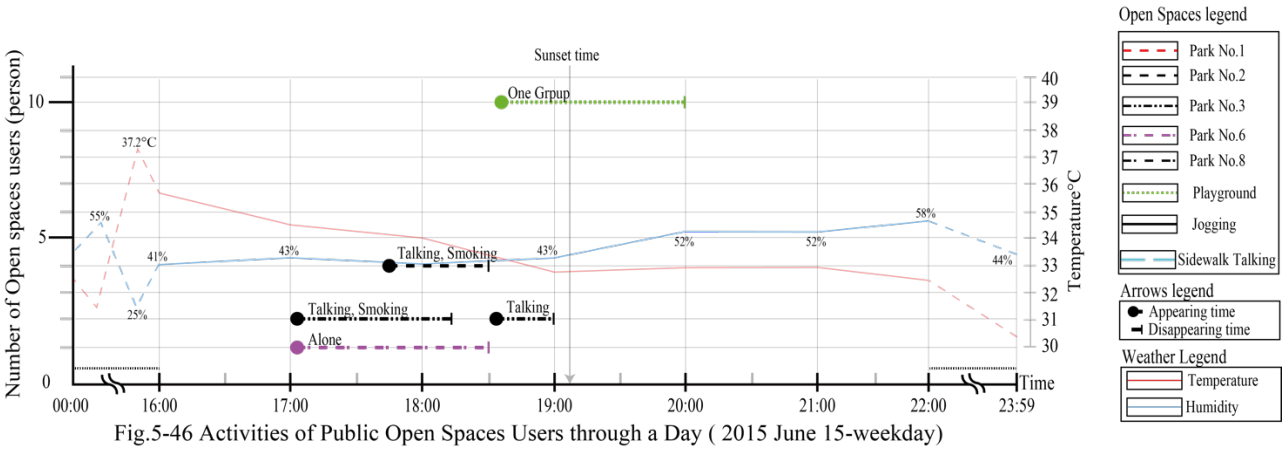


Fig.5-46 Activities of Public Open Spaces Users through a Day (2015 June 15-weekday)

Figures 5-47 to 5-55 show that the age of the majority of joggers is between 30-45 years old. Joggers who prefer jogging on a sidewalk usually use streets that surrounded the neighborhood especially along the street that located in the northern edge. The joggers who jogging along streets located within the neighborhood, they usually jogging along the street close to the cars.

The most frequently used open spaces are parks, playground, sidewalk, and street. Based on interviewing the users, parks such as parks no. 2 which is one of the most favorable park, that is due to its size and feel of openness it gives. Based on the observation, parks usually used as a place for playing children rather than to be used as a gathering place for adults. However, adults usually use sidewalk, or on one side of a street for talking, even play card games, jogging.

Regarding the user's ages, ages between 5-15 usually appear between 16:00 and 19:00 with an activity of play football game in a playground, or use a park to talk with their friends. They rarely use sidewalk as gathering place for them. The users in the age between 15-29 often appear whether talking, having cigarette, play card game on sidewalk (sometimes along the street), or jogging in the inner street within the neighborhood. The majority of joggers were in an age between 30-44, also this range of age also appeared in park for two purposes 1) play their children, 2) gather with same age friend in parks for talk and this was appeared at night.

Fig. 5-47 User's Location, Usage, and Appearing Time (left, 11th June 2015)

Fig. 5-48 User's Location, Usage, and Appearing Time (right 12th June 2015)

Fig. 5-39 A park condition at night

Fig. 5-50 Playground Users

(Photographed the author)

Fig. 5-51 User's Location, Usage, and Appearing Time (left, 13th June 2015)
Fig. 5-52 User's Location, Usage, and Appearing Time (left, 14th June 2015)

Fig. 5-53 Sidewalk Users

Fig. 5-54 Joggers on a Street

(Photographed the author)

Fig. 5-55 User's Location, Usage, and Appearing Time (left, 15th June 2015)

Fig. 5-56 Sidewalk Users

Fig. 5-57 Sidewalk Users at Night

(Photographed the author)

By analyzing fig. 5-58, although half of the users of park 2, and 3 (an average area of 0.75 hectare for each park) come from blocks where a small parks available (such as park no. 4 and 7); however, they prefer to use this type of size of parks to gather with friend, which made these two parks are the most used park in the neighborhood in the summer. As a result of the face to face questioners, figures 5-59 and 5-60 show the usage frequency of open spaces during weekdays and weekend. Joggers occupy the first place in using street (or sidewalk) for their activities, then at night the sidewalk users come as the second place.

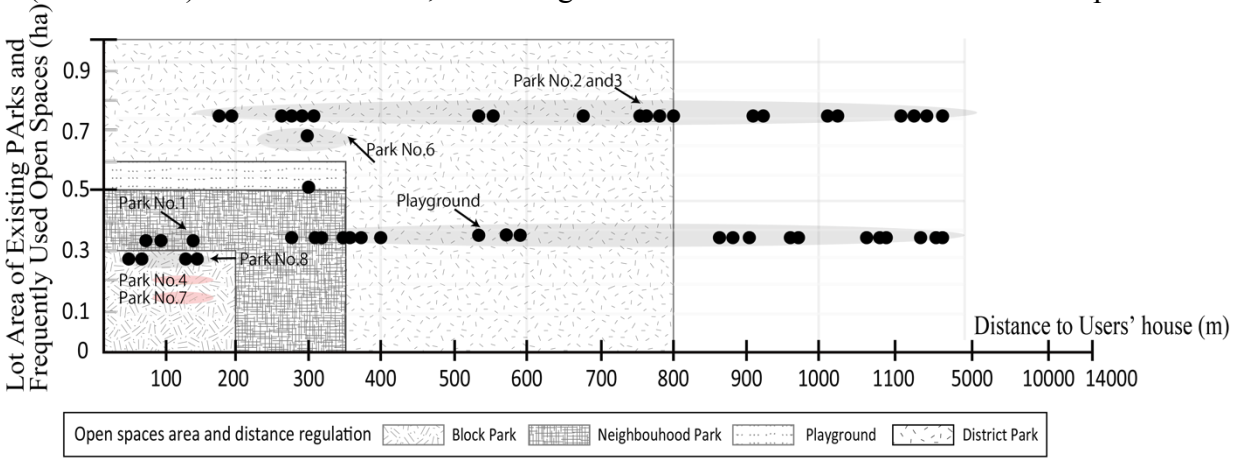


Fig.5-58 Used Open Spaces Area and Users' House Distance

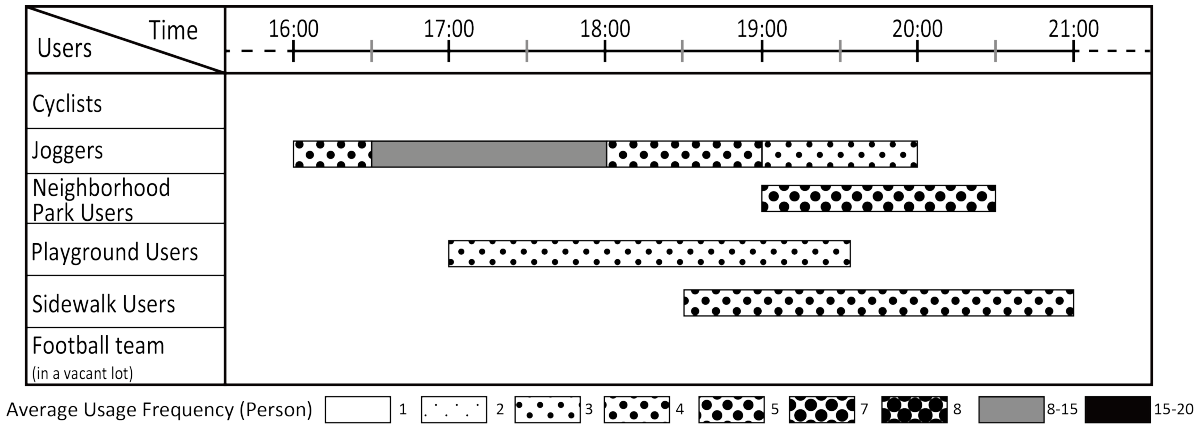


Fig. 5-59 Usage and usage frequency of Public open spaces Users in weekdays during winter

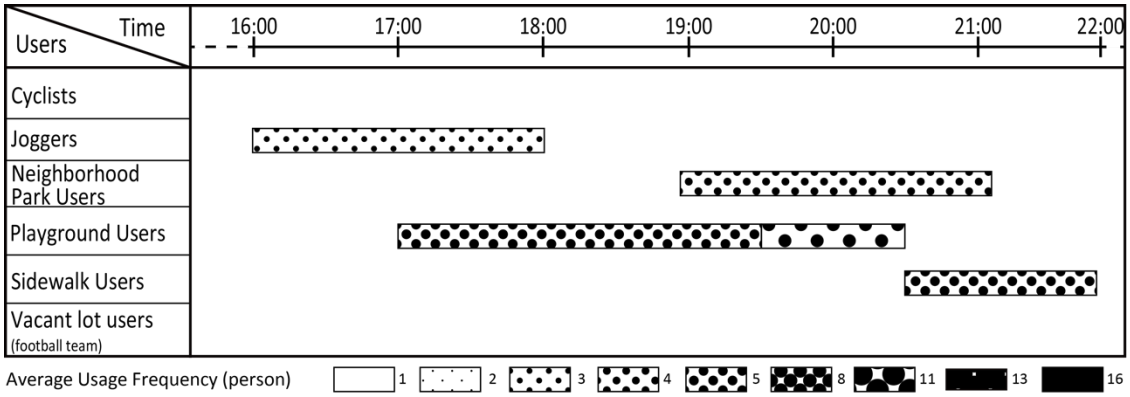


Fig. 5-60 Usage and usage frequency of Public open spaces Users in weekend days during winter

5.4.8 Conclusion of Open Space Users and Usage During Summer

Contrary to expectations, open spaces in summer was more active in comparing to winter season. By analyzing figures 5-47 to 5-57, this section can be concluded that 1) due to the hot weather, joggers have been increased noticeably; however, some of them who want to jogging within the inner street of the neighborhood, they use the edge of the car way for jogging due to lacking of a continuing sidewalk within the neighborhood. Some use the sidewalk that located around the neighborhood to avoid car accident. 2) the majority of users in age between 4-15, use parks between 16:00-18:00. 3) The main activates for the adult in age range between 15-29 are a) talk, smoke, play card game on road or sidewalk, and b) play football at a playground. The majority of this category of users often use open spaces at night time. 4) Adult in age between 30-45 are divided into two categories a) joggers, b) park users (e.g. plays one's children, or gather with friend for talk, barbequing). Finally, 5) the people above the age 46, they only were as a pedestrian to go to mosque. 6) Women were not seen in public open spaces in this type of neighborhood.

5.4.9 Conclusion of Open Space Users and Usage During the Year

Based on the above observational survey and face to face questioners survey that were conducted in three periods as Ramadan, winter, and summer. It was clear that there are different in open space usage from season to season. From user's age, activities, time, type of open spaces, to the usage frequency of open spaces during day and night time during weekdays and weekend days.

As shown in table 5-2, it can be concluded that in Ramadan 1) the sidewalk users annoy the pedestrian and the people who use mosque. 2) vacant lots are the place where football group usually play. 3) the majority of open spaces users use open spaces from 21:00 till approximately 02:00. 4) Parents of 4-15 years old children do not allow them to use the parks due to the use of the adults for the sidewalk till late time. 5) Only two parks were used out of 8 parks throughout the survey days (only 29 users in total). Regarding winter season, only three main parks (park no. 2, 3, and 6) were used, and the children between 4-15 were appeared with their parent these parks between 16:30 till 18:00. Some parks users usually come every weekend to barbeque from a 5 km distance neighborhood. Sidewalk users appear in time between 18:00 and 22:00. In summer, despite of a hot

weather, the open space was more active than winter, this was resulted due to increasing the number of joggers along streets, and the playground users.

Finally, it can be concluded that, the combination of the factors of **'Quality'**, **'Area', 'Location'** of parks in villa type neighborhood are the most three important factors that encourage the residents to go out for using parks. This was noticeable in the majority of park users that instead of using close small park (area below 0.34 hectare), users usually use **large parks** (area above 0.69 hectare) with a **high quality** and located in the **center** of the neighborhood as it gathers the neighbors. In addition to that, as women usually do not use public open spaces due to their life style way, so the factor of privacy between men and women in this type of must not be taken into consideration.

Thus, from the above, it is clear to say that, the important factors regarding parks on the **site planning level** are element number, location, and scale. And on **design level** is the setting. In addition, the factor of openness is necessary which is a common element between **site planning level and design level**.

Table 5-2: Typology of Open Spaces, Users, activities, and Usage time throughout the Year in Al-Basateen 3 Case Study

Open Space		Area (ha)	Users			Number of Users during the Survey Periods												
			Age	Activity	Time	Ramadan(July2014)			Winter (February 2015)						Summer (Jun 2015)			
						21/7	22/7	23/7	6/2	7/2	9/2	11/2	13/2	16/2	11/6	12/6	13/6	14/6	15/6
Parks	No.1	0.32	15-29	Talk, smoke	18:00-22:00 Ramadan (22:00-02:00)	0	0	0	0	0	0	0	0	1	0	0	0	3	0
	No.2	0.75	4-15, 30-45	Talks, plays ones children	17:00-21:00 Ramadan (22:00-02:00)	0	0	0	4	3	1	3	5	0	0	1	0	0	4
	No.3	0.75				1	0	10	0	2	0	2	0	0	0	6	5	1	4
	No.4	0.23	No users			0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No.5	0.34				0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No.6	0.69	30-60	Barbeque, talk	17:00-23:00 Ramadan (22:00-02:00)	6	6	4	7	3	0	2	16	0	0	0	0	0	1
	No.7	0.28	No users			0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No.8	0.32	4-14	Play	16:00-18:00	0	0	0	0	0	0	0	0	0	0	1	0	4	0
Playground	No.1	0.21	10-29	Football game, talk	17:00-21:00 Ramadan (22:00-02:00)	5	7	6	6	0	8	4	0	0	0	6	0	5	10
Vacant Lot	No.1	0.31	15-29	Football, volleyball game	22:00-02:00 Ramadan (22:00-02:00)	8	8	8	0	0	0	0	8	0	0	0	0	0	0
Sidewalk			30-45	Jogging	16:00-19:00	0	0	0	0	0	0	0	0	0	4	2	1	6	0
			15-29	Talk, play card game	18:00-23:00 Ramadan (22:00-02:00)	5	8	8	5	4	0	0	6	5	3	0	2	2	0
Road way			30-60	Walk	13:00-22:00 Ramadan (22:00-02:00)	7	9	7	4	0	2	0	0	0	0	0	0	0	0
			30-45	Jogging	16:00-19:00	0	0	0	2	0	0	1	0	0	9	0	2	0	0
			15-29	Talk	18:00-23:00 Ramadan (22:00-02:00)	4	2	0	2	2	0	4	6	3	2	0	4	0	0
					Total number of users	36	40	43	30	14	11	16	41	9	18	16	14	21	19

5.5 Al-Haramain Case Study

5.5.1 Location and Density

The al-Haramain neighborhood is located in the northeastern part of Jeddah city as a part of the al-Matar sub-municipality (fig.5-2). It is one of the recently built apartment-type residential areas. It is divided into northern and southern parts. Both of them were taken as a case study. The al-Haramain neighborhood is a medium-density modern residential area.

5.5.2 Land Use and Area

As shown in fig.5-62, al-Haramain is divided into northern and southern parts separated by a 25-meter-wide commercial–residential street. Each of the northern and southern parts is divided into 4 residential blocks. Each block differs from the others in size. Each residential block has a park and a mosque; in some blocks, there is a football playground. The northern part occupies approximately 89 hectares3, and the southern part occupies 82 hectares3. The building height restriction is five stories with 2 extension floors, and the building-to-land ratio is 60% of the total land area. Parking is placed on the ground floor.

As shown in fig.5-63, the presence of commercial–residential local streets in between the northern and southern areas and on the western edge would meet the citizens' daily needs. The presence of a mosque and a park within a service distance between 250-300 meters should make the neighborhood more walkable.

5.5.3 Open Space Users and Usage During Month of Ramadan

To clarify to what extent the citizens were satisfied with the open spaces, the open spaces users and the passers-by were the targets for a questionnaire. In total, 97 questionnaires were distributed over 3 days. Because of the Saudi culture and habit that men face difficulties talking to a woman that he does not know, the author just distributed the questionnaire to males.

Fig. 5-61 Aerial Map of Jeddah City

(Source: Google Map, 2014)

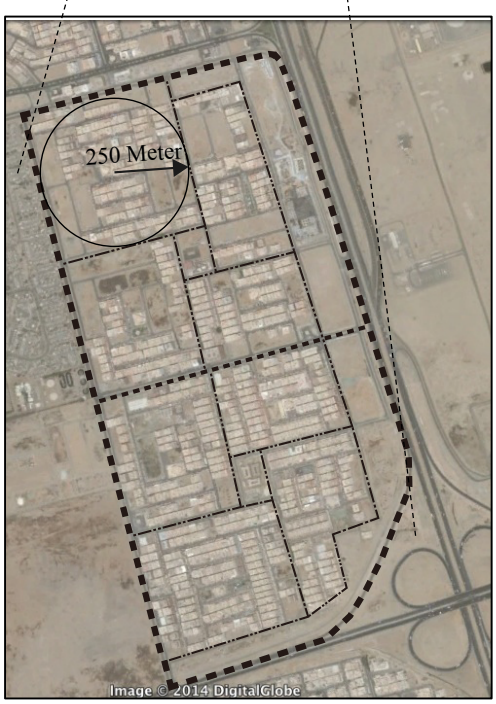


Fig. 5-62 Al-Haramain Case Study

(Source: Google Map, 2014)

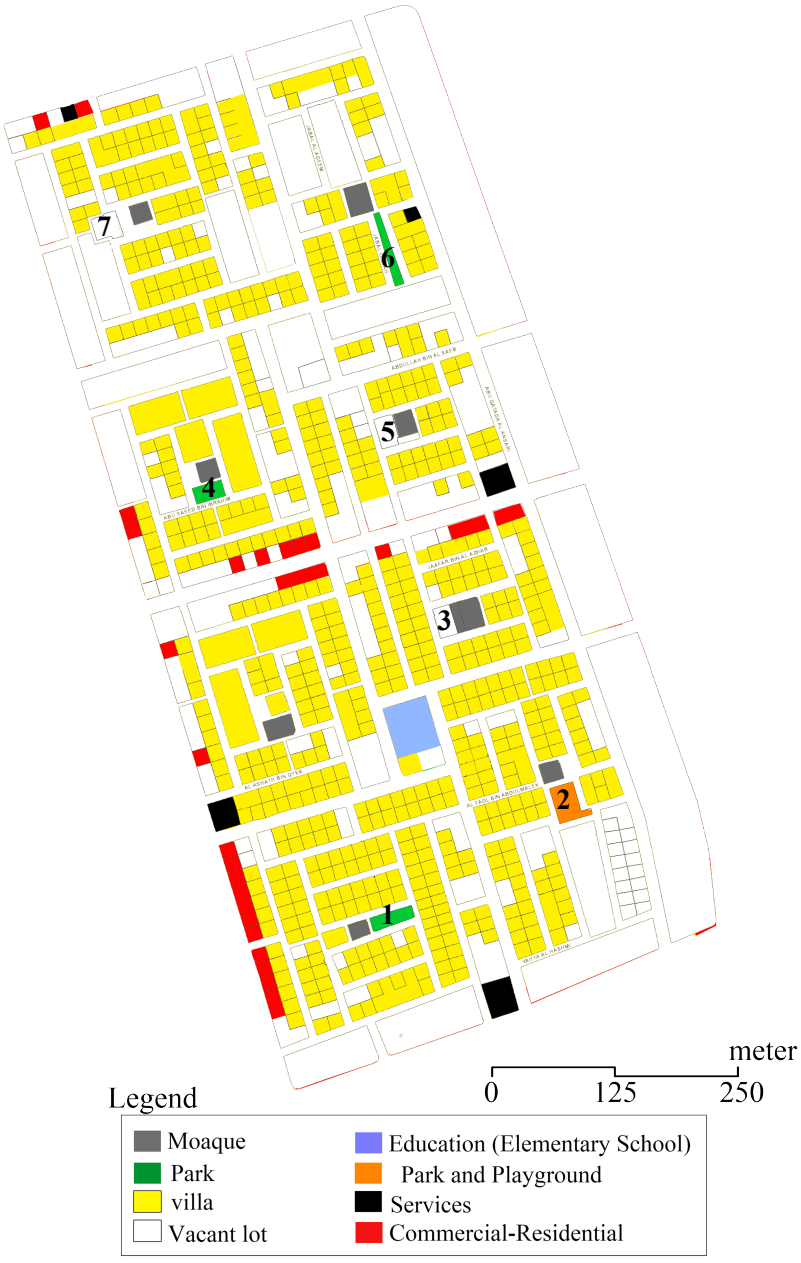


Fig. 5-63 Existing Condition of Land Use

(Source: Jeddah Municipality, 2014)

As it shown in Fig.5-63 seven lots in this neighborhood should be parks, but some parks, such as land number 3, 5, and 7, have not been built yet. Distributing questionnaires to the users of the finished parks and the unfinished parks will cover the entire situation in the neighborhood. Thus, the author distributed the questionnaire to the users of all lots and to passers-by as well (Fig. 5-64 - Fig. 5-67).

Fig. 5-64 Park no. 1

Fig. 5-65 Park no. 4

Fig. 5-66 Park no. 2

Fig. 5-67 Location no. 3

By analyzing the questionnaires, users were divided into three groups 1) park users which constitute 53% of total users, 2) yet unbuilt park lot users that constitute 26%, and 3) passer by which consists of 21% of total users. 61% of total users evaluate the existing parks as good condition, 31% as fair, and 8% as excellent.

The most important facts about the passers-by are: 1) 50% of the passers-by are between the ages of 30 and 44, 45% are between 45 and 59, and 5% are over 60%. 2) 45% of them go to parks just one day every two weeks for an average of less than 30 minutes. 22% of the passers-by go once a week, and 22% go once a month as well. 3) 71% drive to the park because there are no sidewalks for pedestrians, and 29% go on foot. 4) 73% of the passers-by want to go to the neighborhood parks with their family, however because parks lack a family area; a high number of young people have become disinterested in going. 5) This low usage frequency is caused by several factor such as the gathering of young people in the parks and sometimes on the sidewalk, which causes noise to the neighbors; and a lack of shade, toilets, and park maintenance.

Regarding park users, 59% of the park number 1 users are in age of 15-29, 30% are in the age of 5-14, 7% of them are in age of 30-44 and 4% are in the age of 44-59. However, yang people in age of 5-14 said *"When the high school students use the park they don't allow us to use it"* (Fig. 5-68, 5-69, and 5-70). 59% of this park users use it every day for 1-2 hours, 29% three days a week and 12% use it day a week.

The yet unbuilt park (number five) is actually not used by anyone. Instead of that, a group of youth people uses the in-front-of mosque area in social activities such as talking, smoking cigarettes and play football in street. This group mainly complains that they cannot use the football playground that usually used by adult people. Because of lack of number of football playground. Regarding to this group, the most limiting factors make them cannot use the other parks in the neighborhood is too many users in these parks. Lot number 7 users are somehow different to others; the usage of the park is very low however, the usage of the parking lot as football playground is very high. And this makes the passers-by bothered that led them to stop these youth group of playing football.

The results show the most limiting factors for activity in the local parks are too many users in the parks, no enough space for activity, lacking of good street lighting and bad accessibility.

Fig. 5-68 In front of a mosque users

Fig. 5-69 A Park Users (high school age)

Fig. 5-70 A Park Users (high school age)

Table 5-3 Elements Availability of Existing Parks and Park's Number of Users
(Based on the Observational Investigation, conducted in 24th, 25th, 26th July 2014)

Parks	Area (ha)	Elements Availability					Maintenance Condition	Number of Users		
		Grass	Light	P.G	Chair	Trash		24/7	25/7	26/7
No.1	0.24	○	○	○	○	○	Excellent	22	8	3
No.2 Park	0.24	△	△	○	○	○	Good	4	0	0
No.2 FPG	0.12	×	○			×	Good	12	0	0
No.4	0.15	×	○	○	○	×	Fair	0	16	0
No.6	0.18	△	○	○	○	×	Good	0	0	0
Total	0.90							38	24	3

○ Available, △ Somehow Available, × Not Available. P.G: Children Playground. FPG: Football Playground

By analyzing figures 5-71-5-77, playground that located in park no.2 was used every day at late night time. This has made other group of adults to play football in a parking area of a mosque as shown in figure 5-76, which annoys the prayers in the mosque. By asking the pedestrian (age above 30) regarding their usage of parks, they said that once the young people uses the parks we became uninterested in using the parks alone or even with our families. This is clearly noticeable in figures 5-71–5-77, that the majority age of users of parks such as park no. 1, 2, and 4 are between 4-29. The majority of sidewalk users are in age between 30-59 and usually they gather in front of apartments for talk, and smoke.

Fig. 5-71 User's Location, Usage, and Appearing Time (left; 24th July 2014)

Fig. 5-72 User's Location, Usage, and Appearing Time (right 25th July 2014)

Fig. 5-73 Users of Park no. 1

Fig. 5-74 Users of Park no. 2 (Football Playground)

Fig. 5-75 User's Location, Usage, and Appearing Time (26th July 2014)

Fig. 5-76 A mosque Parking Area Users

(Used as football playground area)

Fig. 5-77 Pedestrian (From a mosque to a home)

(Use a road way for walk)

5.5.4 Conclusion of Open Space Users and Usage During Ramadan

From analyzing the above 5-71 to 5-77, it can be concluded that 1) although there is a high demand on football playground by adult users (age between 15-29), there is a noticeable shortage of playground within the neighborhood. This has led to 2) appear a new category of users who use in front of mosque for chat, smoke, or even play football in a parking area of a mosque. Finally, 3) due to the dense use of some parks by users in age between 15-29, people in age above 30 became uninterested in using these parks.

5.5.5 Open Space Users and Usage During Winter Season

Jeddah City restrains its warm in the winter season as the temperature ranges between 15 °C at dawn to 28 °C in afternoon. The survey was conducted in February as it is characterized by its lowest temperature throughout the year.

By analyzing the following figures (from 5-78 to 5-88), usage of open spaces can be divided by activities mainly into three categories. 1) Activities start seen from 16:00 till sunset time (in summer at 18:22). 2) activities start to appeared from sunset time till night time. 3) activities appear in both periods. Activities such as jogging, and playing football are mainly done in time between 16:00 till sunset time. And activities such as talk, smoke, play card game on a sidewalk or a road way, gather and talk in front of an apartment were noticed in the period between sunset time till night. Furthermore, activities such as talk in parks were seen in both periods of time.

During the observational survey period, football players were seen every day plays football in the same vacant lot. *"Due to the ground solid material of the playground that located in park no.2, we prefer to play in a vacant lot instead of using the playground"* football players said. In addition to that, joggers were also seen every day jog around a huge vacant lot. *"As we like jogging, we prefer to jog around this huge vacant lot due to the factor of safety, where the sidewalks within our neighborhood are occupied by parked cars, so walking on road way has the possibility for a car accident"* the majority of the joggers said. Regarding the sidewalk users, they can be divided by age into two groups, first, people in age between 15-29 years old and they usually use sidewalks for smoke and talk at a late night time in a rarely used location. Second, a group who use in front of an apartment sidewalk. These users usually in age between 30-45.

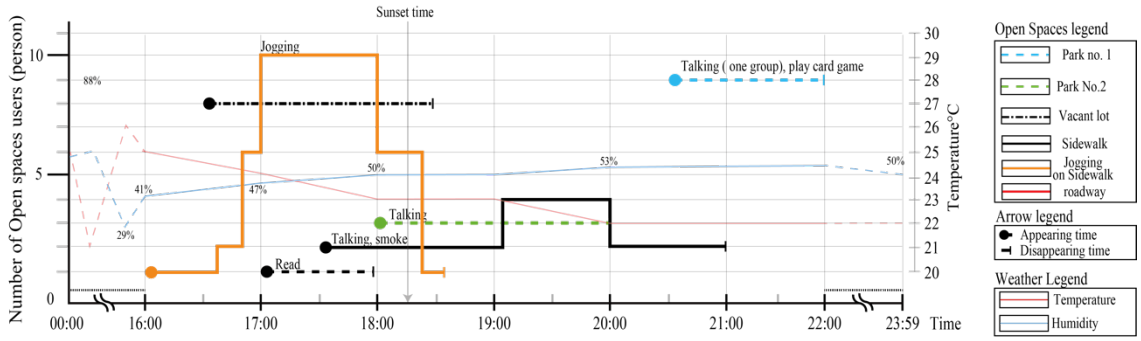


Fig. 5-78 Activities of Public Open Spaces Users through a Day (2015 Feb 12-weekday)

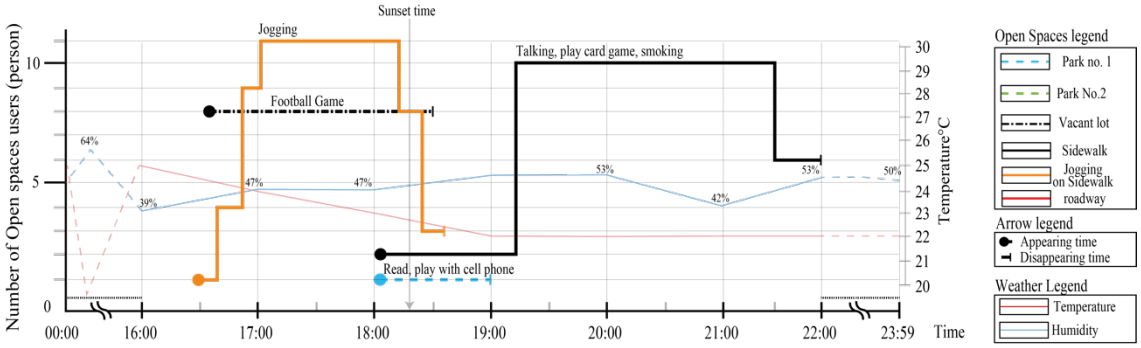


Fig. 5-79 Activities of Public Open Spaces Users through a Day (2015 Feb 13-weekend)

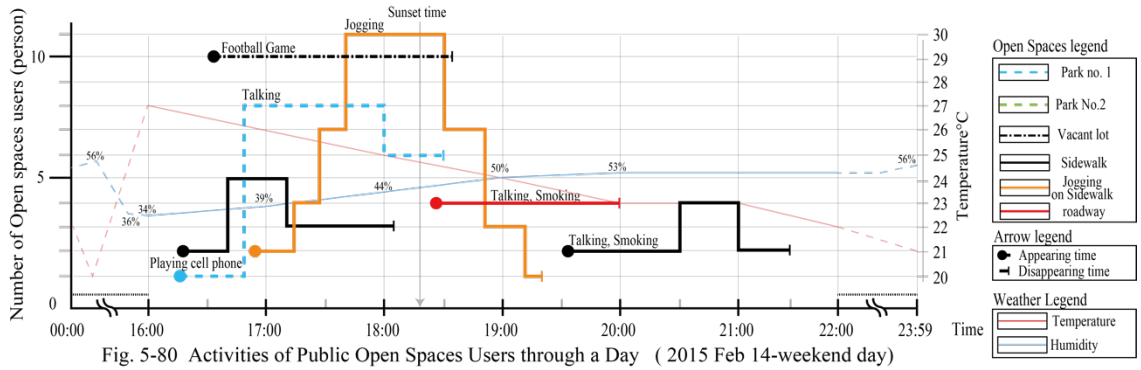


Fig. 5-80 Activities of Public Open Spaces Users through a Day (2015 Feb 14-weekend day)

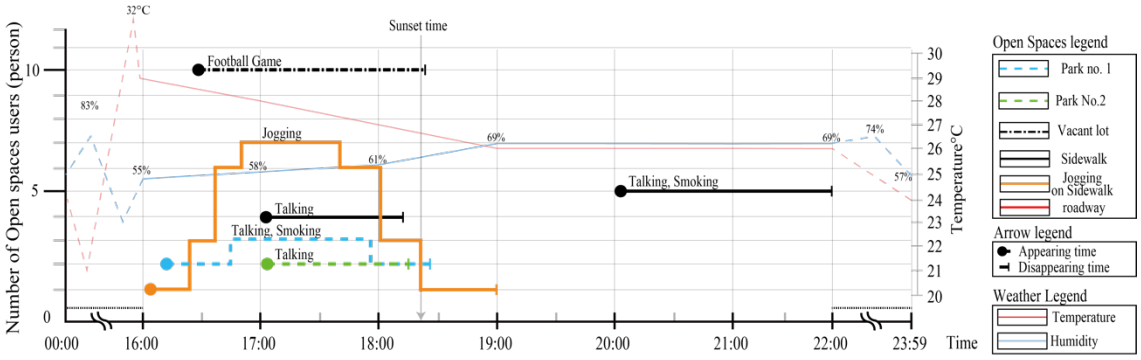


Fig. 5-81 Activities of Public Open Spaces Users through a Day (2015 Feb 16-weekday)

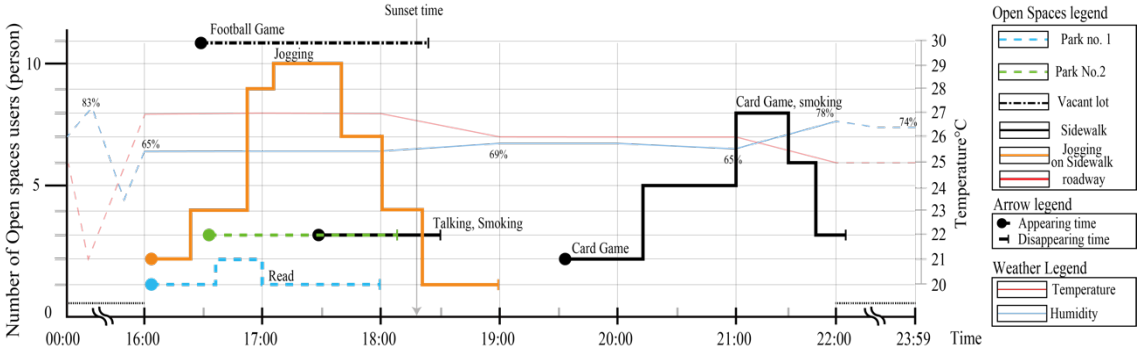


Fig. 5-82 Activities of Public Open Spaces Users through a Day (2015 Feb 17-weekday)

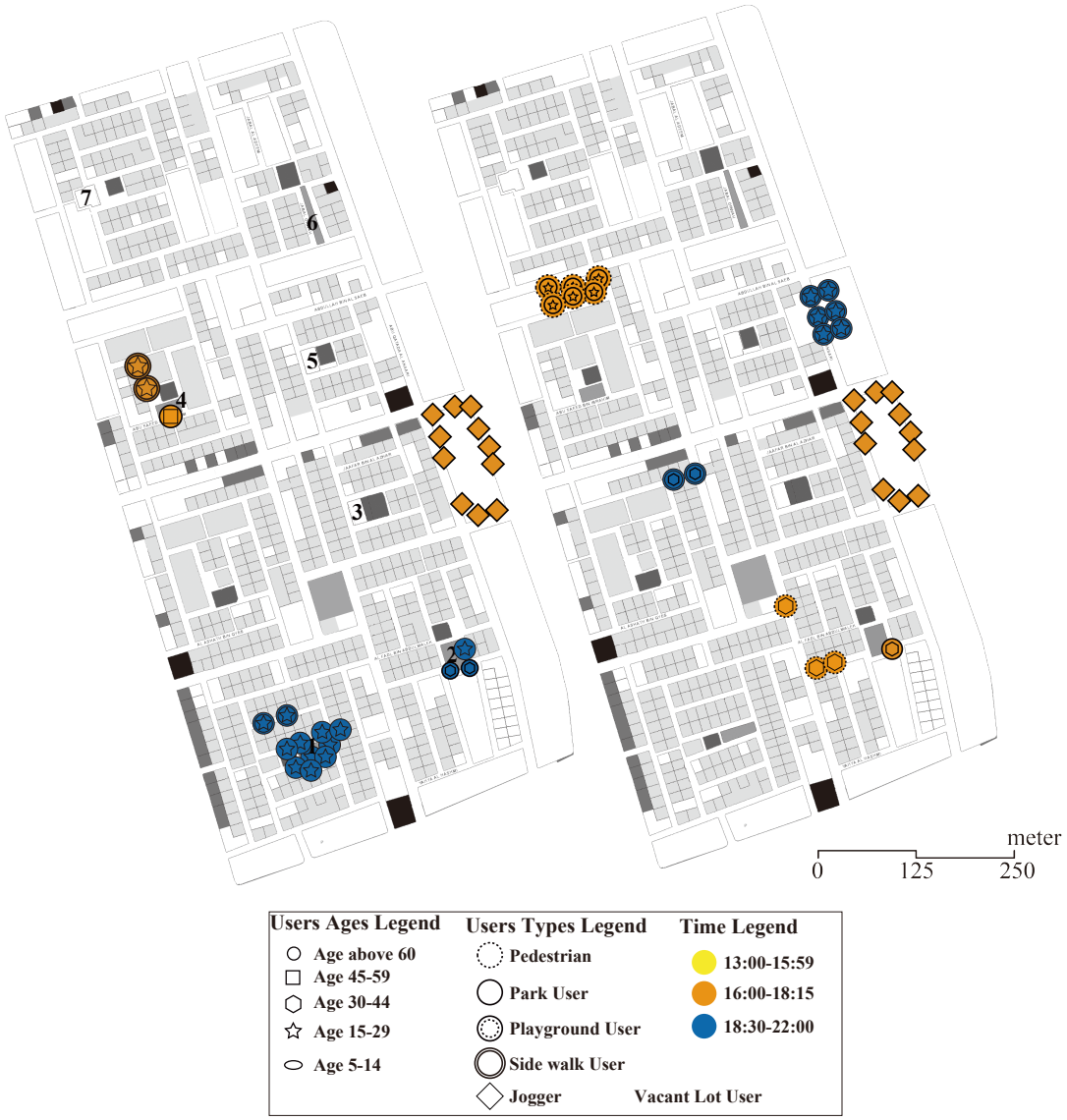


Fig. 5-83 User's Location, Type, and Appearing Time (left, 12th Feb 2015)

Fig. 5-84 User's Location, Type, and Appearing Time (right 13th Feb 2015)

Fig. 5-85 User's Location, Usage, and Appearing Time (left, 14th Feb 2015),

Fig. 5-86 User's Location, Usage, and Appearing Time (right 16th Feb 2015)

Fig. 5-87 Vacant lot used as Football playground

Fig. 5-88 Sidewalk Users

Fig. 5-89 User's Location, Type, and Appearing Time (left, 17th Feb 2015)

Fig. 5-90 Sidewalk in front of an apartment user

Fig. 5-91 Sidewalk Users

figures 4-92 shows that the majority of users parks come from outside the distance services of the park no. 1 and 2. Regarding the usage frequency through the weekdays and the weekend days in winter, the usage of open spaces as similar with different in density of users. So the activities are primarily divided into jogging on a sidewalk, football game in a vacant lot, talking on a sidewalk and parks.

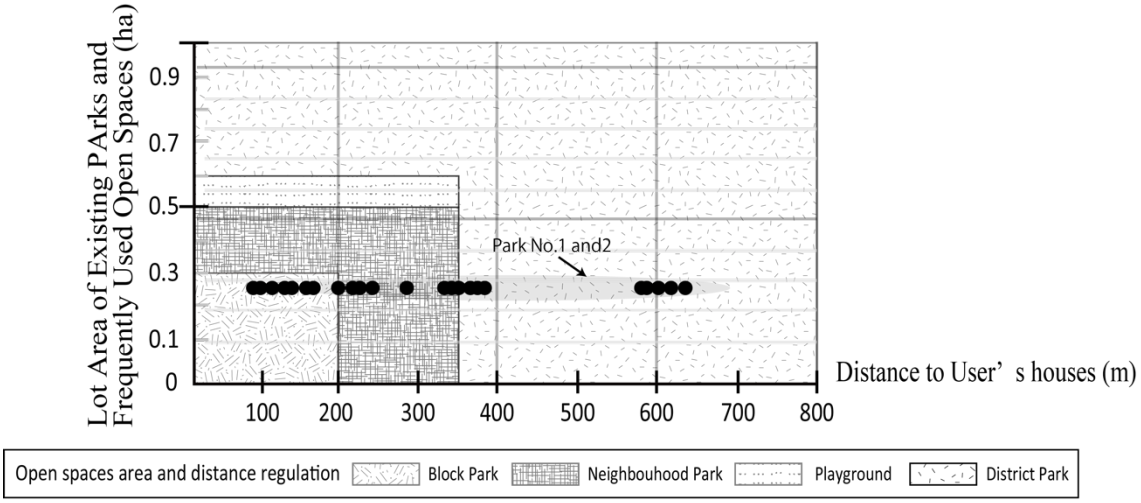


Fig.5-92 Used Parks and Distance to user' s Houses

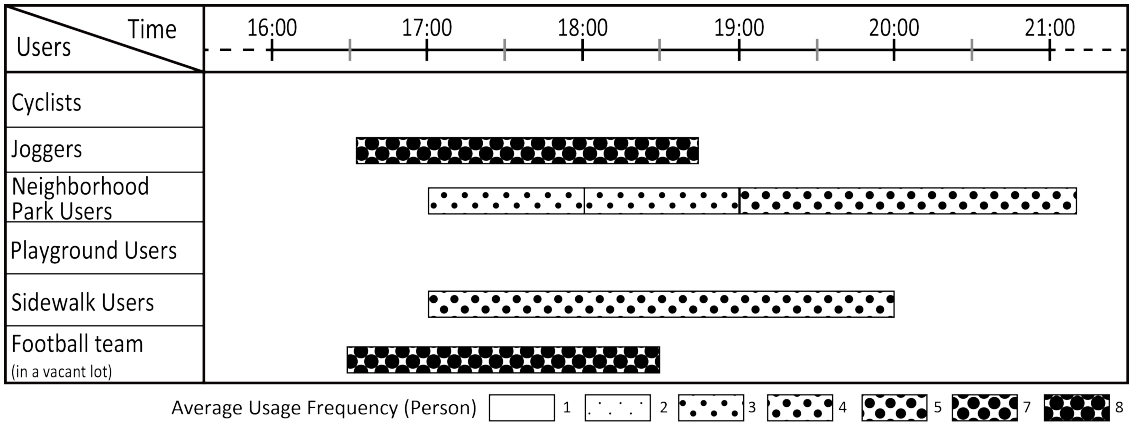


Fig. 5-93 Usage and usage frequency of Public open spaces Users in weekdays during winter

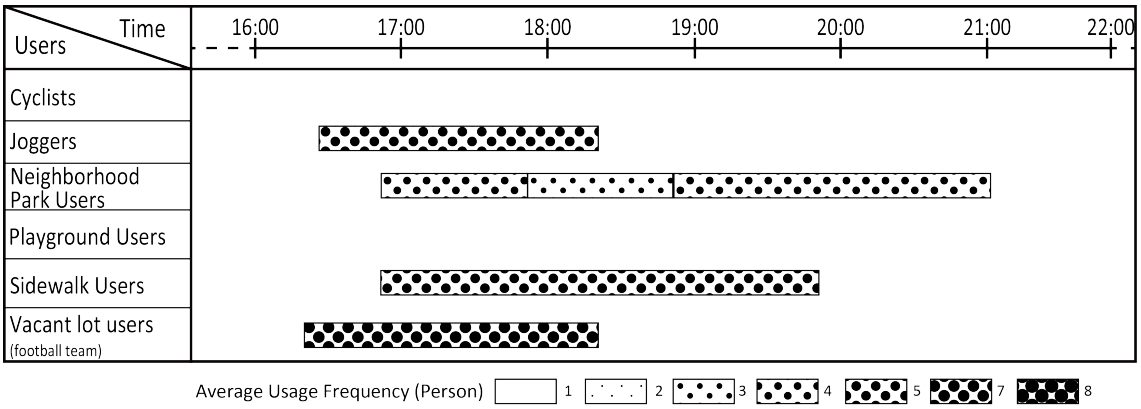


Fig. 5-94 Usage and usage frequency of Public open spaces Users in weekend days during winter

5.5.6 Conclusion of Open Space Users and Usage During Winter

From the above analysis, it can be concluded that as it is noticeable that in winter season that the users of open spaces users are concentrated in sidewalks whether for talking or jogging, and in vacant lot for sport activities. This has an effect on the usage of parks, and the used parks become limited in two parks (park no.1 and 2). Even the joggers and football team players are satisfied by the space they use; however, building apartments in these spaces could have affect the usage of these places that today's users (joggers and football team player) cannot use it. thus, these users must be taken into consideration in the design process by designing a safe, appropriate spaces that respond for their needs. 3) due to the few number of continues sidewalks in the neighborhood, women and men are mixed in one specific sidewalk, which bothers women.

5.5.7 Open Space Users and Usage During Summer Season

Summer is extremely hot in Jeddah City especially when the temperature reaches 40 °C and above. This section tries to clarify the open spaces usage during the day. So, similar to the section of winter, nine observational survey assistants were distributed in the neighborhood for the activity observation and face to face questioners.

By analyzing figures 4-95 – 4-98, activities are clearly divided into "Activities Disappear Before Sunset", and "Activities Appear After Sunset". The first consists of sport activities such as football and jogging, social activities such as plays with neighbors in a park. The second consists of a) social activities such as 1) friend gathering on sidewalks for talking, smoking, playing card game and so on. Regarding the place of this type of activities, the users usually use a sidewalk that located in an edge of the neighborhood where the place is somehow isolated from the residents. 2) Friend gathering for talking in a park. and b) as being alone in a park for smoking or playing with one's cellphone.

"We prefer hot climate for doing sport" the sport activities users said. This is appeared in figures 4-95 – 4-98, that they do sport between 16:00 and 19:00 on purpose due to the high temperature. In contrast, the social activities that appeared at night, their users prefer night time due to the low temperature relatively to afternoon (based on a face to face interview). And they prefer to be isolated, so that they usually do not use parks for their activities.

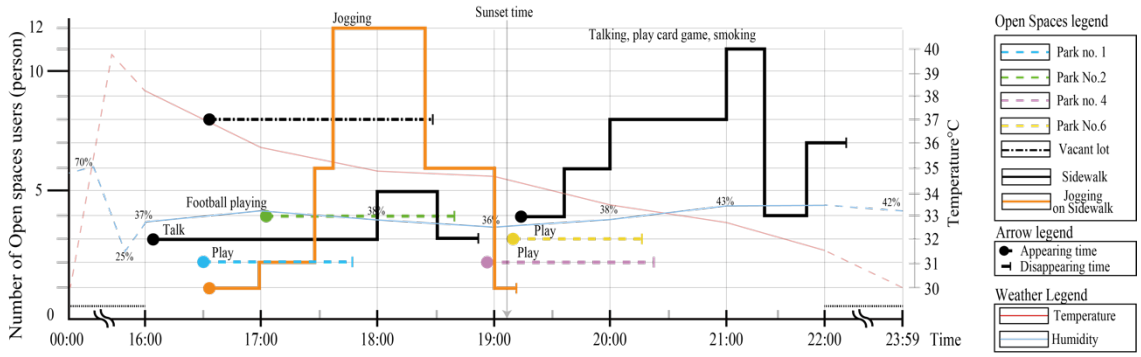


Fig. 5-95 Activities of Public Open Spaces Users through a Day (2015 June 05-weekend)

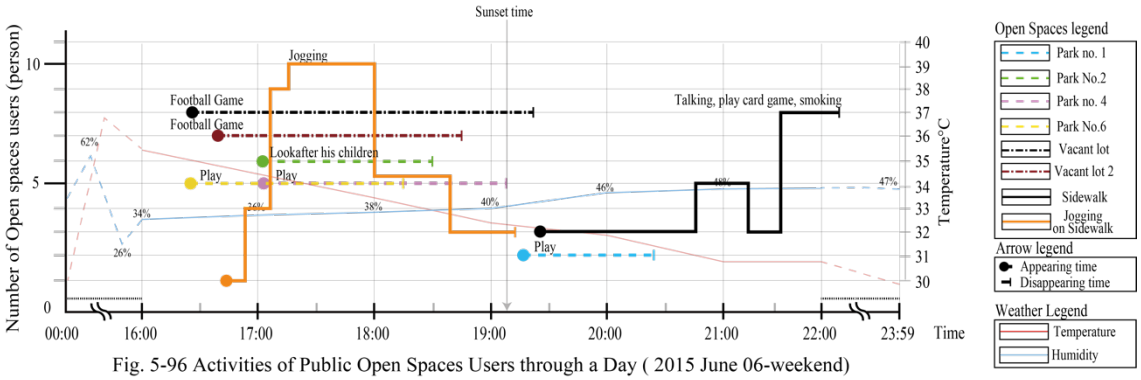


Fig. 5-96 Activities of Public Open Spaces Users through a Day (2015 June 06-weekend)

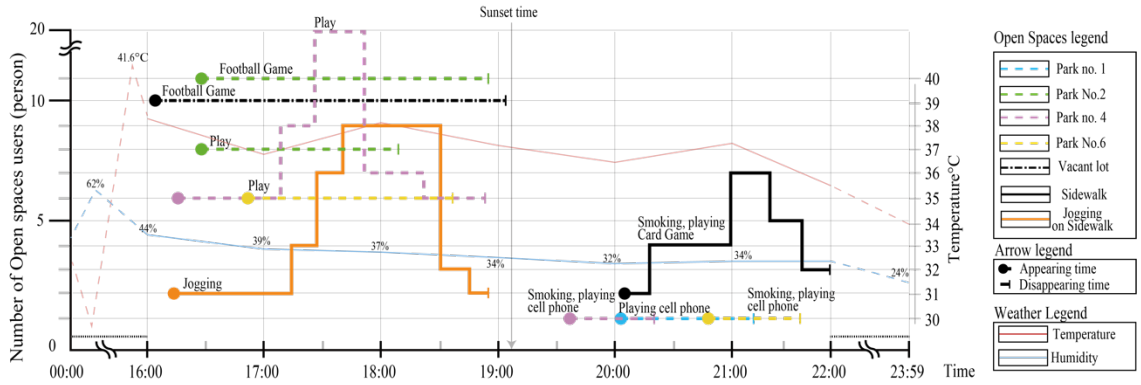


Fig. 5-97 Activities of Public Open Spaces Users through a Day (2015 June 09-weekday)

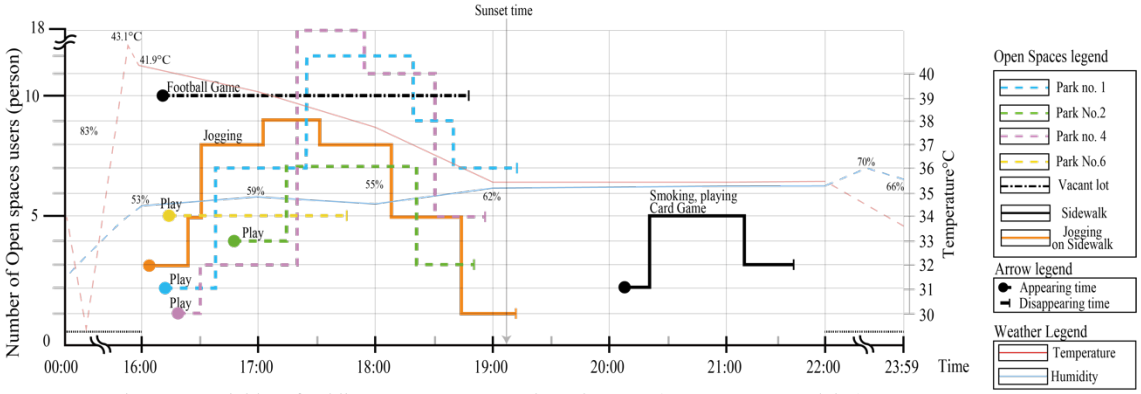


Fig. 5-98 Activities of Public Open Spaces Users through a Day (2015 June 10-weekday)

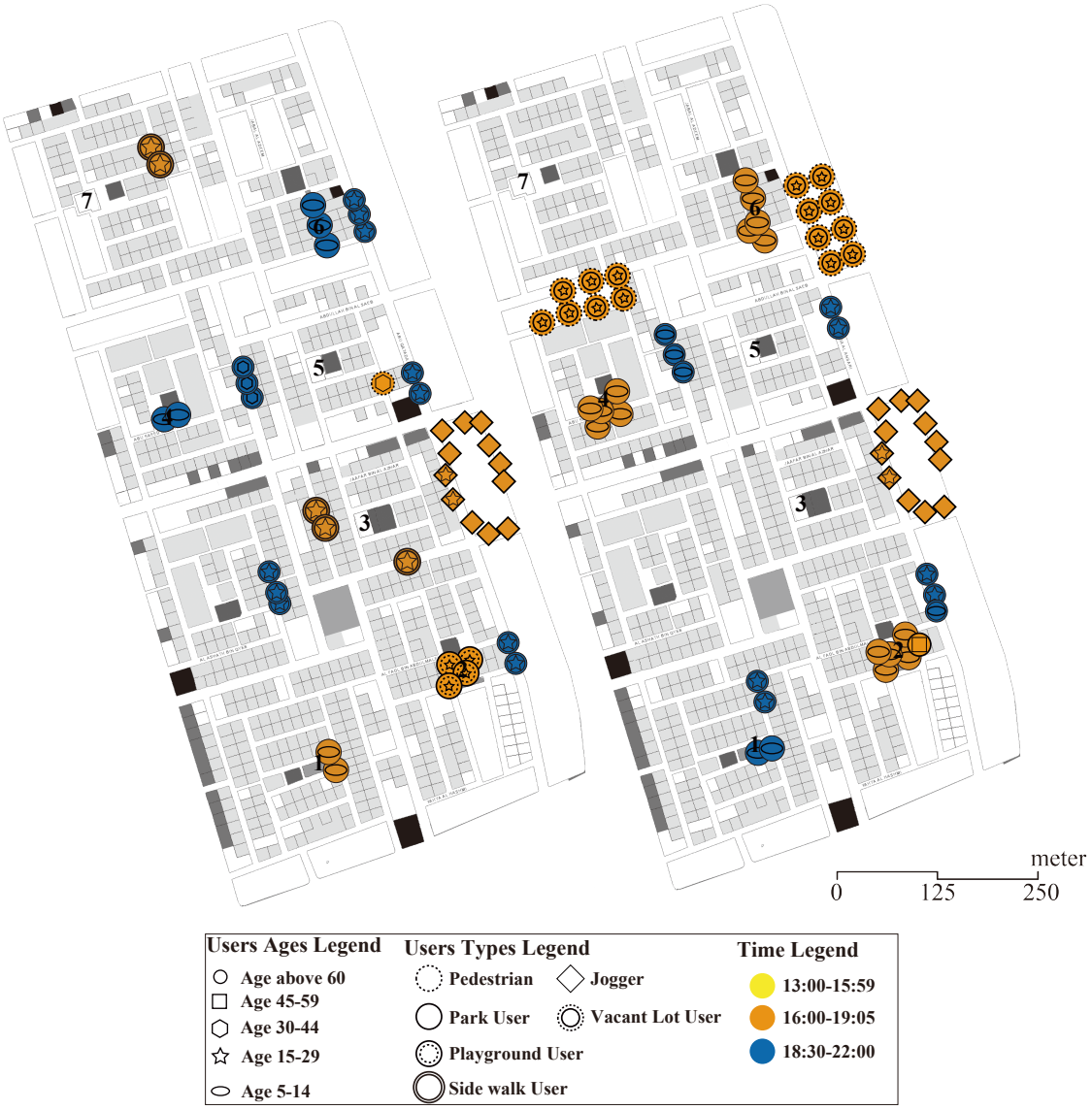
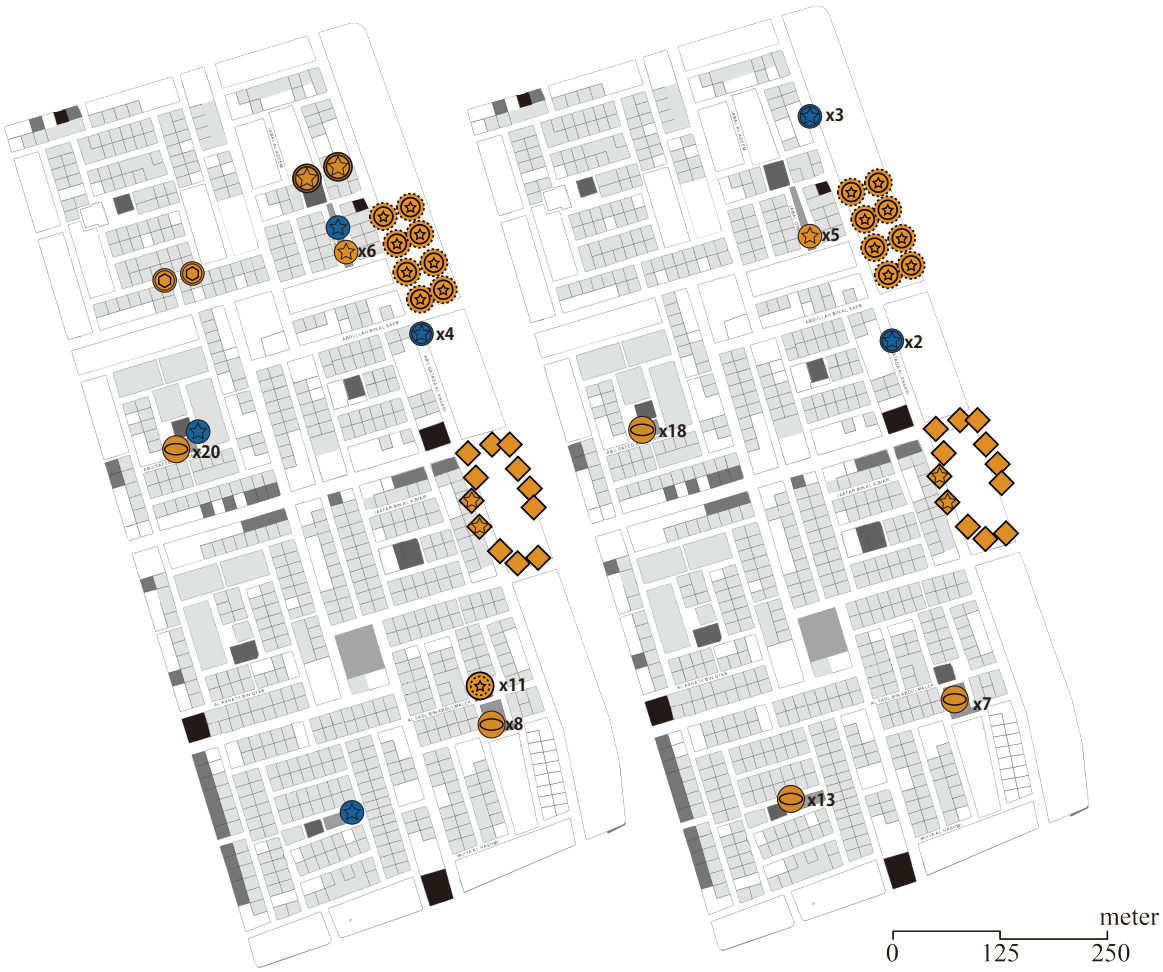


Fig. 5-99 User's Location, Usage, and Appearing Time (left, 05th June 2015)

Fig. 5-100 User's Location, Usage, and Appearing Time (right 06th June 2015)

Fig. 5-101 On Sidewalk Users

Fig. 5-102 Vacant lot Users (sport activity)



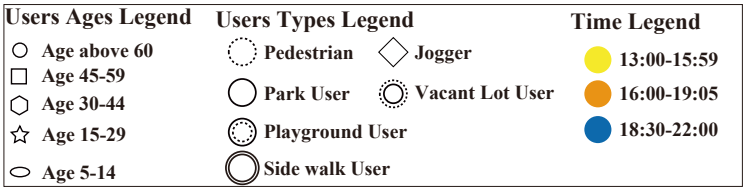


Fig. 5-103 User's Location, Usage, and Appearing Time (left, 09th June 2015)
Fig. 5-104 User's Location, Usage, and Appearing Time (right, 10th June 2015)

Fig. 5-105 Park Users

Fig. 5-106 On Sidewalk Joggers

Based on the questionnaires that were distributed to open space users, figures 5-105, and 5-106 show the usage and average of usage frequency in the weekdays and weekend days. The activities and the time are similar in the weekdays and weekend days with only different in the density of the users for each activity.

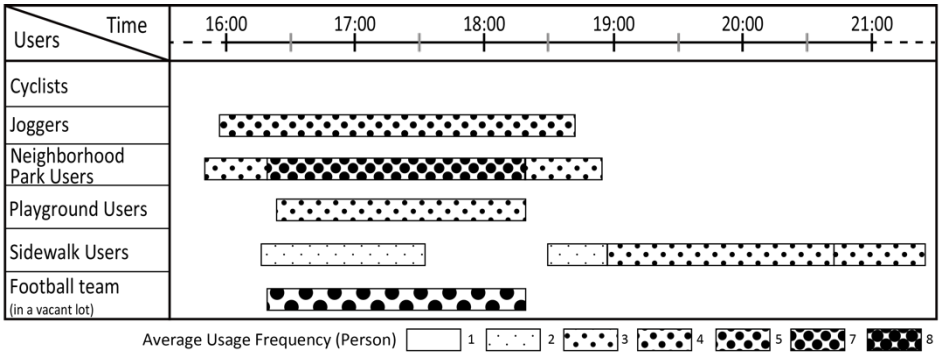


Fig. 5-107 Usage and Average of usage frequency of Public open spaces Users in weekdays days during Summer

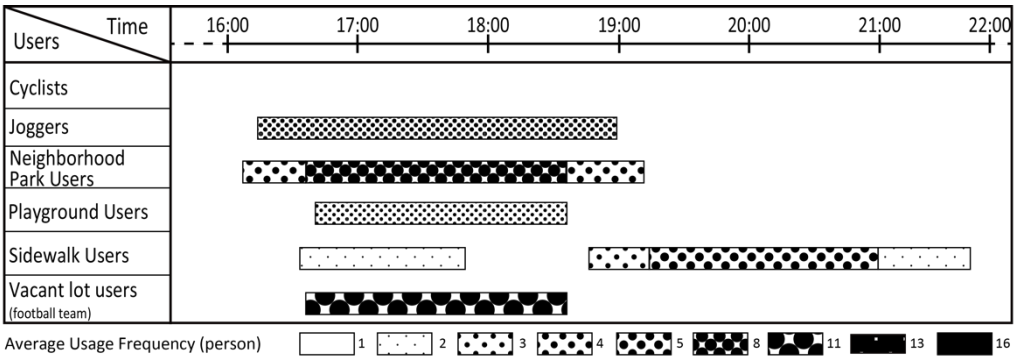


Fig. 5-108 Usage and Average of usage frequency of Public open spaces Users in weekend days during Summer

5.5.8 Conclusion of Open Space Users and Usage During Summer

From the above section, it can be concluded that, 1) no relation between temperature and decreasing open space users. 2) vacant lots are used by sport related activities especially between 16:00 and 19:00. 3) joggers prefer to use sidewalk that surround a huge vacant lot due to the continuity of sidewalk and safety factors. 4) On sidewalk users (at night) prefer to not to use parks in order to be isolated. 5) Park users (children) usually use parks that gather them with their friend and neighbors. 6) Parents of children who use parks do not allow them to use parks alone at night due to the using of some adults for these parks at night. 7) due to the few number of continues sidewalks in the neighborhood, women and men are mixed in one specific sidewalk, which makes women joggers uncomfortable.

5.5.9 Conclusion of Open Space Users and Usage During the Year

From analyzing the usage of open space in the three main seasons that are Ramadan, winter, and summer. It can be concluded that open spaces are used somehow differently from season to season. For instance, In the season of Ramadan, using the only playground in the neighborhood (park no.2) by the adult (age between 14-29) made some of children (age between 4-15) to 1) use in front of mosque space for gathering, which annoyed the prayers in mosque. 2) and some of them use the parking area of some mosques as football playground.

In winter, the most frequently used open space are vacant lots, and sidewalks. The vacant lots were used by football team player between 16:00 and 18:00. And sidewalks were frequently used in two ways 1) sidewalks that surrounded vacant lots were used by joggers as the sidewalk along inner street in neighborhood are not available. 2) sidewalk that isolated (usually located at the edge of the neighborhood) used by adult (age between 15-29) for gathering, smoking, playing card game. Regarding usage of open spaces in summer season. It is similar to winter season with a noticeable increase for the park users (children) during the time between 16:00 and 19:00. Even the sport related users are satisfied with open spaces they usually used; there is a high possibility for spaces they use being built in the future, so this will have an adverse effect on these activities. Whether by being disappeared or other unsuitable location might be used for these activities (table 5-4)

Finally, it can be concluded that the factor of **'Quantity of Parks'**, and **'Distance to Parks'**, and are the most important two factors that have an influence on usage of parks. This was noticeable in the majority of parks users' age which is under 15 years old, so they prefer to use the closer park to their apartment due to the safety factor, and users do not consider park area as an important factor. Regarding sport activities, it was noticeable that the factors of **'Feeling of Openness'** is an important factor for football game player, and '**Continuity of a Sidewalk', and 'Feeling of Openness'** are the most important elements for joggers due to the safety factors. In addition to the factor of **Feeling of Privacy'** especially for women, to be separated from men joggers.

Thus, from the above, it is clear to say that, the important factors regarding parks on the **site planning level** are element number, and distance. And on **design level** is the setting. Regarding the sport (soccer player) related factor on the **site planning level** are location, and openness. And on the **design level**, the providing a sandy land is the most important factor. Regarding the sport (Joggers) related factor on the **site planning level** is openness. And on the **design level**, is the continuity of sidewalk.

Table 5-4: Typology of Open Spaces, Users, activities, and Usage time throughout the Year in Al-Haramain Case Study

Open Space		Area (ha)	Users			Number of Users during the Survey Periods											
			Age	Activity	Time	Ramadan(July2014)			Winter (February 2015)					Summer (Jun 2015)			
						24/7	25/7	26/7	12/2	13/2	14/2	16/2	17/2	5/6	6/6	9/6	10/6
Parks	No.1	0.24	4-15, 15-29	Talks, plays ones children	16:00-19:00 Ramadan (20:00-02:00)	22	8	3	9	0	8	3	3	2	2	1	13**
	No.2	0.24				4	0	0	3	1	0	2	3	4	7	8**	7
	No.4	0.15				0	16	0	1	0	0	0	0	2	5	20**	18**
	No.6	0.18				0	0	0	1	0	0	1	0	3	5	7	5
Playground	No.1	0.21	10-29	Football game, talk	17:00-21:00 Ramadan (22:00-02:00)	10	4	0	0	0	0	0	0	0	0	11**	0
Vacant Lot	No.1	0.31	15-29	Football, volleyball game	16:00-19:00 Ramadan (22:00-02:00)	0	0	0	0	6	9	8	6	0	15**	8**	8**
Mosque Parking area	No.1	0.06	15-29	Football	Ramadan 22:00-02:00	12*	12	12*	0								
Sidewalk			30-45	Jogging	16:00-19:00	0	0	0	0	11**	12**	8**	9**	12**	12**	10**	13**
			30-45	Talk	16:00-19:00	0	0	14	4	2	3	0	3	5	0	4	0
			15-29	Talk, play card game	19:00-23:00	0	0	0	0	6	4	9	8	13	10	4	5
Roadway			15-60	Walk to a destination	12:00-24:00	0	0	7	0	3	3	3	1	1	0	0	0
					Total number of users	36	24	24	18	18	27	26	24	29	29	16	17

* Users were distributed the questionnaires in a day and they appeared again in the same place with the same activities.

** Due to difficulties to conduct a face to face questionnaire, users were just observed along the activities time.

5.6 Conclusion of Open Spaces in Villa Type and Apartment Type Neighborhoods

In this chapter, it is can be conclude that the factors that play important role in increase the attractiveness in open spaces (includes parks, path for jogging, etc.) is different from the villa type and apartment type neighborhood in both site planning level and design level.

Table 5-5 and 5-6 summarize the factors that have an influence on the usage frequency of the most frequently used open spaces in both villa type neighborhood and apartment type neighborhood. For instance, parks are the most used open space in **villa type neighborhood**; however, some certain factors make these parks being used such as its location (center of the neighborhood), scale (more than 0.7 hectare), setting so called the quality, openness, and gather with friends. In contrast, three types of open spaces are the most frequently used in **apartment type neighborhood** that are parks, football playground (vacant lot), and sidewalk (as a jogging path). As the parks users do not mind regarding the location and the scale of the parks; however, they consider distance to their houses as an important factor which is reflected on the number of parks. Regarding the football players, the location of "a vacant lot" is important as they prefer to be isolated to not to bother the residents. Finally, joggers (women) prefer to be isolated in another "continued Sidewalk" due to the factor of privacy.

Table 5-5: Most Frequently Used Open Spaces and Related Important Factors on Site Planning Level and Design Level

Levels	**Factors**	**Villa Type Neighborhood**	**Apartment Type Neighborhood**		
		Park	**Park**	**Football Playground**	**Jogging Path**
Site planning Level	Elements number	—	○	○	○
	Location	○	—	○	○
	Scale	○	—	—	—
	Distance	—	○	—	—
Design Level	Setting (maintenance, children play tools, furniture, etc.)	○	○	—	—

Table 5-6: Used Open Spaces and Related Important Factors that Overlapped between Site Planning Level and Design Level

Levels	**Factors**	**Villa Type Neighborhood**	**Apartment Type Neighborhood**		
		Park	**Park**	**Football Playground**	**Jogging Path**
Overlapped level between Site Planning Level & Design Level	Openness	○	—	○	○
	Gather with Friends	○	—	○	—
	Feel Safe (esp. for women)	—	—	—	○
	Continuity of Sidewalk				○

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Chapter Six
Conclusion

Chapter Six

Conclusion

6.1 Introduction

This chapter concludes the key findings of the research carried out on the planned neighborhoods in Saudi Arabian cities, through three main perspectives: economic, spatial, and activity. Furthermore, it makes arrangements for the transition of residential areas' related standards, guidelines, and decision-making approaches in relation to population growth and housing shortage problems. Afterwards, it suggests some recommendations for today's apartment-type and villa-type planned neighborhoods, and for future planned neighborhoods to avoid today's problems. Finally, it proposes future studies for planned neighborhoods in relation to the population growth the city is experiencing.

6.2 Overview

This research focuses on the problems that planned neighborhoods are experiencing. It mainly aims to clarify the issues of 1) laws related to Residential New Development and their effects on lots in today's villa-type neighborhoods, economically and spatially, 2) spatial configuration between residential buildings and streets and its effects on pedestrianization, and 3) existing open spaces and how they are used throughout the year. Accordingly, the research sets five objectives:

1) To make arrangement for the population growth of the regions and governorates, administrative divisions, the concentration of population in important governorates,

characteristics of residential areas and housing in Saudi Arabia, population growth, and urbanization for important cities in Saudi Arabia (chapter two).
2) To make arrangements for historical transition, chronological urban growth, housing shortage, and the future demand of Jeddah City. Then, to make arrangements for the transition of 1) the residential areas related standards, 2) the open spaces related standards, 3) the decision-making flow, 4) the structure plans, and 5) the urbanized area (Chapter Two).

3) To clarify the trend and diversification of a villa-type neighborhood in Jeddah city, the housing shortage problem and related factors, the population density in residential districts, and the villa-type neighborhood patterns (Chapter Three).

4) To make spatial configuration arrangements in design standards and open spaces, including the streets, in planned neighborhoods. To define the combinations of patterns in the spatial configuration of streets and residential buildings. To clarify street-use characteristics, based on the spatial configuration patterns, to identify issues for existing streets, and to suggest future neighborhood planning issues for Jeddah City (Chapter Four).

5) To clarify the pattern of open spaces in planned neighborhoods, the frequency of use, and the user's activities throughout the year (Chapter Five).

To achieve this, the research is based on the hypothesis that the unsuitability and unreality of residential building design standards, street-related standards, and open spaces-related standards to the Saudi Arabian society and the environment have resulted in the decrease of the use of open spaces in the planned neighborhoods. In addition, the low population density in villa-type neighborhoods, which was set up via a city structure plan, and the residential lot minimum area standards were the main factors behind the housing shortage that the city is experiencing. If the growth and expansion of planned neighborhoods should continue without taking into consideration the spatial, economic, and lifestyle factors (i.e., activities of open-space users), more unnecessary open spaces and a greater housing shortage would prevail in the future.

Moreover, the research has developed a number of questions:

1) What are the characteristics of residential districts in the major cities of Saudi Arabia? What is ratio of the total population in the regions to the population concentrated in these cities?

2) What are the types of building-related standards, street-related standards, and open-space-related standards and have these standards been revised?

3) What, if any, are the adverse effects of the residential building standards or street-related standards to the pedestrianization in villa type and apartment type neighborhoods?

4) Are the sidewalks within all planned neighborhoods used by pedestrians? If not, what are they used for?

5) What amount of housing shortage has Jeddah City been experiencing? What is the projected demand? And what is the ratio of the shortage among low- and middle-income people?

6) What residential building type is expected to increase in planned neighborhoods for future urban sprawl? If the growth continues in the same trend (sequence), to what extent will this respond to the housing shortage?

7) How far are today's villa-type neighborhoods responding to the demands of low- and medium-income people?

8) To what extent are today's parks in planned neighborhoods effectively used? Are there other undefined yet open spaces used?

9) Are today's park systems effective in the summer, winter, and the holy month of Ramadan (as the lifestyle in Ramadan has changed)? What is the frequency of use of open spaces?

10) Is the park area that was recommended by the World Health Organization (WHO) suitable for Saudi Arabian society and environment?

Both qualitative and quantitative analysis methods were used to answer those questions and to fulfill objectives, and the research was conducted through two stages:

First, a theoretical study of urbanization and residential trends in Saudi Arabian cities, residential building related standards and open space related standards, and residential new development related standards and,

Second, an applied study on Jeddah City, which has a long history as the city has been used as a gate for both Makkah City and Madinah City since Caliph Othman, where pilgrims do their pilgrimage yearly from all over the world.

6.3 Key Findings The main findings of this research can be sub-categorized under its two stages:

6.3.1 Findings of Theoretical Studies

They include the key findings to 1) the available literatures about Jeddah City on the issues of city planning, residential area growth, historical old Jeddah (Al-Balad), residential architecture, and planned neighborhoods; 2) transition of residential-open-space-related standards, and residential-building-related standards in relation to urbanization process, population growth, and housing shortage; 3) type of spatial configuration based on design standards; 4) procedure manual for the preparation of the residential land subdivision and its effect on the planned neighborhood composition; and 5) open space and park system in planned neighborhoods.

1) Literature on Jeddah City

The literature review on Jeddah City from the scale of city planning to the architectural scale, in Chapter 1, has shown that some studies that have been conducted previously about Jeddah City were mainly about locations, such as Al-Balad, the waterfront, and commercial areas. Some were based on urban processes, such as urban growth and city planning implementation. Some were based on housing, such as the housing shortage crisis, affordable housing, and residential locations from a city-scale perspective. Some are related to disasters, such as flooding and environmental problems. However, the residential-area-related previous studies did not take the factor of spatial, economic, and open spaces user's activities into consideration, making these studies lacking in analyzing the existing condition of planned neighborhoods in relation to the users.

2) Transition of Residential Building and Open Spaces Related Standards

Jeddah City is now experiencing a housing shortage problem due to several factors: internal immigration policies, population increase, and the lack of a periodical revision for apartment-type planned neighborhoods. The author illustrates this issue, using a table, in Chapter Two.

3) Residential New Development Related Laws

Chapter Three explains that the Procedure Manual for the Preparation of Residential Land Subdivision (PMPRLS) had been created to reflect the policies and objectives that were proposed by the city structure planning department, such as the population density for each type of residential neighborhood and so on. However, this manual was not revised in parallel to the revision of the structure plans that the city had undertaken, which made it difficult to apply the goals of each structure plan.

4) Type of Spatial Configuration Based on Design Standards

Chapter Four shows that the spatial configuration is created, based on the standards that are related to open spaces (e.g., street width and sidewalk) and residential buildings (e.g., residential building floor limit regulation). However, a conflict, between pedestrianization and motorization, had emerged due to the lack of the practicality factor in some design standards, such as the car dimension in relation to the car parking space. Moreover, there is a lack of a prohibition against using sidewalks that are located in front of villas for private purposes.

6.3.2 Finding on Applied Studies

Chapters three, four, and five have conducted three applied studies about planned neighborhoods in Jeddah City, with a different perspective for each study as follows:

1) Economic Perspective (Chapter three)

This study was applied on all villa-type neighborhoods (a total of 103 locations) via several surveys as mentioned in chapter three, followed by several analyses, from correlation analysis and multi regression analysis to cluster analysis. It was clarified that a combination of 6 criteria (out of 27) have a correlation in the growth of villa-type

neighborhoods in Jeddah City: 1) the ratio of vacant lots (net), 2) the ratio of villa lots that range between 300m2 and 400m2, 3) the ratio of villa lots that range between 1,000m2 and 1,400m2, 4) the average of land price, 5) the total area of vacant lots, and 6) the distance between a mosque and a park, by total length of roads. Via cluster analysis, the 103 was grouped into six groups, with a different suggestion and recommendation for each group.

2) Spatial Configuration Perspective (Chapter four)

It was clarified that the Jeddah City pedestrian environment is influenced by three main factors: 1) The mismatch of design standard dimensions with the reality, 2) motor vehicle-oriented neighborhood planning, and 3) using sidewalks for semiprivate purposes, which originate from the historical and cultural background of the city. It is necessary to consider these three factors in planning for the future pedestrian-oriented neighborhoods in Jeddah City.

3) Activity Perspective (Chapter Five)

The subject of activity perspective was studied in two perspectives: the apartment-type neighborhood and the villa-type neighborhood in three seasons throughout the year. The key findings from the survey of the **villa-type neighborhoods** are as follows:

In the Ramadan season, 1) the sidewalk users annoy the pedestrians and the mosque-goers, 2) the vacant lots are used by football teams for playing 3) the majority of the open-space users use the open spaces from 21:00 until approximately 02:00, 4) the parents of 4- to 15-year-old children do not allow them to use the parks due to the use of the sidewalks, by the adults, until late at night, 5) only two parks, out of 8 parks, were used throughout the survey (only 29 users in total).

In the winter season, only three main parks (park nos. 2, 3, and 6) were used, and the children, aged 4 to15 years old, used these parks, with their parents, between 16:30 until 18:00. The parks users, whose homes are located within a 5-km radius, typically go there every weekend to have a barbeque. Sidewalk users appear in the times between 18:00 and 22:00.

In the summer season, despite the hot weather, the open spaces were more active than in the winter due to the increasing numbers of street joggers and playground users.

Moreover, the key findings from the survey in the **apartment-type neighborhoods** are as follows:
In Ramadan season, the use of the only playground in the neighborhood (park no. 2) by the adult (age between 14 and 29) made some of children (age between 4-15) to 1) use the space in front of the mosque for a gathering, which disturbed the prayers in the mosque and 2) use the parking area of some mosques as a football playground.

In winter, the most frequently used open spaces are vacant lots and sidewalks. The vacant lots were used by football team players between 16:00 and 18:00. Sidewalks were frequently used in two ways: 1) Sidewalks that surrounded vacant lots were used by joggers as the sidewalks along inner streets in neighborhoods were not available. 2) Sidewalks that were isolated (usually located at the edge of the neighborhood) were used by adults (ages between 15 and 29) for gathering, smoking, and playing card games.

Regarding the usage of open spaces in the summer season, it is similar to the winter season with a noticeable increase of park users (children) during the time between 16:00 and 19:00.

6.4 Recommendation for the Existing Planned Neighborhoods

Based on the research findings, this chapter set forward a number of general recommendations for existing planned neighborhoods in Saudi Arabian cities. These recommendations are sub-categorized as follows:

6.4.1 Vacant Lots in Relation to Lot Area and Economic Factors

1) The research emphasizes that some neighborhoods should divide the existing vacant lots between 300m^2 and 400m^2 due to the difficulties in owning huge lots by low- and middle-income people. In some case studies, it is necessary to redevelop the streets and lots in parallel with enhancing parks. In some, it is necessary to divide the vacant lots in

parallel with increasing the length of streets. However, some case studies have a high possibility of growing with lots that are sized between 300m^2 and 400m^2, so it is recommended to keep them.

2) The research recommends that revising the PMPRLS annually can have a notable benefit regarding the housing shortage and responding to future projection. This can be done by keeping up with the condition of land prices of villa-type neighborhoods, in parallel with the amount of housing shortage and future projections.

6.4.2 Open Space User's Activities Factor

Villa Type Neighborhood

Due to the natural increase the city has been experiencing, the proposed lot size in the existing villa-type neighborhood is highly expected to be lived by people who have originally grown up in a villa-type neighborhood. The recommendations regarding open spaces for existing villa type neighborhoods are as follows:

1) The research recommends activating today's unused parks (such as small parks that are located within the villa type neighborhoods in this case study) by re-inventing them seasonally. For instance, in the season of Ramadan, as adults often seek out vacant sandlots for playing football, so these parks can be used for sports activities. In the summer and winter seasons, these parks can be reconstructed simply by enhancing them with some outdoor sports facilities based on the movement of Enhancing Free Outdoor Sports Facilities that Jeddah Municipality has been supporting, a movement which has recently gained popularity in Jeddah City.

2) As joggers increase in summer and winter, and they jog along the sidewalks located at the edges of the neighborhoods, the research emphasizes that these areas be enhanced with sports-related facilities and furniture, such as setting up easy-to-jog pavements, furnishing stop-off places with chairs, and so on.

3) As women usually do not use public open spaces due to their lifestyle, so the factor of privacy between men and women in these types of facilities need not be taken into consideration.

Apartment-Type Neighborhood

1) Due to the popularity of jogging that is notable in this type of neighborhood, the research recommends supporting this type of neighborhoods by a dedicated space for jogging (several places to support the privacy for the women joggers) to be located in an unused island on a less-used street. Nowadays, a sidewalk around a huge vacant lot is used as a jogging space; however, once this vacant lot is built, the sidewalk could not be used for jogging.

2) The research emphasizes to enhance this type of neighborhood by the concept of Multifunction Space for Different Seasons, which is summarized in redeveloping a particular open space commensurate with the open space user's needs for each season, for instance, changing a space from a sand lot for a football playground in Ramadan to refunction as a sandy place for children in summer and winter.

6.5 Recommendations for Future Planned Neighborhoods

6.5.1 Villa-Type Neighborhood

As today's villa-type neighborhood could not be an efficient part in solving a housing shortage problem even after the above-mentioned suggestion, it is necessary to propose a policy for the future villa-type neighborhood, with the following suggestions:

Economic Perspective

Due to the natural increase the city has been experiencing, the above proposed 300–400 m^2 lot size in the existing villa-type neighborhood is highly recommended to be expanded for the future villa-type neighborhood. The recommendations are as follows:

1) Increase the population density in villa-type neighborhoods to be at least 100 persons/hectare. This will be done by revising today's structure plan.

2) By increasing the population density, the minimum lot area (Today's minimum standard is 300 m^2.) will be decreased to respond to the increase in population density.

3) In order to increase the diversity of lot areas, it is necessary to enact a new article in the PMPRLS to distribute the ratio of the lot area throughout a neighborhood. This is by categorizing lot areas as $200m^2$-$300m^2$, $300m^2$-$400m^2$, $400m^2$-$600m^2$, and $600m^2$-$1000m^2$.

Spatial Perspective

As the regulation of streets lacks the prohibited usage of sidewalks, which resulted in an unwalkable environment in the existing villa-type neighborhood, these are necessary:

1) Enacting a new article in the street regulation to define the location for pedestrianization to avoid the conflict between them and motorization

2) Defining to what extent the owners of villas can use the sidewalk, whether for plantation, benches, replacement of the pavement, and so on

3) Creating a design guideline for sidewalk space to be maintained and managed under the authority of the local government

Social Perspective

Due to the natural increase the city has been experiencing, the above-proposed lot size in the existing villa-type neighborhood is highly expected to be lived by people who have grown up in a villa-type neighborhood.

The quality, area, and location of parks in the villa-type neighborhood are the three most important factors that encourage the residents to go out to use parks. Users usually use large parks (with areas above 0.69 hectare) with a high quality and which are located in the center of the neighborhood. From the above, the research suggests that,

1) Supporting the center of the neighborhood by a large park (area of 0.70 hectare and above).

2) Locating the mosque next to the central park to increase the park frequency of use.

3) Creating a suitable and safe pathway for joggers to be located within the inner street network within the neighborhood.
4) It is recommended for the football playground not to be paved, to leave a vacant lot as a public lot.

6.5.2 Apartment-Type Neighborhood

Spatial Perspective

In order to decrease the use of sidewalks as parking spaces in this type of neighborhood, the research recommends obligating the owners of this type of residential building to build two floors (as fixed) as parking areas for residents. This will be done by revising the architectural standards that are related to this type of residential building by relaxing the total floor number limitation from five to six floors. In this proposal, the building total area is kept, and the shortage of parking areas is solved by keeping the sidewalk for pedestrians.

Social Perspective

'Quantity of Parks' and **'Distance to Parks'** are the most important two factors that have an influence on the usage of parks. They prefer to use the closer park to their apartments due to the safety factor, and users do not consider the park area as an important factor.

1) The research recommends that in the future apartment-type neighborhood, it is necessary to consider the quantity of parks without considering the area as it is important in a villa-type neighborhood.

2) Consider creating a multi-functional open space for different seasons. For instance, in Ramadan, the majority of users prefer playing football; however, in summer and winter, the park users are as many as playground users.

'Feeling of Openness' is an important factor for football game players, so in the future apartment-type neighborhood, providing vacant lots owned by the local government to be located on the edges of the residence area is necessary. Regarding jogging,

‘Continuity of a Sidewalk’ and **‘Feeling of Openness’** are the most important elements for joggers due to the safety factors. The **'Feeling of Privacy’** especially for women, to be separated from men joggers, is also an important factor. It is necessary to provide several places for jogging that are characterized by the factors of **‘Continuity’**, **‘Safety’**, and **‘Openness’**.

6.6 Contribution to Future Studies

This research contributes to the understanding of issues relating to planned neighborhoods in Jeddah City from three perspectives: **Economic**, **Spatial**, and **Activity** perspectives. The huge land of Saudi Arabia resulted in a variety of climate, culture, typography, and economic conditions; thus, there is a need to clarify the issues of planned neighborhoods in the main cities and other important cities that have concentrated population. This can be done by analyzing the planned neighborhoods from the three perspectives: Spatial, Economic, and Activity. Thence, the analysis will result in different models, and each model will be suitable and compatible for each society.

Furthermore, the research contributes to considering the factor of **“Attractiveness”** of housing (villa type) and its relation to the outer spaces of the neighborhood. This can be done by: 1) analyzing the lifestyle of the users in-depth (from physiological, economic, and social perspectives); 2) clarifying the elements that attract the users (from the “inner space” to “outer space” scale); and 3) the methods of applying and reflecting these elements on the design of villa and neighborhood.