

**“The Grid Iron Patterns & Detached Villas as the Main
Drivers of Sharjah City’s Urban Sprawl”**

النظام الشبكي للطرق ونموذج الفيلات المنفصلة ودورهما الرئيسي في الزحف
العمراني المتسارع لمدينة الشارقة

by

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of the requirements for the degree of
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Abstract

The city of Sharjah is among the Gulf cities that have increased in size at an unprecedented rate by all standards, and within a period of time not exceeding four decades, after it remained confined within its old wall since its inception until the beginning of the seventies of the last century, with an area of 2.5 square kilometers. This is due to the tremendous political, economic and demographic transformations that are affecting the region in general and the city of Sharjah in particular.

On the demographic side, the massive external population migration that trickled towards the city resulted in a major defect in its demographic structure, which represented a decrease in the percentage of the citizen population to only about 10% of the non-citizen population. On the other hand, in contrast to this phenomenon, the percentage of citizens' housing areas amounted to about 90% of the total area of the administrative boundaries of the city, as the city expanded at an accelerated rate and consumed vast areas of its urban land stock which is now almost exhausted, as indicated by the outputs of the city's housing plan. This rapid growth coincided with two phenomena worthy of attention, the first being the conjunction of this growth with the significant decline in residential density, and the second with the phenomenon of the increase in the proportion of non-durable residential lands, which reached 49% (DTPS, 1998) of the total land allocated to citizens. Among the most prominent consequences of the last phenomenon: -

1. Reconstructed plots of land are scattered between residential extension areas equipped with infrastructure services and roads, indicating the weak economic efficiency of these high-cost services as an inevitable consequence of the low density.

2. The city fulfills the conditions for defining the phenomenon of irregular urban sprawl and the negative consequences thereof.
3. The lack of adherence to the principles of sustainable development with regard to the efficiency of urban land management to meet the current housing demand and without prejudice to the rights of future generations in housing services.

This research aims to explore and monitor the basic reasons behind the phenomenon of accelerated urban sprawl that the city is witnessing, and that is based on answering some logical questions such as:

1. How was the ancient nucleus of the city able to accommodate the city's residents and its activities within its old wall, with an area not exceeding 2.5 square kilometers, from its first inception until the beginning of the seventies of the last century?
2. Why did the citizens' housing areas expand at these standard rates after surpassing the old core?

The analytical study proved that the organic pattern of the urban fabric of the city and the traditional housing model with an inner courtyard, which have met, throughout history, the climatic, social and religious requirements are the reason behind the assimilation of the ancient core of the city to its residents and activities throughout the mentioned period.

On the other hand, the same study proved that the grid system and the villa model are the main reason behind the urban sprawl of the city.

The research chapters include a detailed study of all the mentioned elements and some recommendations and proposals related to mitigating the negative consequences of the unprecedented urban sprawl of the city.

المستخلص

تعتبر مدينة الشارقة من بين المدن الخليجية التي زاد حجمها بمعدلات غير مسبقة لكل المقاييس ، وخلال فترة زمنية لا تتعدى أربعة عقود ، بعد أن ظلت محصورة داخل سورها القديم منذ نشأتها حتى بداية سبعينات القرن المنصرم ، وبمساحة 5.2 كيلومتر مربع. ويعزى ذلك الى التحولات السياسية والإقتصادية والديمغرافية الهائلة التي انتظمت المنطقة بوجه عام ومدينة الشارقة على وجه الخصوص.

في الجانب الديمغرافي فقد ترتب عن الهجرة السكانية الخارجية الكثيفة التي تقاطرت نحو المدينة خلافا كبيرا في هيكلها الديمغرافي تمثل في تدني نسبة السكان المواطنين الى نحو 10% فقط بالنسبة لعدد السكان غير المواطنين. ولكن في المقابل وعلى النقيض من هذه الظاهرة بلغت نسبة مساحة مناطق اسكان المواطنين نحو 90% من اجمالي مساحة الحدود الادارية للمدينة ، حيث تمددت المدينة بمعدلات متسارعة واستهلكت مساحات شاسعة من رصيدها من الاراضي الحضرية حتى اوشك على النفاد - كما أشارت مخرجات الخطة الاسكانية للمدينة. تزامن هذا النمو المتسارع بظاهرتين جديرتين بالاهتمام أولا هما اقتران هذا النمو بالتدني الكبير في الكثافة السكانية والثانية بظاهرة ارتفاع نسبة الاراضي السكنية غير المعمرة حيث بلغت نسبة 49% بين اجمالي الاراضي التي تم تخصيصها للمواطنين. ومن أبرز مترتبات الظاهرة الأخيرة:-

1. تبعثر قطع الأراضي التي تم تعميرها بين الامتدادات السكنية المجهزة بخدمات البنية الاساسية والطرق مما يشير بضعف الكفاءة الاقتصادية لهذه الخدمات عالية التكلفة كنتيجة حتمية للكثافة المتدنية.

2. استيفاء المدينة شروط تعريف ظاهرة النمو الحضري غير المنتظم وما يترتب عنها من سلبيات.

3. ضرورة الالتزام بمبادئ التنمية المستدامة فيما يتعلق بكفاءة ادارة الأرض الحضرية للوفاء بالطلب السكني الحالي ودون المساس بحقوق الاجيال القادمة في خدمات الاسكان.

يهدف هذا البحث الى استكشاف ورصد الاسباب الاساسية التي تقف وراء ظاهرة الزحف العمراني المتسارع الذي تشهده المدينة ، وذلك انطلاقا من الاجابة على بعض التساؤلات المنطقية.

1. كيف تمكنت النواة القديمة للمدينة من استيعاب سكان المدينة وانشطتها داخل سورها القديم وبمساحة لم تتعد 2.5

كيلومتر مربع منذ نشأتها الاولى وحتى بداية سبعينات القرن المنصرم؟

2. لماذا تمددت المناطق الاسكانية للمواطنين بهذه المعدلات القياسية بعد تخطيطها للنواة القديمة؟

أثبتت الدراسة التحليلية أن النمط العضوي لنسيج المدينة العمراني ونموذج المسكن التقليدي ذو الفناء الداخلي والذين استوفيا – عبر التاريخ – المتطلبات المناخية والاجتماعية والدينية هما السبب وراء استيعاب النواة القديمة للمدينة لسكانها وانشطتها طوال الفترة المذكورة.

ومن جهة أخرى اثبتت ذات الدراسة أن النظام الشبكي ونموذج الفيلا يمثلان السبب الرئيسي وراء زحف المدينة العمراني. تتضمن فصول البحث دراسة تفصيلية لجميع العناصر المذكورة وبعض التوصيات والمقترحات المتعلقة بالتخفيف من حدة النتائج السلبية لزحف المدينة العمراني غير المسبوق.

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This dissertation is dedicated to:

To my beloved parents, sister and loved ones,

Thank you for all the love and support. This journey with the grace of Allah has finally come to

an end, and I'm pleased with all the support I was given along the way.

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Abbreviation

| | |
|----------------|---|
| UAE | United Arab Emirates |
| SDTPS | Department of Planning and Survey - Sharjah |
| SUPC | Sharjah Urban Planning Council |
| GIS | Geographical Information System |
| UNDP | United Nation Development Programme |
| Habitat | United Nation Program on Human Settlements |

1. Introduction

The research aims to explore the main reasons behind the phenomenon of urban sprawl that the city of Sharjah is witnessing, which is doubling its growth at an accelerated rate and in a short period of time. This phenomenon was accompanied by a significant decline in the housing density, which led to the consumption of vast areas of land available for construction. The first chapter will deal with defining the phenomenon of urban sprawl and its effects on cities, the research objectives, the most important questions asked, and the appropriate approach. The second chapter (Literature review) will monitor the growth stages of the city of Sharjah, which are divided into three phases (slow growth phase - transition phase - rapid growth phase): the implications of each stage on the city's structure will be monitored, and the main factors driving the rapid growth phase will be examined. The third chapter will include the methodologies used for this research. The fourth chapter will deal with the role of urban planning tools that were used during the sixties of the last century and some aspects of modernity in the disruption of the organic urban fabric of the city and the gradual disappearance of its traditional housing model, and their characteristics will be analyzed in terms of their response to the social and religious conditions of the population and its natural environment, namely the harsh climate conditions.

The fifth chapter will be devoted to studying the grid system and the detached villa model that emerged from the ruins of the city's organic fabric and its traditional housing model, and analyzing their differential impact in perpetuating the low housing density rates and then placing the city on the gates of the phenomenon of urban sprawl and the accelerated consumption of its land stock. The sixth chapter mainly revolves on the use of remote

sensing techniques and GIS to trace the urban growth of Sharjah city. The seventh chapter is devoted to analyzing the results of the surveys that were conducted with a selected sample of citizen engineers and city planners and a segment of non-citizens affiliated with Sharjah city planning. The sixth chapter includes the final conclusion of the research and recommendations.

1.1. The Definition and drivers of urban sprawl in theoretical practice

The rapid growth of a city and the enlargement of its geographical boundary over vast unoccupied rural land is often called urbanization or better known as Urban sprawl correlated with irresponsible, often poorly planned development that destroys green space, causes air pollution due to traffic buildup. The term urban sprawl means more growth than the usual, this excessive nature makes it different from urban growth (Habib & Assadi, 2011). (Stefania, 2011) argues that the term urban sprawl has been associated with phenomenon such as dispersion, peripheral urbanization and ignored the different origins (social, cultural and economic) the European Environment Agency (EEA) stated that “the physical pattern of low-density expansion of large urban areas, under market conditions, mainly into the surrounding agricultural areas” is the best description for urban sprawl. Most of the researchers have agreed that the main drivers of urban sprawl have been: urban population growth, low residential density, grid patterns, economic prosperity, spatial segregation of land uses, leapfrog development and private car dependence. (Chin, 2002) argues that the term of urban forms, sprawl is positioned against the ideal of the compact city, with high density , centralized development and spatial mix of functions. The multifaceted nature of sprawl lead to different definitions. (Downs, 1998) identified sprawl by ten different traits:

- i. Unlimited outward extension
- ii. Low- density residential settlements
- iii. Leapfrog development, which leaves large areas undeveloped but fails to provide functional open space
- iv. Fragmentation of power over land use among many small localities
- v. Dominance of transportation by private automobile vehicles
- vi. No centralized planning or control of land uses
- vii. Widespread strip commercial development
- viii. Great fiscal disparities among localities
- ix. Segregation of types of land use in different zones
- x. Reliance mainly on the trickle down or filtering process to provide housing to low-income households; no low-income households outside central cores

In contrary to the common belief that the increase in the world's population is the sole reason for the sprawl, the usual drivers of urban sprawls range from:

- **Investment Policies:** Construction of interstate highways and policies that stood by the encouragement of building new roads and not maintaining the existent ones are one of the contributors of sprawl
- **Development Policies:** Subsidies for businesses to be relocated and built in rural undeveloped areas contributed to sprawls.
- **Speculation:** Another driver for sprawl or urbanization is urban land speculation in the real estate market. Speculation also invades open spaces near urban areas (Nelson, 1990a, 1992a)

- **Land Use Regulation:** Separating land uses and limiting population densities can contribute to urban sprawl.
- **Development Economics:** For a developer, sprawl is considered more economically cost effective because of the savings related to lower land costs, construction and parking for developments in the outskirts of the city.
- **Demographic changes:** ranging from reduced average household size, population growth, higher car ownership and increased average household income.

Though urban sprawl for the most part has been correlated to its negative impacts on rural undeveloped and agricultural land amongst other things. Some of the impacts may vary from positive to negative impacts which are as follows:

A. Positive impacts: According to well renowned historian (Bruegmann, 2005) sprawl isn't a negative reflection of Americans' selfish souls, but rather a natural result of affluence that benefits even those of the most modest means. Furthermore, Robert Bruegmann presents an argument that states that urban sprawl and suburban development maximizes overall social welfare which in turn helps the poor, while historians who are presenting urban sprawl as a negative phenomenon, Bruegmann says they're overstating their arguments as they're barely running out of land and space and most of the agricultural land being consumed by the sprawl are themselves artificial with negative environmental consequences.

B. Negative Impacts:

- Urban land is being consumed at a faster and an unsustainable rate due to low residential densities.

- Extravagant lengths (hence costs) of streets and utilities networks.
- Include increased car dependency with long hours of commute to reach the outskirts of the city, moreover due to the long hours of commute there has been a recorded increase of harmful emissions into the atmosphere
- Obesity and lack of social interactions have also been linked to urbanization.

1.2. Research Aims and Objectives

- To carry out a detailed evaluation of the current challenges by identifying the key urban sprawl generators which resulted in a major change in Sharjah's structure.
- In the United Arab Emirates, the steady rise in population means that a sustainable approach to addressing the growth of the population must be developed and new ways and methods developed. The City of Sharjah, which is still to be built, will be the principal focus of this study and its urbanization will be traced.
- Tracing the size and trends of Sharjah city urban expansion for the period between 1970-2020 by using remote sensing and GIS techniques.
- To explore the main drivers behind Sharjah City urban sprawl with a special focus on the fatal role of planning tools introduced at the beginning of the 1960's, namely the extravagant low density standards used in both, the city new fabric and the minimum lot size.
- To ensure that sustainability was achieved on both, the organic fabric of the Old boundary of Sharjah city and the old traditional house by responding and modifying climate conditions and preserving the inhabitants' privacy and social

values within their homes and their city at large.

- The main purpose is to ensure that both the contemporary norms of planning such as the grid iron pattern, and the new detached villas are an unsustainable approach, environmentally, socially and economically, that contributed a great deal in the unjustified depletion of Sharjah's urban land and ignoring the rights of both the present and the future generations for housing.
- A new planning and housing set of standards, in relation to the population and building density together with the minimum lots size are to be proposed. These standards should inspire the accumulated community experience and adapt with its natural environment and inherited social values, at the same time they should respect the people's rights to enjoy modern technological innovation. In other words a third pass should be paved for the efficient management of urban land.

1.3. Research Questions

The following three questions will be answered in this paper:

1. What are the forces behind Sharjah City Urban Sprawl?
2. What is the role of westernized planning tools in accelerating urban sprawl?
3. What are the appropriate measures (In my opinion) to contain the negative impacts of Urban sprawl?

1.4. Components of the Dissertation

1.4.1. Literature Review

The main aim of having done a literature review is to understand the subject matter and get educated on the research about to be developed, see how previous researchers have tackled the subject being researched, and finally pickup from where they left off. This chapter will include the urban development of the City of Sharjah from 1883 until our present times, it will also mention into the proposed housing plan for the city of Sharjah and how it estimated the total future demand for residential land in the city of Sharjah until 2042. Moreover, it will vividly touch on the horizontal urban growth of the city of Sharjah and the major factors that may have contributed to the sprawl of the city. Chapter 4 will again provide a literature review on the role of planning tools and regulations in the urban sprawl of Sharjah which will be further detailed in chapter 5 that will include the effects of the gridiron system and the detached houses model (villa) in the city of Sharjah.

1.4.2. Methodology

This chapter will describe the different methods of research used in this study which includes a detailed literature review to review the available references, documents and scientific materials regarding the research topic, including the published literature on urban sprawl in general, and reviewing reports and studies on the planning of the city of Sharjah , designing and conducting questionnaires (surveys) with city planners, engineers and academic experts and an inductive analytical approach to track the changes that have occurred in the urban area of Sharjah by applying the method of digital visualization, space and aerial images, together with spatial analysis using geographic information

systems to measure the urban growth and size during the time stages from before the sixties of the last century to the present time. Chapter 4 will again provide a literature review on the role of planning tools and regulations in the urban sprawl of Sharjah which will be further detailed in chapter 5 that will include the effects of the gridiron system and the detached houses model (villa) in the city of Sharjah.

1.4.3. Remote sensing/aerial photography technology and geographic information systems

Chapter 6 will detail the use the techniques of remote sensing and aerial photography and its aim to plan a spatial study of the scale of the urban stream and its development patterns in the city of Sharjah through the integrations of digital data in accordance with the Geographic Information System (GIS).

1.4.4. Survey

After having done a detailed research on the factors contributing to the urban sprawl with emphasis on the gridiron system and the detached villa model, a questionnaire was designed and a survey was conducted with people from the field of city planning, engineers and academic experts, to understand their views on the most suitable planning patterns and housing typologies for the citizens of the city of Sharjah, and their views on certain solutions proposed that might help resolve or at least slow down the issue of urban sprawl in the city. Chapter 7 will detail and explain the choice of sample intended to be surveyed and the survey, result analysis.

1.4.5. Conclusion and Recommendations

Being the last part of the dissertation, this chapter will include a summary of the results deducted from the research and set of recommendations to help tackle the issue of urban sprawl in the city of Sharjah.

2. Literature Review

2.1. Sharjah City Urban Development

Sharjah Creek is a prominent geographical symbol that shaped the origin and creation of the region, and it was no accident that the growth of Sharjah-since the dawn of history-was directly related to the success of the trade revolution through the natural Arabian Gulf, which affected the intensity of its role and its urban growth pattern.

And since this creek is its commercial outlet, it is natural for the city life to form around it to serve this outlet as well as for urbanization to be wrapped around it, and to relate its development to the prosperity or decline of this commercial function. (Abdul al Kareem.S.M, 1990)

It was logical to use the historical analytical approach with its economic and archeological branches to track the growth of the city over the centuries. This approach is useful in explaining the long cycle of recession that for about a century and a half confined the city within its walls with a built-up area of no more than 0.5 km² till the year 1960, and the cycle that pulled it out of its wall and extended its built up area to more than 292.3 square kilometers in 60 years or more than 575 times, see the table and the map of the town.

The time frame was divided into three consecutive stages:

The First Stage (1833-1960)

The longest periods of urban development remain stagnated since the buildings in the town were confined to that wall, with a scale calculated to amount to approximately 2 km² and an urban mass not exceeding 0.5 km², given that more than a hundred-and-a-half times span after its walls were demolished until 1960 (SDTPS, 1990). This could be explained by the following points:

- The population density was low, as a result of low general health problems which were reflected in high mortality levels for children with low life expectancy, given improvements and declines in urban life.
- The prevalence of Bedouins, who were marked by instability and frequent tribal attacks, during that time of the Arab Peninsula.
- The planning pattern had significant consequences on freezing the city growth, as the city was affected by the characteristics of the Arab-Islamic city, which are the incremental spatial distribution in space and the residential lanes structures in which the residential area takes the form of irregular cellar and narrow winding roads and, on the other hand, shade demands and ecological features summarized in the spatial and intimate ethnographic connections of extended families, both of which contributed to increased density of housing within the city wall.
- In the late 30s of this century, the downturn of the pearl trade, following the discovery of artificial pearls, weakened the economic base of the city which relied mainly on natural pearls trade, causing narrow livelihoods in the city. This led to

the migration of so many people to other places in the Gulf Region. (Anderson, 1991)

- We can also add another equally significant factor, namely the intense rivalry that was witnessed after the introduction of merchant boats as appose to the sailing boats which was used by the local population.
- Since oil extraction began in Saudi and Kuwait in 1946 and in Bahrain, Many people were attracted to these new job centers, and the people of Sharjah were no exception, which intensified stagnant urban development. These migrations were linked to some demographic indicators which led to the weakening of the city's economic structure which included the migration of males within the age group of (15 years old – 35 years old) (Tenagi, 2011).
- At the beginning of the fifties, the obstacles to commercial activities persisted in the city following the sediments and accumulations in the Sharjah Creek that hindered the entry of commercial vessels, this led to the shift of the commercial activities to Dubai.

The Second Stage (transitional 1960-1974)

This time period witnessed a variety of variables at all rates, which were reflected in the speed of Sharjah's urban growth, as it lived through the expected economic boom. These changes can be monitored through the following points:

- Sharjah's Emirate experienced the real launch of petroleum exploration in 1962. In this time, too, oil production has been generating revenue in the Emirates of Abu Dhabi and Dubai, and, of course, the impact of the increase to the town of Sharjah, in particular, as a city next door to Dubai, are evident, in Dubai there are many workers who preferred houses in Sharjah and started migrating in this time.
- The contribution of the Trucial States Council Financing Fund and Kuwait's government to Sharjah's educational and urban ventures, were practical steps in Sharjah's growth and prosperity (Tenagi, 2011).
- This time also saw significant political shifts in the Arab, Gulf and local regions and had profound effects on the city's economic and social development at the end of the transformation stage and the start of the explosive third stage which included:
 - The Israeli-Arab War (June 1967) (DTPS, 1990)
 - The issuance of the British Workers' Government statement in January 1968 in which it announced the withdrawal from Gulf before June 1971.
 - The beginning of the first steps towards the establishment of the United Arab Emirates in one political entity
 - His Highness Sheikh Dr. Sultan bin Muhammad Al Qasimi took the reins of the emirate's rule in January 1972

- October 1973 war, which overturned all economic balances as the result of the huge rise in oil prices which was reflected on the rise of spending rates.

The Third Stage (Urban Explosion 1974 – Present)

As stated earlier, the end of the transitional era saw a huge change in the economic structures of the Gulf countries, as a consequence of the rapid rise in oil prices – and this escalation coincided with the commercial exploitation of the Sharjah Emirates' oil field in 1974.

Investment expenditure in the cities of the Emirate were rising and affected the characteristics of the population and urban evolution began which, as shown in (Table 1 and 9) showing the effects of the boom on the construction industry, made Sharjah a singular example in the circles of urban studies as a city whose size jumped at record levels in a very short period of time.

Comparing statistical information on the amount of housing in Sharjah between 1975-1980 and those in the other Emirates it is found to have been the most relative in building rates, such that the proportion of apartment buildings grew from 5.7 percent in 1975 to 18.8 percent in 1980 and the proportion of residential villas also increased From 15.68% to 28.2%, the percentage of homes increased from 15.9% to 21.30% (Khalfan Al Abdouli 1979).

The construction permits of the municipality of Sharjah are considered important indicators for the growth of the number and form of buildings, including the nature of the economic activity prevailing at each point of time (see Table 1).

| Period | Traditional Houses | Villas | Apartment Buildings | Total |
|-----------|--------------------|--------|---------------------|-------|
| 1971-1973 | 1963 | 277 | 57 | 2297 |
| 1974-1978 | 5130 | 3493 | 301 | 8924 |
| 1979-1983 | 2752 | 3078 | 294 | 6124 |
| 1984-1988 | 1114 | 1870 | 281 | 3265 |
| 1989-1993 | 3022 | 4433 | 1118 | 8573 |
| 1994-1998 | - | 1186 | 1245 | 2431 |
| Total | 13981 | 14337 | 3296 | 31614 |

Table 1: Building Permits Issued By Sharjah Municipality (1971 – 1998), (Source: DTPS, 1998)

As the table indicates, the total building permits issued up to (1998) reached 31,614 buildings, of which 13981 traditional housing, 14,337 villas and 3,296 multi-storey buildings, and as shown in the table, the period between 1974 - 1978 represented the height of the urban boom until 1998, where The percentage of residential building permits issued during that period was 28.2%, which can be attributed to the huge increase in investment spending rates on infrastructure projects in that period, which included roads, drainage, markets, bridges and other projects, these projects paved the way for the city of Sharjah to become a pole of attraction for external migrations, as the city's population increased from 58053 until 1974 to 115,000 people in 1978. (SDTPS, 1990)

The number of building permits issued for industrial establishments during that period reached (413) permits. (SDTPS, 1990).

The period between 1979-1983 witnessed a gradual decline in the number of building permits issued, as it decreased to (6,129) permits by 19.4%, and the continued decrease in building permits issued by a greater percentage between 1984-1988, due to the stability of the construction movement. Then a new boom in the construction movement began 1989-

1993, when building permits issued rose by 27.1%. About 22 residential areas, 7 commercial areas and 19 industrial areas emerged during this period, all of them in the eastern direction of the city.

2.2. The housing plan for citizens of Sharjah (2017 - 2042)

2.2.1. Housing needs

The housing plan for citizens of Sharjah cities (2017) estimated the total future demand for residential land in the city of Sharjah until 2042 by about (28,353) housing units. The land area required to meet this request was estimated at about 53737 hectares, (537.4 km²) (in the event that the residential plot area is allocated to 930 square meters. The available area within the administrative boundaries of the city for the continuation of the residential expansion was estimated at (26736 hectares) (267.4 km²). It means that there is a deficit in the space required for the extension of the housing by about (26,461 hectares) (264.6 km²). The plan report concluded that the number of years remaining to meet residential land applications within the city's borders is 12.5 years. Therefore, the plan saw the necessity for the city to jump over the threshold of its boundaries to face the deficit in the aforementioned area.

2.2.2. Proposed policies to accommodate the housing need

- a) Horizontal and vertical urban densification.
- b) Upgrading degraded areas in urban areas (rehabilitation)
- c) Planning new housing extensions.
- With regard to the urban densification policy, the plan suggested re-dividing residential plots that have been allocated but not yet built. The total number of these

plots reached (12,809), with a total area of 2,222 hectares. The plan expected that the re-division process would provide (27,212) new plots of semi-detached villas.

- With regard to the policy of rehabilitating degraded areas, their number has reached (12) areas with a total area of (1195) hectares, and (6433) new plots will be added.
- With regard to planning new housing extensions - the plan suggested the following: -
 - a) Extension areas within the administrative boundaries of the city: there are (12) areas - the net area (1314 hectares) - containing (16215) residential plots with areas ranging between 800 - 1000 square meters.
 - b) Areas extending outside the administrative boundaries of the city: It includes the Shonouf area 3 and the Blida suburb (within the boundaries of Al Bataih municipality) - the total net area (1478) hectares - the number of residential plots (14780) plots with an average area of (1000) square meters.
 - c) The total number of plots of land is (34918) plots.

2.3. The phenomenon of horizontal urban growth (Urban Sprawl)

There is no doubt that the current urban structure of the city has been able to accommodate the unprecedented urban boom that the city has witnessed during the past four decades, but the city's continued growth on a monotonous automatic approach towards the eastern direction mainly with the housing plan devoting to the same approach will put the city in front of the phenomenon of urban horizontal spontaneous flow (urban sprawl) Which has become a reality.

There is no doubt that there are factors that have contributed to the formation and consolidation of this phenomenon in Sharjah, which can be accomplished as follows:

2.4. The Major factors that may contribute to Sharjah City Sprawl

2.4.1. Demographic Changes

Demographic factors have contributed immensely to Sharjah city sprawl. Its population increased from (20,621) inhabitants in 1968, then leapt to (58,053) according to the first official census of the year 1975. By the year 1980 its population was (125,149) inhabitants, then reached (320,113) inhabitants by 1995 (Central Department of statistics – UAE). According to the last census of 2015 Sharjah city became one of the million-plus cities club when its population reached (1,273,353) (Department of Statistics-Sharjah, 2015). In regards to immigration to Sharjah city, their numbers increased from (37,563) migrants in 1975 to (98,822) in 1980 and to (145,293) in 1985 that means that they quadrupled in a period of ten years on a rate of 386% compared to (1975) figures (Central Department of statistics – UAE). The number of non-nationals among the population of the city according to 2015 census was (1,565,055) which amounts to (87%) of the city's total population.

According to the Directorate of Planning and Survey the statistics showed that (50%) of the workforce in UAE was involved in the construction sector. This can interpret the enormous growth of buildings which in turn led to the huge expansion of the physical structure of the city.

2.4.2. Lifestyle Trends

- Significant trends in lifestyles and attitudes of the national population as the result of UAE affluence and rising standards of living after the oil boom era (1973) enabled the majority of families to afford more than one private car and house located a considerable distance from work in the city center. The urban and housing indicators survey conducted by Sharjah Planning Department in (2005) (Planning & Survey department, 2005) revealed that the average car ownership in Sharjah city was 1.63 per household.
- The desire to live in a homogenous community, this trend expressed in terms of ethnic terms. The Emirati residents argue that they have different habits and characteristics that need to be preserved by not mixing with the other nationalities coming from hundreds of countries. The government contributes to perpetuating this trend through decisions that prohibit renting houses to the expatriates where citizens live (Sharjah Executive Council Decree No. (2), 2000). This approach coincided with the citizen's desires to obtain large houses to transform the citizen housing areas into huge urban blocks.
- With the dwindling popularity of the extended family, the younger generation wish for greater independence and privacy than the communal courtyard life could provide. Modern households mostly prefer the status of living in new villas.

2.4.3. Low Residential Densities

This factor represents the main theme of this research. It would be subject to more detail analysis in chapter 4.

3. Methodology

3.1. Literature review method

Literature review in the broad sense of the term describes a method of reading and analyzing a topic of research that one wishes to have a full understanding on, to be able to start his/her quest whether to have a better understanding and add to their personal input or to help solve a problem. Serving as the basis of any research, literature review takes into consideration previous works by scholars and intellectuals in the form of academic papers, books, journals and governmental publications. The literature review employed on this research dove into the historical background of the city of Sharjah. It was reasonable to trace the development of the city over many centuries with its historical study, economic and architectural divisions. This literature review method is helpful in describing the long period of recession that, for around a century and a half, the city was restricted within its walls with a built-up area of no more than 0.5 km² until the year 1960, and the cycle that brought it out of its wall and expanded its built-up area to more than 292.3 square kilometers in half a century or more than 150 years. By the lack of relevant data for the city's population growth until 1968, the importance of pursuing a theoretical method rises and its economic progress can be tracked for many periods. In other words, detailed review of archeological sites, city walls, forts and old mosques, with an analysis of the economic history of the city, can give insight on some of the indicators of its urban fabric and the development of its urban mass.

The main aim of having done a literature review is to understand the subject matter and get educated on the research you are about develop. See how previous researchers have tackled the subject being researched, and finally pickup from where they left off.

Important to note is that the literature view has been divided into two parts:

- **First:** This part will include the urban development of the City of Sharjah from 1883 until our present times, it will also touch the proposed housing plan for the city of Sharjah and how it estimated the total future demand for residential land in the city of Sharjah until 2042. Moreover, it will vividly touch on the horizontal urban growth of the city of Sharjah and the major factors that may have contributed to the sprawl of the city, ranging from demographic changes, lifestyle trends and low residential densities
- **Second:** This part will be after the methodology chapter which will include an analytical analysis on the organic urban structure of the city with emphasis on the housing patterns and the number of dwellings which later on transformed and evolved with the involvement of the British consultant Halcrow where they have been associated with the planning of the city since 1955, where they played an important role in re planning the city. Moreover, a light was shed on the characteristics of the traditional dwellings type in Sharjah with an emphasis on its concept plot sizes, architecture and the gradual fading out of this traditional type of housing. Finally, the grid pattern system and the detached houses model in the Sharjah will be explained.

3.1.1. Advantages of Literature review

Some of the advantages using the literature review approach for this dissertation included:

- Understanding how previous scholars have tried to mitigate the issue of urban sprawl, its negative impacts and the factors that they considered when approaching the problem.
- Literature review from plenty of sources helped fill the gap in history when it came to the birth of the city of Sharjah and how its urban mass grew.

- Theoretical research about planning patterns inflicted on the city by the British Consultant Halcrow (1963) and the land use regulations placed, helped in deducing the main factors that led to the sprawl.
- Spending time and effort on literature review is bound to put the researcher at a better clutch of his/her topic not only by filling the gaps of information but also by swaying the researcher to determine which methodologies have been used previously on the topic and if those methodologies can be used to further help develop the research.

3.2. Survey Method

The survey approach have proven to be one of the most uncritically proclaimed and trustworthy methods of research throughout the years. Scholars and well renowned researchers in the field of urban planning specifically have almost always used questionnaires as a helping tool in their researches.

Though answering surveys might seem as a simple task but designing them would prove different. There are two components to every survey that come to play when preparing a questionnaire. Firstly, the type of questions being asked and how will it help the researcher further his understanding about a topic and secondly, choosing the intended sample or the respondents who will answer the survey.

In this dissertation a survey was designed, conducted and its results analyzed on chapter 7. The questions of the survey mainly covered three aspects which included:

- **The first part:** covered questions related to the traditional organic patterns that characterizes the ancient cities in the region.

- **The second part:** included questions related to traditional housing, villa model and planning conditions (average area - height etc.)
- **The third part:** includes housing options and their prioritization.

Due to the complexity of the research topic, a random sample couldn't have been used. Instead the sample chosen included people related closely to the field of planning and architecture with a majority of the sample being employees from the Department of Planning and Survey and employees in the Urban Planning Council. The survey was formulated using an online tool and was distributed through social media outlets to the intended sample.

3.2.1. Advantages of the survey method

Some of the advantages of the survey for this research included:

- To properly have an understanding of the preference of the concerned people in regards to the planning patterns at hand and the sizes and of the plots.
- The simplicity of answering the questionnaire online through social media outlets.
- The simplicity to collect the data and analyze it when using an online tool.
- It is a very cheap and reliable method of research.

Some of the limitations faced when conducting a survey is the impatience of people to take a minute to answer the questionnaire. And that was kept in mind when designing the survey, to keep the questions as short and to the point as possible, to prove as less of a hassle for the respondents. Also the restriction of direct communication with respondent due to the health ban measures linked to the covid-19 pandemic.

3.3. Remote sensing technology and GIS method

Remote sensing is the science of studying targets, phenomena and spaces and obtaining information about them without physically coming into contact with them. It includes the processes of recording the rays reflected off targets by various sensors and analyzing them to obtain the required information.

It is a branch of geographic information systems that deals with data entry and storage, satellite images (the most commonly used remote sensing) are a source of this data.

Geographic information systems are a method of storing, analyzing and managing remote sensing products.

Remote sensing, using the available software, can apply and execute all GIS operations without using specialized GIS programs. Geographic information systems can also implement their operations without the need for remote sensing, using other means (maps, charts, data, and field surveys).

In fact, there are two sciences that must be integrated between them to obtain the best results.

The outputs of remote sensing, the most important of which are aerial photos, are used in many tasks and studies:

- Follow-up and study of the urban and urban growth of cities and residential complexes
- Managing and monitoring the implementation of large projects
- Study of natural geographical phenomena (desert encroachment)

- Tracking and identifying violations, lack of discipline, and adherence to approved areas
- Determining danger sites at torrents and mountain slopes
- It covers vast areas of the earth's surface, its resources, and its geographical distribution.
- It illustrates the changing phenomena such as: the evolution of floods, fires, and traffic.
- Used in mapping, and in building geographic information systems.
- It is used in urban planning processes, and for monitoring environmental and human problems.

Remote sensing technique has been a major key in this research to properly understand the growth of the urban mass of the city of Sharjah. By tracing the added land uses of the city from the end of 1960 until 2019. The stages of growth were taken at ten year intervals for each period and finally collected onto one comprehensive map showing the different stages of growth in relation to years.

3.3.1. Advantages of the remote sensing/ aerial images techniques and GIS

Some of the advantages of using remote sensing techniques in this research included:

- Enables fast and accurate measurements of distances, areas and altitudes.
- A better understanding of the growth pattern throughout the years
- It gives a permanent source of information that enables us to study the phenomenon at any time.
- It clarifies data that the naked eye cannot see.
- It provides a visual representation for a better analysis.

3.4. Selection of methodology

The phenomenon of urban sprawl has a vast library of literature from around the world. This paved the way to make a variety of comparisons and permitted the appropriate choice of techniques for the case studies. Most of the research papers used different types of techniques, such as surveys, interviews and aerial/satellite images to trace the development and urban sprawl through different time periods.

For this research to reach the solution and understanding intended to fulfill its aims, the researcher should consider the available sources, papers and scientific resources on the subject of study and articles on urban sprawl in general as well as review reports and research on Sharjah city planning. Design and conduct questionnaires with local planners, engineers and research specialists and assess the data gained. Moreover, through the use of remote sensing techniques visually trace the growth of the city boundary with time.

Thus for the selection of the methodology, it was concluded that the most suitable would be the literature review method, survey method and the remote sensing and use of GIS.

4. The Role of Planning Tools and Regulations in Sharjah's Urban Sprawl

The planning tools and land division regulations that have been applied in Sharjah since the second half of the sixties of the last century have played a major role in perpetuating the phenomenon of urban sprawl in the city, and that is through the low density adopted by the aforementioned tools and regulations, specifically with regard to the following conditions :

- Grid Iron Pattern
- Minimum area of the residential plot
- Street lengths and widths
- The size of the open spaces
- The percentage of land coverage
- Building setbacks

Before studying the decisive effect of these conditions and regulations on exacerbating this phenomenon, we consider it necessary to shed light on :

- **The traditional urban fabric of Sharjah City**, which remained confined within the boundaries of its ancient wall from its first inception to the stage of crossing this wall at the end of the sixties of the last century, and the factors that helped confine the city.
- **The traditional housing that used to accommodate** extended families over the centuries within small size plots, and we will see how the urban fabric of the city and its housing type were a direct reflection of the prevailing climatic conditions and the social and religious characteristics of its residents.

4.1. The Organic Urban Structure of the City of Sharjah until the end of the (1960s)

Like other coastal Gulf cities, the city of Sharjah has grown through an organic fabric that combines homogeneity, harmony and cohesion, and is surrounded by a fully defensive wall, where it is connected to the outside through gates, and the main roads start from these gates towards the city center, and branch out from these winding paths most of them are open on one side, and their width ranges between (1.5 meters - 6 meters). These narrow paths (Sikkas) are a clear manifestation of adaptation to harsh climatic conditions due to the high temperature and humidity levels, as these narrow alleys help to retain the shade for the longest period possible, and also allow the passage of the winds easily through the urban fabric. . These paths usually go between north to south, or between the direction of the northeast to the southwest to end at the Sharjah Creek, allowing the prevailing northern winds to pass through them, and the narrowing of these paths also helps the speed of the wind blowing, which creates a relatively comfortable environment.

On the other hand, dividing the city into Fareeg (neighborhoods) inhabited by groups linking them with ties of kinship does not require connecting them by wide streets.

Amjad.B (1986) indicated that the built up area in the Islamic old town determined by the house high walls, which provides privacy from the outside world. Because these walls need no windows, and the neighboring structure may be set on the side without lost space. The system of built up rectangular net creates a logistic city plan and formal unity.

In terms of land use in the nucleus of the city, the neighborhoods of Al-Marija - Al-Jubail - Al-Shuwaihin and Al-Majarah were formed in addition to other neighborhoods that arose at a distance from this nucleus, such as the Al-Khan and Al-Layyah districts towards

southwest by a distance of 2 miles, separated by the Sharjah Wall from the core. The village of Al Fisht (a mile away) and Al Hirah (3 miles away) also originated northeast of the nuclei. In the middle of the city is the fort, the mosque and the market (Anderson, 1991).

The residential buildings formed most of the urban fabric of the city where there were two residential types, the first type of dwellings of Arish (from the trunks of palm trees) and represented the great majority (as the following table shows). The other type of housing constructed with coral stones represented (18% of the total housing). The two-storey residences at the end of the nineteenth century and the barjeel formed the skyline of the city during that period.

The following (Table 2) shows the housing patterns and their number in the city of Sharjah in (1831)

| Neighborhood/Community | No. of Houses | | Total |
|------------------------|---------------|----------------|-------|
| | Palm branches | Stone & Gypsum | |
| Sharjah | 1600 | 450 | 2050 |
| Khan / Al Layyah | 250 | - | 220 |
| Al Heera | 250 | - | 250 |
| Total | 2100 | 450 | 2550 |

Table 2: housing patterns and their number in the city of Sharjah in (1831), (Source: Al Ghasimi, 2014)

The important impact of Islamic legislation in shaping the Arab and Islamic city cannot be overlooked through jurisprudential legislation, the most prominent of which are :

- **Preemption right:** which preserved the social fabric of Fareej (the residential neighborhood) and kept it free from strangers, by giving the neighbor preference in buying his neighbor's house if it was offered for sale. Thus, this legislation contributed to preserving the identity of the residential group spatially and temporally.
- **Inheritance:** and its effect on the division of lands into small units, according to the inheritance rules specified by the Holy Quran, which specified the inheritance of the heirs according to the relationship of kinship with respect to the deceased inheritor.
- **The right of passage:** where Islamic jurisprudence differentiated between the crossing or the penetrating street (the way of the Muslims) and the path (the Sikka) with a closed end, which is considered exclusive to the dwellings overlooking it.

There is no doubt that the urban fabric of the old city of Sharjah is a natural manifestation and reflection of the interaction of all the aforementioned climatic, environmental, social and religious dimensions, and was able to accommodate the natural growth of its inhabitants, its jobs and its service needs over the centuries. It also enables its humans to create planning patterns that adapt to its natural environment and preserve its social and religious characteristics.

4.1.1. The beginnings of the transformation in the traditional urban fabric of Sharjah

In general, and as we mentioned earlier, the Arab Islamic city has grown through slow gradual development processes governed by social, cultural and religious norms and traditions, which in turn produced flexible and simple regulations and mechanisms to

secure the application of these norms, and this tendency provided the opportunity to form the stable urban structures that characterize the Arab Islamic city (Al-Hathloul 1982).

The urban fabric of the city of Sharjah preserved that distinctive configuration of the Arab city throughout the ages until some intertwining factors emerged that caused the gradual loosening and degradation of this fabric, and we will briefly shed light on these factors, with some detail on the decisive role of urban planning mechanisms and regulations in vanishing and finishing Curriculum on the traditional fabric of the city.

4.1.2. Manifestation of Modernity Impact

A. Sharjah Airport 1932

It is considered one of the first sparks of modernity in the country in terms of architecture and types of buildings unprecedented in the history of the built environment in the cities of the country (Mansouri and Mashari 2005). On the other hand, the construction of the airport at the edge of the eastern side of the city may have an indirect impact on the economic structure of the city by opening up opportunities to work is typical of some of the city's population, as well as mobility and commercial activity caused by the private airport during World war II, And the result of it necessarily from the increased movement of vehicles around the city. On top of all that, the airport served as a window through which Sharjah's conservative society overlooked the outside world, friction and interaction between new and multiple cultures, providing one of the conditions for an open city (Cosmopolitan City), which is characterized by tolerance and acceptance of the other, and of course being influenced by its cultural and urban patterns.



Fig 1: Sharjah Airport, UAE, (Source: Sharjah National Archive Center, 1932)

B. British Royal Air Force camp in Sharjah 1971 - 1940

The camp was established during World War II in (1940, as an agreement was signed in (1951) between the ruler of Sharjah and the British government in exchange for an annual rent) to protect the airport and to serve the war effort (The Digital Archive of the Arab Gulf)

It is located to the north of the airport and borders the city from the eastern side. It was a small modern city that includes, in addition to the military installations, about (1200) housing equipped with electricity and air conditioners, where the camp has an electricity generation station. In 1955, the governor's palace was supplied with electrical current. The camp also includes a 50-bed hospital (Aisha Al-Qaidi, 2018)

It is worth noting that the camp provided job opportunities for some of the city's residents. The social and economic transformation brought about by the camp, with its aforementioned facilities, cannot be counted on the urban fabric of the city by raising the aspirations of a sector of the population towards new types of housing and residential environments, which illustrates the location of the camp. (Tengai.K.S, 2011)

C. Oman Coast Force (1952)

It was established in (1952) by Britain to protect oil exploration operations, and to maintain security among the tribes. Its location was in the current Qasimiya area, then the camp moved to the Al-Mirqab area, and it was under British command consisting of (150) individuals, assisted by Jordanian forces of (51) individuals, and the total of the camp's members reached (625) individuals in 1960.

Its services covered all the territories of the Trucial States by using land rovers and Bedford cars, and of course, the camp placed heavy burdens on the fabric of the city of Sharjah through the movement of its people and automobiles. (Wikipedia)

D. Modern educational renaissance

The city witnessed the first regular school in the Trucial States, which was established by the State of Kuwait, and then the Egyptian Educational Mission Schools (1958).

The Air Force has also set up a commercial school to teach management skills and vocational training.

E. Council of Rulers of the Trucial States:

The Council was established in (1952) with the initiative of Britain, to become an entity that brings together rulers to confront the emerging economic changes, which were emerged with the beginning of oil exploration together with Britain's response to global pressures for neglecting the development of the UAE for more than a century. The headquarters of the Council was in the building of the British Commission in Sharjah during the period (1954 - 1964), and then moved to Dubai. Britain contributed to financing its budget. It has also ensured that the ruler of Abu Dhabi contributes 4% of the oil income to support the council's budget. Among the most important projects financed in Sharjah was the improvement of the Sharjah Creek, and the British consultant (Halcrow) was commissioned to study the development of Sharjah Port (1955) (William Halcrow, 1969)

F. Sharjah Pier (1960)

Based on the recommendations of the study prepared by the consultant Halcrow, the Sharjah government established the first berth of Sharjah Port with a length of (850) meters into the sea and a breakwater, to be able to receive only two ships at a time (Aisha Al-Qaidi, 2018), and it has contributed to the recovery of trade movement that was affected by the burial of Sharjah Creek with sand.

G. Sharjah Municipality:

Sharjah municipality was established since (1927) with the voluntary initiative of one of its sons, who were able to visit Cairo, Beirut, Kuwait and India and introduced some municipality regulations in the fields of public health and city planning. It's services revolved around monitoring building violations, building heights, encroachment on roads and protecting the privacy of residents.

The municipality's headquarters was initially in a small shop in the old market, then it moved to a house near the market in the early forties, then the municipality developed into a department in 1955, and in (1962) an expert from Sudan in the field of municipalities was brought in, where he submitted a comprehensive report to organize the municipality and proposals to finance its services through fees. The municipality had appointed an engineer in (1961) to monitor construction and planning affairs (Aisha al-Qaidi, 1986).

Perhaps the most notable event related to the topic of my research was the commissioning of William Halcrow and Partners at the end of 1962 to prepare a preliminary study for the Sharjah master plan, to study its current situation and preliminary proposals for its future growth prospects and trends.

The conclusion is that the aforementioned manifestations of modernity have combined and contributed to the impact on the urban, social and economic structure of the city of Sharjah, which has been confined within its wall over the centuries with a built area of no more than 2.5 km, and along a narrow strip of width less than one kilometer, and its economy depends entirely on the profession of hunting Fish and pearl extraction. The aforementioned factors have had a recurrent impact on the city's economic structure as a result of job opportunities that were provided in modern facilities around the city's periphery and also as a result of the return of the city's youth from some Gulf states. Oil (Saudi Arabia - Kuwait - Bahrain), after the discovery of oil in Abu Dhabi and Dubai, who brought with them some new cultural and social values. They also contributed in the increasing population density and the degree of crowding.

The gradual use of the car has resulted in the inevitability of widening some streets and thus the gradual rupture of the urban fabric. The matter developed into the beginnings of the complete removal of its assets after the application of imported planning mechanisms and systems alien to the reality of the region. This will be detailed in the next section.

4.2. The impacts of master planning tools in changing the traditional city structure

4.2.1. The Master Plan of Sharjah (1963)

The British consultant Halcrow has been associated with planning the city of Sharjah since 1955 when he was commissioned by the ruler of the emirate and funded the Trucial

Emirates Council to study and develop the Creek and Port of Sharjah. It is no secret that Britain is the main financier of the Council's budget.

In (1963) the same consultant presented a preliminary vision that included the outlines of the development of the city of Sharjah, and the proposal indicated that the city plan would accommodate between 20000-30000 people in its first phase, until its capacity reached about 60,000 people in the second phase. (See the proposed preliminary master plan (Fig. 2)

The map included a proposal for seven main uses, including: city center - residential areas - industrial area - aviation center - port - hospital - radio station. He suggested a grid pattern for the city by dividing its immediate surroundings into sectors in the form of rectangles bordered by longitudinal and transverse streets with an average area of 1.5 km² for any of them, and the aforementioned land uses were distributed through the proposed sectors. The following are the most prominent uses:

- **City Center:** includes the palace, a central mosque, a proposal for a service center that includes government departments, and a commercial center that includes corporate offices, banks, hotels, wholesale trade, a market, in addition to residential use. The city center was divided into five sectors that included the existing city at that time. Accordingly, the proposed center was the beginning of the end of the traditional city's fabric.
- **Housing:** It was proposed to distribute the population in the first and second stages into (10) sectors denoted by alphabetical characters, each of which includes between 2,500 and 5,000 inhabitants (Fig. 2).

- **Industry:** It was suggested that two sectors be allocated for the development of the industry.

We will also see later the difference that resulted from the proposed sector system, the low population density standards, and the resulting grid pattern in exacerbating the phenomenon of urban sprawl in the city of Sharjah.

4.2.2. The Master Plan (1969)

The rule of the Emirate of Sharjah was assumed by Sheikh Khalid Al Qasimi (1965 - 1971), who warned that the emirate was on the verge of a new era (Aisha al-Qaidi, 'no date', p. 20), with the approaching unification of the coastal emirates into a single entity, setting in motion its expected independence from Britain, and this coincided with the rise in oil production in Abu Dhabi and Dubai, and the promising exploration in the Emirate of Sharjah. The ruler believed that the city of Sharjah should be prepared and equipped to accommodate the results of these political and economic transformations. Therefore, he hastened to agree with the consultant Halcrow to update the initial study that he prepared in (1963) and develop it into a master plan that defines the current status of the city and its future growth prospects. The consultant completed the scheme in November of 1969 and was presented in the form of a written descriptive report, and a file containing diagrams and illustrations. The following are the most prominent components of the report:-

- a) Adopting the system of planning sectors according to a study proposal (1963)
- b) Adopting the road structure (Grid Pattern) according to a study proposal (1963)
- c) The number of the city's population was estimated at (30,000) people and their number was expected to rise to about (60,000) people in 1980, and the proposed structure would accommodate the expected increase, despite the distorted location of the two RAF camp sites in the east of the city, And the Oman Coast Force (TOS) camp in the east which were restricting the expansion of the city in both directions.
- d) The commercial areas were to be concentrated around Al Zahra Square, while the administrative center and the investment area (residential towers) occupy the place of the existing urban fabric.

e) Based on the previous point, the consultant proposed a comprehensive re-planning for the existing city (William Halcrow, 1969). He provided exemplary illustrations of the stages of the re-planning process (Fig. 3), ironically and for ((discharge registration)) the report recommended preserving the character of the city when implementing the re-planning project.

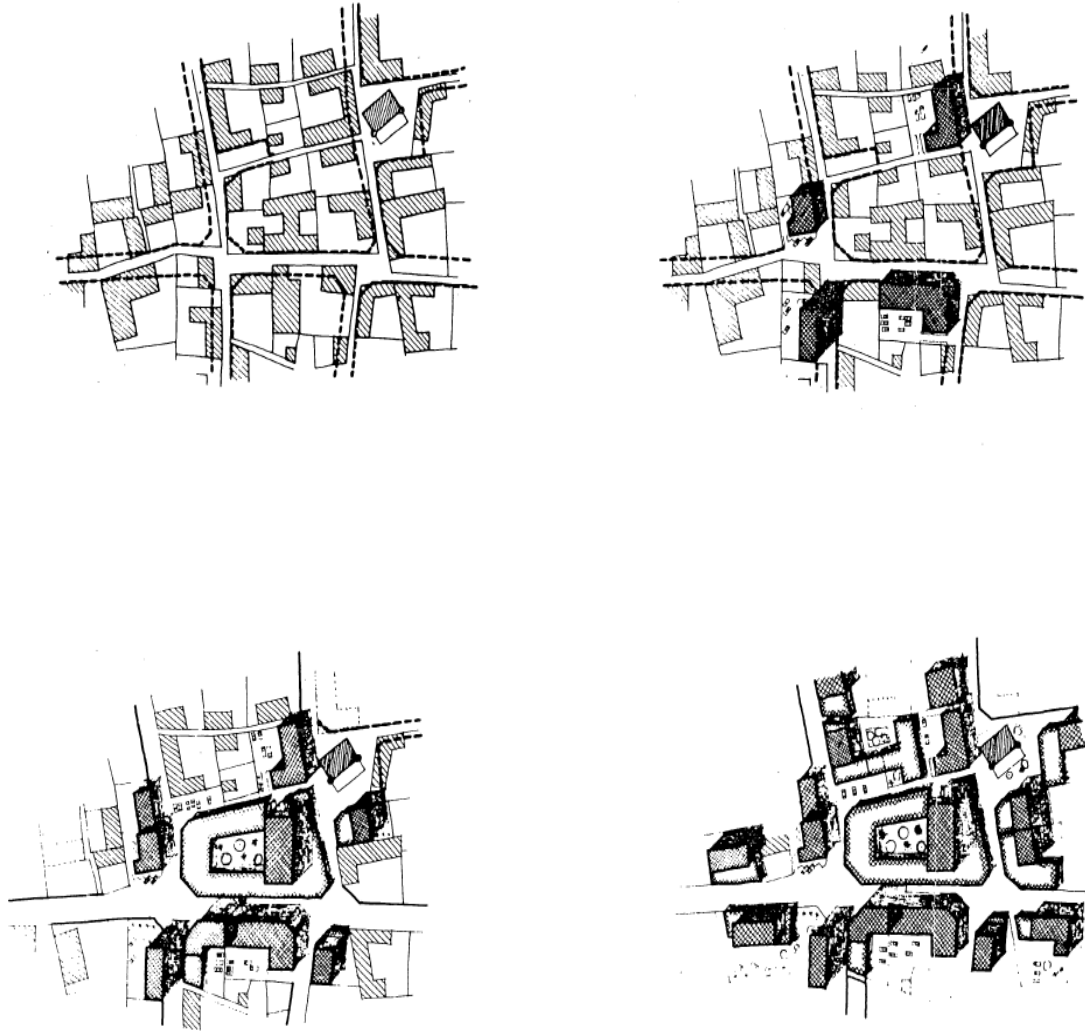


Fig 3: Illustrations of the stages of the re-planning process, (Source: DTPS, 1969)

(Al-Mansouri and Mushari,2005,P. 83), indicate that the plan relied on the assumption of providing funds from the expected oil production revenues to finance the re-planning project, especially compensation for those affected by the removal and the construction of infrastructure.

Indeed, it is noted that the proposed street network did not take into account the urban fabric of the city, and was designed according to the grid system pattern, which includes regular squares that replace the existing organic planning. (Al-Mansouri and Mushari,2005,P. 83) compare the proposals of the consultant Harris, who prepared the plans of Abu Dhabi and Dubai, with the plan of Halcrow on the re-planning project, as the first emphasized the preservation of the urban fabric in the two cities and proposed future development in vacant areas in the city, while Halcrow's proposal tore apart Sharjah's urban and social fabric.

(Anderson, G, 1991, p.91) attributes the idea of the project to re-plan the city in an uprooted way to the ruler, as a symbol of backwardness, as all the rulers of the coastal emirates coincide with the vision of their cities becoming global and modern. While describing Halcrow's proposal to preserve the ambiguous character of the city. The lack of seriousness of Halcrow's proposal can be confirmed by noting the proposed street network, and the proposed interim drawings for implementing the re-planning project.

The implementation of the plan began immediately after receiving the report from the consultant, and the director of the municipality at the time stated that (the work moved from maps to the streets, and at the end of (1969) Sharjah turned into a huge workshop for planning the entire city) (Aisha al-Qaidi, 'no date', p.20) and building permits were halted for a period of 6 months to avoid compensation claims

Some streets were paved, especially Al-Orouba Street, which was transformed from a sandy road 15 feet wide at the beginning of the sixties to a paved road with a width of 120 feet (Aisha al-Qaidi, 'no date'). (Anderson, G, 1991, p.91) believes that the re-planning project faced major obstacles, which were the following reasons:

- The dispersal of properties and the great variation in their areas as a result of the Islamic inheritance system, which hinders the development of an integrated urban project according to the re-planning proposal.
- The opposition of some of those affected to the decision of removal, expropriation and the compulsory purchase decision.
- The lack of financial resources at that time to meet the compensation of those affected and to implement the infrastructure
- The structure of land ownership is complex, with the government owning only about one third of the land in the Old City, while two thirds of the land is privately owned

The most important obstacles of the project, represented in the dispersal of properties, the disparity of spaces, and the widening of the streets, were addressed by planning an area for the removal of some of the affected people outside the city limits established to vacate part of the buildings to be removed and to provide suitable areas to start the re-planning process. The spill over area was named "Maysaloun". This step represents a milestone in the history of the urban fabric of the city of Sharjah, as the city for the first time crossed the boundaries of its urban mass since the creation of its first nucleus. The process of systematic removal of the city's urban heritage began, in which not even buildings of historical interest remained, such as the residence of the British Political Agent, and the fortress of Sharjah, - with their historical symbolism,- which were removed in order to

extend the Burj Street to connect between Al-Orouba Street and the Corniche and to be overlooked by the city's administrative center with its sixteen towers.

As noted, the transformations witnessed by the city of Sharjah since the 1930s have produced a new reality with which the matter of preserving the structure of the old city and its urban fabric has become impossible, as some aspects of modernity have weakened some established social axioms, most notably the dissolution of the phenomenon of the extended family and the desire of new generations to have detached housing. On the other hand, the gradual use of the car led to the inevitability of expanding and widening some streets at the expense of existing buildings. This resulted in a rise in residential and population density and a decrease in the areas of land needed to accommodate the housing demand. This in turn led to the city crossing its historical wall by planning a new spill over area "Maysaloun" using the Grid Iron system.

Then the matter evolved with the frequency of economic and demographic variables, by introducing the Western master planning pattern that rapture the remaining traces of the traditional city and establishing the planning grid system as an alternative to its historical urban fabric. This pattern coincided with the standards, regulations and conditions for dividing the land, standards of housing density and building requirements to place the city on the threshold of the phenomenon of urban sprawl, as will be detailed in the next chapter.

FIG. 2.7: THE MASTER PLAN: SECOND PHASE DEVELOPMENT (After Halcrow's(1969)

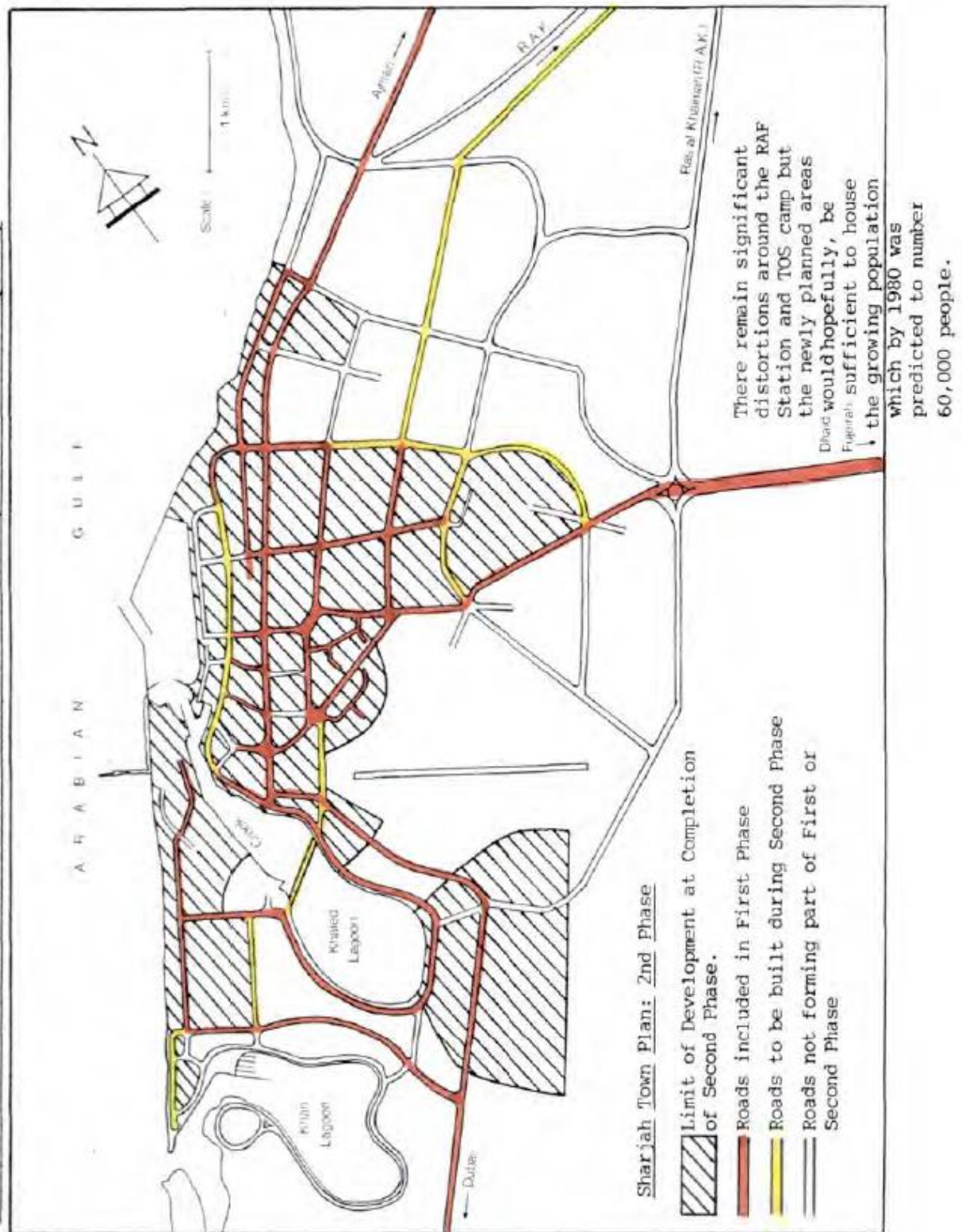


Fig 4: Master Plan of Sharjah, Second Stage, (Source: DTPS, 1969)

FIG. 2.8: THE MASTER PLAN: ROAD NETWORK (1969) After Halcrow's

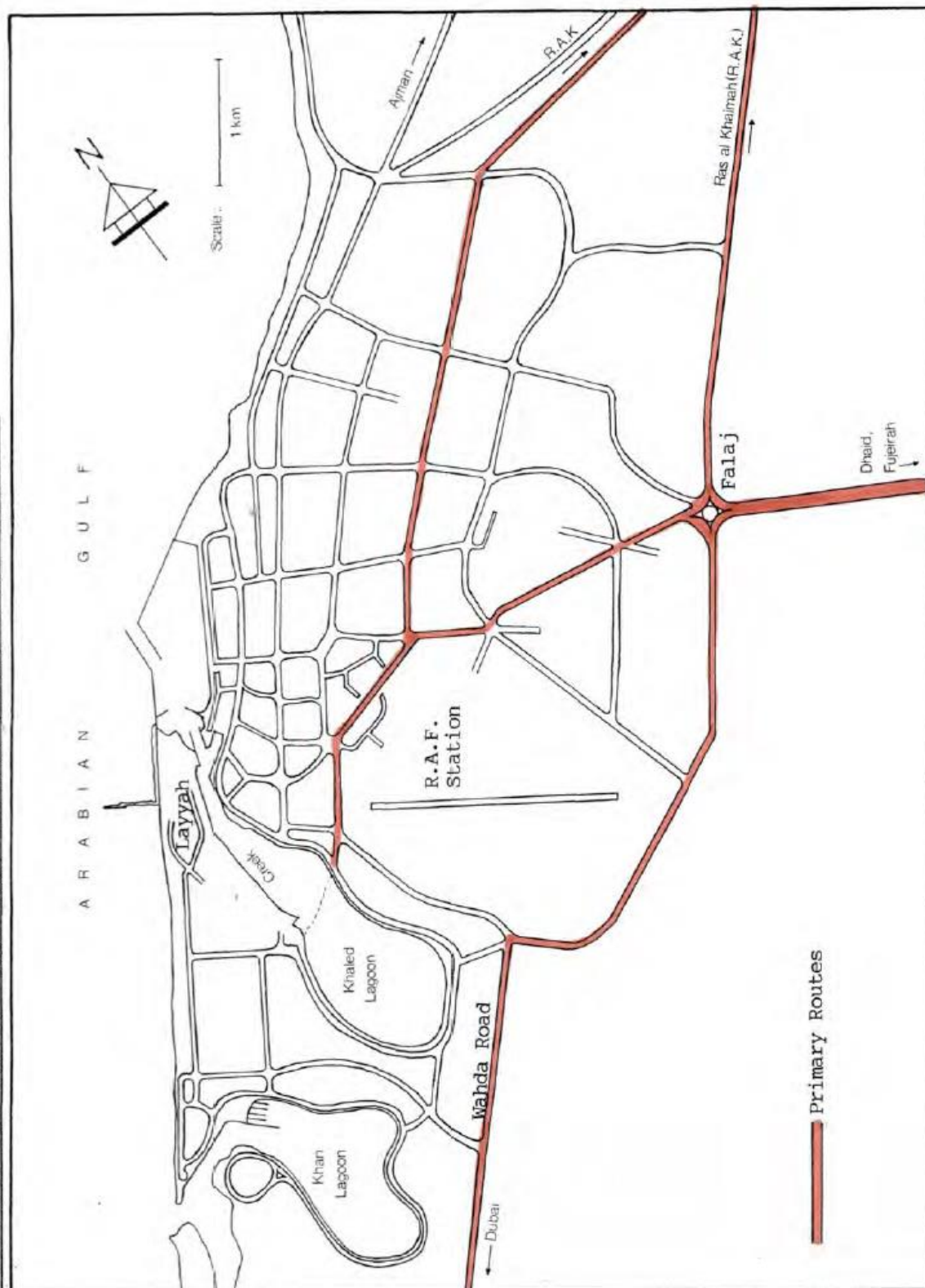


Fig 5: Master Plan of Sharjah, Road Network, (Source: DTPS: 1969)



Key :





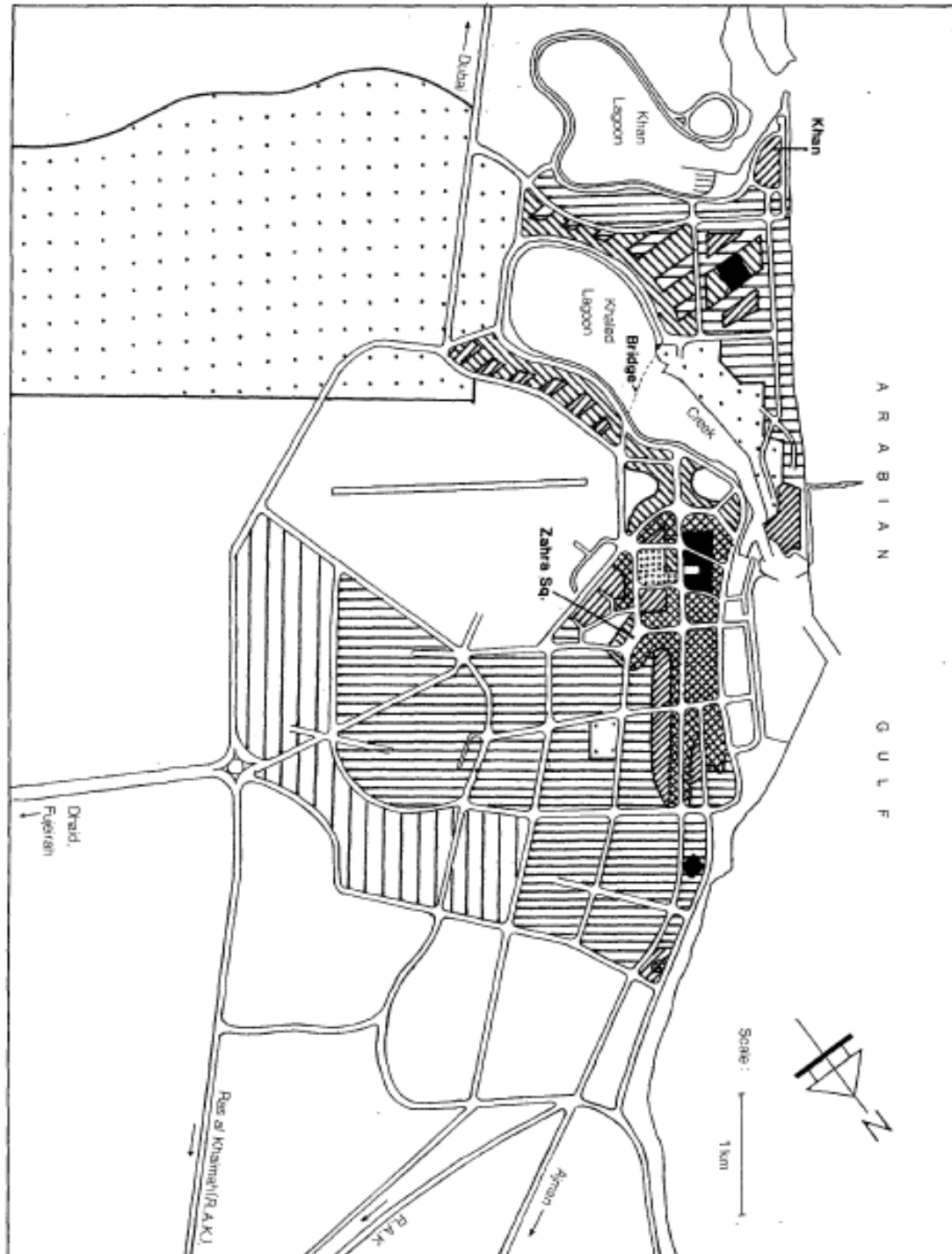
- | | | | |
|---|-----------------------------|---|---------------------------------|
|  | Primary Distributor Roads |  | Occupied Plots |
|  | Secondary Distributor Roads |  | Plots allocated, but unoccupied |
|  | Water Mains | | |
|  | Contours (feet) | | |

Fig 6: Road Network Distribution, Sharjah, (Source: DTPS, 1969)

Key:

| | | | |
|--|------------------|--|----------------------------------|
| | Industrial | | Commercial |
| | Educational | | High Density Residential |
| | Horticultural | | Low Density Residential |
| | Civic and Public | | Mixed Residential and Commercial |



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4.3. Traditional Houses in Sharjah

4.3.1. Characteristics of traditional dwellings

Residential architecture styles represent a major part of the components of any country's culture and heritage, and are closely related to the surrounding environment, and the extent of its human ability to create the architectural style that adapts to its environment.

The UAE was not an exception to this fact. The human being of the state has developed his residence to secure his living needs and fulfill the requirements of his individual privacy and family integrity, and to adapt to the hot climate saturated with humidity through the formation of spaces to provide a comfortable internal environment for the family during the hours of the day, and the requirements of the weather with the alternating seasons of the year.

And through the use of building materials available in the vicinity by local skills, which enabled his people to meet the conditions of sustainability hundreds of years ago.

With regard to individual and social privacy, the traditional housing design was inspired by the distinctive Islamic identity that regulates the behavior and life of the human being and society inside and outside the dwelling through the following elements (Fadany, 1983) (Masoud, 1991) (Zubaidi, 2007):

- The main entrance and the twisted entry, which blocks the view and reveals the family's privacy.
- The building mass is directed towards the inside, allowing adjacent housing to converge in a way that is integrated with the surrounding urban fabric. The inner courtyard, which represents the central nucleus of the dwelling, so that it is considered

the center of social activity for the extended family and the achievement of intimacy for its members, while at the same time securing its privacy from the outside world.

- Where the people of the region were able to invent barges (Barjeel) that collect air from the four directions and then direct it downward, and the water vapor it contains is absorbed by some limestone and then pushes it down.
- Protection of the building with thick walls erected with local building materials to reduce the impact of sunlight, as well as reduce the impact of noise by separating the inner courtyard from the street and from neighbors with the high building mass.
- The iwan (corridor) provides protection for the interior space from the hot summer sun, while at the same time it provides warmth in winter.
- A decrease in the percentage of external spaces (streets) compared to internal spaces.

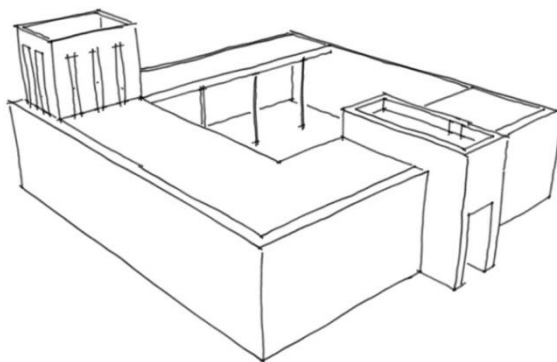
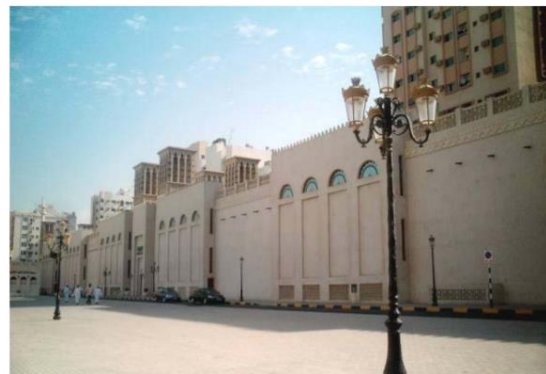


Fig 8: Traditional Houses of Sharjah, (Source: DTPS, 2020)

4.3.2. Courtyard house in Sharjah

Courtyard house referred to as “Arab House” in UAE. (Fadan, 1980) recognizes a threefold classification of courtyard houses: (1) The simple plan one courtyard house (2) The compound plan two-courtyard house and (3) The complex plan Two-courtyard house. (Anderson.G, 1991) indicated that the vast majority of old Sharjah houses were of the traditional small type.

It is built in the form of a compound of square-like proportion, measuring an area of between 100 sq.m – 230 sq. m and the area increases according to the level of wealth of the person owning the house, the height of the houses ranges from 1 floor to 2 floors. The few rooms form one or two sides of the courtyard and open up to a verandah, in general its design has reflected all elements of the traditional house as mentioned above. Limestone and shell coral masonry were commonly used for wall construction, but have been lately superseded by hollow concrete blocks. The vast majority of citizens of the lower income group were living in such types of dwellings.

Sharjah also had many traditional large court houses, some of which have been restored by Sharjah’s government. They were owned by wealthy citizens. It is usually larger in size than the small type, and of two floors with spectacular masonry wind-catching towers (Barjeel) as means of increasing ventilation to the rooms below.(Anderson.G,1991) gave examples of some outstanding courtyard houses in Sharjah.

A. The Habib House (Marijah Area): It is of a simple plan, constructed in various stages of the twentieth century as the family expanded. It is typical to the style of courtyard houses erected in Sharjah, it is distinguished with its two quite distinctive halves. The new half was constructed with new materials such as cement, so its walls

were directly exposed to heat of the sun. It was equipped with air conditioning because the interior was uncomfortable. Whereas the other traditional half did not need such technology. Experiments using modern measuring devices have proven that the temperature in the summer is 5 degrees lower in the traditional house than the modern house, and at the same time temperature increases by the same degree in the traditional house than in the modern house during the winter season (Masoud, 1991).

B. Zarowni House (Shuweiheen Area): Consisting of two floors, it is a type of houses that were erected in Sharjah during the 1960s. It was occupied by a large extended family. Separated areas for males and females, central courtyard and men's Majlis with a direct entry. It was equipped with two Badjir. (see the house plans and photos P.P 382 – 384 (Anderson, 1991).

C. The Mukhtar House (Marijah Area): It consists of only one floor except for room of the wind tower. It also contains most of the courtyard house elements such as the introverted form of the courtyard, high blank exterior walls with few openings, separation of female and male, its twisted entrance, the Majlis and the Badgir. See Figures 370 – 375 (plans and images) (Anderson, 1991).

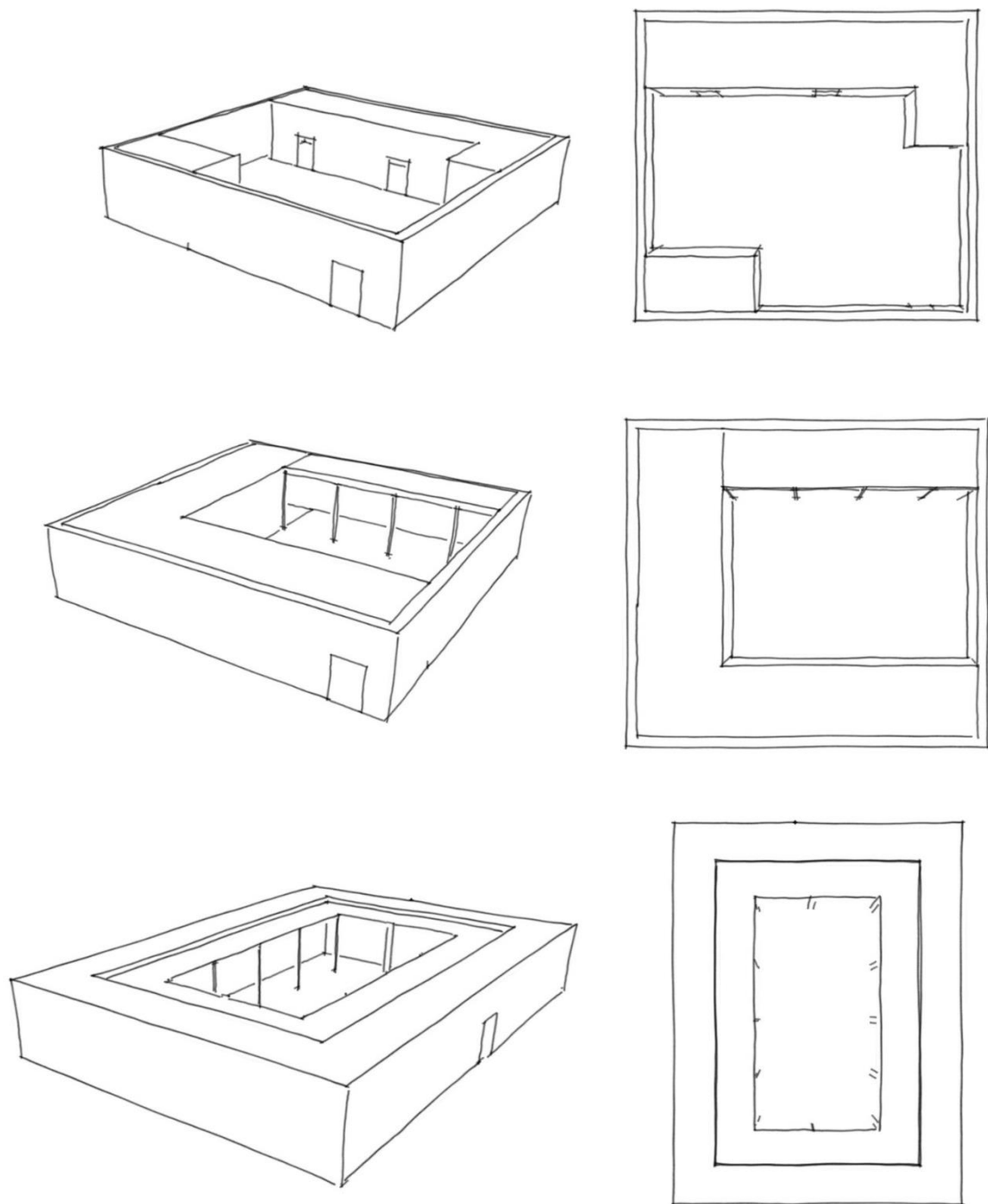


Fig 9: Plans and Perspective drawings of a traditional house in Sharjah (Source: Author, 2020)

4.3.3. The gradual fading out of traditional (inner-courtyard) residence in Sharjah

Needless to point out that the house with an inner courtyard represents the first base cell of the urban fabric of the ancient Arab city, and its urban and social element is the most prominent on it.

As indicated in section (4.1.2), the period of the thirties of the last century witnessed the first sparks of the emergence of new architectural styles that were captured by the mental and visual image of the city's society. These patterns were represented in some public buildings such as Sharjah Airport, the Royal Air Force camp and other aspects of modernity unprecedented in the history of the built environment.

However, (Al-Mansouri and Mashari, 2005) assert that the period between 1930 and the beginning of the 1950s was not a clear period of urban transformation, but at the same time they do not deny the gradual influence of these urban patterns on the general vision of the city's residents.

The 1950s Era

Then the pace of contemporary architecture accelerated since the beginning of the fifties through the following evidence:

- i. The establishment of the Council of the Emirates of the Trusial Coast in (1952), which contributed to financing many public buildings, and Kuwait also built a large number of schools, mosques and hospitals.
- ii. Importing cement for the first time in the region in (1952) and building the first cement-brick house in Dubai in (1955), then using the concrete structure in Al Maktoum Hospital (1958).

The 1960s Era

Most of the researchers agreed that the 1960s was the decade of political, economic, social and urban transformation in the coastal Emirates. Politically, it witnessed the beginning of serious work to build a cohesive federal entity. On the economic side, oil production and export began from Abu Dhabi (1962) and Dubai (1969), and its effects were reflected on the urban environment in all cities of the Trucial Coast, and the desire to modernize the development and modernization of this city increased through the following evidence:

- i. The master plans of Dubai (1958) - Abu Dhabi (1961) - Sharjah (1963) and (1969)
- ii. Projects for re-planning the old city (Abu Dhabi - Sharjah - Dubai)
- iii. Building materials: the explosion of what is known as the revolution of reinforced concrete and the decline in the use of local building materials. New materials emerged with the use of cement bricks, and the spread of brick machines at every construction site (do it yourself machines), and Indian and African sandal wood was replaced by European wood. Steel and glass became important imports
- iv. Electricity and Water: The demand for electricity and water gradually increased with the construction of the first power stations in the coastal city
- v. Foreign labor: Foreign labor was brought in at an increasing rate, with the rapid growth of the local economy and the availability of job opportunities in infrastructure projects.

4.3.4. Evidence of the 1960s on the courtyard residence

The recommendations of the Sharjah Master Plan related to Grid pattern planning and the project of re-planning the old fabric of the city stipulated the removal of a large number of existing housing units and the accommodation of parts of them in the new plan for the old

area (Fixing operations). And those whose housing was affected moved to the new spill over areas (Maysaloon - Nasiriyah - Al Musalla).

The change in the form and content of the courtyard house gradually began, as parts of it were replaced by modern building materials while retaining the design (the inner courtyard) and the introduction of electricity helped to use the air conditioner in these parts. The Habib house referred to in section (4.3.2) is an example of this model. Then the stage of erecting the entire dwelling, with these modern materials in some dwellings that were fixed according to the new planning, and in all the buildings in the new spill over areas, while preserving the basic design elements related to the distribution of blocks and spaces. The recent satellite images of the areas of Al-Nabaa - Bu Tina - Qlaia - Maysalon and Nasiriyah, models of transformation in traditional housing in the city of Sharjah. It is noted that the use of reinforced concrete has contributed to the possibility of building more than one floor in public buildings and some residences (see pictures p.p 79-82). (Salma Al-Damluji, 2006) argues that living life in the Emirates of the coast has changed forever with the introduction of reinforced concrete, and the severity of heat problems and the sun radiation associated with modern building materials has been reduced by air conditioning devices. Those problems that people of the Gulf have addressed through the accumulated experience in using local building materials and forming internal voids, and the building blocks with narrow external openings, which provided free and sustainable sources of natural energy and thermal insulation that are not comparable to the exorbitant material cost of industrial air conditioners.

Perhaps it is important to refer to the areas of the renovated housing that were fixed according to the new planning in the old area and remained at the same old rates, where the average area of most of them was (100 square meters), and the dwelling continued to

include the extended family, then the change in the area of the plot began in its residential density coinciding with Re-planning project at the end of the sixties. Most of the residential plots were divided in the new spill over area (Maysaloun) with areas between (232 square meters) for most of the plots in addition to some plots that reach an area of (929 square meters). These rates continued in the areas of Nasiriyah, Al-Musalla and Al-Ghuwair, then the plot areas gradually increased in the new generations of areas.

Among the results of the re-planning project was the emergence of the phenomenon of the nuclear family as an alternative to the extended family, which diminished with the desires of the new generations of young people for independence and more privacy.

The traditional housing in its modified form remained one of the prevailing housing patterns during the seventies, eighties and early nineties, and successive census statistics indicate that the number of Arab homes reached (9274) dwellings in 1975 and the number doubled in 1980 when it reached (20053) dwellings, then the curve began to decline and diminish when it reached (9223) according to the (Department of Statistics, 2015). This escalation and decline in the number of housing can be explained by the following reasons:

- i. Sharjah began to reap the fruits of the discovery of oil starting in 1974, and investment spending was directed to various sectors, including the government housing sector. It is natural that the completed housing does not maximise the housing need, as the total number of government housing completed by the Sharjah government in the period 1971-1998 was (2328) housing units, and the total number of housing units completed by the federal government (2043) during the same period.

- ii. The improvement in the level of per capita income gradually began in Sharjah after the mid-seventies, which means that the cost of building villas far exceeds the financial capabilities of most of the residents during that period.
- iii. The number of traditional housing declined during the period between (1980-2015) as a result of removal and replacement operations, as well as their abandonment by their owners to new residential areas (villas), and they were occupied by expatriate Asian workers, while some of them were left abandoned and neglected for maintenance, most of them in Al Sharq and Qulaia and al Nabaa areas.
- iv. By the year 1993, the Sharjah Municipality had finally stopped issuing building permits for traditional housing. The following table shows the building permits issued to different housing types during the period (1971 - 1992).

With this, the Sharjah Municipality allied with other factors to finally bring down the curtain on the traditional housing, which is considered one of the cultural legacies of the region that coincided with the social and cultural life of its local community, its economic potential, and with the local building skills, as well as adapting to the surrounding natural and climatic conditions. The villa style emerged as an alternative entirely to the traditional residence in terms of the design idea and the distribution of blocks and spaces. The courtyard house faded away and the building became directed towards the outside, and the requirements of the minimum space were imposed, the building set back from neighbors and the streets, and the proportion of the plot of land coverage. Thus, the residential density in the city of Sharjah decreased at great rates having the city face the phenomenon of urban sprawl.

The next chapter will pay attention to the detailed study of the grid pattern planning and the villa model and their direct impact on establishing this phenomenon.

5. The Grid Iron system and the detached houses model (villa) as main drivers for of Sharjah city sprawl

This chapter will deal broadly with the grid planning system and the residential villa model as the two main drivers of the urban sprawl phenomenon in the city of Sharjah since the 1960s, and as we indicated in the chapter (4) that both models were imposed on the urban fabric of old Sharjah through the master plan prepared by the British consultant Sir William Halcrow in 1963 and 1969. Who forcibly inserted the grid system pattern with straight and perpendicular streets to the organic fabric of the city with narrow winding roads, which was shaped over the centuries through the accumulation of the experiences of the Gulf human being in adapting to his harsh natural environment and responding to the demands of his religious, social and cultural values.

The first part of this chapter will begin by observing the grid system as a pattern for city streets and tracking its use in cities of the ancient world, and the objective conditions that necessitated reliance on it in their planning. Then we will investigate the circumstances surrounding the introduction of this system and its imposition on some cities in the Middle East and the Arabian Gulf by European consultants, and analyzing the experience of the Greek consultant Doxiadis, who is considered the most famous consultant who used this system in planning in many cities in the Middle East and some Gulf cities.

More space will be devoted in this part, to study the experience of the city of Sharjah with the named grid system, and that includes the analysis of the city master plan prepared by Halcrow as mentioned above. Then we conclude by monitoring the outcomes and results of the grid system and its main role in perpetuating the phenomenon of urban sprawl, and

we will also shed light on some of the attempts that have been tried by the urban planning authorities to address some of the drawbacks of this system.

The second part of this chapter is devoted to tracing the circumstances of the emergence of the detached housing model, (the villa) for the first time, intertwined with the grid system within the master plan sequences, specifically the planning of the Maysaloon area. We will also notice that the villa model has become an alternative to the traditional housing style, and contradicting it in terms of form and content and the reasoning on how it became the preferred model by the recent generations until the traditional houses eventually disappeared. Then we analyze the design of the villa, and the extent of its response and adaptation to the natural, social and environmental conditions in the city of Sharjah with a comparison between the two models. Then we conclude this part by shedding light on the impact of the building and planning regulations and conditions related to the minimum residential villa area, the coverage and construction rate, and the building setback conditions in perpetuating the low housing density rates. We will also monitor the significant decrease in the reconstruction rate of the granted lands and its impact on all of that, and in alliance with the implications of the grid system in urban land in the city and eventually placing it on the cusp of the phenomenon of urban sprawl.

5.1. The Grid Pattern

The grid system is considered the most influential and common among street planning patterns in various world cities, and throughout the ages, and it is characterized by its many forms. In terms of its name, it is noted that it appears in the references as Grid Plan or Grid Street Plan or Grid Iron Plan, and it is called in ancient Greece (Hippodamian Plan), and all the names lead to one definition:-

“It is a type of a city plan in which streets run at right angles to each other forming a grid”
(Wikipedia)

In terms of shape, it is noticed that there is a great diversity in the patterns of this planning system, and in this regard (J.H Crawford, 2005) indicated that there is a pattern with a strict and precise system, consisting of streets and intersections of complete straightness at perfect right angles, and Manhattan represents this pattern. On the other hand, there is another pattern whose structure is still grid, but its streets are not straight, and do not intersect in the form of right angles. The justifications for planning lattice streets vary, ranging from military necessity, capitalist and religious motifs, aesthetic preference, and speed and simplicity of achievement.

5.1.1. History of the Grid system

This pattern dates back to ancient times, when it was used in the planning of many ancient cities with different civilizations, and the following are models of these cities, according to chronology: (Laurence, 2006)

A. BC:

- The city of Akhenaten, east of Minya (3,000 years ago) (Riyad, 2001)
- Mohenjo - daro and Harappa in the Indus Valley
- City of Babylon (17th century BC)
- The Chinese city (15th century)
- The Greek city of Miletus, 479 BC
- Teotihuacan near Mexico City

B. AD:

- Fujiwara Kyo - ancient capital of Japan (710 - 694 AD), (Tokyo used irregular pattern instead of the grid system for defense reasons. In later periods it applied the grid pattern partially)
- Gyeongju - Korea (7th century)

C. Medieval Europe (9th – 15th Century)

- Wales (Britain), Florentine (Italy), where many cities were built according to the grid system on the ruins of Roman camps built on the same system.
- Canary Islands (1496 AD)
- Hundreds of urban communities were established in the Americas with the grid system

D. Renaissance -(1500 – 1600)

- The grid system flourished with the beginning of the Renaissance and was used in many new cities. The city of Mannheim was known as the first city in the Renaissance that was planned with the grid system

- Then followed by the cities of Edinburgh and Glasgow, the Australian and Canadian cities, and in the United States New Haven (1635) and Philadelphia (1682)
- In the sixteenth century, the city (Valletta), the capital of Malta, was built according to a strict grid plan.

E. Early nineteenth century: -

- New York City is the most famous city according to the Grid System (1811). Then Austin City (1839), Salt Lake (1870)

F. Late 19th century to Present

- Barcelona's city planning experience has been known to be the most innovative
- The use of the grid system continued in the United States until the 1960s - but with the increase in car use since the 1920s, the percentage of accidents and deaths has doubled, especially among children, as straight street scars and speed-stimulating cars have doubled. Therefore, urban planners were able to process and rearrange the super blocks to be directed inward to reduce the transit traffic, and direct it towards arterial roads, and traffic generators were prohibited planning on the edge of super blocks and arterial roads (residential towers - shops) and this trend prevailed in the period between 1930 - 1960 especially in Los Angeles and Panorama

G. Milton Keynes

Milton Keynes is one of the new towns in England, about 50 miles north east of London. It was constructed in (1967) to relieve housing congestion in London. It was one very famous use of the grid pattern among British New Towns. It has ten horizontal and eleven vertical roads at 1 km intervals with roundabouts at each intersection. Unlike the other grid squares in the other cities, its squares are far larger, and the road layouts within the grid squares are generally “Organic” in form. It uses cul-de-sac streets which were

complimented by cycle tracks and foot paths which connect the entire sector and beyond (Wikipedia).

5.1.2. The Grid System in the Middle East

As previously indicated, the pattern of grid streets is not new in the Middle East. The ancient civilizations that prevailed witnessed some examples of this pattern - even if they remained isolated and did not take root in the fabric of their cities, as well as the traditional organic fabric. He traces the beginnings of his move to the cities of the region to the era of Khedive Ismail, who was impressed with the plans of Paris prepared by the famous French engineer "Haussmann" and ordered the planning of the Ismailia neighborhood ((present-day Cairo city center)) in the year 1869 in the same pattern - the grid system.

The grid system was also applied to some neighborhoods of North and East African capitals and the cities of the Levant and Iraq with the advent of European colonialism in the nineteenth century with regard to the Arab Gulf region. The grid system was transferred by oil exploration and production companies in the 1930s, as the cities of Dammam were planned. The news is according to this system by the US Company Aramco (Al Hathloul, 1994).

5.1.3. The Role of the Greek consultant “Doxiadis”

There is no doubt that the ideas of the consultant Doxiades have been silent on the fabric of many Arab and Islamic cities since the middle of the last century. This consultant is linked to the American aid programs that contributed to the reconstruction of Europe after World War II. And the strict and refined Grid Iron chess system and developed it in what is known as the model city of Doxiadis, which he applied in various cities without distinction between them and without regard to the objective conditions of each city, and that in cities: Fig. No (10) Khartoum (1959), Islamabad (1960), Baghdad (1959), Riyadh (1968).



Baghdad, Iraq



Riyadh, Saudi Arabia



Khartoum, Sudan



Islamabad, Pakistan

Fig 10: Master plans of Baghdad, Al Riyadh, Khartoum & Islamabad (Source: Doxiadis, 1959-1968)

Although Doxadis' proposals enshrined the strict grid system in these cities, and other cities that were affected by their planning, these proposals found harsh criticism for their neglect of the human scale and their observance of the car's control through the wide and intersecting streets that did not take into account the strength of the hot, dry climate in the Middle East.

(Aqeel Al-Houthi, 'no date') believes that the proposals of Doxadis, which adopted the rigid and inflexible geometric grid design, did not take into account the original values of the traditional Islamic city with organic fabric.

5.1.4. The Grid iron system in the United Arab Emirates

Use of the grid system in the cities of the United Arab Emirates dates back to the beginning of the sixties of the last century, and this coincided with the fashion of the master plans that spread in some cities of the Middle East. It should be noted that the first generation of these schemes were the preserve of British treaty-based consultants, who worked with the development office of the Trucial Emirates Council.

Consultant John Harris prepared the master plan for the city of Dubai in (1960), where he designed the future extension of the city according to the network system. To the credit of this consultant, he suggested expanding some of the roads of the Old City and did not resort to complete removal as is the case in the cities of Abu Dhabi and Sharjah (Al-Mansouri and Mishari, 2005).

The first master plan for the city of Abu Dhabi was prepared in (1962) by the consultant Halcrow and Co., and the plan did not deviate from the planning pattern that prevailed in that period, as the grid system and the residential neighborhood model were adopted to cover the entire city space, and it was suggested removing the core of the old city while preserving some few buildings. Consultant John Harris presented in (1961) a proposal for planning the city of Abu Dhabi to preserve the old area and did not work with it) (Al-Mansouri and Mashari, 2005).

5.1.5. The Grid iron system in the city of Sharjah

It was also indicated in Chapter (4) that the proposal of the first master plan for the city of Sharjah (1963) - which was prepared by Halcrow - had proposed the Super Blocks system, synonymous with the grid system, and presented initial proposals for planning neighborhoods based on this system, the second master plan was prepared in (1969) in the same manner, whereby the project of re-planning the old area and forcibly dropping squares on its urban fabric was implemented, while the spill-over area was designed according to the grid system (Maysaloon), which represented the first building block in establishing this. The system in planning areas and neighborhoods of the city since (1969) until the present time.

Through a review of the written report attached to the master plan for the year 1969, which was submitted by the consultant Halcrow to the Ruler of Sharjah on 11/10/1969, it is noticed that the report tries in its chapter (1.4) to criticize the planning of the Maysaloon area, and indicates that it followed the pattern of the strict grid system which from His opinion was the cause of the problems that arose at that time, as he says: “The plots in

Maysaloon are set out and conform to a rigid iron pattern. The very nature of the layout creates all the attendant problems of cross road intersections and monotony, and is also inflexible; presenting a handicap should the demands of a rapidly expanding community change from those initially forecast.”

The consultant indicates in (Appendix A / 3) that he submitted proposals to amend planning by adding feeder roads to reduce traffic risks resulting from direct entry and exit to and from the main streets.

In sum, the consultant is trying to remove his responsibility for imposing a strict grid system on the Maysaloon district plan, although it is known that Halcrow was directly overseeing the planning of Sharjah city until recently. It can be clearly seen that the first plan planning for the "Maysaloon" area is random and lacks the hierarchy of the urban structure: (a housing unit, housing block, housing cluster, neighborhood)

It should be noted that the "Super blocks" system that Halcrow adopted in the diagram is considered the basis of the grid system and represents the highest level in the road network structure. These Super blocks are considered as the product of perpendicularity to straight main streets. We are not in a position to diminish the competence of this global consultant, but we can confidently decide that his regional office, which has been in the country since the fifties, was specialized in purely engineering projects and was not concerned with urban planning tasks, and this is evident in the modesty of the part devoted to these tasks, and in general Its outputs.

According to the master plan, the city was divided into sectors (districts and neighborhoods), the area of each sector ranges between (2 km x 2) and (2 km x 1.5), and the sector became, as mentioned above, the basic level of the grid system.

Until (1970), the number of areas reached 10 areas representing the squares that were installed on the areas of the old nucleus, and they include: Al Marija - Al Shuwaiheen - Jubail - Al Majarah - Al Fasht - Al Khan Village - Bu Tina - Al Nabaa - Al Ghuwair - Umm Al Tarafa

Then the stage 1970-1975, when the city crossed the boundaries of the old area wall for the first time in its history, when (13) new areas were planned, starting with the Maysaloun area, as mentioned above. Where the total number of areas for various land uses reached (155) areas, details of which are as follows:

| Landuse | No.of Districts |
|-----------------------------------|------------------------|
| Residential (Villas) | 98 |
| Residential (Apartment Buildings) | 31 |
| Industrial | 17 |
| Others | 9 |
| Total | 155 |

Table 3: Landuses in relation the number of districts in Sharjah, (Source: DTPS, 2017)

There is no doubt that the first generation of the new areas, whose planning was based on the grid system and its residential units were constructed on the detached villa model, represented a quantum leap compared to the organic fabric of the old city and its traditional residences, and it became seen as a symbol of modernity and modern life, and this was evident in the arrangement of squares, street planning and building materials Used and architectural styles of residential units. And those aspirations began to escalate with the increase in economic growth rates and the rise in living standards, and reached their climax after the economic boom that the emirate witnessed in the second half of the seventies.

5.1.6. Grid pattern impacts

The grid system resulted in an increase in the length of the streets to unprecedented degrees, as the total length of the streets in the city reached 3022 km (Mukatatat, 2019). At the same time, the widths of the streets increased in high degrees compared to the narrow roads in the old area, where the width ranged between (18 meters) In roads leading to housing - to (152 meters) for regional roads, the following is a summary of the road classification adopted in the city: -

- Regional roads: connect the city with its regional perimeter and its width is between (67 meters - 152 meters) (three lanes).
- Main roads: linking city areas with a width (24 meters - 67 meters).
- Secondary roads: linking parts of the area with a width (18 meters - 24 meters).
- Secondary roads: It connects secondary roads and residences entrances.

Therefore, the area allocated to roads is equivalent to many times what it was in the old area. Planning studies indicate that the traditional road grid patterns (closed, curved, etc.) consume (16 - 25) less than the percentage consumed by the grid system (Fanis Grammenos, 'no date').

On the other hand, the increase in the length of the streets resulted in an increase in the length of the infrastructure networks at high rates, as the total length of the water network in Sharjah is 3711.1 km, while the length of the sales gas network reached 1657.5 km.

Therefore, the huge areas allocated to the roads and infrastructure under the grid system have resulted in a decrease in residential density at high rates, which is required in turn, in addition to the waste resulting from the approved housing models, as we will explain in the second part until the rates of urban sprawl accelerate at unprecedented rates.

5.1.7. The most prominent reservations and criticisms of the grid system

Despite the popularity of the grid system as a basic feature of Western city planning throughout the historical ages, it was not without criticism and reservations from some researchers, and its use witnessed periods of decline.

Among the most prominent conservatives is the Austrian architect Camillo Sitte, who praised the organic system in the planning of medieval cities in his book issued in (1889) entitled "The Birth of Modern City Planning" followed by the British city planner Ebenezer Howard, who published his famous book "Garden Cities of Tomorrow" In 1899, his proposed city was distinguished by the curved lines instead of the straight lines that characterized the grid system, and the idea was applied in building two cities in England, namely Welwyn and Letchworth, and Lewis Mumford criticized some of the characteristics of the grid system in a harsh term, as he said: -

“With a T- square and triangle, finally, the municipal engineer could, without the slightest training as either an architect or sociologist, ‘plan’ a metropolis, with its standard lots, its standard blocks, its standard street width; The new gridiron plans were spectacular in their inefficiency and waste.” (Oghail, 2006)

On the other hand, some researchers question the efficacy of the traditional organic pattern in adapting to the requirements of the present era. In his book entitled *Architecture and Life Forms in the Islamic City*, Estefano Bianca says: “The traditional style is far from the modern lifestyle and is not suitable for our present that we live now, but it can be applied. The model is in the case of private housing complexes, where the idea of an inner courtyard residence reappeared”. (Al Mashaabi and Al Enezi, 1991)

On the other hand, some researchers question the efficacy of the traditional organic pattern in adapting to the requirements of the present era. The case of private residential communities, where the idea of an inner courtyard residence reappeared.

5.2. Modern housing style (villas) and the exacerbation of urban sprawl

5.2.1. The emergence of the detached villa model in Sharjah

As indicated in the section (4.3.4) that the emergence of the villa model gradually escalated in conjunction with the gradual disappearance of the courtyard residence, which disappeared permanently with the beginning of the nineties of the last century (Table. 1). We also explained that the traditional housing has been partially affected by the waves of modernity after the implementation of the re-planning of the old urban fabric of Sharjah and re-fixing some houses according to the new planning, where cement bricks were used instead of local building materials, and the house was provided with air-conditioning equipment while preserving the basic design elements related to the distribution of blocks and voids within the old rates of the plot area. This trend continued in the residential expansion areas with a relative increase in plots areas of the first generations of residential areas until the end of the eighties (see Google Earth Maps Fig.(11) (12) (13) (14).



Fig 11: Aerial view of Al Sabkha area, Sharjah, (Source: DTPS, 2020)



Fig 12: Aerial view of Al Qulaya'ah area, Sharjah, (Source: DTPS, 2020)



Fig 13: Aerial view of Al Nasserreya area, Sharjah, (Source: DTPS, 2020)



Fig 14: Aerial view of Al Nasserreya area, Sharjah, (Source: DTPS, 2020)

Within the aforementioned areas, the traditional housing and villa models are found side by side. This can be attributed to the fact that the financial ability of a large segment of the owners of these homes at that time (1969) did not enable them to meet the high cost of building a model villa, in addition to the fact that the government housing did not maximize the housing need during that period.

5.2.2. The rise and tyranny of the residential villa model in Sharjah

The United Arab Emirates in general and the Emirate of Sharjah in particular witnessed a comprehensive development renaissance after the first half of the seventies of the last century as a result of the production and export of oil and the rise in its prices at unprecedented rates after the October 1973 war, and the Sharjah government was keen to employ the revenues towards the production base. Employing an estimated part of this revenue in laying the infrastructure and basic equipment such as sea and air ports, electricity, water and sanitation, and community services, industry and housing (The Amiri Diwan, 1988).

The Sharjah government issued encouraging laws to attract local, Gulf and foreign investments, creating an environment conducive to economic growth, as internal and external trade activities flourished, doors were opened for groups of citizens to enter the field of private business, while job opportunities were provided to large segments in the government, private, military and security sectors.

On the other hand, the Emirate of Sharjah has been characterized by a relative development in the field of education compared to other Emirates since the beginning of the fifties (Al-Tunaiji, 2011). A large number of her sons joined the universities of Cairo, Baghdad, Beirut, British and American universities, and others. It is natural for their ideas

to be affected by contact with new social and cultural values. Thus, the objective conditions were met for the emergence of an integrated (**middle class**) that includes at its top segments of businessmen and professionals (doctors - lawyers - accountants ... etc.), while its base consists of public and private sector employees of the armed and security forces.

Needless to point out that social science studies have agreed on common cultural features and characteristics that distinguish members of this (**middle class**), the most prominent of which is the ability of this class to adapt itself to every new social and cultural behavior, and its characteristic of a culture of consumer spending and keeping pace with fashion and trends. Therefore, it was natural for people to love owning private villas. In this regard, (Al-Zhubaidi, 2007) believes that after more than three decades of unprecedented rapid rates of economic, social and cultural change that faced the citizens of the country, it should have had a great impact on housing, and believes that after many years of poverty and despair Citizens look forward to all the luxuries of modern life enjoyed by citizens of other countries, and it was decided that with most of the citizens of the United Arab Emirates they prefer to own a villa model (she did not support this claim with a documented reference), but she realizes and acknowledges that the villa model is considered an emergency and has not crystallized through a stage of transition and a natural development process Compared to the traditional dwelling, which responded to the cultural, social and climatic requirements of the people of the Gulf during a process of gradual development that lasted for centuries.

Paradoxically, in a short time, the concept and philosophy of traditional courtyard housing was turned upside down after the imposition of a system of detachment of the building from the boundaries of the plot, and the building mass moved from the edges of the plot to

its middle. The building became outward following the disappearance of the inner courtyard and its social, religious and climatic functions.

From the social and religious point of view, the visual privacy of the family was breached after the dwelling became exposed to neighbors and it was impossible to use the garden by family members.

Climatically, the large space around the building became directly exposed to solar radiation and became repellent during daylight hours. On the other hand, due to the hot air, it is impossible to open the windows and the openings of the building during the day, forcing the residents of the house to rely on air-conditioning, which has become an integral part of their lives despite their high cost. In this regard (Shabana Hameed, 1991) says:

“The house has turned itself inside out, the façade displaying wealth and social status. Space has been inverted, by eliminating the familial space of the courtyard in the traditional house and placing the house in the center of a large plot. Treating the house as a manipulable object in space, isolated and exposed. Traditional elements, like the proper placement of doors and windows that supported the sacrosanct role of family and preserved its privacy have been ignored “.

A study in the Kingdom of Saudi Arabia indicated that after measuring the energy consumption of three types of housing units in a complex. (The first and second types: detached residential villas, and the third type: attached villas). The study confirmed that the energy savings in the last type is 27% (more than a quarter) compared to the two types of detached villas) (AlNajem and AlHamad).

5.2.3. Other factors contributed to fostering detached villa style

Governmental housing

After the formation of the UAE Federation in 1971, the federal government and local governments (Abu Dhabi - Dubai - Sharjah) undertook the construction of ready government homes and delivered them free of charge to thousands of national families in the various emirates of the country. It is noted that the design of the first batch of government housing was inspired by some elements of traditional housing - especially the location of the majlis and the baths, but within a large area of the plot of land, about four times the area of the traditional housing, which ranged between (100 square meters - 150 square meters), While the area of the government housing land reached **576** square meters, meaning that the area of the land plot increased by five times. (UNDP, 1982). Then the design of the second batch of government housing that was completed after (1972) took the detached housing model – (the villa) and has since become the distinctive characteristic of government housing, and this trend has identified with the aspirations of all social classes.

Although government housing has contributed to meeting the housing need for large sectors of citizens, its design content has highlighted many of the negatives that resulted from the backgrounds of engineers and designers who worked in the Ministry of Public Works at the beginning of the state's formation, who came from different countries and cultures and did not take into account, the social, environmental and cultural characteristics of the region in housing design, as they neglected the functional relationships of the housing and the spaces allocated to each job (Al-Abdouli, 1989). (Zhabidi, 2007) summarizes these negatives as follows- :

- Inappropriateness of planning to accommodate to environmental conditions and occupants' social needs.
- Total disregarding for the climate that led to uncomfortable internal spaces and total dependency on artificial air conditions.

The Ministry of Public Works and Housing prepared a field study in 1981, which included 450 governmental housing, to study the suitability of housing to actual needs and inherited social characteristics, and to know the general trends of citizens regarding housing design, in order to improve the content of these designs. Some elements of the occupational distribution of rooms in the dwelling have been modified to ensure privacy among family members (Khalfan Al-Abdouli, 1989). However, the visual privacy penetrated from the neighbors and the climatic and planning problems resulting from the wide spaces around the block of the villa building - due to the setback conditions - remain insurmountable for nearly half a century.

Land allocation policies

The policies of granting residential land free of charge to all categories of citizens have contributed to the dedication of aspirations for the acquisition of the villa, and according to the policies, any citizen is entitled to obtain a residential plot of land for free upon reaching the age of (25) years in areas equipped with infrastructure and community services.

Housing financing policies

- A. **Private Housing Financing Program:** It was established in (1993) to provide easy housing loans to citizens who acquired residential land to build their homes, and the loan value at that time was 500,000 dirhams, to be repaid over a period of (25) years without interest.
- B. **The Sheikh Zayed Housing Program:** It was established in (1998) as an alternative to the previous program and provides the following- :
- Provides a non-refundable financial grant to those whose salaries are less than 15,000 dirhams per month
 - It provides an interest-free home loan to those whose salaries exceed 15,000 dirhams per month.
 - Building government housing, whether as a separate housing unit or within a residential complex.
- C. **The Department of Housing - Sharjah:** It provides the same facilities as the Sheikh Zayed Housing Program for citizens of the Emirate of Sharjah, provided that he is married and has children and is not less than (21) years old. People with special cases are exempt from these conditions.
- D. **Banks:** Islamic banks provide financing for building a house according to Islamic Murabaha formulas. While non-Islamic banks provide loans not exceeding 500,000 dirhams, with interest.

Building regulations and conditions

Building regulations and conditions issued by local governments - including the government of Sharjah - have contributed to the legalization and consolidation of the residential villa model. For example, the conditions issued in Sharjah have obligated the necessity to leave setbacks between the building and the boundaries of the plot of land (6 meters front setback - 3 meters side setback - 3 meters rear setback), this condition has permanently closed the curtain on the traditional yard dwelling model, and the most important design determinants of private housing, which are preserving family privacy from visual encroachments, have been removed. This new concept is rooted by building percentage conditions and population density conditions, as well as the minimum area requirement for residential land.

In the second part of this chapter, we will highlight in more detail the minimum standard adopted for the area of residential plots.

5.2.4. Minimum standards for residential land plots

- **The concept of the minimum:** We have also indicated repeatedly that the villa model was imported from the western environment (North America and Europe) and forcibly imposed on the local environment (the Gulf and the Middle East) with social, cultural and climatic conditions contrary to the first. The villa model in the West coincided with the issuance of zoning regulation, which stipulated conditions: minimum plots - setback - coverage ratio - heights.... etc.

These conditions were approved - in accordance with the aforementioned regulations, to secure a low population density in residential neighborhoods. This is to alleviate problems

resulting from overcapacity of basic facilities, environmental protection and public health. This was the justification for legalizing a high minimum standards of residential land areas, and (Al-Hathloul, 1994) argues that the main purpose of legalizing this condition in the United States of America since the nineteenth century is to exclude and isolate some segments of the population with low incomes and from Negro and Asian backgrounds from housing in White areas, and the exploitation of their weak financial capabilities, which do not enable them to possess and construct large-scale lands. It is clear from Al-Hathloul's testimony that the minimum requirement has been used for some deliberate intentions in the United States.

However, we cannot generalize this isolated experience and ignore the positive aspects of this condition related to controlling population density and in determining the beneficiaries of (site and services) housing projects for large sectors of citizens through a mechanism for re-dividing residential land plots, provided some important conditions are met For example: the average size of the family - the social and cultural aspect - the economic aspects related to the financial capacity - some technical matters related to building materials and building skills.

The (Habitat, 2016) emphasizes the importance of sustainable and rational use of land and its good management to meet current needs and without compromising the rights of future generations.

5.2.5. Minimum standards for plots of land (international experiences)

It is necessary to monitor the experiences of foreign countries regarding the standards of the minimum area of residential plots, to compare them with the experience of the city of Sharjah, to verify their consistency with international practices.

The standards of approved residential land plots vary from one country to another according to the objective conditions prevailing in those countries, which are represented in the number of residents, suitable land for development, the climatic, social and economic conditions. For example, the average area in Latin American countries is (32 square meters) as a minimum, while in India it ranges between (25 - 35 square meters), and in the Philippines the area is limited to 96 square meters as a minimum. In the United States, the minimum requirements for detached housing are (500 square meters) and (300 square meters) for contiguous housing (Allam, 'no date').

5.2.6. The minimum standards for residential land plots in the Arab region

To begin with, a distinction must be made between the minimum area of plots of land allocated to housing projects and the minimum for registering the shares of individuals in the real estate registration departments in accordance with the laws of inheritance. More light can be shed on this difference through the experience of Sudan.

Sudan experience

A. Housing plans lands: The minimum plots of land within the housing plans are determined according to the family's income level, and site projects have been classified into three categories as follows: -

- First class (high incomes): Minimum land area (400 square meters)

- Second class (middle-income earners): Minimum land area (300 square meters)
- The third degree (with limited income): the minimum land area (200 square meters)
- That the plot frontage length not to be less than (10) meters in all cases

B. Common share lands

The minimum for land registration for individuals is (25 square meters), and partners whose shares are less than the minimum are obliged to transfer it to other partners in accordance with Islamic Sharia laws and pre-emption regulations.

Iraq Experience

| Housing Type (Villa) | Plot Area (Sq.m) | Façade Width | Residential density Housing unit / ha | Net population density Person \ ha |
|---------------------------------|-------------------------|---------------------|--|---|
| Detached Villa | 400-600 | 16-24 | 13-21 | 80-130 |
| Semi Detached Villa | 300-400 | 10-20 | 18-27 | 110-160 |
| Attached | 200-350 | 5-10 | 24-42 | 140-250 |
| Courtyard house | 150-300 | 10-15 | 28-48 | 170-290 |

Table 4: Average Residential Plot Sizes in Iraq, (Source: Ministry of Construction and Housing, Iraq, 2010)

The Experience of Saudi Arabia

The minimum plot area approved is 300 square meters, with a width of not less than 15 square meters.

The Experience of the Emirate of Dubai

The minimum for private housing is determined according to the classification and type of the residential area. There are 5 models for separate villas, and one model for attached villas (the minimum plot area in general is 106.18 square meters)

| Zone | Area | | Width (Feet) | Setback | | | Plot Coverage (%) |
|------|--|---|-----------------|--|-------------------|------|-------------------------|
| | Sq.Ft | Sq.m | | Front | Sides | Back | |
| R1 | 40000 | 3716.12 | 150 | 20 | 15 | | 40% |
| R2 | 10000 | 929.03 | 80 | 10 | 10 | | 50% |
| R3 | 7500 | 696.773 | 65 | 10 | 10 | | 60% |
| R4 | 5000 | 464.52 | 60 | 10 | 10 | | 60% |
| R5 | 2500 | 232.26 | 50 | 10% of the length of the opposite side | | | 65% |
| R5T | 2500 (1150 for the single parcel) | 232.26 (106.8 for the single parcel) | 50 | 5 | Not Compulsory | 5 | - |

Table 5: Average Residential Plot Sizes in Dubai, (Source: Dubai Municipality, 2015)

5.2.7. Standards of Residential land plots areas in Sharjah

This section will focus on monitoring and analyzing the prevailing practice in the Emirate of Sharjah regarding the minimum standards for residential plots of land areas for the villa model and its effect on devoting low residential density rates and the multiple negative consequences of this, the most important of which - for the research topic - accelerating urban sprawl rates and urban land consumption. By analyzing aerial photographs of the city of Sharjah - according to its chronological order, and with the help of geographic information systems (GIS) techniques, we will determine the size of urban growth at each time stage.

On the other hand, it should be noted that urban land consumption in the city is related to other phenomena that are no less important than the phenomenon of urban sprawl, including the phenomenon of undeveloped allotted plots reserved for long years for various reasons, which in turn produced the phenomenon of scattered urbanization and with its many negative aspects.

In other words, it must be noted that the urbanization limits that appear in the aerial photos of the city do not mean that there are large areas of land vacant and available for reconstruction.

The last part of this chapter will be devoted to some recommendations related to alleviating the problems arising from low density rates in light of the experiences of countries with similar conditions. We will also present some proposals regarding containing the phenomenon of undeveloped allotted plots.

5.2.8. Sharjah city experience

After carefully reviewing the volume of the set of decrees, laws and local orders issued by the Sharjah Municipality, and the regulations for conditions and standards for urban planning in the Emirate of Sharjah for the year 2013, we did not find a documented condition that specifies the minimum area of plots in general. Therefore, we resorted to auditing residential area plans in the city by the (GIS) so that each group of areas represents a specific period of time starting from (1969) the date of the first residential extension, in order to monitor the average areas of land plots in the period between the years (1970 - 2016). And we came out with the following table: -

| Time Period | Average Plot Size (Sq.m) | Selected Residential Districts |
|-------------|--------------------------------|---------------------------------------|
| Before 1970 | 232-929 | Maysaloun – Al Naserrya - Al Musalla |
| 1970-1975 | 576 - 700 - 929 | Al Mansoura – Al Faiha – Al Qadisiyah |
| 1975 - 1980 | 232 | Al Ghafya – Al Sabkha |
| | 576 - 700 - 929 | AL Hazana - Ramla - Dasman |
| 1980 - 1985 | 232 - 576 - 700 - 1100 | Al-Mirqab - Sharqan - Azra - Samnan |
| 1985 - 1990 | 700--1100 | Al Quoz - Riffa - Al Talaa |
| 1990 - 1995 | 731 - 929 - 1200 - 1800 - 3000 | Al Ramaqia - Sweihat - Al Yash |
| 1995--2000 | 1500--11000 | Al-Juraina – AL Garayin - Al Nouf |
| 2000-2015 | 1100 - 2000 - 2500 - 4000 | Al Suyoh - Rahmaniyyah |
| 2015 - 2020 | | Al Shonoof - Blida |

Table 6: Average Residential Plot Sizes in Sharjah over the years, (Source: DTPS, 2020)

After studying and checking the outputs of the table, we came out with the following observations:

- In the plan of the first residential extension to the city of Sharjah (Maysaloun area) in 1969, two models were adopted for the area of the plots: The first for people with limited income (with an area of 232 square meters), and the second (with an area of 929 square meters) for people with middle and high incomes.
- In the period between 1970-1975, after the independence of the state and the relative improvement of the economic situation, the minimum area of land allocated to low-

income people was raised to 576 square meters, and this may be attributed to the fact that this period coincided with the construction of federal government housing, which was characterized the same minimum plots areas.

- In the period between (1978 - 1980) the average areas that were monitored in the previous period continued, while the minimum decreased to (232 square meters) in the Al Ghafia and Al Sabkha plans. This is due to the fact that most of the lands in these two areas have been allocated to deal with housing problems for some groups that does not have passports or identity papers.
- In the period (1980-1985) the average plot area exceeded the previous averages for the first time and reached (1100 square meters) for a large number of planned lands, while some lands were allocated according to the previous rates.
- In the period 1985-1990, lands were allocated at an average of 1100 square meters, while other lands were allocated with an area of 700 square meters.
- The plans for the period (1990 - 1995) witnessed big leaps in the average areas, as multiple plots were allocated with areas ranging between 1200 - 3000 square meters.
- The period (1995 - 2000) witnessed a record and unprecedented jump in the average land area in the city of Sharjah. The minimum area reached 1,500 square meters, and the highest was 11,000 square meters.
- In the period between (2000-2015) the average areas decreased and ranged between (1100 square meters - 2500 square meters), although there were large plots with an average area of 4000 square meters (this period witnessed a qualitative shift that represented the experimentation of a different planning pattern than the strict grid planning pattern which has been prevalent since the period before (1970), when five neighborhoods in the Al-Suyoh area - of which there are 16 neighborhoods - were

planned according to the pattern of closed cul-de-sac streets. All the neighborhoods of the Rahmaniya area were also planned according to this new pattern.

- The period (2015-2020) witnessed the preparation of the housing plan for the cities of the Emirate of Sharjah, which was alerted for the first time to the problem of diminishing land available for construction and the increase in demand for residential land, and suggested multiple alternatives to accommodate the housing demand until the year (2042).

The plan was issued in two written reports, namely:

- **First stage report:** Current situation analysis (March, 2017).
- **Second Stage Report:** The Strategic Plan and Housing Policy (August, 2017)

The report of the first phase included the following (Table 7), which represents with (Table 6) related to the historical development of the average areas of residential land plots, as well as the two tables of building requirements in both Sharjah and Dubai - our focus in our quest to prove the hypothesis of the main role of the villa model in accelerating rates Urban sprawl.

5.2.9. Classification of the total residential lands in the city of Sharjah according to the average area

In the numerical and relative distribution of the average areas of residential land plots in the city of Sharjah, we relied on the following table, which was mentioned in the report of the first phase of the housing plan - as mentioned above.

| Plot Size (Square Meter) | No.of Plots | Site Area (Ha) | % |
|---------------------------------|--------------------|-----------------------|------------|
| <500 | 10864 | 311 | 19.8 |
| 1000 – 500 | 15937 | 1247 | 29.1 |
| 4000 - 1000 | 26591 | 4375 | 48.5 |
| >4000 | 1405 | 1902 | 3.6 |
| Total | 64797 | 7835 | 100 |

Table7 : Classification of the total residential lands in the city of Sharjah according to the average area, (Source: DTPS, 2020)

- As the numbers indicate, the number of residential plots whose area ranges between (500 square meters - 1000 square meters) is (15987) plots by 29.1% and covers an area of (1247 hectares), while the number of residential plots with an area of less than 500 square meters (10864) pieces at a percentage of (19.1%).
- The number of residential plots whose area ranges between (1000 square meters - 4000 square meters) is (26591) plots with a rate of 48.5%, meaning that the number of residential plots that exceed an area of 1,000 square meters amounts to (27996) plots at a rate of 52.1% (i.e. more than half of the total) number of residential plots in the city of Sharjah As shown in (Table 7), there are residential plots of up to 11,000 square meters.
- By comparing the average areas of residential plots in Sharjah with the international standards referred to, it will become clear that Sharjah uses extremely excessive rates, and by all accounts, in the height of the upper limit for residential villa land areas. It is noted that the draft bylaw of the proposed zoning regulation consecrated these high

rates and were included in its articles. The following table shows building requirements for residential villa models in the cities of Sharjah and Dubai. (Table 8).

| Typology | Sharjah | | Dubai | |
|----------|-----------------------------------|----------------|-----------------|--------------------------------|
| | Type | Area (Sq.m) | Type | Area (Sq.m) |
| R1 | Detached | More than 6000 | Detached | 3716.12 |
| R2 | Detached | (6000-3000) | Detached | 929.03 |
| R2(A) | Detached | More than 3000 | - | - |
| R3 | Detached | 3000-1000 | Detached | 696.8 |
| R3(A) | Detached | 1000-500 | - | - |
| R3(B) | Detached | less than 500 | - | - |
| R4 | Detached | 1000-500 | Detached | 464.5 |
| R4(A) | Detached | 3000-1000 | - | - |
| R5 | Two Villas attached from one side | 500-250 | - | 232.26 |
| (R5T) | Detached | less than 250 | Attached Villas | 232.26 (106.8) for each villas |

Table 8: Comparison in building requirements for residential villa models in the cities of Sharjah and Dubai, (Source: DTPS and Dubai Municipality)

From the table we come out with the following notes:

- i. The upper limit of the area of the model (R1) in the case of Sharjah starts between (6000 square meters and reaches 11,000 square meters), while the upper limit of the same model ends in the case of Dubai with an area of (3716.2 square meters). In other words, the beginning of the upper bound in Sharjah was more than double the upper limit of Dubai.
- ii. It is noticed the large number of villa models in the case of Sharjah, as there are (9) detached models and one model for adjacent villas, while in Dubai the number is (6)

only, including (5) models for separate villas and one model for adjacent villas. This can be explained by the fact that Sharjah lacked the scientific criteria for classifying and planning residential villas, as well as the urgent pressures that the Urban Planning Authority is subjected to by those entitled to land to increase their land areas. The Planning Studies Department of the Planning Directorate in Sharjah has prepared a draft bylaw for zoning, which accommodates the prevailing models instead of reclassifying them according to a scientific study that includes all the elements of determining the area and then applying the outputs of this study to residential villas in the new extension.

- iii. By comparing the average areas of the upper limit of residential villas in the city of Sharjah with their counterparts in Iraq - which amount to only 600 square meters in the case of the latter as indicated in the (Table 4) - we find that the minimum area of residential land plots in Sharjah within the category (RA) exceeds the maximum area. The lands of villas in Iraq are about 60 times greater.

By reviewing the urban growth map of the city of Sharjah (Fig. 17), we note that the size of the urban mass added to the city during the period between (1915 - 1995) - that is, during twenty years - has reached (292.3square kilometers) at a rate equivalent to (1152%) of the total area of the city since its inception, We can find an explanation for this phenomenon during our endeavor to enumerate the most prominent reasons behind the increase in the average land area during that period.

5.2.10. The main reasons for the increase in residential land plots areas in Sharjah

1. Free residential land

The Sharjah government undertakes to allocate private housing lands (villas) equipped with infrastructure and community services free of charge to all categories of citizens, which encourages the beneficiaries to seek to obtain the largest possible space, in fulfillment of the previous aspirations mentioned in section (5.2.2), in other words, if the person entitled to the land pays the value of the land equipped with services according to their price in the real estate market or a price subsidized by the government, will be the situation completely different and the average plot area would have been decreased. In this regard, we refer to the experience of the Kingdom of Saudi Arabia, where the lands north of the city of Al-Riyadh were allocated to middle and high-income people, with a minimum of 400 square meters, but after paying the value of the land and its services. Land for people with limited income has been planned with areas with a minimum ranging between 150 square meters - 200 square meters (it is not clear whether or not it was donated for free) (Al-Hathloul, 1994) this experience is proof that allocating lands according to their value inhibits the pursuit of big spaces.

2. Aid and housing loans

The government policy contributed to granting those entitled to residential land, housing assistance for people with limited incomes, and long-term easy loans for those with middle and high incomes, encouraging them to build into housing larger than the size that is compatible with their income levels.

3. Land grant policies

Among the conditions for entitlement to residential land in the Emirate of Sharjah, the number of family members of the applicant, and consideration is given - usually - to the size of the family when determining the area of the granted land. This measure does not take into account the phenomenon of social change with regard to the disappearance of the of the extended family, the inevitability of the children moving to their own homes, and the spacious housing remains almost empty, and in this regard Dr.A.S.Farman, who was working within the United Nations assistance program for the Ministry of Public Works in the UAE in the year 1982) with this fate for the model of the large villas that the ministry was building, and he said:

“It is doubtful if such solid and large houses would not be functionally obsolete within few years. This will be due to the growing number of the modern conjugal family household. It may be appropriate to discourage more buildings of such dwellings or at least not at the cost of any public subsidy directly or indirectly”.

4. Other reasons

Through a dialogue with a number of Emirati engineers, some of them attributed these large areas of plots of land in the city of Sharjah to the significant decrease in the number of citizens in relation to the number of non-citizens, as their number reached (104,353) people according to the 2015 population census, while the number of non-citizens reached (1,168,997) i.e. a rate of (7% - 93%) and there is a belief that the Sharjah government is working to avoid the reflection of this large difference in the number of inhabitants on the city's lands, so it is keen to grant residential plots of land with these large areas. However, this belief appears to be groundless, as evidenced by the relative

decrease in spaces in residential areas that have been distributed during the recent period (2015-2019).

5.2.11. The implications of the high average area of residential plots

1. The implications for the urban land stock

The leniency in terms of land allocation for every citizen of twenty-five years of age and the high areas of plots granted in the city of Sharjah, in comparison with Gulf standards, have resulted in the speed of consumption of constructible land in the city, and this policy has led to the addition of about (square kilometers) to the city urban mass. The housing plan for the city of Sharjah (2042) anticipated the depletion into force of lands suitable for reconstruction within the administrative boundaries of the city of Sharjah within (12) years, that is, before the time frame of the housing plan comes about (8) years. The housing plan estimated the number of plots required to meet the housing demand in the city at (28,353) plots. It also estimated the area required to accommodate the housing demand at 4,253 hectares (assuming that the average villa area is 750 square meters) - and indicated that the available area for construction is only 1998 hectares. As the aforementioned figures indicate, the average villa area used in calculating future residential demand represents half of the average prevailing villa area.

2. The economic implications

A. For the government: The studies of the cost of preparing residential lands in the country, which include the work of leveling sand dunes lands and extending the basic facilities (electricity - water - gas) indicated that the cost of equipping one hectare (10,000 square meters) in citizens' housing lands is 850,000 dirhams, i.e. About (70-75 thousand dirhams) per villa. While the cost of one hectare within the range of multi-

storey lands is between (1.5 - 1.8 million dirhams), with an average cost of 24,000 Dirhams for the residential unit (it should be noted that the study dates back to the year 2000) and it is natural that the cost has increased greatly in current time according to prevailing rates. Therefore, these large resources that are spent on preparing low-density lands in Sharjah could be sufficient to supply twice the number of residential extension lands in the event of increasing the residential density by reducing the average areas of private villas plots.

Fig (15) and Fig (16) illustrate the effect of increasing the size of the plot on the cost of installing the residential networks of water, electricity, sewers and roads (Abdulkareem, 1982) (Note how this data relates to a minimum size plot of 100 sq.m, not for the larger plots (Doxiadis, 1960)

- B. For the owner of the land:** large plots of land represent a great burden on the land holder, especially if he has limited or medium incomes, as the longer the outer wall surrounding the plot of land increases, the higher the cost of building it. According to the prevailing prices, the cost of building an external wall is estimated for a plot of 15,000 square feet (139,355 square meters) of about 100,000 dirhams, in addition to the high cost of landscaping and beautifying the garden, which accounts for about 80% of the total area of 15,000 square feet of plots, in addition to the cost of maintenance.

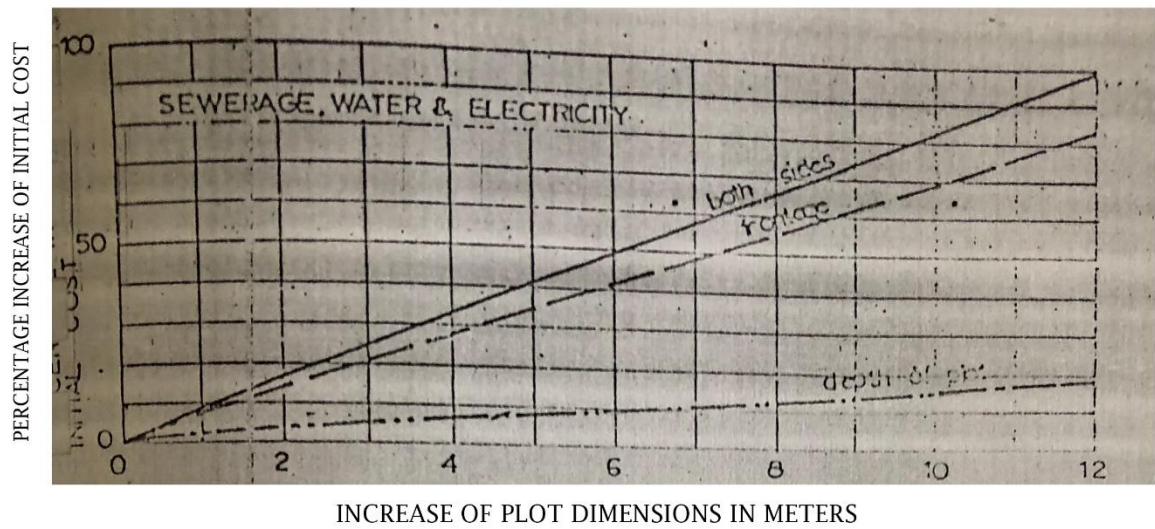


Fig 15: Effect of increasing the size of the plot on the cost of installing the residential networks of water, electricity, sewers and roads, (Source: Abdulkareem,S 1982)

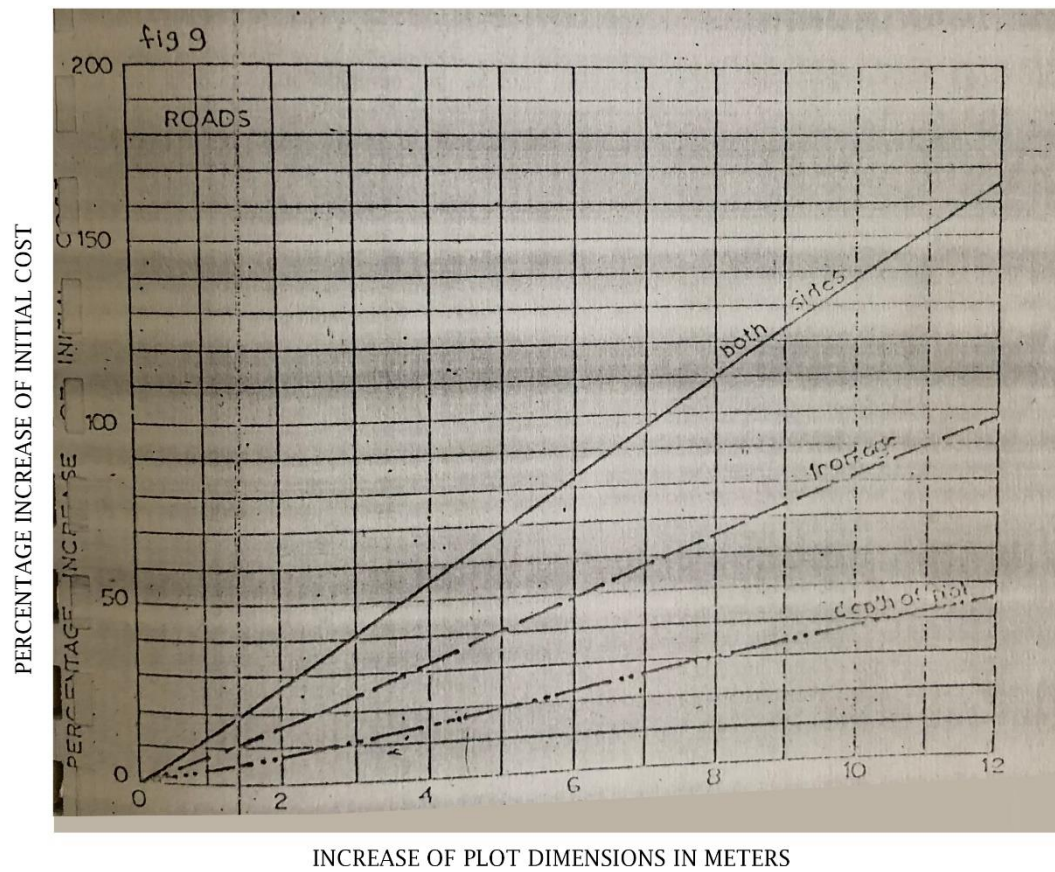


Fig 16: Effect of increasing the size of the plot on the cost of installing the residential networks of water, electricity, sewers and roads, (Source: Abdulkareem, 1982)

6. Using remote sensing technology and geographic information systems to study the urban growth of the city of Sharjah

6.1. Data Collection

- Remote sensing and aerial photography techniques were employed in conjunction with geographic information systems (GIS) in order to prepare a spatial analysis of the size of the urban sprawl and its growth trends in the city of Sharjah through the integration of technical data.
- Aerial photos of Sharjah city were used for the years: 1960 - 1968 - 1972 - 1980 - 1988 - 1994 - 1997 - 2007 - 2010 - 2019.
- The modern basic maps of the city were also used.
- Work began by digitizing the boundaries of the residential and industrial extensions and the rest of the land use for each time stage and using the ArcMap and ArcGis program to calculate the area of the extension boundaries added in each phase, and grouping them according to the chronology in (Fig. 17), which shows the city's growth in the years (1970 - 2019).
- (Table 9) has also been prepared, which shows the area added in square kilometers at each stage, the average and annual urban growth trends, and the growth rate for each phase in relation to the base year (1970). Columns showing the total population of the city (citizens and non-citizens) have also been added in each time period through the use of various population censuses and demographic data issued by:
 7. The National Center for Statistics in Abu Dhabi
 8. Department of Statistics and Community Development - Sharjah.

| Time Period | Area Sq.Km | Amount Increased Sq.Km | Average Annual Increase in Area | The increase in area in relation to the base year | Direction of Growth | Population | | |
|--------------------|------------|------------------------|---------------------------------|---|---------------------|------------|-----------|------------------|
| | | | | | | Citizen | Expat | Total |
| Before 1970 | 8.68 | - | - | %100 | East | 23336 | 8623 | 31959 |
| 70 - 75 | 18.1 | 9.42 | 1.9 | % 208.5 | East | 25024 | 33029 | 58053 |
| 75 - 85 | 71.29 | 53.19 | 5.32 | % 821.3 | East & South | 48327 | 125460 | 173787 |
| 85 - 95 | 96.55 | 25.26 | 2.53 | % 1112.3 | East & South | 80042 | 240071 | 320113 |
| 95 - 2005 | 141.83 | 45.28 | 4.53 | %1634 | South | 81098 | 534607 | 615705 |
| 2005 - 2015 | 271.45 | 129.62 | 12.97 | % 3127 | North & East | 104353 | 1,168,997 | 1,273,350 |
| 2015 - 2019 | 292.3 | 20.85 | 4.17 | % 1152 | East | 117907 | 1,220,636 | 1,338,543 |

Table 9: Urban and population growth of the city of Sharjah (1970-2019), (Source: Author, 2020)

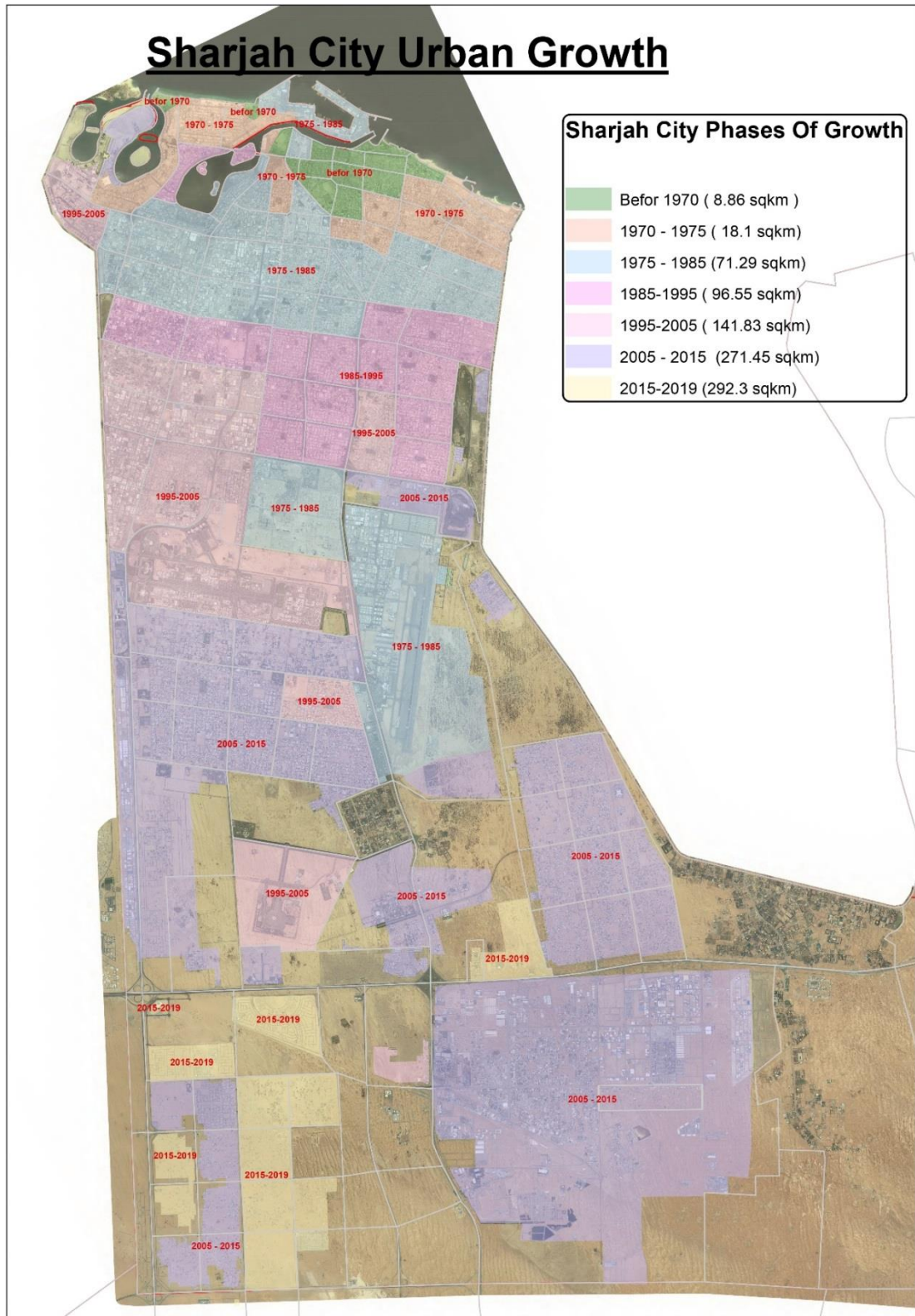


Fig 17: Tracing the urban and population growth of the city of Sharjah using ArcGIS (Source: Author, 2020)

6.2. Data Analysis

6.2.1. Urban growth in Sharjah between 1970-2020

This chapter deals with the urban growth of the city of Sharjah starting from the end of the 1960s to the present time. This beginning was chosen due to its association with the first residential extension of the city after it crossed its old wall for the first time since its inception during prehistoric times (Wikipedia)

- i. The stages of growth were divided into periods of ten years for each period, except for the first period (1970-1975) for several reasons including
- ii. It represents the stage of independence of the state, which was declared in December 1971
- iii. This period witnessed the beginning of the economic and development boom in the Emirate of Sharjah with the production and export of oil
- iv. The year 1975 witnessed the first population census of the country's cities, which provided detailed information and data for population and housing that represent a starting point for monitoring development every ten years to keep pace with the population censuses that were conducted afterwards.

6.2.2. Urban development in the period before 1970

This period included the districts of old Sharjah (10 areas) in addition to the Maysaloon and Al Musalla areas, which represent the first extensions outside the Sharjah wall.

- Total urban mass: 8.86 km²
- Growth direction: East
- Total population: 31,959 people – Citizens (23336), Expats (8623)



Fig 18: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1960)

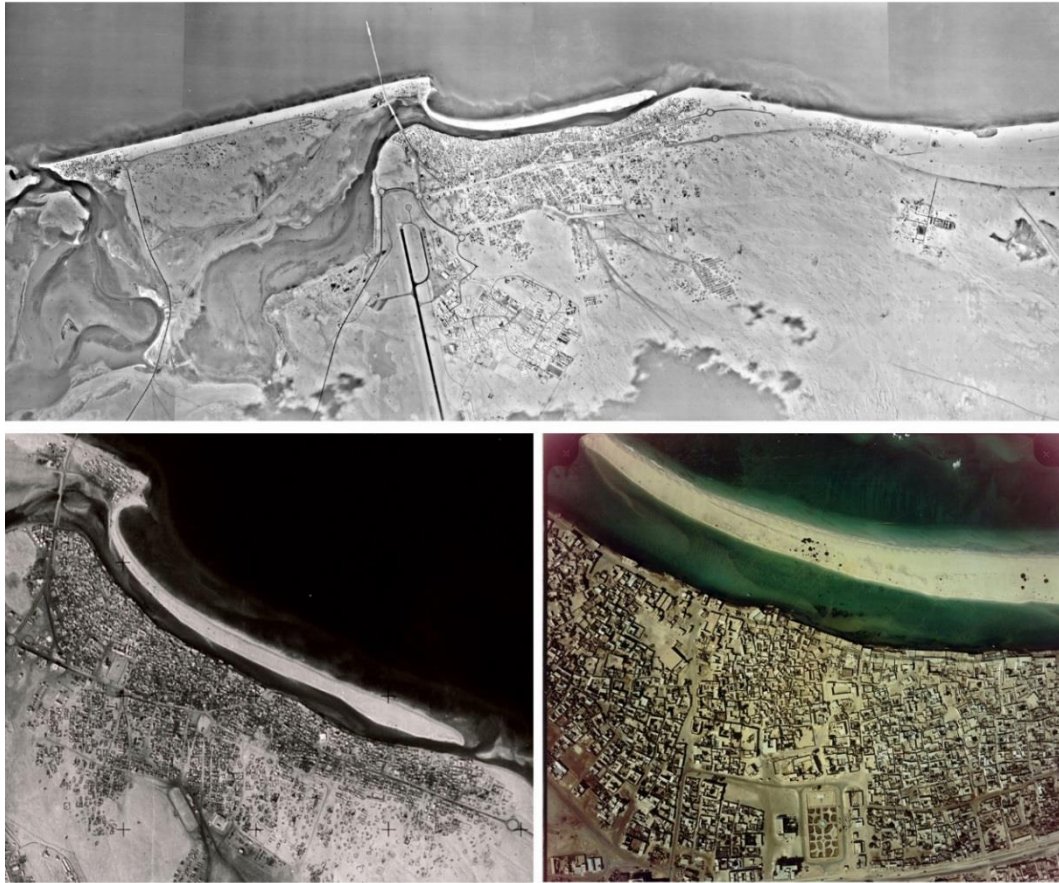


Fig 19: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1968)

6.2.3. Urban development in the period (1970-1975)

- Total urban mass: 18.1 km²
- Added area: 9.42 square kilometers
- The percentage of the added area for the base year 208.5%
- Growth direction: East
- The population reached: 58053 people – Citizens (25024), Expats (33029)

This stage marked the beginning of the development phase and the increase in spending on infrastructure and government housing in the city of Sharjah.

- **Residential areas:** Jubail - Al Marija - Al Shuwaihean - Al Majara - Al Qulaia - Al Fisht - Bu Tina - Al Nabbaa - Al Ghuwair - Maysaloun - Al Musalla.



Fig 20: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1972)

6.2.4. Urban development in the period (1975 - 1985)

- Total urban mass: 71.29 square kilometers
- Added area: 53.19 square kilometers
- The percentage of added area for the base year 821.3%
- The population reached: 173,787 – Citizens (48,327), Expats (125,460)
- Growth direction: East and South
- The number of residential building permits issued by the Sharjah City Municipality in the period (1974 - 1983) reached (15048) building permits.

- Added citizens' housing areas: - Al Raffa - Al Mirqab - Al Nakhilat - Al Sabkha - Al Ghafia - Sharqan - Al Qadisiyah - Al Hazana - Al Jazzat - Al Nasiriyah - Al Faiha - Al Ramla - Dasman - Al Abaar - Al Ghubaiba - Samnan - Al Khalidiya - Industrial Area (1-8) - Sharjah International Airport - Al-Falah camp.

Notes:

- As shown, a large area was added to the urban cluster during this period, amounting to 53.19 square kilometers, or 18.2% of the total area added since (1970), due to the fact that this period coincided with the economic boom.



Fig 21: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1980)

6.2.5. Urban development in the period (1985 - 1995)

- Total urban area: 96.55 km²
- Added area: 25.26 square kilometers
- The percentage of added area for the base year 1112.3%
- Growth direction: East and South
- The population reached: 320,095 – Citizens (80024), Expats (240071)
- Added citizens' housing areas: Azra - Ramtha - Al Ramaqia - Mawafajah - Falaj - Al Quoz - Al Khazamia - Al Talaa - Riffa - Al Shahba - Al Darari - Al Tarfa – Industrial areas (3-6).

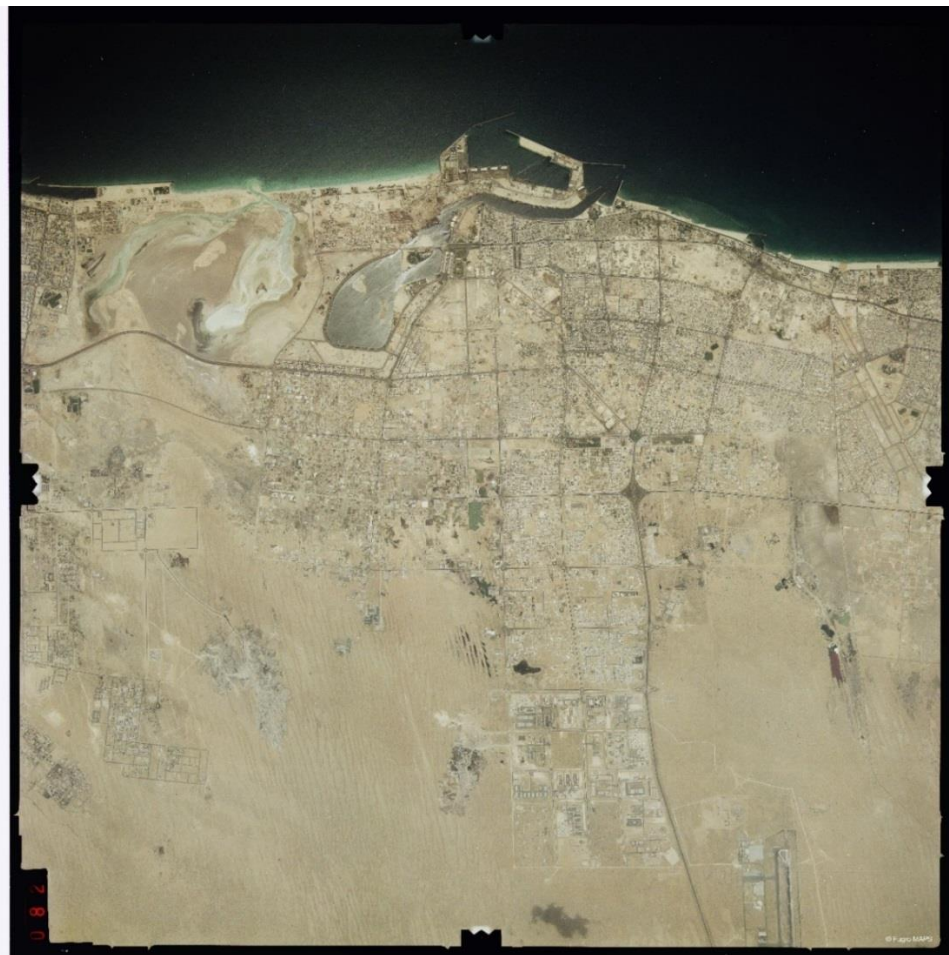


Fig 22: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1988)

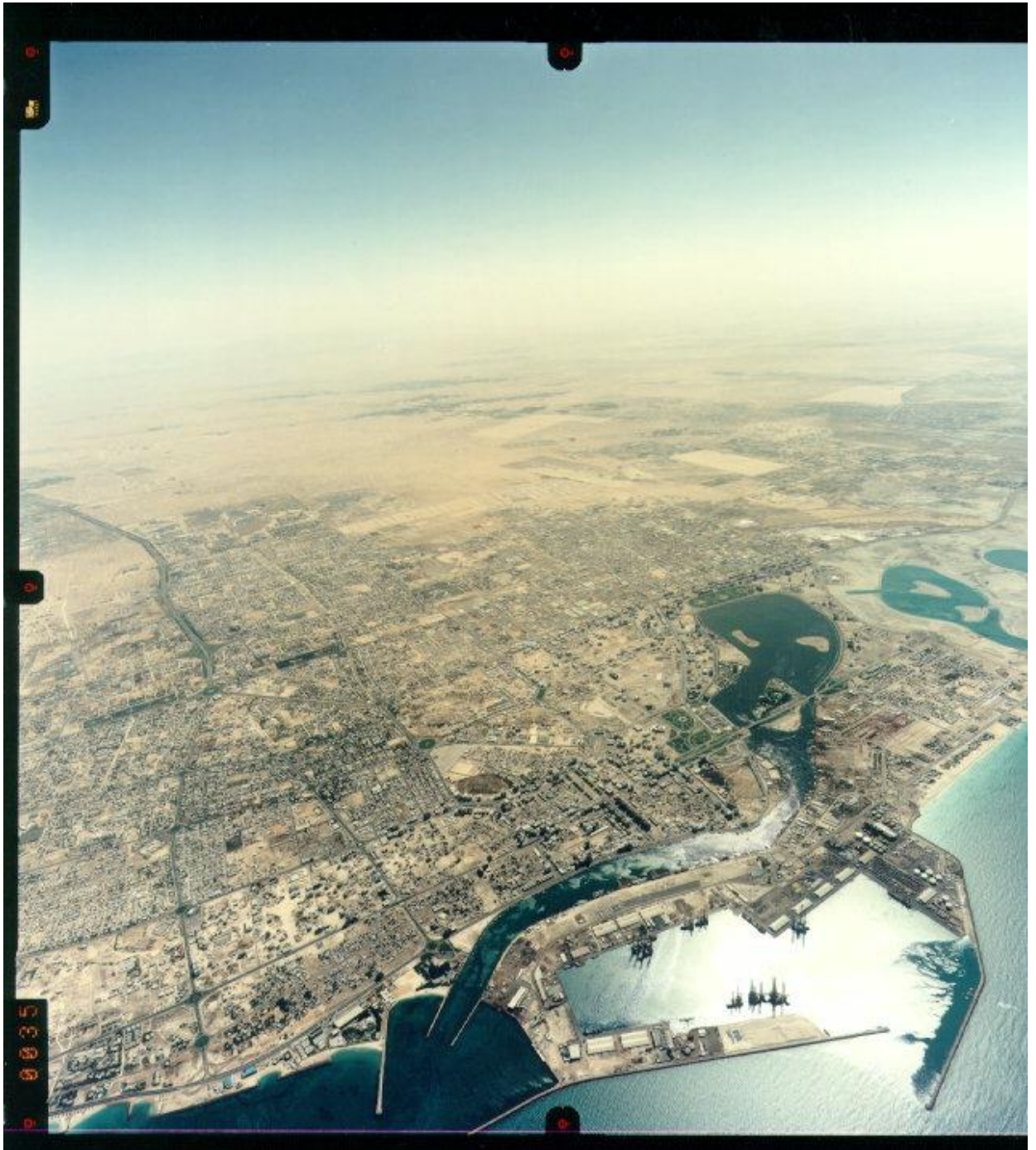


Fig 23: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1994)

6.2.6. Urban development in the period (1995 - 2005)

- Total urban mass: 141.83 km²
- Added area: 45.28 square kilometers
- The percentage of added area for the base year 1634%
- Growth direction: South
- The population reached: 15,705 – Citizens (81,098), Expats (534,607)
- Added citizens' housing areas: Al-Qarayen area in addition to the governor's palace - the university city - industrial areas (10-17)



Fig 24: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 1997)

6.2.7. Urban development in the period (2005-2015)

- Total urban mass: 261.45 km²
- Added area: 119.62 square kilometers
- The percentage of added area for the base year 3012.1%
- Population: 104,353 - the number of Expats (1,168,997)
- Growth direction: North and East
- Added citizens' housing areas: Al Juraina - Al Juraina (1) - Al Qarayan (1 - 2 - 3 - 4 - 5) - Al Nouf (1 - 2 - 3 - 4) - Hoshi - Muzairaa - warehouse land - Al Attin - Rahmaniya (1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10) - Al-Suyoh (1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16) Al Sajaa Industrial - Emirates Industrial City.

Notes:

- This period of time topped the rest of the periods in terms of the area added to the urban cluster, which represented 44.3% of the total added area in 1970-2019, in proportion to the large number of added residential areas, some of which were distinguished by the average large areas of residential plots, (4000 square meters - 11,000 square meters).
- It also witnessed the development of the Sajaa industrial areas and the Industrial Emirates.



Fig 25: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 2007)



Fig 26: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 2010)

6.2.8. Urban development in the period (2015 - 2019)

- Total urban mass: 287.68 km²
- Added area: 26.25 square kilometers
- The percentage of added area for the base year 1152.1%
- Growth direction: Eastern
- The population reached: 1,338,543 – Citizens (117,905), Expats (1,220,636).
- Added citizens' housing areas: Al Shonouf



Fig 27: Satellite Image of the City of Sharjah, UAE (Source: DTPS, 2019)

7. Survey

7.1. Data Collection

1. Considering the objective conditions related to the measures of the ban and social divergence due to (Covid-19) and for the sake of obtaining the largest possible response, we resorted to choosing a representative sample that can be accessed easily.

Limiting the selected sample to a segment of engineers, architects and urban planners closely related to the nature of the research and included:

- A. Employees of the Department of Planning and Survey (DTPS) and its branches
- B. Employees of the Urban Planning Council (SUPC).

2. The consensual national urban plan group (which includes engineers in urban planning departments in other emirates).

3. Ensure that a segment of the UAE citizens constitutes a large percentage of the sample.

4. A segment of non-national engineers was selected from among those who worked in the field of city planning (whether in the private or public sector) for long periods, and those with Arab nationalities due to the similarity of the built environment.

5. We do not need to point out that the general public questionnaire requires obtaining approvals and complex administrative procedures (especially for non-citizen researchers).

Therefore, we resorted to a questionnaire for the segment of relevant professionals.

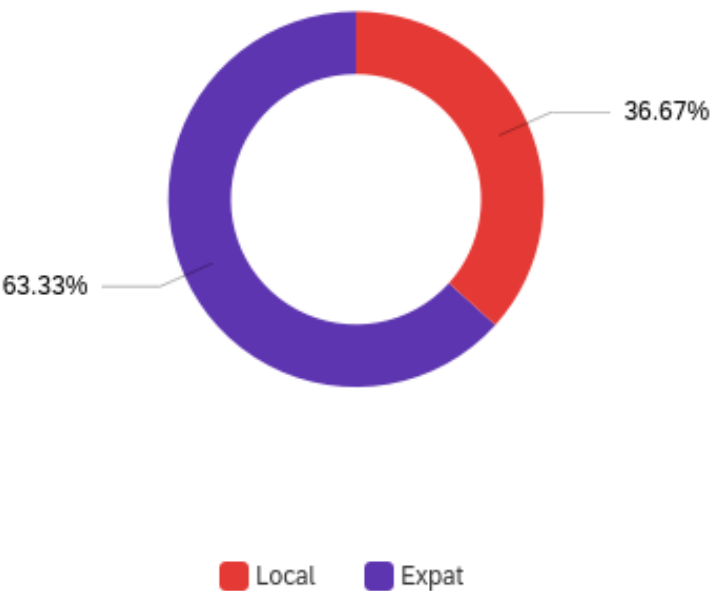
6. The questionnaire included in its introduction the usual introductory questions about identity, profession, destination, and nationality of the person who would fill out the questionnaire.

7.1.1. Questionnaire analysis

The questionnaire was sent by phone to about (60) individuals as representatives of the selected sample, and after vigorous and repeated pursuit, (30) individuals responded and cooperated with us in filling out the questionnaire, i.e. about 50%, and this percentage is considered good according to the experience and practice in the country, especially if the researcher was not a citizen. As well as restrictions on direct communication due to the known health circumstances.

7.2. Data Analysis

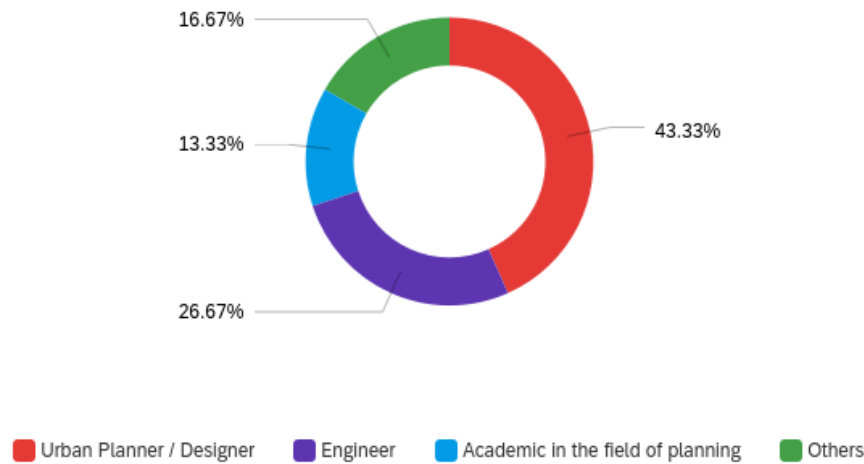
Nationality



| # | Answer | Count |
|---|--------|-------|
| 1 | Local | 11 |
| 2 | Expat | 19 |
| | Total | 30 |

The number of citizens who responded was (11) citizens by 36.67%, while the number of non-citizens reached (19) individuals, at a rate of 63.33%.

Occupation



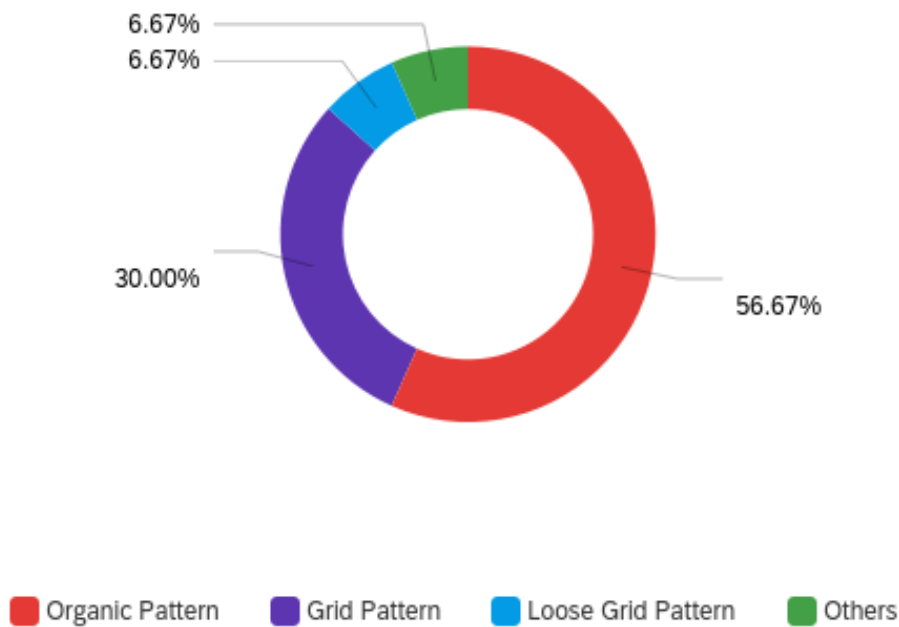
| # | Answer | Count |
|---|-----------------------------------|-------|
| 1 | Urban Planner / Designer | 13 |
| 2 | Engineer | 8 |
| 3 | Academic in the field of planning | 4 |
| 4 | Others | 5 |
| | Total | 30 |

As shown in the table and diagram, the category of urban planners topped the selected sample by 43.33%, followed by engineers by 26.67%, then other groups by 16.67%, and finally academics working in the field of planning.

There is no doubt that the result is excellent, as the percentage of the category directly related to the field of urban planning (urban planners and planning academics) is 56.66%.

It should be noted in this year that the category of urban planners included the Ex-chairman of the Department of Planning and Survey, directors of departments in the department, as well as the Secretary-General of the Sharjah Urban Planning Council, all of them from among the citizens segment. The non-citizen segment included urban planners and engineers, among whom had contributed to the establishment of the department since 1985. It also included the Dean of the College of Urban Planning at Cairo University and the supervisor of Sharjah Urban Plan.

1.1 - According to your opinion, which of the common urban planning patterns is the most suitable for the local conditions of the United Arab Emirates

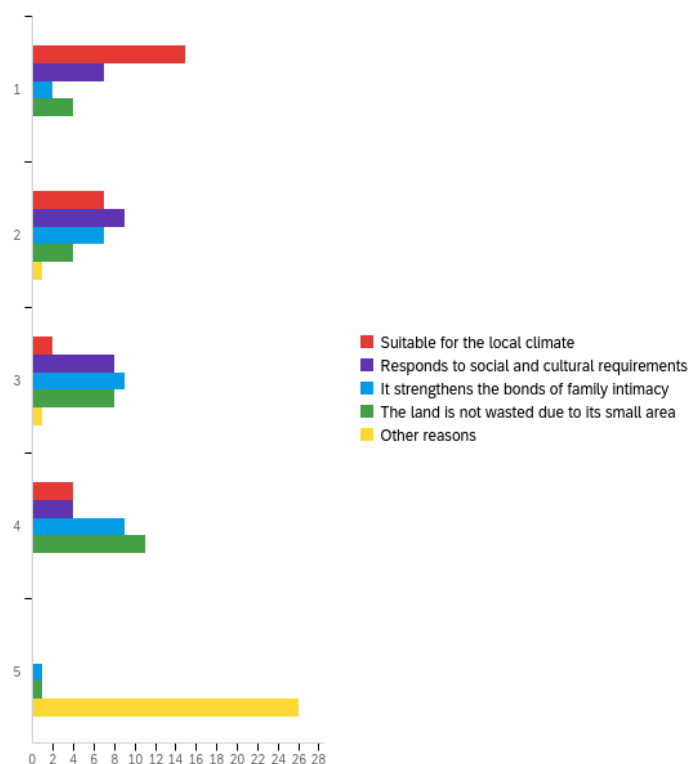


| # | Answer | Count |
|---|--------------------|-------|
| 1 | Organic Pattern | 17 |
| 2 | Grid Pattern | 9 |
| 3 | Loose Grid Pattern | 2 |
| 4 | Others | 2 |
| | Total | 30 |

Urban Pattern: The urban pattern most appropriate to the conditions of the UAE:

The percentage of those who prefer the traditional organic fabric pattern is 56.67%, while the percentage of those who prefer the grid system is 30%.

1.2 - If the organic pattern is the best, please rank the features of this type according to precedence

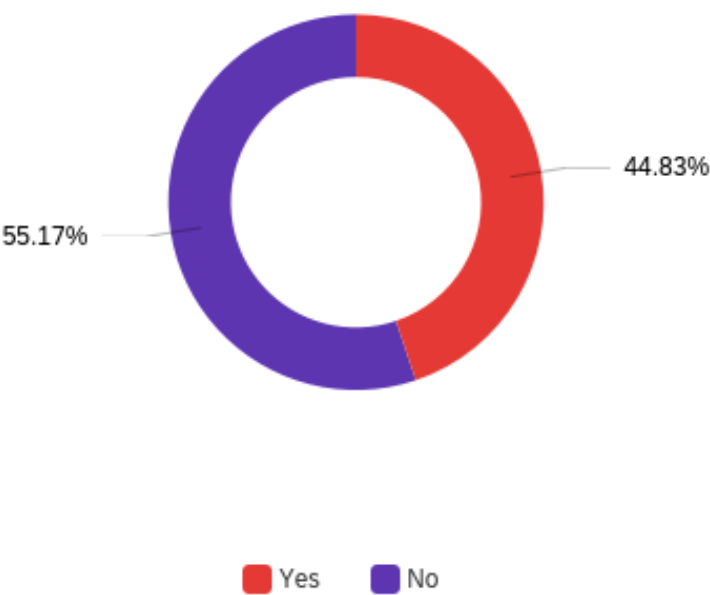


Those who prefer organic fabric ranked the reasons for their preference for it in the following order:

| # | Question | 1 | 2 | 3 | 4 | 5 | Total |
|---|--|----|---|---|----|----|-------|
| 1 | Suitable for the local climate | 15 | 7 | 2 | 4 | 0 | 28 |
| 2 | Responds to social and cultural requirements | 7 | 9 | 8 | 4 | 0 | 28 |
| 3 | It strengthens the bonds of family intimacy | 2 | 7 | 9 | 9 | 1 | 28 |
| 4 | The land is not wasted due to its small area | 4 | 4 | 8 | 11 | 1 | 28 |
| 5 | Other reasons | 0 | 1 | 1 | 0 | 26 | 28 |

1. Climate - 2. Response to social and cultural conditions - 3. Not to waste the land - 4. Strengthening family ties - 5. Other.

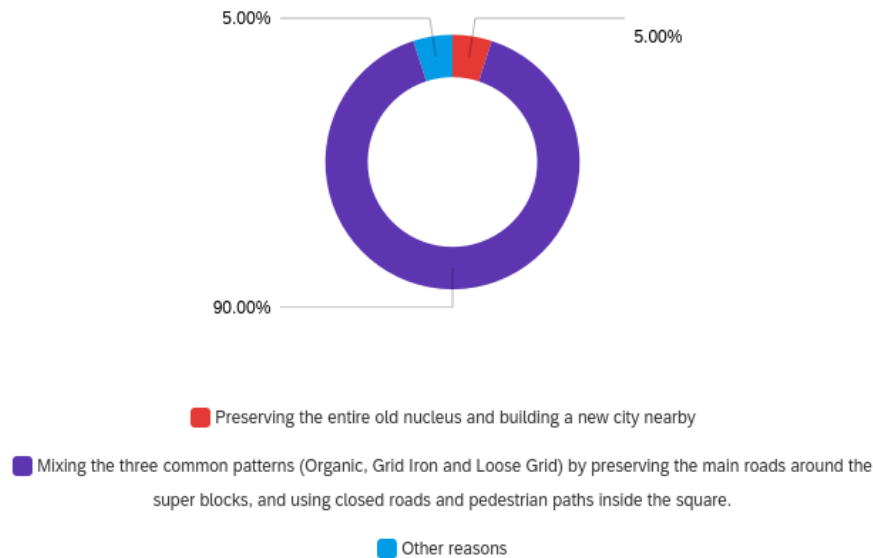
1.3 - Opponents of the organic pattern argue that it does not fit the current reality imposed by the use and control of “the automobile” Are you a supporter or opponent of this argument?



| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 13 |
| 2 | No | 16 |
| | Total | 29 |

With regard to a survey of respondents about some prevailing opinions that the organic system does not fit the current reality imposed by the use of the car: 55.17% objected to the opinion and 44% 83% supported it.

1.4 - If the answer is (No), do you have proposals for suitable treatments for the organic pattern to keep pace with the current reality? Mark in front of the preferred suggestion: -

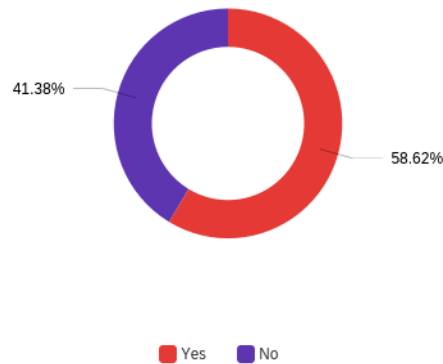


| # | Answer | Count |
|---|---|-------|
| 1 | Preserving the entire old nucleus and building a new city nearby | 1 |
| 2 | Mixing the three common patterns (Organic, Grid Iron and Loose Grid) by preserving the main roads around the super blocks, and using closed roads and pedestrian paths inside the square. | 18 |
| 3 | Other reasons | 1 |
| | Total | 20 |

Those who do not prefer the organic pattern and the means of treating it and adapting it to the current reality ranked the causes according to the following precedence:

1. Using a mixture of the main patterns (Organic - Grid – Loose Grid), so that the main streets remain around the super blocks, while the closed roads (cul-de-sacs) are used inside the block. Among the most prominent global practices in this regard is the experience of Milton Keynes in Britain.
2. Preserving the nucleus of the old city as it is, and building a new neighboring city (from among the most prominent international practices - the experience of the city of Tunisia).

1.5 - There are some attempts to use the Suburban pattern which incorporates the use of the Cul-de-sacs system Do you support these attempts?

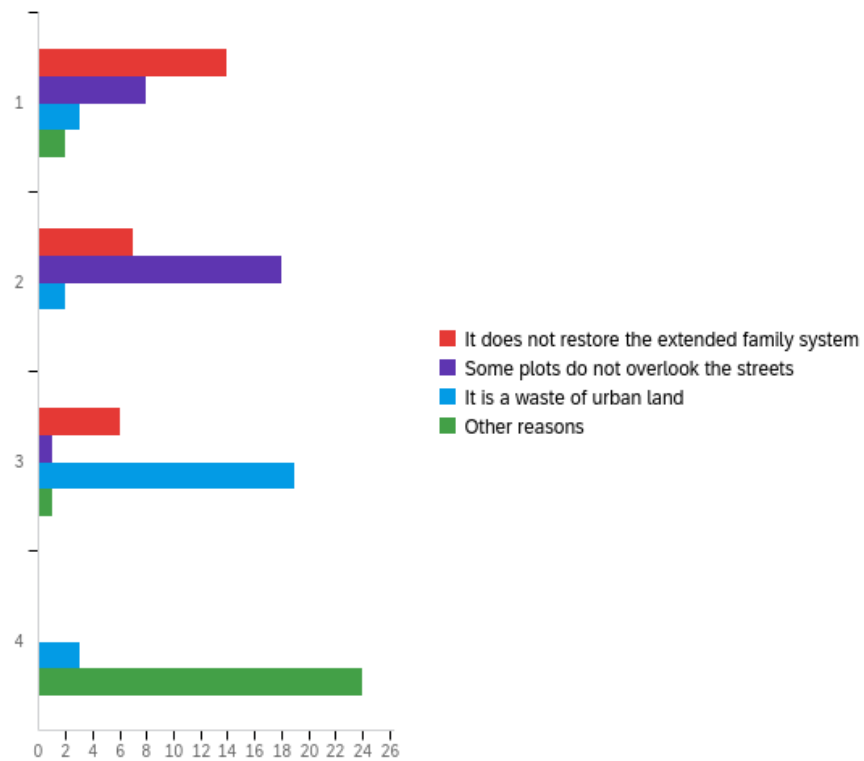


| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 17 |
| 2 | No | 12 |
| | Total | 29 |

Regarding the opinion of the respondents regarding the attempts to use the closed roads system (Cul-de-sacs) in some neighborhoods, 58.62% agreed with these attempts, and 41.38% opposed it. It should be noted that this pattern was used in planning (5) neighborhoods in the Al-Suyoh area in Sharjah city, and in all the neighborhoods of the Rahmaniya area in the city. This experience has not yet been evaluated by the Department of Planning and Survey, but some initial observations have been made by some planners in the department as follows:

- A. This pattern consumes more spaces than the grid pattern.
- B. The existence of conflicts between neighbors in the residential cell between those who overlook the streets and those who overlook the inner square only.
- C. An in-depth evaluation study is required by the department.

1.6 - If the answer is (No), please rank the following reasons according to precedence

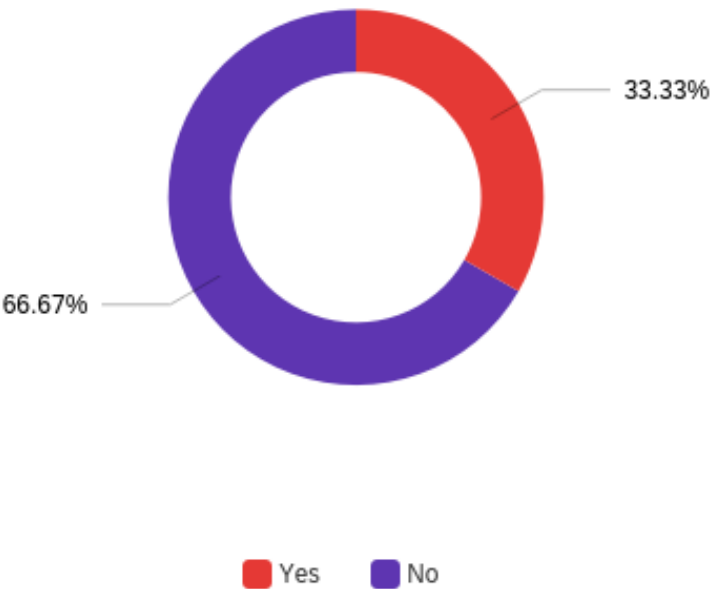


| # | Question | 1 | 2 | 3 | 4 | Total |
|---|--|----|----|----|----|-------|
| 4 | Other reasons | 2 | 0 | 1 | 24 | 27 |
| 3 | It is a waste of urban land | 3 | 2 | 19 | 3 | 27 |
| 1 | It does not restore the extended family system | 14 | 7 | 6 | 0 | 27 |
| 2 | Some plots do not overlook the streets | 8 | 18 | 1 | 0 | 27 |

Those who do not prefer the closed road system have ranked their reasons for rejecting it as follows:

- It does not maintain the culture of the extended family
- Some pieces do not overlook the streets
- Waste of land
- Other reasons

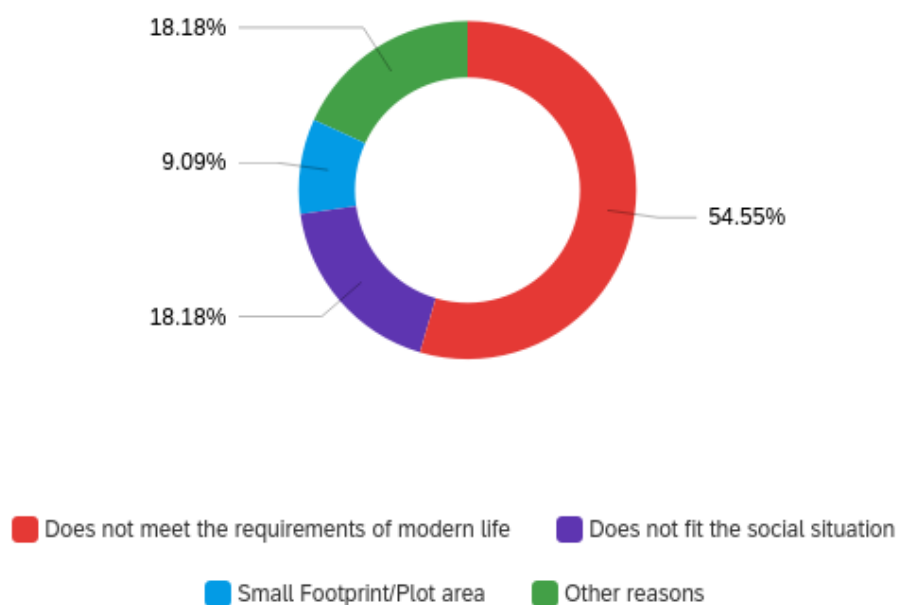
2.1 - Do you support the decision of the Municipality of Sharjah to suspend permits for the construction of traditional houses?



| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 10 |
| 2 | No | 20 |
| | Total | 30 |

66.67% objected to the decision, while 33.33% supported it. In our opinion, the decision did not include any reasons to justify it, and we believe that it is in line with aspirations towards owning villa style, without being inspired by the characteristics and characteristics of traditional housing.

2.2 - If the answer is (Yes), choose the preferred justification (You can choose more than one answer)

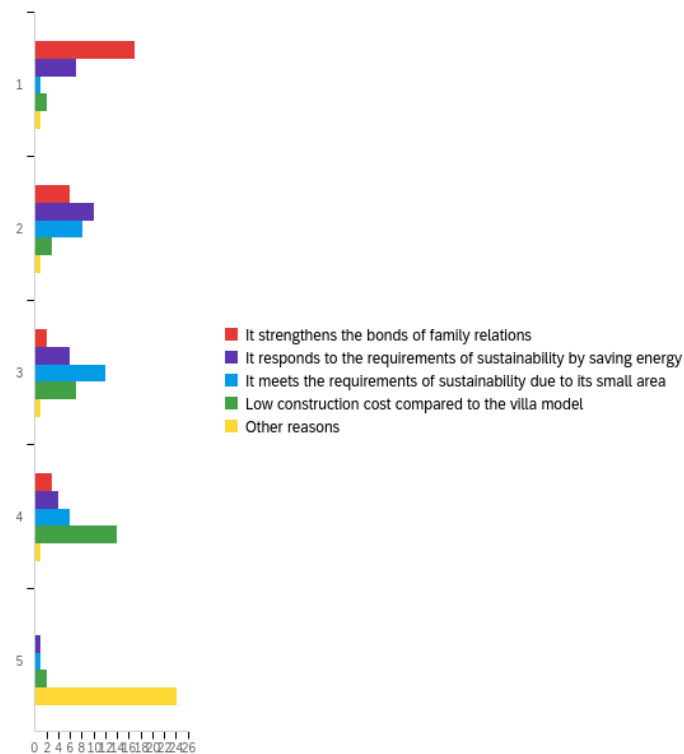


| # | Answer | Count |
|---|---|-------|
| 1 | Does not meet the requirements of modern life | 6 |
| 2 | Does not fit the social situation | 2 |
| 3 | Small Footprint/Plot area | 1 |
| 4 | Other reasons | 2 |
| | Total | 11 |

Those who support the municipality decision ranked their causes according to the following order:

- Does not respond to modern requirements
- It does not suit the social situation
- The small area of the dwelling
- Other reasons

2.3 - If the answer is (No), please rank the following reasons according to precedence

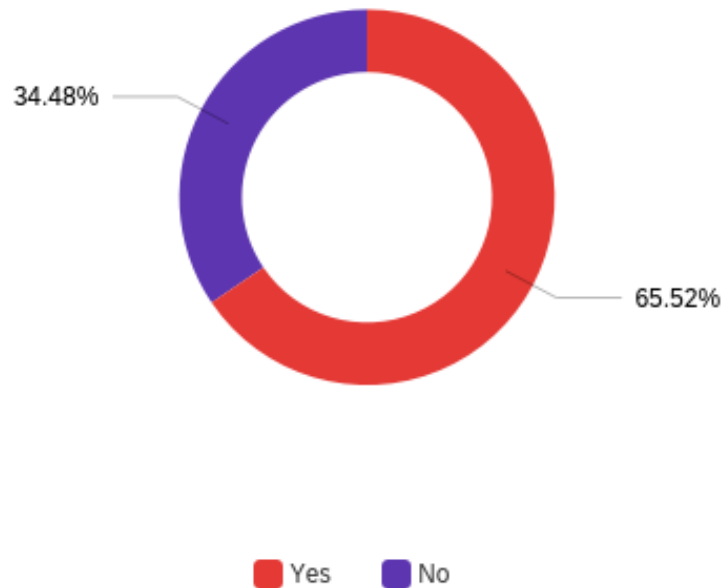


| # | Question | 1 | 2 | 3 | 4 | 5 | Total |
|---|--|----|----|----|----|----|-------|
| 1 | It strengthens the bonds of family relations | 17 | 6 | 2 | 3 | 0 | 28 |
| 2 | It responds to the requirements of sustainability by saving energy | 7 | 10 | 6 | 4 | 1 | 28 |
| 3 | It meets the requirements of sustainability due to its small area | 1 | 8 | 12 | 6 | 1 | 28 |
| 4 | Low construction cost compared to the villa model | 2 | 3 | 7 | 14 | 2 | 28 |
| 5 | Other reasons | 1 | 1 | 1 | 1 | 24 | 28 |

Those who object to the decision ranked the reasons for their objection as follows:

- Arab housing strengthens family relations
- Responds to the requirements of the principles of sustainability by saving energy
- Lower construction cost compared to villa model
- Other reasons

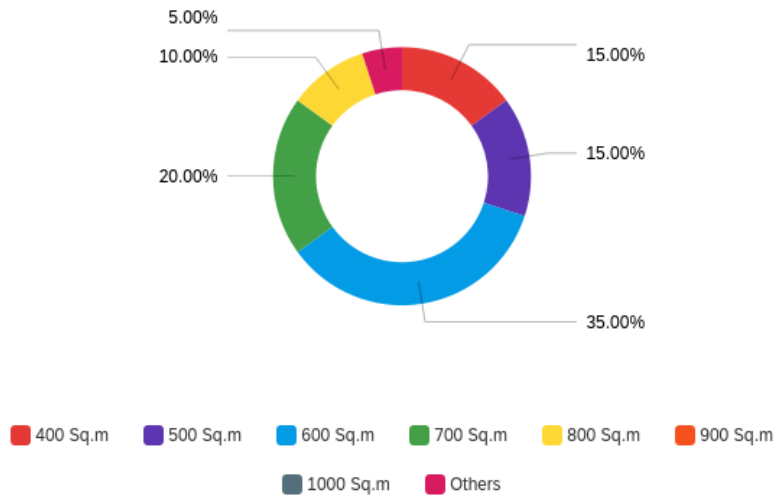
2.4 - There are those who believe that the average villa plot area prevailing in the different emirates of the country (which is more than 1000 square meters) is much greater than the actual need for a local Emirati family Please choose the answer according to your opinion



| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 19 |
| 2 | No | 10 |
| | Total | 29 |

With regard to the opinion of the respondents in some prevailing beliefs that the average villa area in the country far exceeds the needs of the family: 65.52% agreed with this opinion, while 33.48% disagreed.

2.5 - If the answer is (Yes), choose what you consider as an appropriate/suitable plot area



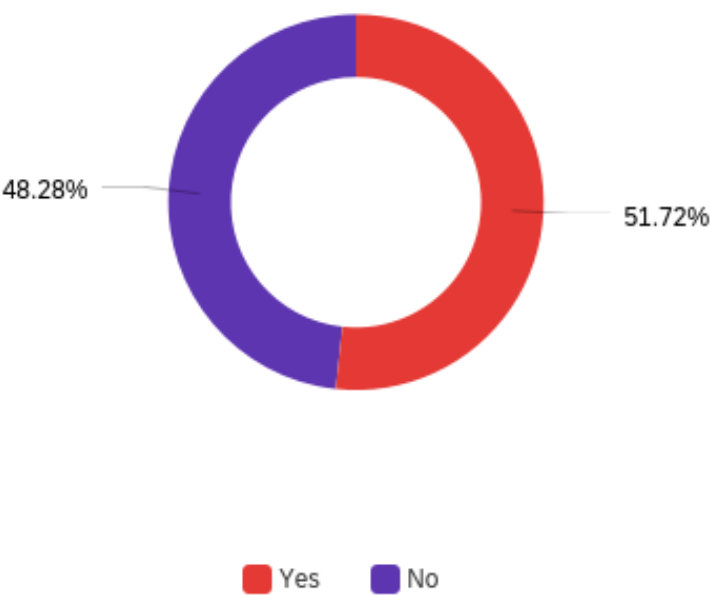
| # | Answer | Count |
|---|-----------|-------|
| 1 | 400 Sq.m | 3 |
| 2 | 500 Sq.m | 3 |
| 3 | 600 Sq.m | 7 |
| 4 | 700 Sq.m | 4 |
| 5 | 800 Sq.m | 2 |
| 6 | 900 Sq.m | 0 |
| 7 | 1000 Sq.m | 0 |
| 8 | Others | 1 |
| | Total | 20 |

The approvers ranked the appropriate average villa area as follows:

- 600square meters
- 700square meters
- 500square meters and 400 square meters
- 800square meters
- Others
- No one agreed on the average size of 900 square meters and above.

The result is in line with the average size of government housing in the country and with the average size of housing in Saudi Arabia and Iraq. It is believed that it is the ideal and suitable space to raise residential density rates and reduce urban sprawl.

2.6 - There are proposals to increase the building density of the residential villa by increasing the maximum height to three floors (the current maximum is Ground + 1) Do you agree with this approach?

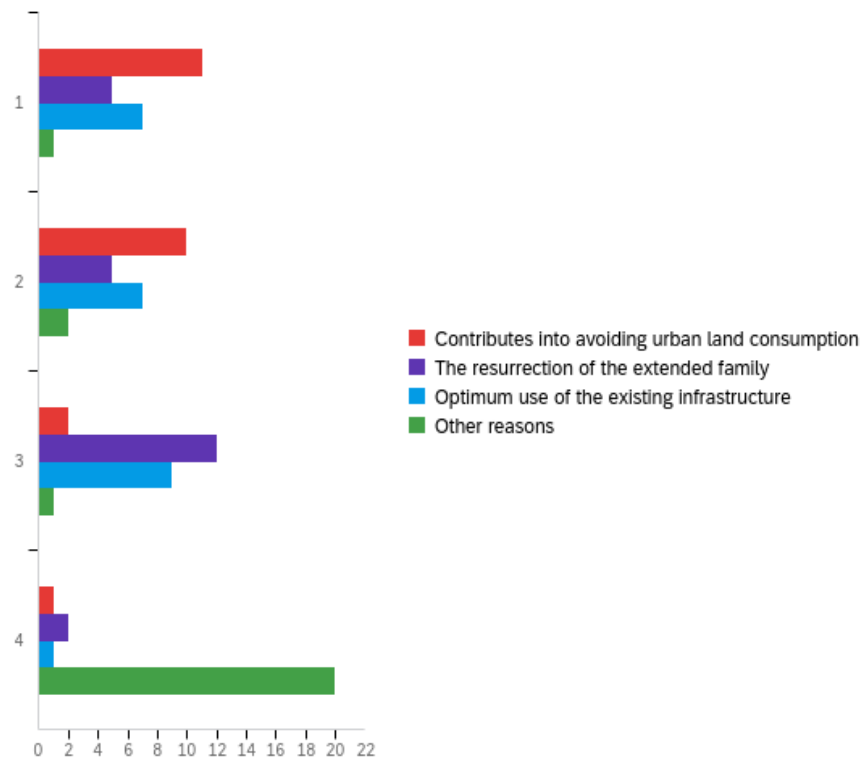


| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 15 |
| 2 | No | 14 |
| | Total | 29 |

With regard to the proposal to raise the density rate of the villas by increasing the height to three floors:

%51.72agreed with the proposal and 48.28% opposed it.

2.7 - If the answer is (Yes), please rank the following reasons according to precedence

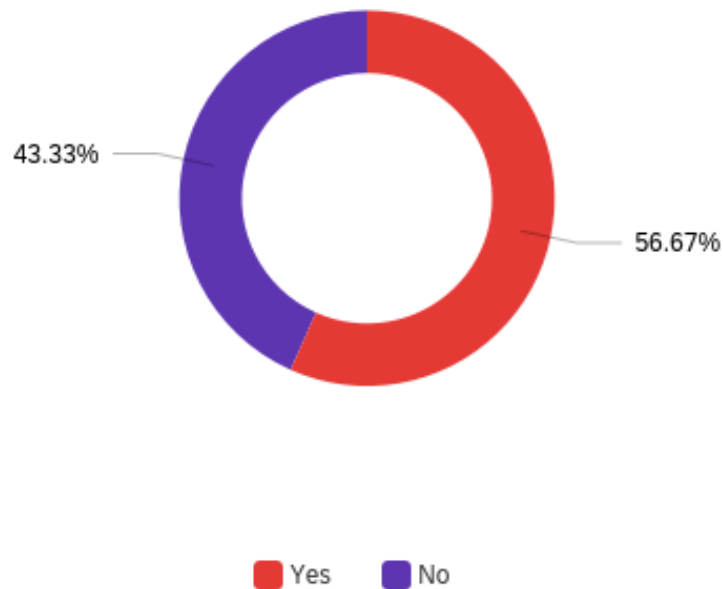


| # | Question | 1 | 2 | 3 | 4 | Total |
|---|--|----|----|----|----|-------|
| 4 | Other reasons | 1 | 2 | 1 | 20 | 24 |
| 2 | The resurrection of the extended family | 5 | 5 | 12 | 2 | 24 |
| 1 | Contributes into avoiding urban land consumption | 11 | 10 | 2 | 1 | 24 |
| 3 | Optimum use of the existing infrastructure | 7 | 7 | 9 | 1 | 24 |

The proponents of the increasing density ranked their reasons in the following order:

- Avoid depreciating land stocks
- Optimal use of the infrastructure
- Restoring the extended family
- Other reasons

2.8 - Do you see that there are chances for the success of the proposal of accommodating local families in residential apartments due to the scarcity of land in some of the emirates?

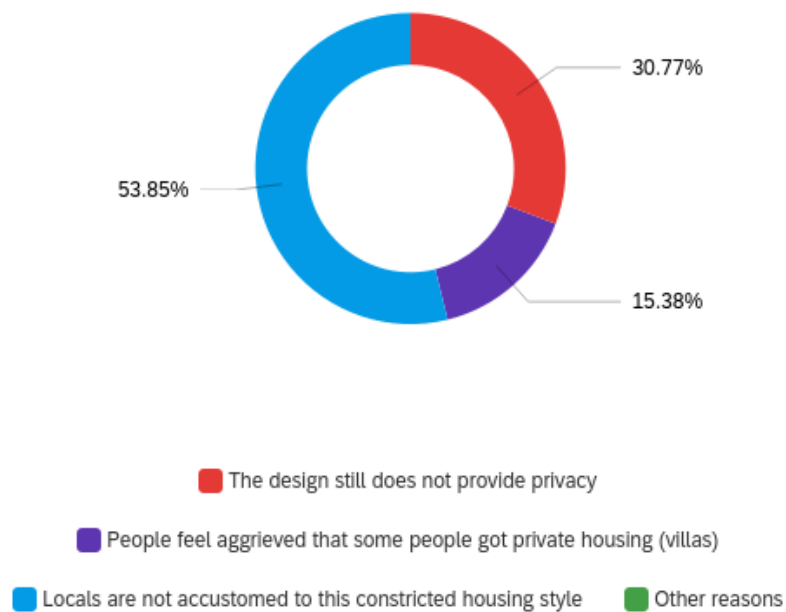


| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 17 |
| 2 | No | 13 |
| | Total | 30 |

With regard to the possibility of success opportunities for housing the citizens of some areas of the Emirate of Sharjah that suffer from a scarcity of land for construction in residential buildings according to the apartments system.

56.67% of respondents answered that there are chances for the success of this endeavor, among which 43.33% said that there was no chance for the endeavor to succeed.

2.9 - If the answer is (No), choose the reason for failure

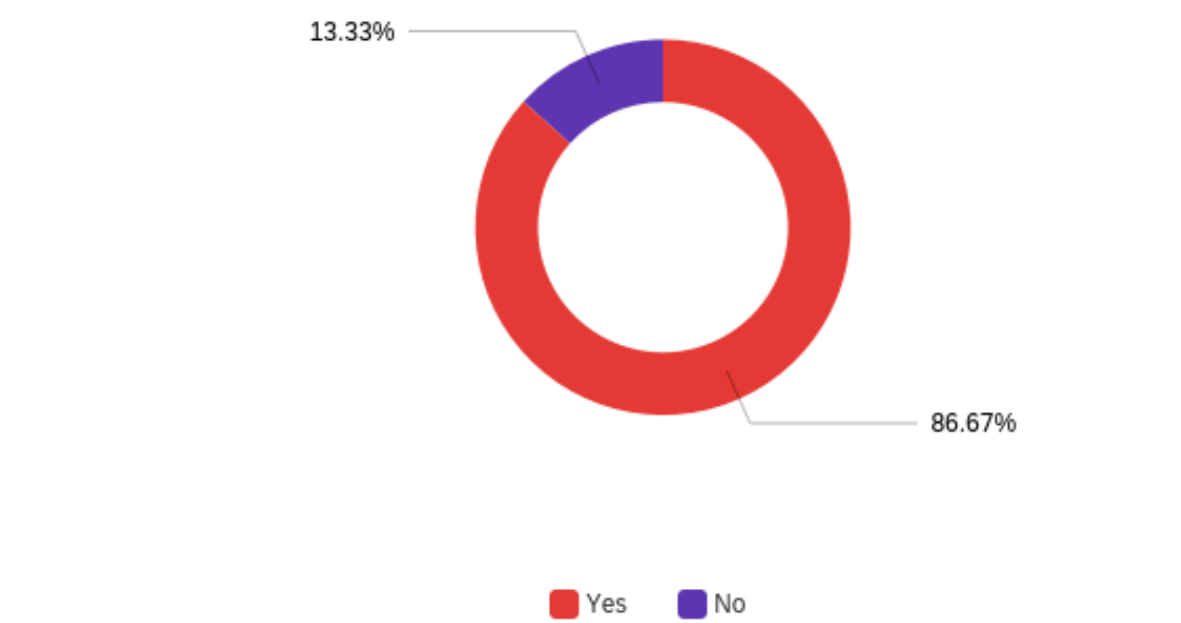


| # | Answer | Count |
|---|---|-------|
| 3 | Locals are not accustomed to this constricted housing style | 7 |
| 4 | Other reasons | 0 |
| 2 | People feel aggrieved that some people got private housing (villas) | 2 |
| 1 | The design still does not provide privacy | 4 |
| | Total | 13 |

The ranks of those who answered that there are no chances of success for their reasons are as follows:

- Citizens are not used to this pattern
- The design does not provide the privacy of the national family
- A feeling of unfairness because they were not able to acquire the model of the villa like others
- Other reasons

3.0 - To avoid urban land consumption and preserve the rights of residential generations. There are experiences in some countries in providing different styles of residential units instead of relying on one option (the detached villa), and among these types are semi-detached villas - connected villas - residential apartments. Do you support this approach?

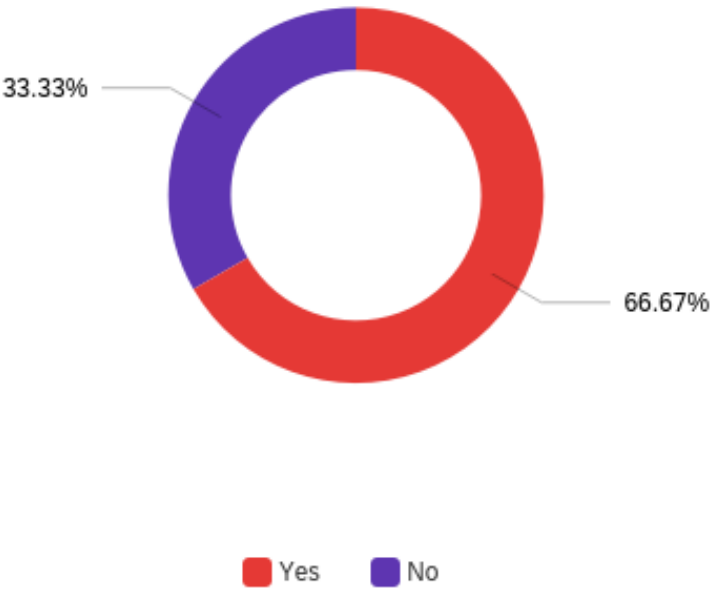


| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 26 |
| 2 | No | 4 |
| | Total | 30 |

With regard to the questionnaire of the sample members about the extent of their support for an experiment other than the separate villa, such as: semi-detached villa - attached villas - apartments.

86.67% of respondents supported this trend, and 13.33% opposed it

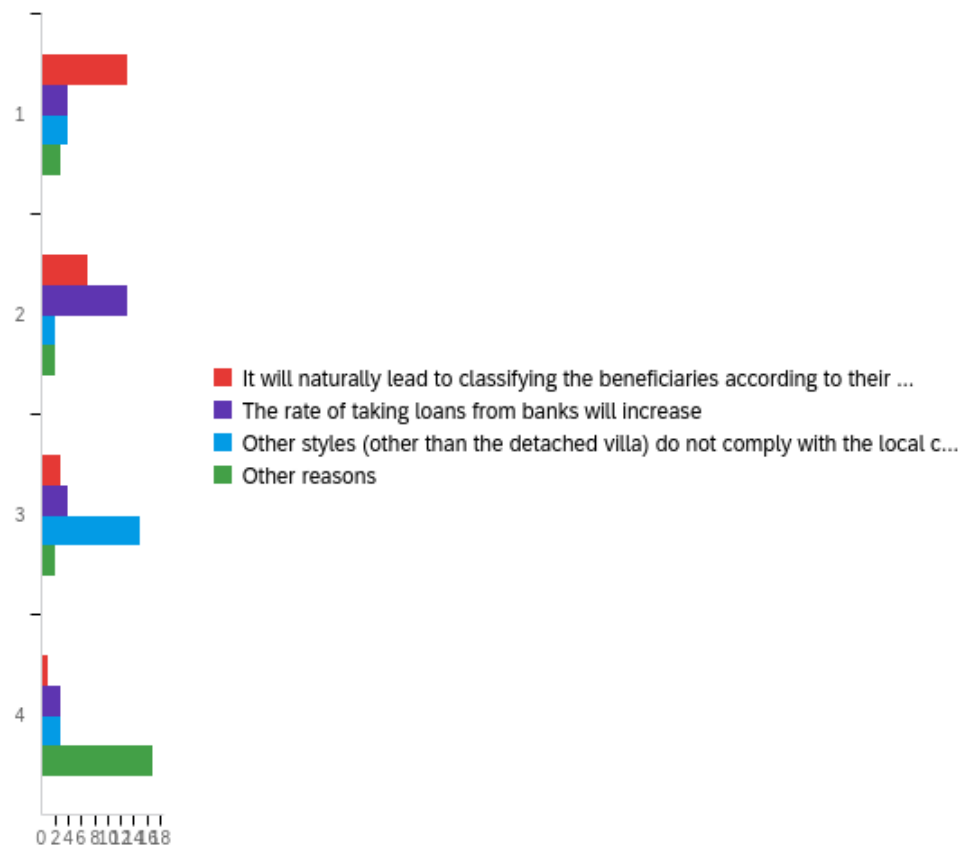
3.1 - Do you agree that the choice of the housing style by the beneficiaries is according to progressive fees (for example, the apartments are semi-free and the fees escalate to reach their maximum in the detached villa option?)



| # | Answer | Count |
|---|--------|-------|
| 1 | Yes | 20 |
| 2 | No | 10 |
| | Total | 30 |

66.67% agreed with the proposal and opposed it by 33.33%.

3.2 - If the answer is (No), please rank the following reasons according to precedence

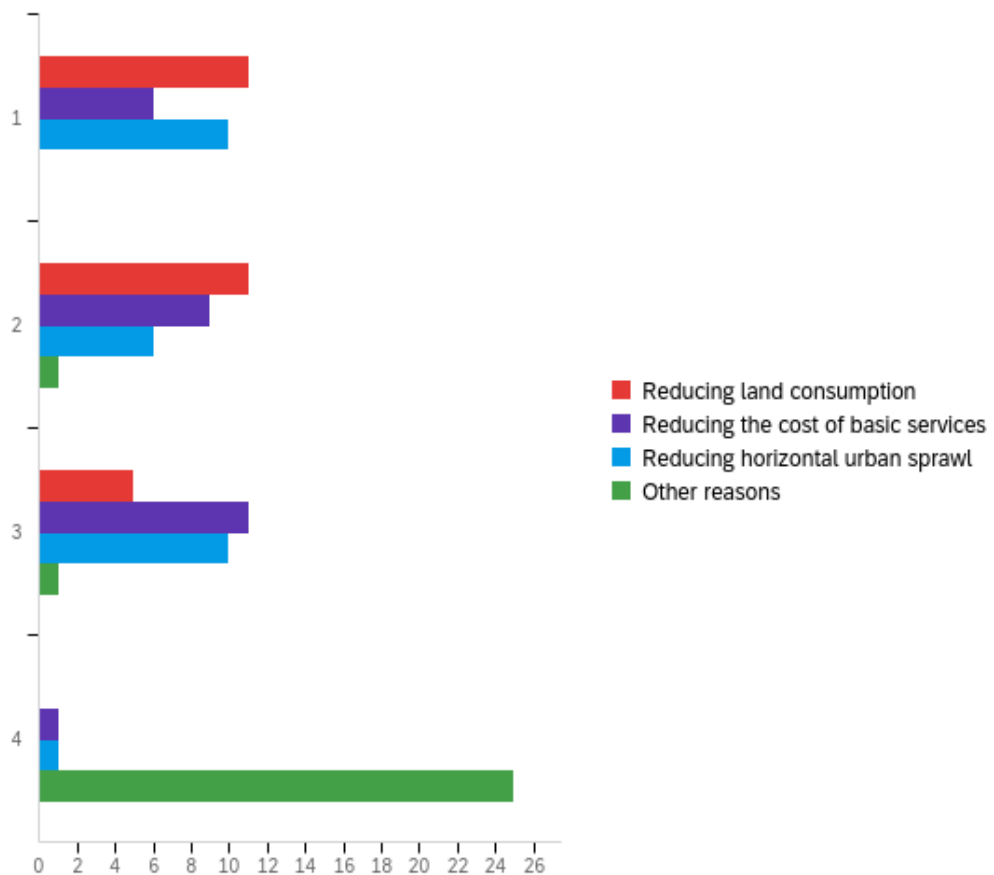


| # | Question | 1 | 2 | 3 | 4 | Total |
|---|---|----|----|----|----|-------|
| 1 | It will naturally lead to classifying the beneficiaries according to their income | 13 | 7 | 3 | 1 | 24 |
| 2 | The rate of taking loans from banks will increase | 4 | 13 | 4 | 3 | 24 |
| 3 | Other styles (other than the detached villa) do not comply with the local customs | 4 | 2 | 15 | 3 | 24 |
| 4 | Other reasons | 3 | 2 | 2 | 17 | 24 |

Those who did not agree to the proposal ranked their reasons according to the following:

- The proposal will classify the beneficiaries according to their income.
- Bank borrowing rates will increase
- The residential models (other than the separate villa) do not comply with local customs
- Other reasons

3.3 - If you are in favor of diversifying housing options, rank the following features according to precedence



| # | Question | 1 | 2 | 3 | 4 | Total |
|---|-------------------------------------|----|----|----|----|-------|
| 1 | Reducing land consumption | 11 | 11 | 5 | 0 | 27 |
| 2 | Reducing the cost of basic services | 6 | 9 | 11 | 1 | 27 |
| 3 | Reducing horizontal urban sprawl | 10 | 6 | 10 | 1 | 27 |
| 4 | Other reasons | 0 | 1 | 1 | 25 | 27 |

The approvers of the proposal to diversify the housing options ranked the advantages of the proposal according to precedence:

- Reducing the percentage of land consumption
- Reducing the rate of horizontal urban sprawl
- Reducing the cost of extending basic services

8. Conclusion and Recommendations

8.1. Conclusion

The traditional urban pattern in the Gulf countries and the Arab and Islamic world - whether it is an urban fabric of cities or a traditional residence - is a product of the interaction of a set of cultural, religious, social, economic and environmental characteristics.

The people of Sharjah were able to adapt to this urban pattern for several centuries, which extended until the sixties of the last century, when a stormy political, social, economic and technological transformation stage began that swept the entire region. The environment of the urban city of Sharjah was not immune to the effects and consequences of this change. Its streets and alleyways have moved away from the human scale, and its yards have become - due to the newly introduced grid system intersections of streets in the car service, and its traditional residences with internal courtyards have transformed from extended family intimacy into separate and spacious individual villas. The alliance of the master planning system with - western roots - with the role of architects - who came to the country in the early seventies from different countries and cultures and influencing the architectural design - and with the aspirations of the local middle class towards modernity to consolidate the grid pattern in the city streets and the villa model to house its citizens, which in turn led to - according to their distinctive characteristics - to an excessive degree of low residential density, as the minimum area of housing increased from 100 square meters to an average area ranges between (1000 - 4000 square meters), in the other hand the city streets expanded and increased in length to astronomical degrees approaching 2000 kilometers.

This caused the city to increase its size in a period not exceeding five decades in unprecedented degrees, as its urban mass increased between about 8.7 square kilometers at the beginning of the seventies of the last century to about (292.3) square kilometers at the present time, and thus Sharjah has become among the cities that are exposed, the phenomenon of urban sprawl and its negative economic, social and environmental consequences, as well as the rapid and unsustainable consumption of its land stock.

Needless to argue that sustainability is strongly linked to better management and use of urban land. Sustainability is about using the resources including land for current needs without compromising the needs for the future generation.

In relation to sprawl mitigation policies, there are multiple measures that can reduce the proliferation of unsustainable patterns among which: Increasing residential densities through decreasing the minimum area of the private villa, clustering houses, density bonuses and reconsidering building regulation in relation to setbacks and building heights.

Finally, there is an important issue that must be clarified with regard to the grid system, which is where respecting the human scale does not mean neglecting the importance of modern transportation, as well as modern architecture technology cannot be overlooked, but they must be used well in a way that preserves the identity and privacy of the local environment.

8.2. Recommendations

8.2.1. First

Since the low rates of residential density in Sharjah are the main driver of the urban sprawl phenomenon, it is necessary to raise the housing density through the following measures:

- i. Reducing the minimum residential land area (separate villa) without prejudice to the actual housing needs of the citizen family. In this regard, the results of the questionnaire prepared by the researcher can be guided, as most of the selected sample members agreed that an area of 700 square meters is sufficient to meet the needs of the citizen family.
- ii. Preparing a scientific study in conjunction with the departments of architecture and planning in universities in the UAE, and with the participation of stakeholders, to re-divide residential plots of land that have been allocated and were not built for long periods of time. Their number reached (12,809), according to the city's housing plan. It represents 48.5% of the total private residential lands. In conclusion not to exceed the residential and population density specified in the urban plan.
- iii. Reconsidering the permissible height of private residential buildings with two floors as a maximum, and increasing the permissible height to three floors to accommodate the extended family.
- iv. Encouraging contiguous and semi-detached villa models.
- v. Reconsidering the traditional courtyard housing and preparing models adapted to the achievements of modern technology. The Testing Sustainability Assessment Method (SAM) has proven that traditional housing is superior to the villa model in

all criteria, including: location - energy - building materials - internal structure
Water and waste consumption (see Fig.(28) in the appendix.

- vi. Rehabilitation of the old and degraded areas in the city, which were identified by the Department of Planning and Survey (12 areas) and encouraging their owners and their extended families to return to them through planning incentives such as increasing the height, reducing setback distances or allowing contiguity with the neighborhood.

8.2.2. Second: The Urban Pattern

- A. Preparing a scientific study in cooperation with the Faculties of Architecture and Planning in universities in the country and the Gulf region to study alternative urban patterns and study local experiences in this regard, including:
 - i. Experimenting with the application of the closed street pattern (cul de sacs) in the city of Sharjah (Al-Suyoh and Al-Rahmaniyah areas) and studying the negatives that resulted from the experience as previously mentioned.
 - ii. Study the experience of restoring the idea of Al Freej residential housing cells in the Dubailand area of Dubai.
 - iii. The experience of the city of Najran in the Kingdom of Saudi Arabia regarding the hybrid pattern, which balanced the human scale with the vehicle scale.
 - iv. The British experience in Milton Keynes.
- B. Reconsider the pattern of wide streets and luxurious spaces that are not compatible with the natural environment and hot climate.
- C. Preparing a study for the purpose of reducing the average street length in one hectare and linking it to the minimum area of the proposed residential plot.

8.2.3. Third: The Phenomenon of Un-built and Scattered Residential Plots

- i. Developing residential land allocation policies for people with urgent and immediate housing need, and not reserving it for young people, and the due land is not handed over before the financial ability for its reconstruction is proven, and in this regard, beneficiaries can be given deeds that prove their entitlement to residential land, and it can be presented as a guarantee for housing programs in Sharjah, the state and banks, to get aid and home loans.
- ii. Planning residential areas so that they are gradually developed by equipping the first stage with basic and service facilities, and handing over the land to the beneficiary who has already proven his financial ability, provided that he is given a specific time for construction. And after the completion of the reconstruction of the first area, the transition will be made to the next stage. This proposal will address the phenomenon of land dispersal in the areas equipped with services, and thus achieve the principle of economic efficiency and optimal use of resources.

8.2.4. Fourth: General recommendations

- i. Prepare a comprehensive urban plan for the Emirate of Sharjah, and redistribute the population and activities in a balanced manner in order to alleviate the phenomenon of urban primacy that characterizes the city of Sharjah.
- ii. Increasing public awareness on issues of sustainability, the environment, and the negative aspects of urban sprawl, through community participation in decision-making.
- iii. Developing laws and regulations to ensure efficient and sustainable management of urban lands.

- iv. Effective cooperation with the Faculties of Architecture and Planning in Sharjah and in the country to develop sustainable housing and built environment research, and to participate in addressing urban planning and housing problems and including them in the bachelor's and postgraduate programs.

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10. Appendix

Table 9.2 – Results of testing sustainability assessment for traditional and contemporary case studies
(Source: the author)

| | Traditional House | | | | Contemporary House | | | |
|---|--------------------------|--|--------|--------------|--------------------------|--|--------|--------------|
| | Area of assessment | Sub-area | credit | Total credit | Area of assessment | Sub-area | credit | Total credit |
| Environmental Sustainability Assessment | Site | Site selection | 4.8 | 12.9 | Site | Site selection | 3.6 | 9.6 |
| | | Site planning | 6 | | | Site planning | 3.6 | |
| | | footprint | 2.1 | | | footprint | 2.4 | |
| | Energy | Carbon dioxide | 10 | 29 | Energy | Carbon dioxide | 9 | 17 |
| | | Renewable energy resources | 10 | | | Renewable energy resources | 1 | |
| | | Building envelope | 9 | | | Building envelope | 7 | |
| | Resources | Building materials | 8.1 | 20.1 | Resources | Building materials | 5.4 | 13.2 |
| | | Recycle & reuse | 7 | | | Recycle & reuse | 4.2 | |
| | | Materials lifecycle | 5 | | | Materials lifecycle | 3.6 | |
| | Indoor environment | Natural ventilation | 4.5 | 11 | Indoor environment | Natural ventilation | 2.5 | 7 |
| | | Indoor air quality | 3 | | | Indoor air quality | 2.5 | |
| | | Thermal comfort | 3.5 | | | Thermal comfort | 2 | |
| | Water & waste | Water consumption | 8.8 | 14.4 | Water & waste | Water consumption | 3.3 | 6.5 |
| | | Waste output | 5.6 | | | Waste output | 3.2 | |
| | Final credit (100) | | | 87.4 | Final credit (100) | | | 53.3 |
| Social Sustainability Assessment | Privacy | Planning & Design | 11.7 | 22 | Privacy | Planning & Design | 10.4 | 17.2 |
| | | Philosophy | | | | Philosophy | | |
| | | External facades | 6.3 | | | External facades | 2.8 | |
| | | Acoustical privacy | 4 | | | Acoustical privacy | 4 | |
| | Social relations | Hospitality | 9 | 17 | Social relations | Hospitality | 8 | 17 |
| | | Guest honouring | 8 | | | Guest honouring | 9 | |
| | Neighbourhood | Strong neighbourhood relations | 6.4 | 17.2 | Neighbourhood | Strong neighbourhood relations | 3.2 | 14 |
| | | Preservation of neighbourhood's rights | 10.8 | | | Preservation of neighbourhood's rights | 10.8 | |
| | Family | Strong family ties | 15 | 24 | Family | Strong family ties | 9 | 14 |
| | | Extended family | 9 | | | Extended family | 5 | |
| | Identity & social status | Humility & self-advocacy | 4.5 | 7.5 | Identity & social status | Humility & self-advocacy | 1.5 | 6 |
| | | Revealing social status | 3 | | | Revealing social status | 4.5 | |
| | Final credit (100) | | | 87.7 | Final credit (100) | | | 68.2 |

Fig 28: The Testing Sustainability Assessment Method (SAM), (Source: Amal, n.d)

Topic / Role of the Planning Regulations and Villa Type in Urban Sprawl

The researcher is currently preparing a scientific thesis on the above topic, and he wishes to seek your opinion and your valuable comments in the same regard by answering the questions included in the questionnaire - there is no doubt that your comments will represent a qualitative addition to his efforts to improve the content of the research with his sincere thanks in advance.

Nationality: ☐ Local ☐ Expat

Occupation: ☐ Urban Planner / Designer
☐ Engineer
☐ Academic in the field of planning
☐ Others

Firstly: The Organic Fabric of the Old Gulf City

1.1- According to your opinion, which of the urban planning patterns is the most suitable for the local conditions (Put a ☒ in front of the weighted answer?)

- Organic pattern ☐
- Grid Pattern ☐
- Loose Grid Pattern ☐
- Others ☐

1.2- If the organic pattern is the best, please rank the features of this type according to precedence

- Suitable for the local climate. ☐
- Responds to social and cultural requirements. ☐
- It strengthens the bonds of family intimacy. ☐
- The land is not wasted due to its small area. ☐
- Other reasons (please explain in writing): - ☐

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Are you a supporter or opponent of this argument?

- Yes ☐
- No ☐

1.4- If the answer is No, do you have proposals for suitable treatments to keep pace with the organic pattern of the current reality? Mark in front of the preferred suggestion: -

- Preserving the entire old nucleus and building a new city nearby. ☐
- Mixing the two patterns by preserving the main roads around the super blocks, and using closed roads and pedestrian paths inside the square. ☐
- Others (please explain in writing): - ☐

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1.5- There are some attempts to use the Suburban pattern which incorporates the use of the Cul-de-sacs system. Do you support these attempts?

- Yes ☐
- No ☐

1.6- If the answer is (No), please rank the following reasons according to precedence

- It does not restore the extended family system.. ☐
- Some plots do not overlook the streets. ☐
- It is a waste of urban land. ☐
- Other reasons (please explain in writing): - ☐

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Secondly: The Traditional Arab house / Villa

2.1- Do you support the decision of the Municipality of Sharjah to suspend permits for the construction of traditional houses?

- Yes ☐
- No ☐

2.2- If the answer is yes, put a ☒ in front of the weighted answer (You can choose more than one answer)

- Does not meet the requirements of modern life. ☐
- Does not fit the social situation. ☐
- Small Footprint/Plot area. ☐
- Other reasons (please explain in writing): - ☐

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numbers (1 - 3), where the number (1) refers to the most accurate/reliable answer.

- It strengthens the bonds of family relations. ☐
- It responds to the requirements of sustainability by saving energy. ☐
- It meets the requirements of sustainability due to its small area. ☐
- Low construction cost compared to the villa model. ☐
- Other reasons (please explain in writing):- ☐

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of the country – (which is more than 1000 square meters) - is much greater than the actual need for a local Emirati family, please choose the answer according to your opinion

- Yes ☐
- No ☐

2.5- If the answer is yes, place a sign in front of what you consider as an appropriate/suitable plot area:-

- | | | | |
|------------|--------------------------|-------------|--------------------------|
| • 400 Sq.m | <input type="checkbox"/> | • 800 Sq.m | <input type="checkbox"/> |
| • 500 Sq.m | <input type="checkbox"/> | • 900 Sq.m | <input type="checkbox"/> |
| • 600 Sq.m | <input type="checkbox"/> | • 1000 Sq.m | <input type="checkbox"/> |
| • 700 Sq.m | <input type="checkbox"/> | • Other | <input type="checkbox"/> |

2.6- There are proposals to increase the building density of the residential villa by increasing the maximum height to three floors (the current maximum is Ground + 1) Do you agree with this approach?

- Yes ☐
- No ☐

2.7- If the answer is yes, please rank the features of the proposal according to precedence: -

- Contributes into avoiding urban land consumption. ☐
- The resurrection of the extended family. ☐
- Optimum use of the existing infrastructure. ☐
- Others (Explained in writing): - ☐

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2.8- Do you see that there are chances for the success of the proposal of accommodating local families in residential apartments due to the scarcity of land in some of the emirates?

- Yes ☐
- No ☐

2.9- If the answer is "No", put a ☒ in front of the reason for failure.

- The design still does not provide privacy. ☐
- People feel aggrieved that some people got private housing. ☐
- Locals are not accustomed to this constricted housing style. ☐

- Other reasons (please explain in writing): - ☐

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3.0- To avoid urban land consumption and preserve the rights of residential generations. There are experiences in some countries in providing different styles of residential units instead of relying on one option (the detached villa), and among these types are semi-detached villas - connected villas - residential apartments. Do you support this approach?

- Yes ☐
- No ☐

3.1- Do you agree that the choice of the housing style by the beneficiaries is according to progressive fees (for example, the apartments are semi-free and the fees escalate to reach their maximum in the detached villa option)?

- Yes ☐
- No ☐

3.2- If the answer is (No), please rank the following reasons according to precedence

- It will naturally lead to classifying the beneficiaries according to their income. ☐
- The rate of taking loans from banks will increase. ☐
- Other styles (other than the detached villa) do not comply with the local customs. ☐
- Other reasons (please explain in writing): - ☐

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3.3- If you are in favor of diversifying housing options, rank the following features according to precedence: -

- Reducing land consumption. ☐
- Reducing the cost of basic services. ☐

- Reducing horizontal urban sprawl. ☐
- Other reasons (please explain in writing): - ☐

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