

**Enhancing Urban Connectivity and Regeneration of Historic  
Areas:  
Case Study of Heart of Sharjah**

تعزيز الاتصال الحضري واعدادة احياء المناطق التاريخية:  
نموذج الدراسة: قلب الشارقة

by

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of the requirements for the degree of**

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## **Abstract**

Sustainable urban regeneration of historical districts in the Gulf Region generally and in the United Arab Emirates specifically becomes a dynamic area of development during the last decade. This research employs the integrative design process of sustainable urban regeneration of the historical district in Sharjah city in UAE by applying comprehensive design strategies to promote connectivity and revitalize the public places and consequent place identity and people well being. It also improves physical and visual connectivity and integration within the neighborhood and among the surrounding areas to encourage walkability in the district provides a liveable community, and increase accessibility and social interaction. A unique and significant historical district in Sharjah called 'Heart of Sharjah' is analyzed and assessed in terms of its livability and connectivity through a resilient urban framework. It does so through conducting a field study to understand the current master plan situation, its potential, limitations, and characteristics. To permit this, a correlation between the quantitative and qualitative approach was applied through conducting field study and parametric simulation tool to validate input data that are used in space syntax computer simulation program for visualizing and generate model analysis starting with the existing master plan, proposed master plan by Shurooq, then to optimize and regenerate design proposals that meet all the goals and visions at different levels for a sustainable neighborhood. All scenarios were tested and evaluated for each parameter of space syntax (connectivity, integration, choice, visibility graph analysis). The study yielded several significant findings; most notable was the increment of the integration value of the optimized master plan by approximately 41% in comparison with Shurooq proposed master plan 2025, as a result of improving the urban configuration, the street network enhances the connection between the old district and the waterfront, and introducing a central plaza to be connected with Al Rola park to achieve the holistic desired approach.

## المخلص

أصبح التخطيط الحضري المستدام للمناطق التاريخية يحظى باهتمام متزايد في منطقة الخليج بشكل عام وفي الإمارات العربية المتحدة بشكل خاص.

يدرس هذا البحث عملية التصميم و الاستراتيجيات الشاملة و المتكاملة للتطوير الحضري المستدام في واحد من اهم المناطق التاريخية في مدينة الشارقة في الإمارات العربية المتحدة تسمى "قلب الشارقة" من خلال اجراء دراسه ميدانيه لفهم الوضع الحالي للمنطقة و خصائصها و ايجابياتها و سلبياتها. للتوصل الى تطبيق استراتيجيات تصميم شاملة لتعزيز الاتصال وتنشيط الأماكن العامة وما يترتب على ذلك من الحفاظ على هوية المكان الثقافي و التاريخيه و القيم الاجتماعيه بما رفاهية الناس و الصحة العامة. كما أنه يحسن الاتصال المادي والبصري والتكامل في العلاقات داخل الحي وبين المناطق المحيطة لتشجيع حركة المشاه و استخدامات الفراغات العامة في المنطقة لتوفير بيئه مناسبه للعيش.

اعتمد البحث بالاضافه الى الزياره الميدانيه على تحليل و مراجعه نماذج سابقه لبناء قاعدة البحث و التحقق من صحه بيانات المدخلات المستخدمه في برنامج المحاكاه بالكمبيوتر لتحليل النماذج الافتراضيه حيث تم اقتراح سيناريوهات مختلفه لكل حاله بهدف المقارنه و التقييم لتحقيق النهج المستدام الشامل المنشود اليه برؤيه الامارات 2021.

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This thesis is dedicated to:

*My beloved Father and Mother*

Who taught me to work hard, to achieve my dreams,

My supporter, for all his encouragement and trust through all hard times

*My Husband*

My power and strength in this life

*My Princes Noura*

*And My Angel Jawad*

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## Abbreviations

CBD	Central Business District
CNU	Congress for New Urbanism
EGBC	Emirates Green Building Council
EPAA	Environmental Protection Awareness Awards
GCC	Gulf Cooperation Council
GHG	Greenhouse Gases
LEED-ND	Leadership in Energy and Environmental Design–Neighborhood Development
MDGs	Millennium Development Goals
NP	New Pedestrianization
NUA	New Urban Agenda
OSM	Open Street Map
SCTDA	Sharjah Commerce and Tourism Development Authority
SEWA	Sharjah Electrical and Water Authority
SDGs	Sustainable Development Goals
SUPC	Sharjah Urban Planning Council
TOD	Transit Oriented Development
UAE	United Arab Emirates
USGBC	United State Green Building Council
VGA	Visibility Graph Analysis
WCD	World’s Cities Day
WUF	World’s Urban Forum

**CHAPTER ONE**  
**INTRODUCTION**

# 1 CHAPTER 1 INTRODUCTION

## 1.1 Urban Design Development

In the late 1950s, the word urban design was invented in North America and replaced the narrower and somewhat obsolete word 'civic design' that concentrated mostly on the city's key landmark buildings such as museums, opera houses. While, Many theories and urban planners have argued over the past few years that urbanism should be seen as an integrative process with such a constant understanding of the whole interaction of the parts to the whole system, and the whole to the parts, at the core of which is a commitment to creating places for people. Christopher Alexander (1977) outlined the theory of 'pattern language' which emphasizes the variety of levels at which integrated process system functions in urban design. Thus, concerning the aforementioned qualities of sociocultural values, activities, and entertainments, Bob Jarvis (1980) addressed two broad traditions of urban design vision that stems from the visual artistic aspects of buildings and spaces. Lately, these two styles of urban design have been formulated into a tradition of creating places.

Moreover, this development of the theories of urban design was interestingly illustrated by the following criteria: [1] 1953, Frederick Gibberd argued that the object of urban design is not only to work properly but is pleasing inexperience. [2] Jane Jacobs addressed the city as art for life in 1961.[3] In 1965, Alexander described both the weakness of non-contextual design theories and the risks of pursuing urban design in ways that did not permit a rich variety of cross-connections between activities and places. [4] In 1988, Peter Buchanan stated that urban planning was simply about creating places where all the events and activities which make it feasible. [5] The Planning Policy Guidance in England (1997) described the urban design as the deep interaction between all the factors of the built and unbuilt environment. The guide defined seven urban design priorities, each linked to the definition of placemaking: place characteristics, physical and visual

interaction, the performance of the public square, movement flow, uniformity, resilience, and sustainability.

This approach to urban design reflects a more comprehensive vision. Adapting integrative mechanism from an initial architectural issue with the allocation of the building masses and the space between the buildings, it has been increasingly concerned with the nature of the public domain – both physical and sociocultural and providing places for people to experience and use. Thus, the conception of urban areas and places including all stakeholder groups: local governments, local communities, business communities, property developers and investors, occupants and users, tourism, and future generations. All of these groups play a key role in the design and decision-making process.

On the other hand, in 1981 Kevin Lynch described five dimensions of performance in urban design as following: morphological, perceptual, social, visual, functional, and temporal. All dimensions and contexts need to be linked and related at a local and global level through the iterative design process. UAE cities witnessed rapid vast expansion, construction, development that affected the historic district's identity and sense of places in the cities. Several years ago, after the industrialization and the innovations, The style of architecture in the cities was influenced as being introduced to structures that can match anywhere without taking into account the identity and heritage of the cities. Recently, this culminated in several spatial ideas being developed to ensure the relevance of space-related problems in the urban structure over different Gulf regions.

In comparison, new urban grew aggressively over heritage sites, resulting in a lot of anxiety, including but not limited to: (1) losing a sense of connection and places. (2) Strong means of distinguishing physical and visual links and facilities. (3) the fragmented urban areas. (4) Inefficient use of the places. (5) The social and cultural values and significances of the urban areas.

Meanwhile, urban planners, architects, residents, policymakers must ensure the systematic strategy and method of sustainable urban regeneration through the incorporation of all components and parts.

### 1.1 Sustainable Urban Design Status- Globally:

The New Urban Plan embodies a shared vision for a stable and more equitable future through which all people have fair access to the opportunities and services that cities can offer and in which the international community is rethinking the urban system and physical features of our urban spaces to accomplish this. Meanwhile, the New Urban Plan represents a modern understanding of the connection between successful urban growth. It highlights the linkages between successful urbanization and job growth, employment opportunities, and a better quality of life. In this regard that should be included in any policy and plan on urban regeneration projects. Further, emphasizes the relationship between the Current Urban Agenda and the sustainable development goal 11 Plan in particular (Douglas Farr, 2009).

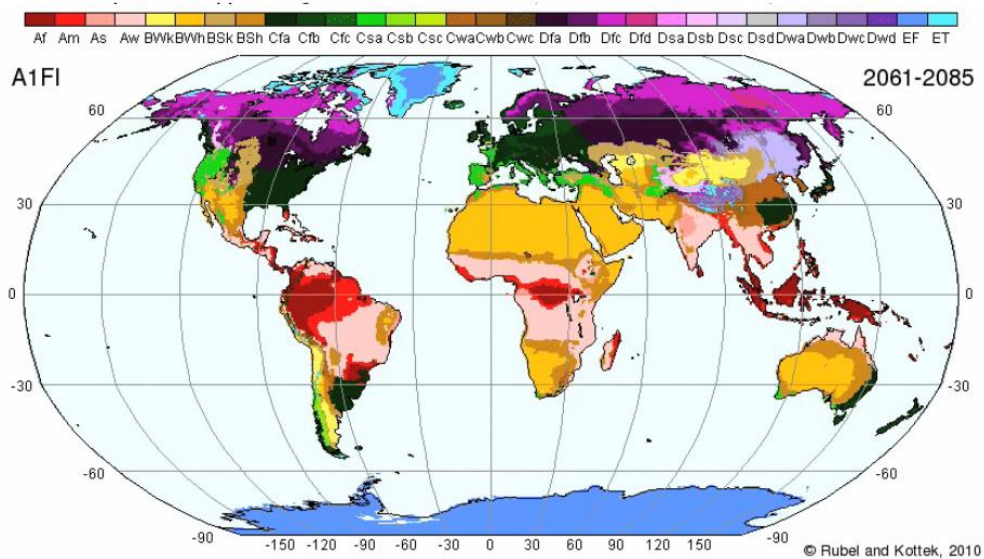


Figure 1: World map of climate zones (source: Köppen-Geiger 2018)

Worldwide, most cities are vulnerable to the impact of a variety of natural as well as human-made shocks and stresses. Currently, as a result of accelerated urbanization, global warming as shown in Figure 1, and political instability, communities and townspeople face new and intensified obstacles. Considering that 50 % of the population now lives in towns and that this number is projected to hit 70% by 2050, which proved by much of the research up to now. makes urbanization among the most transformative trends of the twenty-first century. Communities, economic activities, social and cultural interactions, as well as environmental and human rights impacts, are increasingly concentrated around countries, and this creates a serious challenge to sustainability. which introduces the urban regeneration projects as one of the most significant current discussions (UN, 2018).

Recently, a growing trend in urban sustainability has become more common in the international policy debate over the past decade and has emerged as one of the main concepts of sustainable urban development in global development agendas and priorities, including the New Urban Agenda, the SDGs GOALS, the Paris Agreement, and the SENDAI Framework. However, creating more sustainable communities saves resources and the climate on a wide scale. Additionally, our cities and communities considered as a major area of interest within the field as stated by the United Nation nowadays due to COVID-19 and pandemic, now it's the opportunities to recover better by building more resilient, inclusive, and sustainable cities so now it's the time to rethink and reshape the urban world.

## 1.2 Sustainable Urban Design Status in UAE

In 2010, the UAE government launched the UAE Vision 2021, which aims to make the UAE one of the top destinations. Sustainable growth has become a priority on the agenda in cities across the globe. In consideration of all that has been discussed so far in the pursuit of these goals, the United Nations has outlined a holistic approach to SDGs, made up of 169 targets. While the SDGs serve as an inclusive platform to guide the country's efforts to fulfill both Vision 2021 and the UAE Centennial 2071. The UAE National Agenda was developed to steer efforts to achieve the vision across six strategic priorities as seen in Figure 2. Meanwhile, UAE is committed to providing a sustainable environment and infrastructure as a continuation of the eleven goals of the SDGs which concentrated on sustainable cities and communities as mentioned previously (Oliver Wyman 2019).

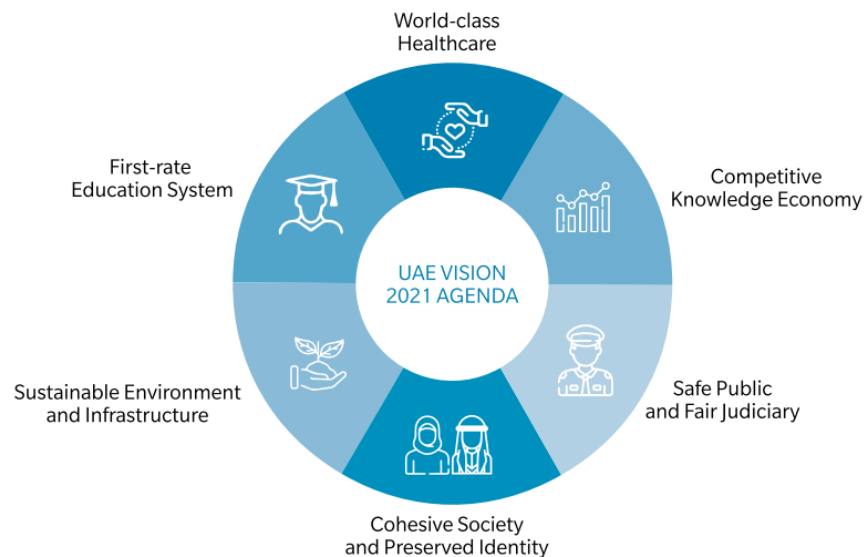


Figure 2: UAE vision 2021, (source: vision 2021.ae)

Based on the SDGs, Dubai Expo 2020 has been identified its theme of connecting minds, creating the future through emphasizing three main sub-themes as following: prosperity, accessibility, and sustainability. Therefore, those three sub-themes tackle the broad issues facing humanity nowadays. While, because of COVID-19, Expo 2020 has been postponed to 2021. On the other hand, the site will continue as a smart city including mixed-use development to be a catalyst for sustainability initiatives in Dubai and the UAE in the long term. According to the 2018 SDG Index, The UAE ranks 60th among 156 cities, slightly increased by 17 points compared with 2017. Also, among the GCC Region, The UAE was the best-ranked country in both years as shown in Figure 3. So, numerous companies in the UAE adopt varying paths to environmental programs. This also leads to a lack of coordination of private-sector efforts against the overall target of national development. In this respect, the leaders of the private sector have begun to resolve these issues, collaborating closely with the government. Maintaining and capitalizing on this relationship is crucial to dealing with the problems and promoting more sustainable growth in the UAE. (Oliver Wyman 2019).

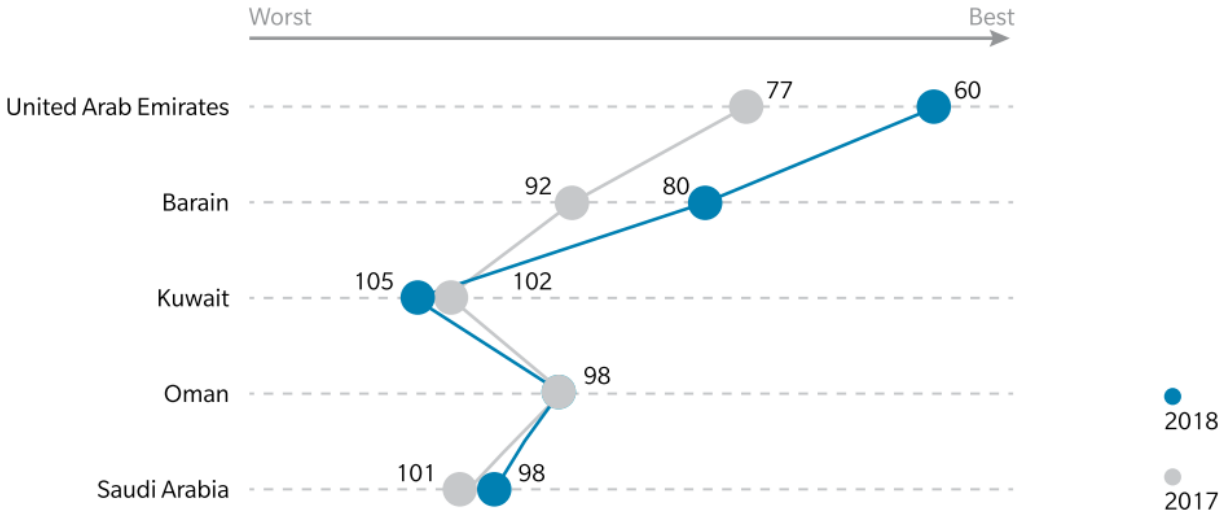


Figure 3: The ranking trend of GCC countries in the SDG index (2017-2018) (source: Oliver Wyman 2019)



A key aspect, countries must set up a national platform and commit funds and services to fulfill their needs and ensure the progressive success of the strategies that implement these objectives and vision. Based on that, Emirates Green Building Council was founded in 2006, as a part of worldwide evolution toward sustainability in all sectors of our life Emirates GBC has encouraged and continued to grow and develop to be aligned with UAE vision and objectives. As stated on their official website the vision was mainly focused to make the UAE a world leader in sustainability. Meanwhile, this forum provides support for businesses, developers, and company owners to develop green solutions and evaluate them in creating sustainability structures that fulfill their business strategy and financial objectives. As well, increasing public awareness allows access to the annual sustainability reports and get an overview of green and social initiatives.

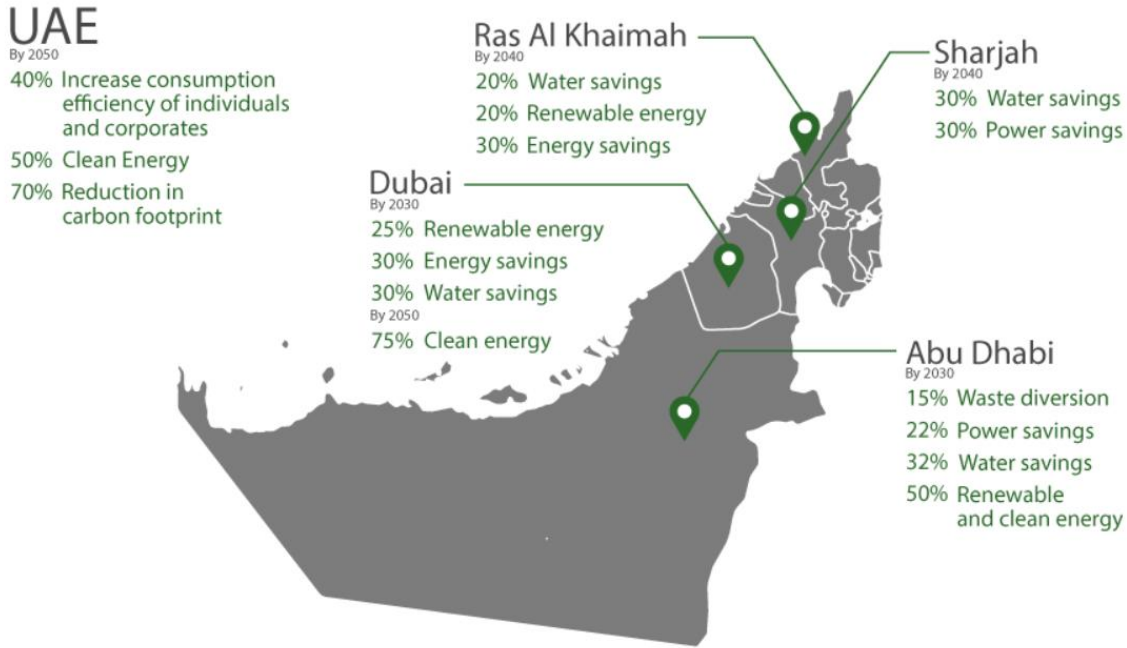


Figure 4: UAE future sustainability vision map (source: *UAE Sustainability Initiatives*, 2020)

Consequently, the government has revealed its potential goals, beginning with a decrease in electricity and water usage by up to 30 % by 2030, while using renewable energy by up to 15% of the overall fuel mix. And eventually, in 2050, the city plans to meet 75% of its electricity consumption from renewable and energy-efficient sources as shown in the above Figure 4. Also, the U.A.E. has implemented a variety of regulations associated with environmental conservation, and by following under international guidelines and protocols UAE ratified a variety of world-renowned environmental agreements since 1989 from 2015 such as the Montreal protocol, Vienna Convention for the Protection of the Ozone Layer 1985, United Nations Convention to Combat Desertification (UNCCD), United Nations Framework Convention on Climate Change, Convention of Biological Diversity 1992, Conservation of biodiversity and its natural ecosystems in the GCC Countries 2001, The Kyoto Protocol 1997, COP 21 ("EGBC" 2020)

Based on the global situation and as per UAE vision 2021, sustainable urban regeneration has become a central issue in the region, with an impact that has led this report to designate the regeneration of historical district to be investigated in details in terms of various variables, which will carry out the main aims and objectives of this study. Recently, researchers have shown an increased interest in assessing and investigating the historical districts in the Gulf region in general and UAE in particular. As stated by (Hadjri & Boussaa 2015) more efforts should be invested to ensure the accessibility of the historical areas and promoting them to the public.

### **1.3 Motivation and Scope of the Research:**

Some fundamental priorities and strategies concern the whole world. Urban areas are responsible for 70% of greenhouse gas emissions and environmental degradation. However, these rapid changes are having a serious effect on our cities. In addition to assessing convergence with economic growth and the feasibility of coping with long-term urban challenges, sustainable urban design should achieve the necessary balance. It also promotes public participation by including stakeholders in the planning process across its different phases and encourages everyone to respond to the decision-making process, which is among the pillars of government action in the development of the sustainable urban design. The vision of this paper is to explain the need for sustainable urban regeneration to protect the earth from destruction and taking immediate steps on climate change to satisfy the needs of current and future generations.

Previous research has reported that the evaluation of sustainable urban development by the determination of isolated urban context. Yet it provides a holistic perspective of the region and its multiple components. Almost all of these elements form the basis for the assessment of urban planning. In addition, in the last few years, several of a very well international measuring instruments have expanded their framework for building measurement to the assessment of sustainable urban growth. Such as LEED-ND for Neighborhood Development (2007), BREEAM Communities (2011-2012), CASBEE – UD for Urban Planning (2007), PEARL CO (Estidama Pearls Community Rating System 2010) (Fawzi et al. 2014).

As a consequence, cities have been the major competitors in the field of urban sustainability. To date, a consensus has been reached on what is known as the UAE Vision 2021 for developing more inclusive cities. There is also a need to identify ways to build a balanced environment that provides healthier living spaces in urban areas and achieves harmony between humans and the ecosystem.

Nature must still be valued for it is the primary source of energy and services that bring alternatives to the city of today and the future generation. Furthermore, comprehensive urban regeneration programs have been undertaken to turn historic city centers into vibrant and appealing hubs, draw people to stroll around city centers, and improve the use of space and pedestrian experience in old districts since 2009. Because of many concerns need to be highlighted following the sustainable urban design goals and UN agenda 2030 which mainly constraint on creating an inclusive, sustainable space for all generations.

In this regard, several attempts have been made by the Sharjah Investment and Development Authority (Shurooq) was formed to oversee Sharjah's social, cultural, environmental, and economic growth in line with its Islamic identity as an autonomous government body. This aligned with H.H Sheikh Dr. Sultan bin Muhammad Al Qassimi and the Sharjah government vision to restore and revitalize the historical center of the city since 2008 and recall the city image and identity from 1950 as a hybrid hub of the city and enhance the social, cultural, and economical values. Additionally, from my experience of working with Dr. Rasem Badran on the revitalization of the historic district in cities that has driven this research.

#### **1.4 Aims and Objectives:**

The main intention of this study focuses on achieving a holistic sustainable and resilient urban framework through enhancing the visual, physical connectivity, and well-being of all stakeholders and their attitude in such area either on the phycological, social, cultural, or economic levels.

This research aims to enhance the connectivity within the city level, and neighborhood urban level. This will be studied by following three scenarios including the existing base case, proposed master plan 2025 by Shurooq, optimized master plan through applying mixed-mode method. To be able

to accomplish the following objectives to achieve the overall aim of the study, these objectives were as following:

1. Evaluating and analyzing the existing master plan through field study and document notes, site photos, informal interviews.
2. Identifying public spaces through landscape features, sitting area, pathways, users experience, safety, visual, and physical connectivity.
3. Investigating the proposed urban plan fabric by Shurooq in terms of configuration, connectivity, and movement flow.
4. Generating cognitive maps to assess the visual experience and actions of the user's motion flow of the current status and Shurooq proposal.
5. Proposing optimization scenarios based on variable parameters to promote the quality of the public spaces, walkability, and users experience
6. Drawing future recommendations, strategies to improve the optimized master plan.

### **1.5 Significance of the Study:**

Cities over decades failed on forecasting how people going to perceive the urban spaces and how the flow of people in these communities. This leads to help the architects, planners, and decision-makers to speculate what the future should look like by using and forecast the integrative planning process. Many urban theories proved that the physical and visual connectivity in the urban areas has great value, socially & economically. Meanwhile, creating visible places enhance the people's experience through improving the sense of the place, and its urban quality. Authorities and policy makers have recognized throughout human history that city space has organized as a significant gathering place for urban residents and visitors to promote the culture and traditions of communities and to revitalize memories connected with several factors, peoples and destinations.

There is no doubt that some positive progress is ongoing and that decision-makers are eager to make improvements and upgrades. Therefore, Inspired analysis such as this closes the divide and provides a holistic summary of how to assess reality processes as a network, along with decision-makers researching possibilities and limitations to be able to propose a comprehensive, sustainable solution through involving technologies and parametric design.

This paper will focus on improving integrated urban model based on the spatial layout as the base. Which will introduce recommendations for future studies of urban regeneration in our cities' at both local and global levels. Additionally, urban connectivity and integration is considered a strong base and inspiration to enhance people perception of urban spaces where they can live or meet, entertain, and spend time which consequently will introduce the holistic approach of the master plan. Subsequently, the philosophy of the study has emerged the importance of the conservation and regeneration of the historic part of the city of Sharjah from its role in preserving the national identity of Sharjah and revitalize the Heart of Sharjah as a vibrant center of the city where the cultural and artistic pulse is felt throughout which comply with the vision of His Highness Sheikh Sultan bin Muhammad Al Qassimi. Also, providing sustainable and resilience urban design framework and strategic guidelines to enhance the connectivity, integration, and regeneration of the historic area through improving the public spaces, introduce walkability and cycling pathways, friendly car-free – environment, and social and cultural entertainment places. Thus, taking in consideration physical distances measurements due to COVID-19 to form a sustainable environment that considers the cultural, learning, shopping, working, tourisms, and entertainments dimensions.

As well as, this research would answer many questions related to all countries and stakeholders, working in a collaboration with the governments to adopt this strategy. We are committed to save the humanity, and to restore and protect our world. Finally, we remain determined to take the brave and progressive steps that are urgently required to push the growth and sustainability of our communities. When we begin this joint adventure, we make sure that no one would be left behind.

### **1.6 Research Focus and Limitations:**

The chosen case study in this research would be the Heritage District of Sharjah, UAE, which is considered to be the oldest historic district and the largest heritage site in the Persian Gulf region with an area of approximately 35,000 square metres. While it is distinguished by its location, buildings and historical social and cultural values, it has also been proposed to be a UNESCO World Heritage Site since 2014. To achieve the main goals and objectives, based on prior awareness of the region to improve accessibility to maximize the efficiency of the public area.

The complexity of urban planning places introduces a multitude of techniques, criteria, and processes that influence the humanities and the built environment. Francis (1992) concluded that we need to avoid concentrating on individual buildings and start to think more of places as the inclusion of all urban components and sections as a single entity to improve the meaning of certain places that will impact human well-being and create a healthy community. At the same time, many issues remained unresolved until the current time. Subsequently, more study is needed to enhance our built environment, as a variety of criteria have been established by Douglas Farr (2008), which focuses primarily on the benefits of community living conditions, which as a basic unit of human settlement incorporates five factors: definition, compactness, completeness, accessibility, and biophilia. However, these parameters are associated to be the sustainable process of what was defined earlier by Lynch (1981) in terms of the five dimensions of urban planning.

Furthermore, field studies have been seen as an important method and represent an essential vital role in urban design, involving people from a different qualifications and experience and discipline who will strengthen the design process in the early stages of design. Thus the best way to involve this method in the integrative process developed is to use it with a simulation tool, which is to triangulate space syntax analysis and to correlate the result which is recognized to be an effective way in the research, taking into account data and results at both the macro and the micro-levels. At the same time, the drawbacks need to be recognized as a large volume of data and timeline. In addition to the challenges in the field research, either by time, safety issues, and cost. As well as informal interviews and consultations with project managers and engineers from Shurooq and the Sharjah Urban Planning Council found as time-consuming.

### **1.7 Dissertation Contents and Structure:**

The paper divided into six chapters, mentioned below, which are covered by these chapters: Chapter 1, Introduction, addresses context details on urban planning and includes a description of the framework at the global and local level. Also, this chapter lists the purpose, study goals, aims, objectives, and limitations of research.

Chapter 2, a literature review, explains sustainable urban regeneration globally and in UAE along with taking into consideration historical district conservation and development. Moreover, an explanation of resilience urban places and urban configuration associated with many parameters and urban frameworks including livability of spaces, walkability, decentralized neighborhoods, mixed land use. This chapter, analyzing the factors that affect historical district regeneration based on space syntax theory including connectivity, integration, choice, and visibility graph analysis. Further, highlight the narrative design of urban spaces that concentrate on social and cultural



values. Overall; investigate a holistic vision including all layers of thinking to improve public places, experience, and life of people.

Chapter 3, methodology, highlight the methodologies that are used to enhance and achieve integration within the neighborhood and it's surrounding through applying parametric design and space syntax method to specify strategies and framework to investigate the performance of the existing site, proposed master plan by Shorouq, where each of them is evaluated to show the pros and cons. The methodologies to be explored in this section are field observations, parametric tools, simulation tools that are used to obtain successful outcomes. The methodological framework of this research approach is also mentioned in this chapter.

As well as, understand the current status of Heart of Sharjah through field study, describes the main features, and highlight all the problems such as fragmented area, connectivity in all level which made the government of Sharjah to regenerate the area. Further, this chapter investigates the proposed master plan 2025 which has been developed by Shorouq and compares all the suggested strategies to improve the area at all levels through optimizing the new design by using a parametric design tool to enhance the area.

Chapter 5, results and analysis, covers the results of the simulation of the current site and proposed a master plan to generate different suggested scenarios by using Grasshopper and AutoCAD. After that test, all master plans by space syntax simulation. Many parameters were tested by using depth map x software such as connectivity, integration, movement flow, and VGA to compare all the results.

Chapter 6, finding and discussions, compare all the measurement parameters result from the space syntax through chart and graphs to set the recommended strategies as a framework of sustainable urban regeneration to satisfy the vision of the area and enhance the people's experience.

Chapter 7, the Conclusion, describes the study in which the conclusions of the simulation results are presented to respond to the theoretical question and to cross-refer to the goals and priorities mentioned in the introduction. Also, this chapter points forth the importance of research and study limits. Recommendations for future research will finally be described.

**CHAPTER TWO**  
**LITERATURE REVIEW**

## **2 CHAPTER 2 LITERATURE REVIEW**

### **2.1 Sustainable Urban Development- Global Level**

Furthermore, Urban growth, increasing dependency on motorized vehicles, and urban lifestyles that produce unsustainable waste and use vast volumes of energy are some of the main contributors to the global rise in greenhouse gas emissions. Nevertheless, UN-HABITAT conducted evidence studies indicate that not all cities lead to climate change and global warming in the same manner. Although promoting the use of environmentally sustainable renewable energy, the city's environmental footprint and carbon emissions will be greatly minimized. Globally, about 60 percent of the world's people living in low-lying coastal areas. Global mean forecasts suggest that global warming will lead to an increase in sea levels in the decades ahead. There is an increasing concern about the catastrophic effect on coastal areas and urban communities due to the increment in water levels caused by climate change (UN-Habitat 2009). After industrialization, global warming, human activities have raised emissions of greenhouse gases, in particular CO<sub>2</sub>. Their existence has now warmed the Planet at an average temperature of around 1o C. Emissions are once again increasing worldwide, and if existing rates persist, global warming is likely to reach 1.5oC between 2030 and 2052. Thus, cities are responsible for 70% of global greenhouse gas emissions from fossil fuel extraction. To meet the goals set out in the Paris Agreement an urgent call would be required to become carbon-free (United Nations 2019).

As a result, changes like the biosphere caused by human actions are inevitably observed in the current environmental conditions on Earth. Global per capita energy consumption rose from 1.3 to 1.9 tons of oil equivalent between 1965 and 2015, but the individual consumption rate in developed countries is three to four times higher.

Indeed, the promotion of public transit and active transportation (e.g. walking and cycling) remain essential approaches for reducing carbon emissions from the transportation and energy sectors.

Moreover, least developed countries members of the Climate Vulnerable Forum, they would be an urgent switch to 100 % clean energy by 2050 reported that during the twenty-second Conference of the Parties (COP 22) to the United Nations Framework Convention on Climate Change, held in Marrakech, Morocco in 2016, 24. Despite these developments, there are significant gaps in academic and technical inequality between developed and developing nations.

On the other hand, in the Arab region, the challenges are related to ongoing conflicts in the area, for instance: increased food shortages and deteriorated human growth. The field also includes 14 of the 20 most water-stressed countries in the world. Income inequality is more than 30%, hitting 48% among young women internationally, 35% of urban areas do not have access to municipal waste services. People with disabilities face many obstacles to active life in many cities worldwide as public transit, public housing, and shopping malls are not made accessible to them. As stated by Secretary-General António Guterres, life as we know it and the future that we desire are in danger. Despite this, still we are not on track to meet the Sustainable Development Goals by 2030. We need to speed up the rate of change drastically as we approach a crucial decade for the coming generations and the world (Department of Economic and Social Affairs 2013).

Over the last decade, much community-based analysis has underscored the means of coordinated economic initiatives and initiatives by creating employment and business growth, providing safe and sustainable housing, and constructing prosperous communities and economies. Which requires investment in public transport and the growth of green public spaces in an inclusive manner. Sustainable urbanization will, above all, be an efficient tool for sustainable growth for both developing and industrialized countries. Meanwhile, the 2030 Plan, The New Urban Agenda is a

common vision for a prosperous and more equitable future – one in which all inhabitants have equal rights and access to the advantages and resources that cities can provide, and in which the global community is rethinking the urban system and physical form of our urban structure to do this. Also, Promote the involvement of all stakeholders, build a feeling of belonging and ownership for all their residents, give priority to secure, sustainable, Open, sustainable and accessible public spaces that are family-friendly, encourage social and interaction, cultural identities and political engagement (Nation, 2017). Approximately 15 years ago, the Millennium Development Goals (MDGs) resolved to fix poverty indignity. The MDGs set solid, mutually accepted goals for combating extreme widespread poverty, preventing fatal diseases, and extending primary education to all ages, along with other development objectives. The hazard has been described as bold and calls for strong concerted international measures to improve action to reduce pollution. The meeting was then ended with a commitment to complete talks by 2015 and to take decisive steps against unavoidable global climate change. The Sustainable Development Goals (SDGs) replaced the Millennium Development Goals (MDGs), As a universal call for commitment to preventing hunger, preserve the environment to ensure that all residents reach health and wellbeing by 2030. As shown in Figure 5, 17 SDGs integrated within each other comprising 169 Sub goals that are, they understand that growth must incorporate social, economic, and environmental sustainability to be accomplished by 2030. In addition to that, the SDGs tool will help City Authorities and Service Providers to evaluate and lead to the development of initiatives to achieve sustainable urbanization following the New Urban Agenda (NUA). Consequently, The main aim was to establish a set of common priorities that resolve the immediate natural, political, and economic problems facing our world. Highlight goal 11 which is called sustainable cities and communities which mainly refer to as sustainable, resilient, safe, and inclusive cities and

human settlements. It also promotes services that lead to economic, social and environmental interactions between cities and rural areas by improving future development planning.



Figure 5: Sustainable Development Goal (SDGs) (United Nation 2020)

By 2020, due to COVID 19 over 90% of cases in urban areas and around 47% of the population live within 400 m walking distance to open public spaces. Significantly increase the number of cities and human populations that adopt and implement consistent policies and strategies for engagement, resource efficiency, resilience and response to climate change, and develop and implement efficient disaster risk management at all stages in line with the Sendai Disaster Risk Reduction Framework 2015-2030 (UN-Habitat 2019).

Global development strategies, agreements, and structures, programs, and conventions understand the connection between successful urbanization and urban growth, focusing on cities as a means of the solution rather than the origin of the problems facing the world nowadays. In terms of this, UN-Habitat objectives focus on increasing awareness of sustainable urbanization among stakeholders, including the general public, and improve the knowledge through inclusive

debates and sharing best practices, as well as, increase coordination between all stakeholders through the organization of worldwide forum and conferences such as world urban forum (WUF) which convened every two years around the world. In February 2020 WUF took place in Abu Dhabi, cities of opportunities: connecting culture and innovation theme, it was interesting and full of knowledge to attend such an amazing forum and get an amazing experience of learning and sharing knowledge and meeting expertise from around the world, also being introduced to Doctor Tim Stonor Director of Space Syntax Limited and meeting Professor Donovan Rypkema president of Heritage Strategies International specialized in heritage conservation.

Besides, the World's Cities Day (WCD) is the first international day introduced by the Chinese Government in the United Nations as its theme of harmonious urbanization in 2008. As cities increase in scale and density, the equilibrium between the geographical, social, and environmental dimensions of the city and its residents is of utmost importance. This peace is focused on two main pillars: equity and sustainability. Rapid, unplanned, and poorly coordinated urbanization, on the other hand, also raises problems such as sufficient housing availability, adequate facilities, provision of critical services, protection concerns, and the sensitive use of natural resources.

After all, despite the initial commitments, the planet is not on track to meet any of the 169 goals contained in the priorities. The minimal progress of the Global Sustainable Development Study 2019 against the targets poses significant questions and worries the international community. Just over 10 years to meet the 2030 Agenda, the systemic transition towards sustainable growth over the next decade relies on the parallel accomplishment of the country-specific creative pathways.



However, as shown in Figure 6 the suggested points of entry and levers can more be used as tools to lead regions and all stakeholders in their context-specific delivery plans for the accomplishment of the Sustainable Development Goals and their evaluation of the trade-offs relevant to the priorities outlined in the study (United Nation 2019).

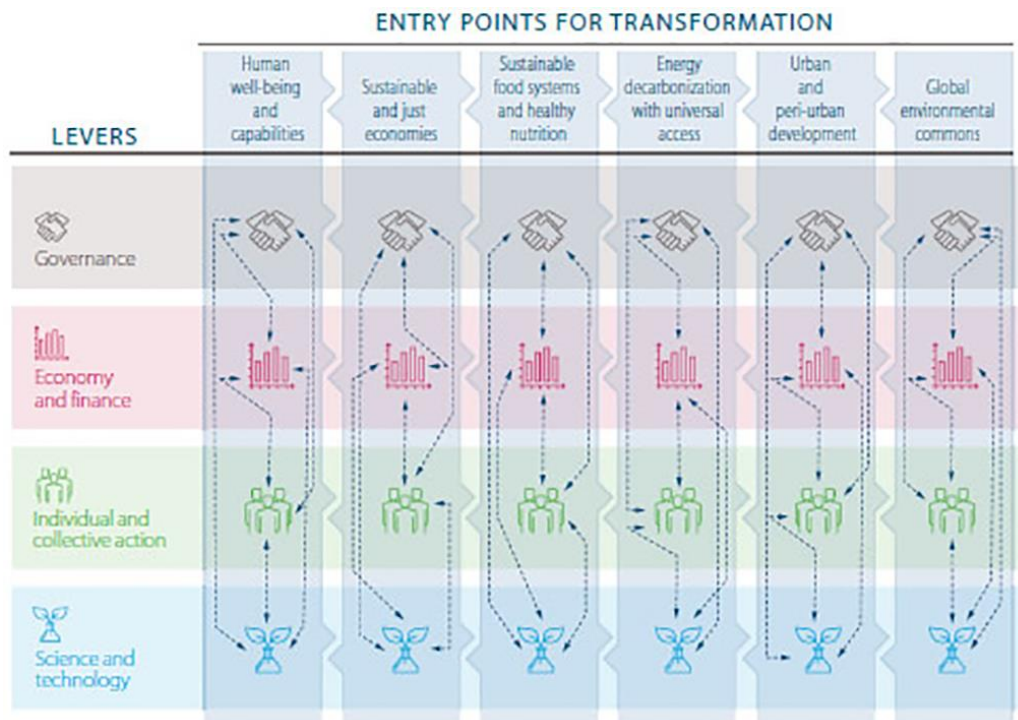


Figure 6: The entry point for transformation (United Nation 2019)

In the end, 2020 witnessed COVID 19, during the shutdown many scholars, experts, educators from all over the world took part in online webinars and workshops to highlight the importance of active transport such as walking and cycling which proved its efficiency during this time even in the hot region. John Butcher stated that walking is simple, does not require specialized guidance. Walking is the first thing that the kid has to do, and the last thing that the person wishes to give up. Walking is a sport that does not require a gym. It's a treatment without medications. Furthermore, it does not harm the environment, uses the least natural resources, and is highly

profitable. Also, Michael Berkowitz, said that because of this pandemic, we're going to get a whole new wave of infrastructure, and we've got to do things better than usual (Urbis Planning, 2020).

## **2.2 Urban Design Theme and Trends (past, present, and future)**

The urban environment has changed dramatically in recent years. The phase of urban transition and its results in terms of industrial, post-industrial, and technological urban change. While population development can be narrowly separated into organic and grid patterns in traditional cities. Thus, even during the nineteenth century and the first half of the twentieth century, modernism originated in urban planning, implementing innovative high-rise structures to address the new challenges and demands that lead to industrial cities as a result of industrialization. However, the exponential expansion in population has contributed to extreme overcrowding and the emergence of slums in towns. On the other hand, this introduces the motivation for moving to suburbs to avoid the industrialized city and its noise, illness, and corruption for a better standard of living. Although the automobile was the key contributor to this trend of economic development. Because our economies and the world are being highly car-dependent and correlated with several natural, economic, and social issues as shown in the below Table 1 (Telford 2001).

Table 1: Problems of car dependency (Matthew et al, 2003)

Problems of car dependency:		
Environmental	Economic	Social
Oil vulnerability	External costs from accidents and pollution	Loss of street life
Smog	Congestion costs, despite road building	Loss of community
Toxic emissions	High infrastructure costs in new sprawling suburbs	Loss of public safety
High GHG	Loss of productive rural land	Isolation in remote suburbs
Urban sprawl	Loss of urban land	Access problems for those without cars and people of determination
Stormwater problems		
Traffic problems like noise & severance		

In the late 1960s and early 1970s, cultural and historical factors of the traditional urban world were adopted across Europe and the United States with considerable reverence for the individuality of places and their history. There was a growing presence from ideas that were disappointed with the successes of the modernist urban revolution, which struggled to create decent streets or decent towns. As a result, highways have no social features and continued to separate and break local areas, resulting in effective urban regeneration problems today.

On the other hand, the digital age and the internet of life have become as essential to urban life as a street network, as much of the commercial, social, political, and cultural interaction has moved to cyberspace, and the internet is even closer to having universal accessibility than the automobile. The world is going to be different from today, in ways we don't know yet. Mitchell (1999) suggests that the influence of the digital revolution would redefine the philosophical and professional goals of planners, urban planners, and those who think about the spaces and areas in which we conduct our everyday lives, as global warming and the loss of greenhouse gases, can bring about dramatic change. In particular, the incorporation and sophistication of urban environments necessitate an

iterative approach of accountability for local and global contexts and social and political backgrounds, without a doubt, that urban planning is by and around people concerning equity, ethnicity, and income classes. Thus, the overlapping and association of these dimensions is a matter for urban planners every day.

The iterative process of urban design can be disaggregated into a series of thinking layers as following: sitting aims involving all stakeholders and urban dimensions, gathering and analyzing information and ideas, generating and suggestions of various frameworks through an iterative process, synthesis and testing the proposed solutions to identify alternatives, decision making of the alternatives, evaluation and measuring according to the goals and objectives. Meanwhile, the holistic approach to sustainable urban design has the potential to play a key role in addressing this challenge. Integration between urban context and the sixth dimensions of urban design as stated by Lynch will address a comprehensive sustainable impact. Strongly influenced by urban dimensions which are: morphology, psychological wellbeing of people, functionality and mix-use environment coping with the local environment all effect on energy consumption, visual connectivity is a key sustainable quality, also sustainable development is a long-term objective accomplished through many micro-scale interventions (Mathew et al, 2003).

More than 15 years of smart-growth research and studies are considered the basis and the core of sustainable urbanism and are central to its sustainability. Although the Smart Growth Movement followed a wider platform in 1996 with the creation of ten smart growth concepts by Harriet Tregoning (Furlan 2016).

Besides, the Congress for New Urbanism (CNU): The Sustainable Urban Planning Movement was founded by six architects – Peter Calthorpe, Andres Duany, Elizabeth Moule, Elizabeth Plater-Zybrek, Stephanos Polyzoides, and Daniel Solomon – and was first held in Alexandria, Virginia,

in 1993. Emphasis on promoting public health and architecture by enhancing communities. In the meantime, sustainable urbanism is walkable and transit-oriented, combined with high-performance buildings and high-performance infrastructure sustainable urbanism stresses that the personal attractiveness and social advantages of the neighborhood of living – fulfilling everyday needs on foot – by combining five attributes: concept, compactness, completeness, accessibility, and biophilia (Douglas Farr, 2009).

In 1993, the USGBC United States Building Council was formed and completed the Green Building Standard in 1995 under the title of Leadership in Energy and Environmental Design (LEED) and introduced the pilot version in 1998 and it's a ranking system in 2000. LEED Neighborhood ranking system was established in 2010 with the priority of sitting policies at the local and regional level. As a result, LEED has become an increasingly mainstream power that has moved policymakers around the world to more sustainable policies (Haapio 2012)

LEED recently revealed that people spend nearly 90 % of their time indoors. Despite, all this time spending indoors deprives people of the physical and emotional advantages of cycling, outdoor fitness, and time absorbed in nature. Many of our towns and communities have been built in a manner that discourages recreational recreation. So the loss of human interaction with nature has incurred and even blinded us to the horrible harm that we are doing to our world. The future urban design required to be positive attempts to make better places and associated with SDGs and the 2030 agenda across all the sustainability pillars. It has been demonstrated, there is a clear relationship between the spatial and physical characteristics of a city, and its functional, social, economic, and environmental qualities. The need, therefore, is to design cities and urban places to work well, to be people-friendly, and to have a positive environmental impact.

Rather than anything else, many urban design developments and patterns have been launched a few years ago under the banner of new urbanism that encourages environmental, healthy practices by building walkable communities. Sustainable urban planning thus incorporates a range of planning concepts and developments such as Conventional Community Development, Transit Oriented Development (TOD), Smart Growth, Modern Pedestrianism (NP), Central Business District (CBD) (Furlan 2016).

Generally, each pattern entails various mechanisms and solutions to enhance the quality of life for today's citizens without sacrificing the next generation needs to be based on the five concepts listed above, e.g. the TOD neighborhood, which mostly oriented neighborhood to the use of public transit with walkable distance Bus-centered growth, decreases greenhouse gas pollution, ensures that riders need it (USGBC 2009).

On the other hand, Modern Pedestrianism (NP) considered the more idealistic form of New Urbanism in urban design theories dealing with the reduction of numerous social, wellness, resources, economic, functional, and environmental issues, with particular focus on the reduction of the function of automobiles. The pedestrian village will range from being almost vehicle-free to having limited car entry, but the main ones are still the pedestrian lanes. The present united nations sustainable development Report recognizes six entry points that give the most potential to deliver the needed changes at the appropriate scale and pace. Its relevance for the execution of organizational objectives and targets – will negatively impact development in some aspects of the 2030 Agenda. The selected entry points are: Human well-being and capacities, Healthy and equitable ecosystems, Food systems and dietary trends, Energy decarbonization with equal access, Urban and peri-urban growth, Global environmental commons (United Nation 2019).

As an outcome, they observed that each nation must adapt to its circumstances and goals, while at the same time breaking away from current development policies first and cleaning up later towards more prosperous micro-scale communities and macro-scale cities. As a result, based on LEED-neighborhood initiatives to expand sustainability certification beyond single buildings to the neighborhood level, where substantial savings and reliability can be obtained by coordinated land use, mobility, and infrastructure planning, compatible with smart development, modern urban development, and green building concepts (Talen et al. 2013).

### **2.3 Sustainable Urban Regeneration in Historical District**

Over the mid-twentieth century and beyond, urban expansion in historic cities has been at the forefront of today's diverse environmental, socio-economic, and political transformation mechanism. As discussed earlier, with rapid economic progress, population growth, growing demands, and evolving habits, most of the Gulf's historical centers have faced difficulties in making the required improvements and transitions to new requirements and changes as shown in Figure 7 (Boussaa 2018).



Figure 7: Historical district urban regeneration inspired by the Qatari traditional architecture, (Boussaa 2018)

In the Gulf, cities have observed significant social, cultural, and economic shifts due to the oil discovery in the 1950s and 1960s. These transformations have had a direct effect on their historic surroundings, thereby significantly endangering the distinctiveness and identity of their towns. The developments in globalization and the accelerated transfer of information have played a major role in transforming the built environment as a result, their distinctive identity dependent on their history has drastically shifted. The dramatic building boom in the Gulf has left no space for stakeholders to enjoy their city's cultural heritage. Although the built heritage is significant, other values associated with memory and culture should not be ignored as they form the nature of the urban identity of a community. UN-Habitat highlighted the significance of cultural heritage in today's cities. consequently, urgent actions is needed to conserve and encourage the tangible and intangible cultural heritage of urban societies because heritage has been recognized as having a key role in shaping the culture of the region.

as stated by Lynch, If the transformation is possible, it must be enhanced and regulated to avoid violent distortion and to regenerate full harmony within the context. It is, therefore, necessary to retain the built heritage, without sacrificing intangible principles, and to establish a clear continuity with the heritage (Boussaa 2018).



The conventional market (Souq Wakif) in Doha, Qatar, represented by (Tannous & Furlan 2018) as seen in Figure 8 below as a sustainable neighborhood case study that has formed a bond between the triple bottom line. However, this paper focuses on the social side of the place where people of all groups can live, work, and play. Throughout this analysis, a broad variety of variables were assessed by a qualitative approach in three separate phases, such as behavioral mapping, network quality, walkability, integrated land use, landscape design, waste network, density, livability, security, block shape, structure, user interface and pattern of movement.



Figure 8: Revitalize Traditional market in Doha, Qatar (Souq waqif), (Tannous & Furlan 2018)

However, the region is considered to be one of the most desirable heritage areas in Qatar, which strengthens the social, cultural, and economic aspects of the community. This result was obtained after the triangulation between theoretical, conceptual, and questionnaire analysis. On the other hand, a variety of concerns have been found in the analysis, such as promoting the greenery features to improve the user's experience and reduce the lack of space by adding more facilities, children's play area, more connectivity to the local area, which would make the community more user-friendly.

Furlan et al. (2019) investigated the historic district of Musheireb downtown Doha, Qatar, as a sample of a sustainable, regenerated historic district by improving uniqueness and sense of place, living, quality, and image. As a result, the integrated mixed-use, and reducing cars' presence have been undertaken to achieve the walkability. However, three distinct parameters have in turn, led to promote the development in terms of walking and living conditions: cultural principles, modernity, and the strengthening of the public domain, including certain features of urban space. The result demonstrates that the revitalization of Musheireb downtown has been accomplished by improving the following elements: urban fabric, introducing pedestrian pathways, promenade, square, and green areas, landscape & hardscape features. In addition to mixing conventional and contemporary design styles. On the other hand, the report outlined several suggestions for isolated community districts owing to the main highway surrounding it, which would make a big contribution to the development of the city in Figure 9.



Figure 9: The new historic district of Msheireb Downtown, Doha, Qatar, (Furlan, Petruccioli & Jamaledin 2019)

(Hussein 2017) As described in several literature reviews, It has been found that walking strategies, can have a dramatic effect on accessibility, walkability, and the efficiency of public spaces. Hussein's research was performed on the Salamis rode of Famagusta in Cyprus, which has several issues related to walking experience and space efficiency. However, the study showed that incorporation of pedestrian philosophy and walkability can be accomplished by applying several criteria based on the urban environment and human needs of the city, including but not limited to: minimize the cars pass through the area, by applying different solutions, urban configuration and morphological fabric, security, and safety, social entertainment, walkways quality, visuall connectivity. According to the results, pedestrianization leads to economic development in terms of cultural interaction and tourism. Decision-makers should also increase awareness of heritage places to improve strategy development and regeneration policies by applying integrated urban planning to support all layers of planning Figure 10.

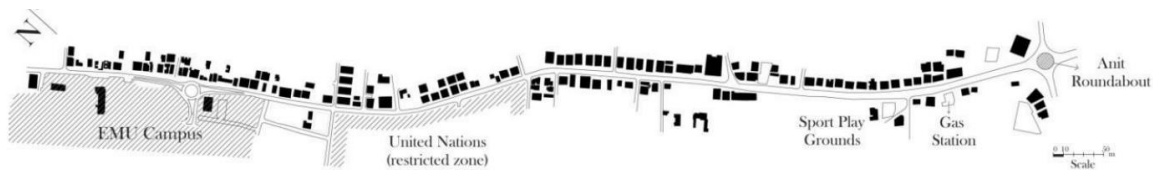


Figure 9. The location of Salamis Street in Famagusta town.

Figure 10: Salami Street in Famagusta town, (Hussein 2017)

### **2.3.1 The Livability of Public spaces**

A sustainable urban design strategy will efficiently promote the design and development of better open public places. Urban spaces are widely known as central focal points of the urban system and as an integral part of modern social life. Among them the plaza shows the most excellent features, exhibiting a rare combination of characteristics: an optimistic void form defined by the surrounded physical structure, ceremonial importance, a social significance enhanced by the incorporation of political and cultural events following community activities of different age groups (Pezzica1 &, João Ventura Lopes 2017).

Physically, communities are the collection of buildings connected through spaces and utilities. They support cultural activities, social, economic, and environmental. In effect, they are means-end structures whereby the purposes are physical and the ends are functional (Hillier 2007). Nor does it refer to our need to recognize the city as a functional and structural whole, which has been a crucial failure for decades. Urban development and transition mechanisms tend to develop both the 'introduction' from which unexpected global-changes arise from a sequence of local-changes and the reverse phenomenon by which global-changes cause unintended micro-scale impacts. At all until recently, there were no clear ways to model those systems. Places don't make towns out there. It's a town that makes a place. The difference is crucial, without recognizing cities we cant make places. Spaces are divided and per the aspect of human well-being and how they perform, perceive, and use space to establish the experience of all meanings. The spatial and physical growth of cities is a result of the social and economic forces that provide reasons for their existence. Despite this, the second objection is somewhat less evident and somewhat contrary to the first. As formulated by Edward Relph, to highlight the difference from space to a place: the idea of place as profound centers of human existence, accompanied with where we have been born and raised,

where we are currently alive, or where we have had unique moments. The place tends to be a critical center of a person and cultural identification and stability.

On the other hand, Yi-Fu Tuan Space has a spatial dimension, is situated everywhere, memories shift over time, and inhabits history. There's a place where things, incidents, and events happen where encounters and stories have been committed to memory.

Put another world, Defined the place to be more memorized by people than space due to special events or experience. What starts as an indistinct space then becomes a place where we get to know it better and giving it meaning. Moreover, if we think of space as that which enables movement, then the place is a break, any pause in motion makes it possible for the space to be converted into a place.

Public place qualities in an urban environment, are more than the individual physical characteristics that they contain, it's more about the potential of cultural value. However, the perceptual dimensions play a key role in the value of the place especially when we are dealing with the historical district. Perceptual qualities are related to the sense of the place a sense of comfort, safety, and level of interest, which reflect people's reactions and understanding of public places. Based on perceptual theories of the urban environment- public places quality measurement factors were produced from tangible and intangible features in the urban environment. Based on that, various valid and reliable assessment tools were introduced to evaluate the public places in historical urban centers such as imageability, enclosure, transparency, complexity, human scale, and coherence.

As stated by Kevin Lynch (1960), the visual place is full of life, creativity, unforgettable, mimicking curiosity that can generate an impression and a sense of place by a mixture of multi-physical and spiritual elements. The serial vision concept conceived by Gordon Cullen (1961), determines the place experience through an active mode of travel which allows the users to see, engage, and form a cognitive map of urban places.

Paul Zucker (1959) outlined five basic forms of urban spaces: dominated, closed, nuclear, and grouped spaces which all create the space enclosure either visually or physically. As explained by Henry Anrold (1993) that the space boundaries can be defined by a row of trees that create a sense of enclosure. Consequently, the morphological dimension of urban design-related mainly to the urban layout and urban form (physical features). It's important to create integrated, permeable grids to enhance the coherence of places that refer to the sense of visual consistency and at the same time improve the perception and experience in such public places. Alexander (1977), has been claimed that all structures above four floors are out of a human scale. Overall, all these tangible and intangible elements in the urban environment must collaborate all in a holistic approach towards inclusive cities for all people to promote a holistic and comprehensive way of thinking before considering specific solutions and interventions including economic, environmental, socio-cultural, and spatial dimensions in short and long terms vision (Reid Ewing, 2013).

### **2.3.2 Walkability**

As elaborated in the previous section and mentioned through several theories and research in urban design it allows us to see the bigger picture and how different urban functions and systems are interrelated today and in the possible future to identify the challenges using a vision-based approach in collaboration between all stakeholders, private, and public sectors of various disciplines to allow for synergies and integrated solutions that lead to better flexible sustainable solutions cyclically. Successful public spaces it's not only affected by the physical features of the urban area but also the cultural participation contributes to raising cognitive, creative capabilities that empower people and make them feel part of a community, encouraging urban planners to switch from a deeply subjective meaning to a more analytical framework that has the power to build a sense of place. Furthermore, Walkability can be defined through 'six Cs' principles, these indicators are highlighted through many studies as following: connectivity, continuity, convenience, convivial, comfortable, and clarity.

Walkability is recognized to be a priority in any sustainable urban design in the development of a healthy pedestrian community by the establishment of a comprehensive system of convenient, healthy, and safe pathways for all ages and abilities. So this will allow people to get to their destinations easily on foot. In addition, 'Vision Zero' is a plan to reduce both road accidents and serious injuries while at the same time increasing safe, secure, and equal access for all. (Moura, Cambra & Gonc 2017).

On the other hand, the negative environmental consequences of the use of impervious materials, in this case, the measures needed to encourage the use of sustainable pavement technologies to enhance outdoor thermal comfort and enhance the walking experience.

As seen in multiple studies, parallel parking along the lane exposes the pedestrian to danger when crossing the road. However, several variables take into account the requirements for measuring paths specifications, for example, the width of pathways, security, street furniture, signage and lighting, shading system, creative solutions currently available for public places furniture such as solar-powered benches include wireless charging, lighting, and cooling systems. Landscape features can also enhance user experience and enable them to be able to walk in a safe and enjoyable environment (Gwilliam 2013).

### 2.3.3 Cycling Network

Cycling is known to be one of the most common environmentally friendly ways of active transport. Promoting healthier cities, reducing transit and traffic congestion, and improving public health through the implementation of a cycling network. The Figure 11 represent sustainable street design components (Publishing et al. 2020).

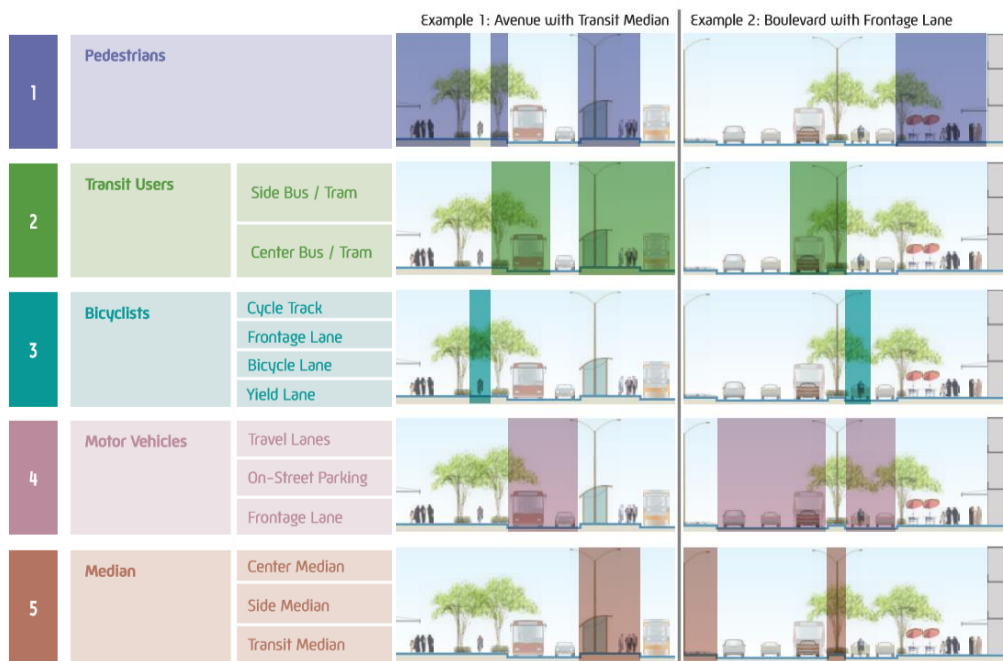


Figure 11: Street design components (USD 2014)



### 2.3.4 Connectivity

Urban space connectivity applies to the number of publicly accessible pathways intersections per square mile, including street intersections with designated corridors, mobility rights, and non-motorized paths. As seen in Figure 12, improved street accessibility within and around neighborhoods makes walking and biking more convenient, decreases traffic congestion, and encourages facilities, green parks through providing more connected pathways physically and visually which will enhance the movement flow opportunities to be more affordable by direct urban vistas. Moreover, Adequate accessibility to public services, such as bus stations or train stations, helps minimize greenhouse pollution, decreases the need for road maintenance, and facilitates walking and cycling. Subsequently, this will enhance the social interaction, economic, and environmental aspects of public urban spaces (Gharaibeh 2019).

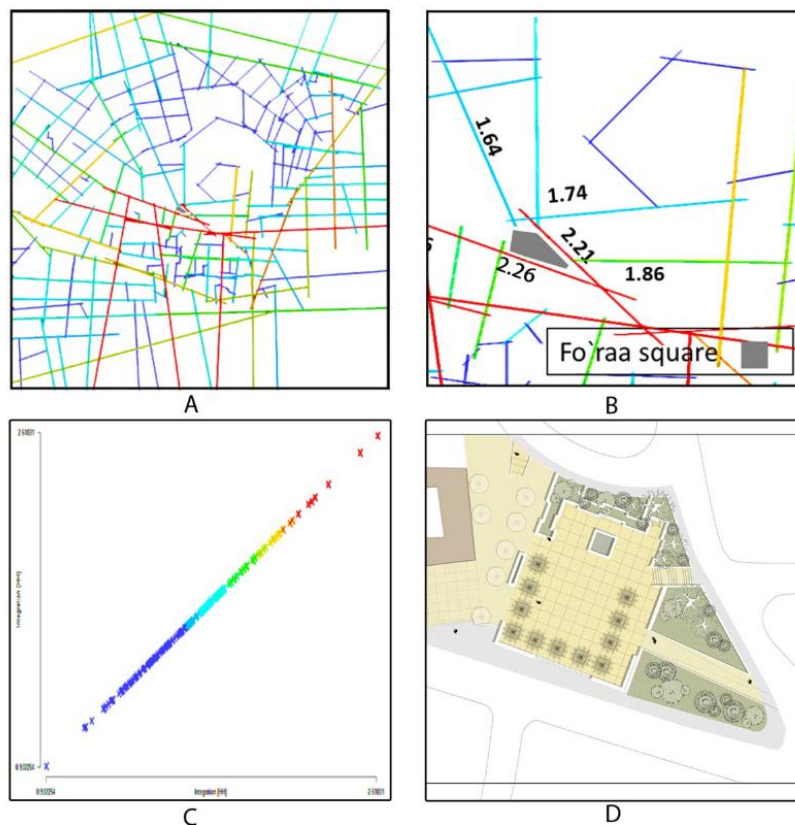


Figure 12: Axial local integration map of Irbid downtown and Fo'raa Square, ( source: Gharaibeh 2019)

### **2.3.5 Integrated Land Use**

Mixed and variable land use, active transport-oriented societies are associated with high sustainable and resilience communities' criteria. The indirect relationship between urban features and pedestrianization is supposed to contribute to an ideal condition for public health. Increased levels of commuting and walking are associated with human wellbeing and lower vehicle running speeds. In addition, maintaining a higher degree of community quality and public health requires a holistic design pattern planning strategy that first incorporates the particular needs of pedestrians and cyclists, followed by affordable high-quality public transport, services, and parks. Generally, the idea of active transport, now demonstrated by urban walking and cycling, is particularly important in the field of urban planning as it aims to combine urban sustainability with other related societal agendas, such as health, quality of lifestyle, and social integration.

Furthermore, the pandemic affects and transforms our lifestyle which identified the quick calls for immediate actions from the governments and decision-makers to collaborate and implement strategies towards sustainable resilience communities based on human needs. As summarized from previous research and studies, our cities key functions elaborate in the following spaces: workspaces to strengthen our economy, public places to enhance the social interaction and human wellbeing, markets, public services, tourist spaces, transportation hubs, schools, and public facilities, all to be connected in a safe and attractive network so all can benefit and flourish the community life (Telford 2001).

### **2.3.6 Social and Cultural Values**










As Peter Hall proposed in 1998 that information technology offers new ways of organizing society as a whole, and to transform the future of life, through provides new possibilities to create new urban forms and change the old ones. As noted earlier, it is important to conserve not only the physical elements but also the non-physical structure of urban spaces by creative means that enhance the nature of heritage spaces, while also using them as a foundation for improving more recent urban spaces. Currently, many cities put culture at the core of sustainable urban regeneration (Mathew et al, 2003).

Nowadays, many cities have created a dynamic link between heritage tourism, cultural values, and a refreshed awareness of the meaning and identity of the places. While, UNESCO's published a Global Study on Culture for Sustainable Urban Growth underscores the essential linkage between heritage areas and continuing urbanization (UNESCO, 2016).

In the meantime, innovative methods are required for the preservation and enhancement of built heritage. Also, dreaming about how to build a unique urban place-identity to enhance cultural and social inclusion and integration. Thus, It can be generated by linking culture and creativity and by developing new public spaces that encourage social and cultural entertainment as a means of complementing and enriching local heritage. At the same time, the sustainability of this kind of community plays a vital role in developing and strengthening human value, with the potential to inspire and promote citizens' engagement in public life, promoting the well-being of individuals and societies, equity, and an inclusive approach. As stated by Lynch, the temporal dimension is important in the historical sites since it's considered as a dynamic, active, and essential resource to support sustainable urbanization aligned with sustainable tourism including economic potential.

UNESCO was initiated in 2004 to facilitate cooperation against a shared goal: to place creativity and the cultural and creative industries at the forefront of cities development strategies at the local level and to collaborate successfully at the international level. already developed programs in different thematic fields to promote these practices, in particular the Innovative Cities Network (Montalto & Saisana 2019).

Table 2: The Cultural and Creative Cities Monitor’s dimensions, sub-indices and indicators – 2019 edition (Montalto & Saisana 2019)

Sub-indices		Dimensions		Indicators	
1. Cultural Vibrancy		1.1 Cultural Venues & Facilities	1	Sights & landmarks	
			2	Museums & art galleries	
		1.2 Cultural Participation & Attractiveness	3	Cinema	
			4	Concert & music halls	
			5	Theatres	
			6	Tourist overnight stays	
			7	Museum visitors	
			8	Cinema attendance	
			9	Satisfaction with cultural facilities	
2. Creative Economy		2.1 Creative & Knowledge-based Jobs	10	Jobs in arts, culture & entertainment	
			11	Jobs in media & communication	
		2.2 Intellectual Property & Innovation	12	Jobs in other creative sectors	
			13	ICT patent applications	
			14	Community design applications	
		2.3 New Jobs in Creative Sectors	15	Jobs in new arts, culture & entertainment enterprises	
			16	Jobs in new media & communication enterprises	
3. Enabling Environment		3.1 Human Capital & Education	17	Jobs in new enterprises in other creative sectors	
			18	Graduates in arts & humanities	
			19	Graduates in ICT	
		3.2 Openness, Tolerance & Trust	20	Average appearances in university rankings	
			21	Foreign graduates	
			22	Foreign-born population	
			23	Tolerance of foreigners	
		3.3 Local & International Connections	24	Integration of foreigners	
			25	People trust	
			26	Accessibility to passenger flights	
			27	Accessibility by road	
	3.4 Quality of Governance	28	Accessibility by rail		
		29	Quality of governance		

In 2015, the joint research center initiated a reflection with a group of 15 experts working on culture, creativity, and urban development internationally. The effort led to the launch of the Cultural and Creative Cities Monitor, as a first agreed framework to measure a city's cultural and socio-economic vitality from a threefold perspective: cultural, economic, and environmental as shown in Table 2. While, the C3 index 2019 score monitor has been designed to assess a city's performance on key culture-related dimensions, to identify strengths and weaknesses in comparison to peer cities, and to track changes over time which yet considered from the statistical structure as a conceptual framework (Montalto & Saisana 2019).

As highlighted previously, Sharjah city was listed on the UNESCO list in 2014 as the Arab cultural city. Aligned with the vision of H.H Al Qasimi culture and education build cohesive societies as well as a more inclusive approach, supporting innovation, creativity, and sustainable jobs and growth. Over the last decade, several Gulf cities, such as Dubai, Doha, and Sharjah, have begun urban conservation and have grown from an initial concern for the preservation of individual buildings and monuments to the conservation of urban areas. Heritage preservation has gradually been used as a powerful policy tool to help restore old Dubai (Boussaa 2017).

## **2.4 Space Syntax Theory**

Space Syntax is an architectural and urban space theory. It is also a compilation of techniques for the social assessment of cities and buildings of all styles and scales. In the early 1970s, Space syntax was founded by Bill Hillier, Julienne Hanson, and colleagues at the Bartlett School of Architecture, University College London. For almost 40 years, space syntax has been used in studies, teaching, and development in hundreds of organizations and university practices around the world. Based on a comprehensive spatial definition, various empiric experiments have proven their usefulness in the following areas: spatial safety and crime, development and spread of urban

city centers and urban sprawl, social behaviors, neighborhoods and connectivity, spatial awareness and movement flow, and spatial spread of different forms of traffic flow (Batty 2004).

In the 1980s, when Bill Hillier developed the Space Syntax Theory (HILLIER; HANSON, 1984), A substantial development towards the accomplishments of quantitative morphological explanations was done. In particular, the Space Syntax group has encouraged the development of a range of analytical methods capable of capturing the properties of urban systems at different levels as shown in the below case in Italy Figure 13 (Pezzica1 & , João Ventura Lopes 2017).

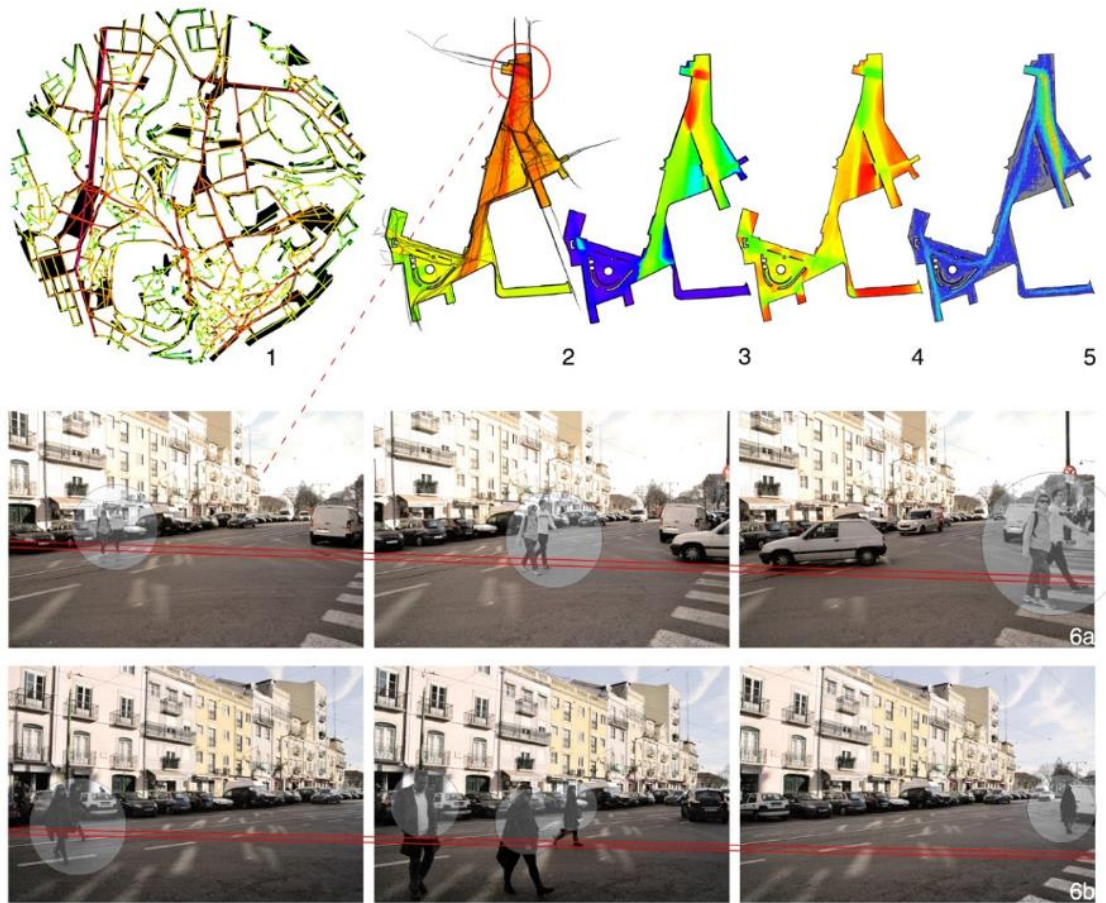


Figure 13: Space syntax simulation of public space in Italy, (Pezzica1 & , João Ventura Lopes 2017)

Moreover, Hillier (1996a) defined cities as aggregates of buildings connected by a sequence of spaces flowing between structures. This network connects a variety of urban spaces, pathways, and structure. Space Syntax Theory, both as a theoretical framework and as a way of thinking about the relationship of space and culture through analysis of urban pattern with Depthmap X software requires attention to be given to the configuration of urban spaces and their potential impacts on social behavior and economic development. The core concepts of space syntax, as demonstrated in theoretical analysis, can be described by two simple proposals. The first concept is that space is an integral part of human life. Space is generated in ways that produce a clear link between space and humans, from which the space we build becomes humanized. In addition, the second core idea of space syntax is that space is simply a configuration entity. Configuration, specifically defined as a separate relationship at the same time, is about the morphology of the built structure from the components that are in a unique relationship among each other (Al\_Sayed, K., Turner, A., Hillier, B., Iida, S., Penn 2014).

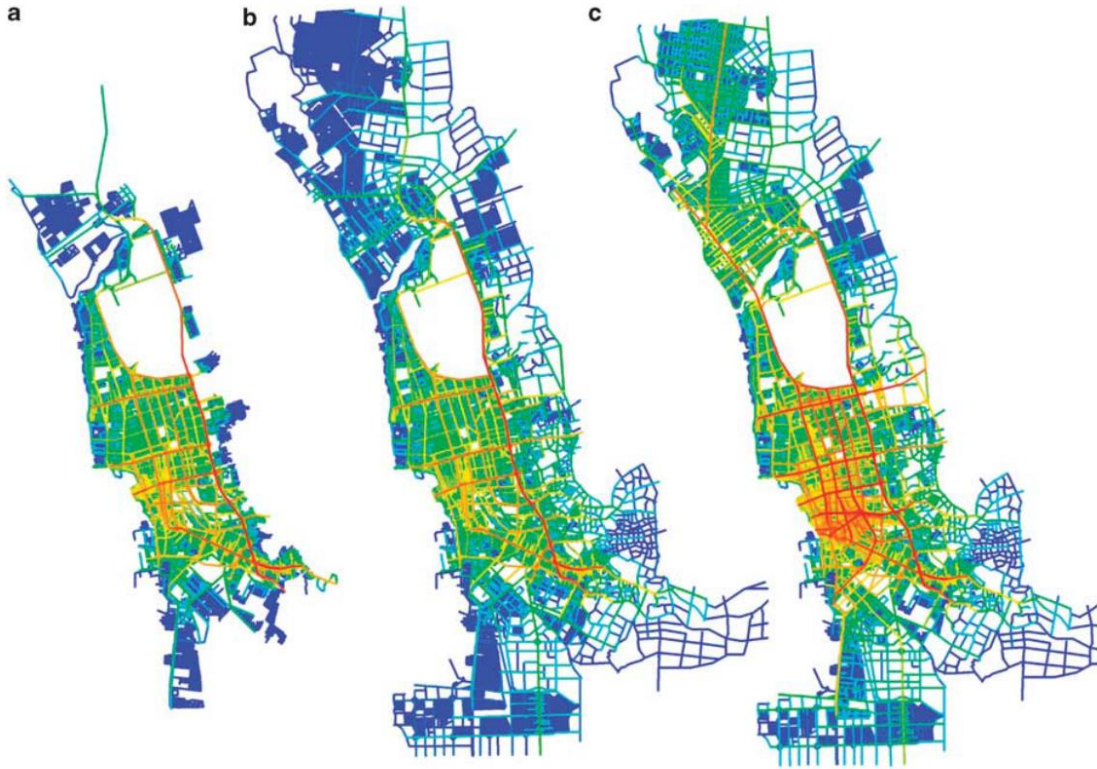


Figure 14: Space syntax model of the city of Jeddah, Saudi Arabia, (Karimi 2017)

Space syntax technique has since been used widely in a wide variety of urban development and planning initiatives, ranging from the size of small urban spaces to the size of cities as a whole. However, the ability to collaborate with a wide range of variables and the benefit of using a single technique to work with various development sizes have proven especially useful in urban design. Many successful case studies around the world were illustrated in different research papers ranging from the city level, neighborhood scale, public spaces, and bridges. For instance, Millennium Bridge in 1997-2000, was further improved in London to create an enhanced public realm. As shown in Figure 14 a study conducted on the city level of Jeddah was highlighted in many seminars by Doctor Tim Stonor to reconsider the massive infrastructure in our cities which resulted in cities for cars with fragmented spaces. On the other hand, an interesting study conducted by Dwimirnani



(2017), correlate between the space syntax measurements and the lighting strategies in public space in London, to enhance movement pattern and encourage walkability in a safe environment.

Furthermore, with the rapid growth of technology, data availability has recently opened incredible opportunities for both space syntax research and design techniques. On the other hand, space syntax may be incorporated into different spatial models to predict potential design impacts. It will also expand the way we use input data from the basic simulation to forecasting. The incorporation of data and spatial models will radically transform the way designers and planners interpret and construct space (Dursun 2007). The same concepts that have previously been explored for the application of investigational methods to the urban planning process are focused on a sequence of primary analyzes – or a reference analysis – that guide the design process from the beginning by defining the challenges and possibilities found by the spatial configuration assessment. However, based on the extent of urban planning proposals, additional layers of knowledge are connected to the analysis of structures to create composite plans that resolve more specifically complex problems that cannot easily be solved by spatial analysis. The second and more important task of the baseline study at this point is to improve and bring more objectivity to the research component of the conjecture-test loop subprocess. The process of generation and assessment of ideas can be replicated at various points and sizes before the optimal solution is achieved (Karimi 2017).

#### **2.4.1 The Parameters of Natural Movement Flow**

Walking is becoming a key element in encouraging healthier, environmentally sustainable, and socially engaged neighborhoods. Various areas of study have identified the effects of walking for people, correlated with exercise, and contribute to diabetes, physical and mental health impacts. Walking could also be seen as the foundation of a safe society, providing social, environmental and economic benefits, which is almost the only way for many people to gain access to their daily

lives. activities. It also gives life to the streets and makes the streets liveable contribute to healthy urban environments. The importance of walking to neighborhood protection, mobility, and social integration has arisen as a global challenge to the nature of the urban world, as pedestrian access has gradually deteriorated in most cities over the last century. Over the last four decades, Space Syntax researchers have identified a variety of steps to understand social behavior, some of the most important of which are described here (Moura, Cambra & Gonc 2017).

### **2.4.2 Connectivity**

degree measures the immediate accessibility between nearest neighbors to space. These connectivity values are then highlighted on the axial map to show the local network layout of urban spaces. This intersection of connectivity, focus, and co-operation continues to create high rates of public life and 'co-presence' in community space.

### **2.4.3 Integration**

Urban neighborhoods are typically classified from the most integrated to the most fragmented. Integration is typically representative of how many individuals are going to be in space and is thought to correlate to the level of social encounter and retail activity (Hillier, 1996a). It is often useful to demonstrate higher values in the method (the higher 10 percent values) the more integrated the line, so more movement along the line, the less integrated the lower the direction is used. The integration could have various forms (a spine, a deformed wheel, spread, and clustered). However, the movement stream in the urban system is assessed by the 'Integration' in the space syntax technique (Hillier and Hanson, 1984). Meanwhile, the analytical method includes Hiller's word 'natural flow' as a set of convex spaces connected by straight axial lines uses a variety of algorithms that can be created automatically by computer programs (Hiller et al., 1993). For pedestrians, the link between places is crucial, and efficient public spaces are usually incorporated

into the local movement scheme. From the created axial lines, each line integration value is considered to be a good predictor of natural movement. The public life and sociality of the city are more intensive with a high degree of integration, they are more 'urbanized'. Thus, as a general theory of urbanity, space syntax is the most promising tool to achieve that (Pafka & Dovey 2018).

#### **2.4.4 Choice**

Tests the flow of movement across space. Spaces that record-high global preference is situated on the shortest routes from all origins to all destinations. it's considered a powerful measure for estimating the opportunity for pedestrian and automobile traffic. It is typically used for axial analysis rather than for convex analysis since it is symbolic of movement rather than an occupation. The triangulation between some of these measurements may define some of the characteristics of layouts that contribute to pathfinding (Conroy Dalton, 2000). For example, knowledge is the correlation coefficient between connectivity and global integration. It helps to identify how easy it is for one to grasp the global system in a local role. Synergy is the relationship between smaller integration radii (R2 integration) and larger radii (Rn integration). The interaction between the smaller and larger radii is an example of the relationship between the pieces and the whole of the spatial fabric (Al\_Sayed, K., Turner, A., Hillier, B., Iida, S., Penn 2014).

#### **2.4.5 Visibility Graph Analysis (VGA)**

Visual features of the configuration, that is, the intervisibility between two points in the model and how they are designed into the visual perception of the urban environment. This representation leads to understanding the visual experience of the built environment will help to determine how open spaces accommodate movement. (Al\_Sayed, K., Turner, A., Hillier, B., Iida, S., Penn 2014).

On the other hand, As Benedikt had theorized that isovist sectors would relate in some way to human patterns of movement, and Hillier had demonstrated that the interaction between lines across space corresponds to patterns of movement within space, it was agreed to combine isovist fields with space syntax to provide a measure of how well incorporated isovists themselves are within the plan of the environment. Later, the approach was more simply formalized as a visibility graph analysis. To measure the visual integration of a space is determined by the number of visual axes taken to get from that point to some other point within the place (Turner 2004).

Overall, the suggested approach is based on the principle of space syntax, which considers space as an inherent entity in culture, formed by a sequence of interactions and patterns or spatial configurations. Analysis of spatial structure offers an effective method of analysis to investigate the flexibility and performance of urban environments, which is an important part of an empirical urban planning process (Pezzica1 & , João Ventura Lopes 2017). Designers were engaged in establishing their projects on solid foundations and critically justifying their work. Developers and stakeholders were thrilled to find it very useful to improve their planning, generate more demand, and explain it more successfully to others, particularly local authorities. The public sector was also concerned as it could critically evaluate their proposals and offer better input to decision-makers and stakeholders (Karimi 2017).

## 2.5 Research Case Study, Sharjah background

One of the seven emirates of the United Arab Emirates (UAE) federation. Sharjah is the third largest UAE emirate with a land area of 2,590sq. km. It occupies 3.3 percent of the total area of the UAE. It is famous for its picturesque countryside and seascapes. The population of Sharjah at the beginning of the 20th century was about 15,000. At that time, the population of the city was very low- and the-income sources were associated with economic activities such as trade, farming, hunting, fishing, and pearl farming. Therefore, in 2012 it has a population of 1,171,097. Its GDP increased to about AED 113.89 billion in 2014. The estimated number of UAE citizens in Sharjah as of 2010, was: Males: 78,818, Women's: 74,547, Overall: 153,365. The above coincided with fast population development and encouraged a global urban sprawl development. This has caused a historic waterfront, farmland, and urban environment to be lost and deteriorated. Resulting in losing the cultural identity and the traditional image of the portal city.



Figure 15: United Arab Emirates map, (source: United Arab Emirates map, 2020)

Further, as shown in Figure 15, it is the only emirate located on both coasts; the west of the Arab Gulf and the east of the Oman Gulf. The Gulf coastline spans for about 20 km. And within 80 km.

To the Oman Gulf. Due to this special location, it has a multifunctional and active edge from the waterfront side. The 17th century was also the city's turning point when the British came into the area and began trading with Al Qawasim. Europeans desired the area of the Gulf and the Red Sea for connecting major trade routes between the Mediterranean and India. With the support of coastal trade and pearling, the settlement flourished. Thus, occupies a critical link to global trading routes and positions it at the heart of international trade. The below Figure 16 (a& b) From the other side the emirate has large desert areas and like all the historical cities fabric is protected by a wall and fort from the local tribes. Additionally, Sharjah has several beaches, marshes, and trees of acacia, as well as, the highest number of natural reserves in the UAE are in Sharjah (A. Ganapathy et al, 2019).

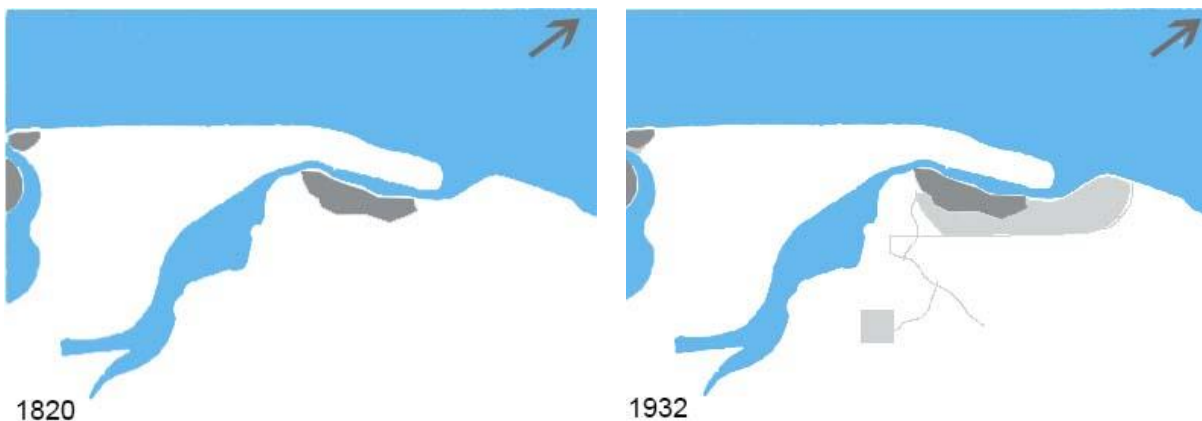


Figure 16: Graphical analysis of the urban sprawl of Sharjah, (a): The first map of Sharjah drawn by the British military. (b): Transfer of the British military base to Sharjah's airport considered the main event happened in 1932, (source: Author, 2020)

The above graphical maps analysis showing the urban sprawl in the city along with three main features of the historical portal city: produced naturally as per the need of inhabitant, It suited naturally and was exposed to a body of water; it was shielded from the edge of the desert by a wall and a stronghold, and it preserved a complex and multifunctional existence linked to the coastline.

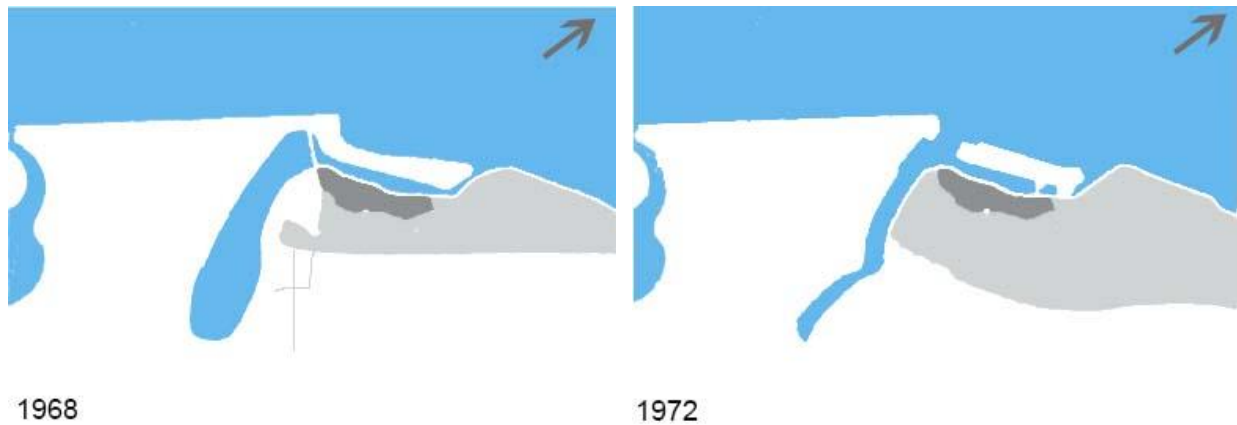


Figure 17: Graphical analysis of the urban sprawl of Sharjah, (a): In 1968, Sharjah start to expand, and the British military was prepared to leave the emirate, also the city start to have newly paved road and divide the city into grid district, (b): In 1972, the city continued in growing toward the desert and at that time the government of Sharjah decided to change the creek shape which influenced the commercial activities.

In 1971, witnessed the announcement of the UAE independence date and on 2 December 1971, Sharjah joined the United Arab Emirates as a founding member Thus, Oil production began in 1974, and gas exploration also began in 1990. Sharjah city has grown tremendously since oil exploration as shown in Figure 17 (Rab 2005).

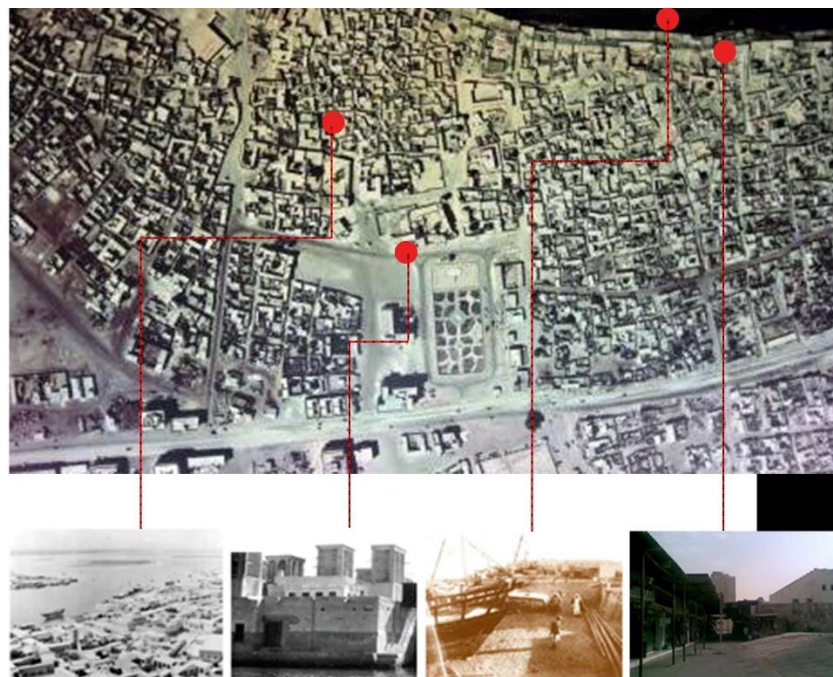


Figure 18: Identical four main features of the historical (port city), Sharjah, (Al fareej, historical wall, Sahel, souq), (source: A. Ganapathy et al, 2019)

Dr. Tim Stonor stated that the old urban fabric is naturally fit in based on the needs and requirements of the inhabitants. While many researchers notice that vernacular architecture is associated with a relevant cultural and economic structure that goes against concepts and space of a modern lifestyle. Hassan Fathi the Egyptian Architect proposed another vision of urban architecture intending to provide an example of an emerging sustainable human development that reacts to local communities as well as contemporary practical requirements while retaining strong ties of cultural heritage and the local community. As shown in Figure 18, Sharjah's old city vernacular fabric consists of four main areas which are Al Fareej, historical wall, Sahel, and the old souq. This leads to the urgent call of providing inclusive and equitable quality of living standards for all people (United Nation 2016).

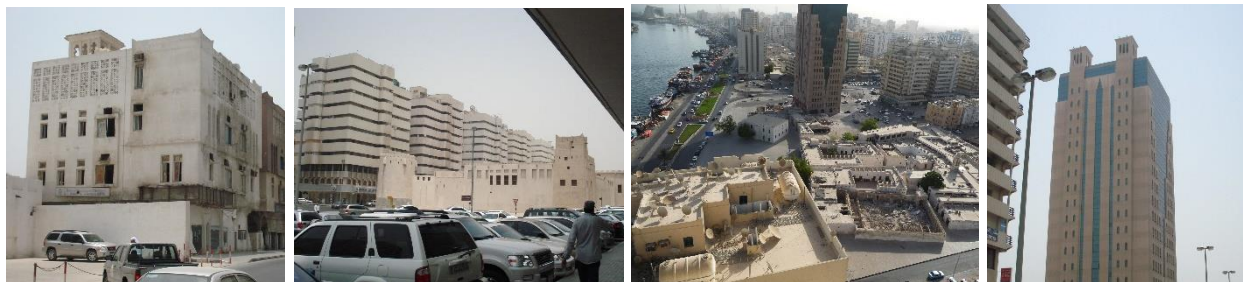


Figure 19: Stages of urban growth development in the historical center from 1970 to 1990 as following: pre traditional, post-modern, restored, and modern, (source: Auther, 2020)

As discussed previously, Sharjah city witnessed rapid growth due to many factors and events which affected the image of the city. As well as, destroyed the main features in the historical city center as shown in Figure 19 through introducing modern Highrise buildings in the area, highways segregate the area from the vital waterfront active edge. Overall, the modern structure and infrastructure fragmented the urban spaces' spirit, historical fabric, and layers, lose the social and cultural values and memories because of a lack of physical and visual connectivity. Consequently, the commercial hub port was transferred and isolate the souq area from the waterfront which



affects the economical values of the souq and the private shop owners and the historical area overall (A. Iyer, K. Deboo, Sh. Gandhi 2019).

### **2.5.1 Art and cultural background**

Over the years, Sharjah has been an art and culture center. The cultural scene of Sharjah has grown under H.H Sheik Dr. Sultan bin Mohamed Al Qasimi, Supreme Council member and Sharjah ruler. The significance of cultural tourism is important as it has major social and economic impacts on the regeneration of previously neglected destinations. Sharjah is more conservative and is closely observing Islamic religious values and cultural standards.

In 1998, the United Nations Economic, Scientific and Cultural Organisation (UNESCO) called it the 'Cultural Capital of the Arab World.' And in 2014, the Association of Islamic Countries designated the Capital of Islamic Community 2014. Sharjah was also given the status of Arab Tourism Capital for 2015 at the 15th session of the Council of Arab Tourism Ministers in Cairo on 18 October 2012.

Further, It was also named the Capital of Arab Press in 2016 at the launch of the Fifth Annual International Government Communications Forum (IGCF) and awarded UNESCO with the valuable title 'World Book Capital' in 2019. Currently, Sharjah is home to about a quarter of all UAE museums and famous activities such as the Sharjah Biennial and the Sharjah International Book Expo. In addition to a special experience intended to catch the interest of everyone, Sharjah's prestigious monuments and historic structures stand out. This stunning and electrifying February days festival fills Sharjah with light and color, explores the art of painting with light, and incorporates visuals and captivating music to make an unforgettable experience Figure 20.



Figure 20: Sharjah festival days, Heart of Sharjah, (source: Festival Gallery, 2020)

Besides, Sharjah is a place with architectural beauty and cultural riches. It is also renowned for its numerous tourist attractions, including ancient places such as the center of Sharjah and new attractions such as Al Qasba and the Al Majaz waterfront. In 2015, Sharjah initiated Sharjah Tourism Vision 2021 intending to attract up to 10 million visitors by 2021 and increase the contribution of tourism to the economy as shown in the below Figure 21 (Corporate Profile - Vision & Mission, 2020).



Figure 21: Sharjah tourism vision 2021, Sharjah Commerce and Tourism Development Authority, (source: Sharjah Tourism vision 2021, 2020)

Sharjah is the ideal venue for sustainable tourism focused on its culture and heritage. Grow, foster, and facilitate the Sharjah tourism sector by promoting and improving its infrastructure and investments to improve its contribution to the economic growth in collaboration with the public and private sectors to effectively achieve goals of the Sharjah Government (Sharjahtourism.ae, 2020).

Furthermore, as mentioned previously this study will focus on the city of Sharjah as a case study. Supporting Sharjah's sustainable development through establishing Sharjah Urban Planning Council, The council was founded in 2006. It seeks to develop a holistic vision for sustainable urban planning and infrastructure to follow the rapid growth of the economy and urbanization in the city. The Sharjah Urban Planning Council (SUPC) aims to empower people and companies to play a significant role in forming societies that enhance people's lives by maintaining the right balance between sustainable growth and basic services, environmental conservation, and innovation – together in great harmony. The goal is for Sharjah to be a more resilient city with great experience from a lively historical downtown with linked communities, all the way to open fields and active industrial areas. However, Sharjah being active and initiatives to provide sustainable solutions including three pillars: environment, social, economic levels and conservation of history as an art and cultural destination through various foundations, developers, and committees under the umbrella of SUPC like Shurooq, Beeah, SEWA, SCTDA, Sharjah Art Foundation, Sharjah museum Authority, RTA, which all meet and agreed to achieve the comprehensive strategies on both local and global level. Moreover, as highlighted in chapter one, Shurooq has associated its practices with the UN SDGs and 2030 national agenda as a continuity of UAE sustainability vision 2021 and particularly with Sharjah sustainable tourism vision 2021, to keep up with the directives of Supreme Council Member, Ruler of Sharjah H.H. Sheik Dr. Sultan

bin Mohammed Al Qasimi, on the conservation of the environment and sustainability in the Emirate of Sharjah. In November 2018, The Shurooq Sustainability Department has been set up as interventions that relate directly to the objectives of the UAE. Taking into account the SDG's priorities like SDG 11 (Integrated Cities and Communities), also associated with the 2030 vision as outlined by UN-Habitat to ensure an equitable sustainable urban solution for our cities. Meanwhile, Sharjah paid more attention to the development of eco-tourism in the UAE, focusing on sustainable tourism as a resource for generating jobs and raising sustainability values for healthier lifestyles and people's equity. To define the future of the tourism industry from a sustainable perspective, the Sharjah Commerce and Tourism Development Authority (SCTDA) organized the sixth edition of the Sharjah Hospitality Forum in 2019 under the framework 'Sustainable Tourism creates business opportunities.' Shurooq has played a vital role in facilitating this, leading to SDG 15 and SDG 11.

In 2012, The Kalba eco-tourism project was initiated by Shurooq, one of the ancient mangroves, as a tourist destination both for protection of the natural environment and increase environmental awareness through various projects and education centers. in collaboration with the Environment and Protected Areas Authority in Sharjah also under the supervision of SUPC. Another project invested by Shurooq that falls under Eco-tourism sustainability is the Mleiha archaeological project which was nominated by UNESCO as a World Heritage Site (SUPC initiatives, 2020).

In partnership with Shurooq and Diamond developers, a leading sustainable society developer in the UAE, the Sharjah Sustainable City project was declared in March 2019 as a world-class sustainable neighborhood, Net Zero Energy Environment in the Emirate of Sharjah. It is the first urban mixed-use project in Sharjah to comply with strong environmental sustainability standards




and satisfy the requirements of the green economy. The initiative would also include a sustainable school as well as a Sustainability Learning Center – to improve understanding of sustainable communities. Aligned with that, the EPAA initiated the environmental awareness campaign in 2008, regarding the preservation of the natural resources and wilderness areas environment (The Environmental Awareness Campaign for the Wilderness Areas Goer in Sharjah, 2020). As well as, The airport has implemented a range of sustainability policies and programs in line with the pledge of the UAE to mitigate carbon emissions under the UAE Sustainability Growth Plan and to help the national agenda for achieving the UAE Vision 2021. Adding to that, Sharjah Airport has become the first carbon-neutral airport in the GCC and the second in the Middle East, from the Airport Carbon Accreditation program issued by Airports Council International (ACI) (Sharjah Airport becomes the first carbon-neutral airport in GCC, 2020).

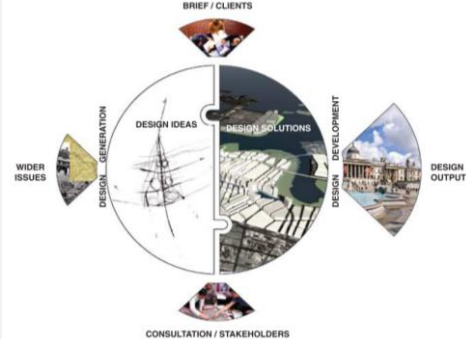
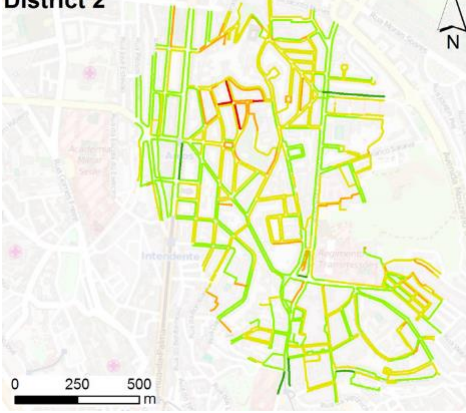


Another reputable governmental institution and board member of SUPC is Sharjah Electrical and Water Authority (SEWA) which supports the smart city infrastructure initiatives for sustainable urban planning and development that has been adopted. To reduce the carbon footprint by constructive energy conservation strategies and adaptation to climate change challenges. SEWA seeks to provide its citizens, business, and industrial areas with a continuous supply of electricity, water, and natural gas. Its powerful and flexible electricity service infrastructure guarantees connectivity and stability to meet the needs of its consumers at a reasonable cost. All of the previous initiatives and successful examples aligned with the 2030 national agenda (SEWA 2020: Roadmap towards a brighter future 2018). However, most of the recent studies highlight the importance of sustainability standards in all of our life's manners especially nowadays human well-being. Also how the built environment will affect and reflect on the social and cultural values of the recent generations and future generations.

In respect to this, the Sharjah government encouraged the young generation to innovate and create opportunities even during the pandemic due to COVID-19 through conducting a valuable webinar called Sharjah Designscape to ensure the city sustainability framework and strategies, highlight the impact of architecture on spaces and quality of life during the lockdown 2020, trends in urban design, and key factors of sustainable and resilient future cities. This unique online webinar series, as posted on their government page designed by Shurooq, focuses on all stakeholders and creates constructive conversations among them, such as architects, artists, academics, urban planners, property developers, and community leaders in the UAE and beyond and seeks to inspire them to push the envelope to build sustainable urban spaces in which the social and environmental realms are situated. (Shurooq - Sharjah Investment and Development Authority, 2020).



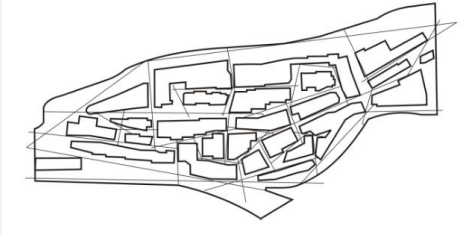
## 2.6 State of Art

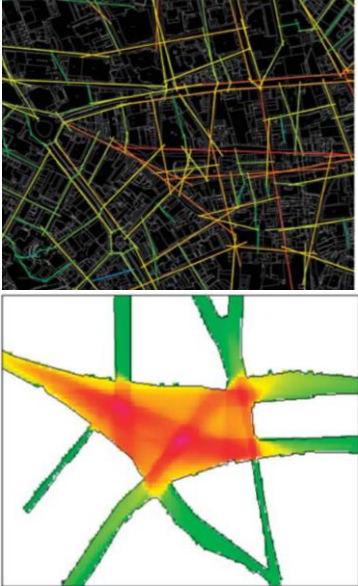
Table 3: Summarized latest research case studies (source: Author, 2020)

Case Study	Location	Photo	Parameters	Citation
Trafalgar Square	London		Regeneration Urban quality, Livable public space, walkability, Integration, Movement pattern, Visual and physical connectivity,	(Dursun 2007)
Urban regeneration of Msheireb District	Old Doha, Qatar.		Sustainable Urban Regeneration, Historical identity, Urban quality, Physical structure, Community involvement	(Boussaa 2018)
Fo`raa urban square on the City of Irbid Downtown	Irbid, Jordan		Square Efficiency and Attraction, Pattern of static and dynamic uses, Integration and connectivity,	(Gharaibeh 2019)

<p>public spaces, urban masterplans, and city-wide or regional strategic planning model</p>	<p>Selective case studies-around the world</p>		<p>Space Syntax, Integrative urban design process, analytical methods, spatial configuration</p>	<p>(Karimi 2017)</p>
<p>Lisbon's central area</p>	<p>Portugal</p>	<p><b>District 2</b></p> 	<p>Measuring walkability, IAAPE: indicators of accessibility and attractiveness of pedestrian environments, pedestrian network, pavement quality</p>	<p>(Moura, Cambra &amp; Gonc 2017)</p>
<p>Souq Waqif (Old Souq)</p>	<p>Doha, Qatar</p>		<p>Walkability, Connectivity, The social aspect, Mixed-use, High density, Livability</p>	<p>(Tannous &amp; Furlan 2018)</p>
<p>Salamis Road of Famagusta</p>	<p>Cyprus</p>		<p>Sustainable urban quality, Pedestrian precincts, Living streets, social activity, mixed activities, Safety and security</p>	<p>(Hussein 2017)</p>



<p>Abu Dhabi 2030 Master Plan.</p>	<p>Abu Dhabi, UAE</p>		<p>sustainable community, walkability, livable city, Connectivity, socialization and interaction, visibility of landmarks</p>	<p>(Rim Meziani 2017)</p>
<p>Revitalization of the Corniche in Doha</p>	<p>Doha, Qatar</p>		<p>Sustainable urbanism, Accessibility and regeneration of Open public realm, Social interaction, Landscape and hardscape features, Comfort facilities, and entertainments</p>	<p>(Furlan 2016)</p>
<p>History of Berlin with spatial syntax of digital technology</p>	<p>Romanian Cities</p>		<p>Regenerate urban features, cultural and social identity, urban morphology, fragmented spaces, movement flow</p>	<p>(Trif 2019)</p>

Nottingham Market square	London		Visibility Graph Analysis (VGA), spatial configuration, Movement flow, stationary and leisure activities, landscape and hardscape features,	(Karimi 2017)
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**2.7 Summary of Chapter 2: Literature Review**

Urban planner provides creative thought and brings meaning by the settlement of discrepancies that integrate functionality with social values and visual goals. Although the use of empirical approaches becomes more apparent in the second half of the twentieth century, modern urban ideas arise and urban planners begin to use quantitative techniques and urban models. As shown in Table 3, summarized case studies all around the world conducted by different researchers and academics represent a broad variety of approaches and parameters to regenerate and enhance a sustainable urban environment at both macroscale and microscale. Conzen tried in 2004 as an observational urban geographer to drive the urban geography to create tangible techniques of urban form analysis focused on the morphology of its components: avenues, plots, buildings, etc. Kevin Lynch, 1960, attempts to investigate the city based on the perceptual understanding of urban elements – roads, edges, neighborhoods, nodes, and landmarks. Christopher Alexander's 1968 gives way to more formal thinking about layout through graph representation and graph analysis of the urban pattern. In the 1970s, a massive critique of scientific approaches or development approaches for failing to

consider the challenges of design complexities. More recently, Mike Batty, 1994, used fractal geometry mathematics to show that cities could be studied and clarified by concepts of self-similarity, hierarchy, and complexity. As a result, in addition to the efforts to establish an empirical view of the city based on statistical equations and quantitative approaches, there have been numerous analytical instruments. Motta, 1999 mentioned that the Parametric Design tool is considered as the most recent tool of these methods, which allows designers to alter design parameters and automatically simulate the effects. The ability to overlay on urban data layers and to evaluate these layers quantitatively have converted space syntax into a valuable tool for urban planning. UN-Habitat helps nations to improve current urban strategies and programs. This strategy is based on multiple variables that promote the three main characteristics of sustainable cities: social, economic, and environmental. Figure 22 illustrate the key factors to foster sustainable public spaces in our communities.

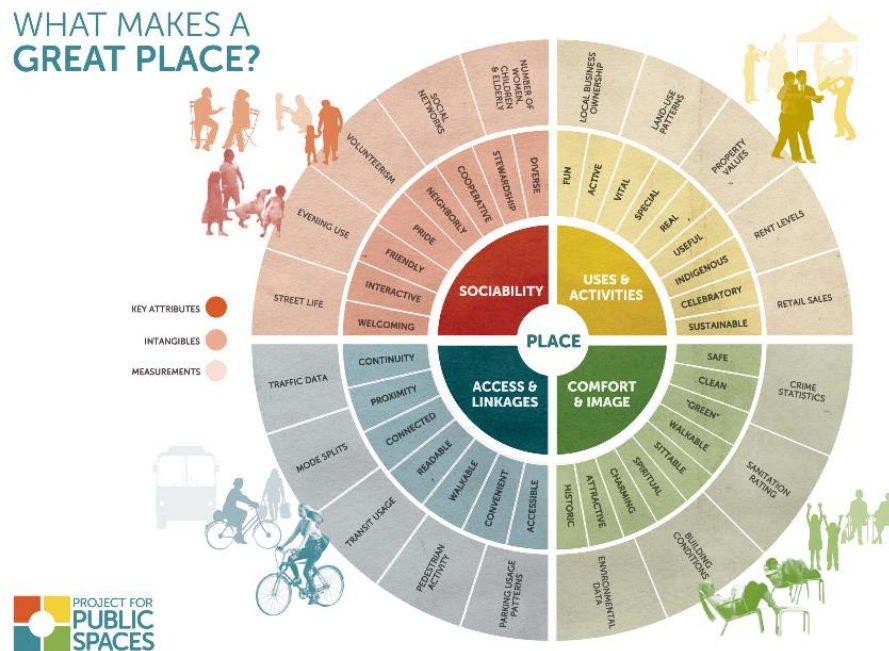


Figure 22: Sustainable communities, what makes a great place, (source: What Makes a Successful Place? 2020)

## **2.8 Research Questions and Hypothesis:**

This research was built based on the vision of H.H Sheikh Sultan bin Mohammed Al Qassimi which made the Government of Sharjah rethink and decide on the regeneration of the historic city and revitalize the image of The Heart of Sharjah, which can support the effort to enhance the livability of public places and set the strategies for sustainable design guidelines for urban planner and decision makers.

At the end of this study, the Author's goal is to conclude with a strong, well-proven baseline response. that is proven through scientific research approved methods for the following questions:

1. Does the regeneration of the historical part of the city promote the sense of a rich cultural heritage and people's lifestyle within the Sharjah city context?
2. What are the new parameters that need to be considered in the historical urban regeneration along with a comparison between before and after COVID-19?
3. Possibilities of applying the SDGs strategies related to sustainable urban design and resilient cities and spaces?
4. Does the urban configuration and fabric enhance the urban experience visually and physically?
5. How we can improve the urban quality and connectivity through a sense of places and entertainment along with safety and well-being?

## **Chapter Three**

### **Methodology**

## **3 CHAPTER 3 METHODOLOGY**

### **3.1 Introduction**

This section is related to the previous chapter, which describes many article references were searched further, which add more reliability to the study. To date, there are various approaches and methods used in this area of research, that has been set to confirm and validate the analysis findings and outcomes.

Nowadays, the sophistication of the urban planning process and the ecosystem brings several techniques, criteria, and parameters that influence the humanities and our cities. In the meantime, many contradictions remained unresolved until the present time. However, this part will help the Author in the methodology understanding and selection process based on a scientific justification from previous studies that covered the same scope of work. As well, this will help to set research parameters accurately. Case studies have been long established in the urban environment, to present a detailed analysis of many methodologies that were identified to analyze urban regeneration and enhance historical district integration and livability. Each one of them has advantages and disadvantages that will be explained in detail in this chapter.

### **3.2 Previous Research Method**

#### **3.2.1 Site observation, Survey, and Interviews method:**

(Furlan, Petruccioli & Jamaledin 2019), They studied the configuration of spatial construction, network, and public spaces and how various factors affect the authenticity of shared urban spaces to facilitate the area's viability. The complexity of the analysis was accomplished by a combination of different methods. In the meantime, the approach was used in this research through observation, surveys, interviews with experts, and on-site interviews. Besides, a variety of factors were explored in the research that makes it unique and original, such as place features, landmarks, street

landscape, hardscape, pathways, water features, and greenery for the development of lively public spaces and pathways through improving urban life and cultural identity.

(Hussein 2017), The research established a way using Maslow's hierarchy of human needs variables such as Esthetics, traffic conditions, Civic Interaction, Welfare & Security and Physical Characteristics Organisation to examine the on-site walking problems to encourage comfortable walkable spaces by improving the quality of urban public parks, and safety, and all means of sustainability. Therefore, social aspects play a crucial role in the research, as argued in many of the studies on pedestrian strategies. The research then related social needs through a questionnaire survey in the research methodology. However, they propose a range of ideas and guidelines for enhancing walkability, which is primarily related to the following: realistic, contextual, environmental, and practical approach.

Furthermore, many urban studies have been performed using the survey approach either as complete qualitative or combined with quantitative analysis. In the following research (Omar et al . 2016), they started their investigation by evaluating the neighborhood to assess the current state of the pedestrian network. This move leads to the discovery of certain factors linked to pedestrian accessibility, affordability, convenience, connectivity, and maintenance. As a result, 400 survey questions were created to test the actions of the perceptual consumer. The results of this study correlate between community and user linkages to improve youth public spaces to enable them to walk to enhance their activities and well-being.

Another study carried out using primarily survey methodology in the historic district of Souq Waqif in Qatar (Tannous & Furlan 2018), the qualitative approach assessed several parameters in three key phases:survey and site observation, Literature analysis theories in sustainable urbanism,

organized survey. Subsequently, the goal of each step of the study is to accomplish particular goals and then to collaborate to address the research questions.

Also, (Seanders 2018) highlighted the descriptive method by introducing survey and site observation to highlight the importance of the collaboration between all parties either professional or unskilled people in decision-making. A visual cognitive map was developed to examine both the positive and negative effects of the action to destroy the old library. However, the unfavorable finding indicates that the historic monument has not been restored, but the integrative planning process has been participatory and improved.

### **3.2.2 Computer simulation:**

(Rim Meziani 2017), Research on connectivity and incorporation of part of Abu Dhabi's master plan 2030 utilizing space syntax tools by performing axial map analysis using Depthmap-X on street networking throughout the city. Many variables were evaluated using space syntax words: integration, accessibility, the choice to be calculated, and aligned with movement pattern. The goal of this analysis is to define the urban configuration, infrastructure, utilities, and routes for enhancing the feasibility of the public space.

(Ye et al . 2016) mentioned different approaches of Space Syntax to develop a GIS plug-in, Space Matrix, and Mixed-Use Index syntax to quantify street infrastructure, several lanes, and integrated land use. Meanwhile, the quantitative approach used to improve urbanity strategies means mobility, residential spaces, and urban configuration, etc. However, the collection of input GIS data as a street network, building structure, and land uses helps in the implementation of new tools as a quantitative method in urban analysis has given rise to good techniques over the conventional qualitative methodology that motivates the researcher's in this pattern.



Utilizing advanced digital approaches, which have been implemented by the use of space syntax theory, which has distinguished urban parameters as one unit and the most powerful component in connecting all urban components to all areas of cities. (Trif 2019) identified in his study several urban parameters referred to physical elements such as building, vacant spaces, street network, as well as a social activity in the neighborhoods seen as negative space in the maps. Put other words, improving these parameters will focus on space forms, specification, and sense of place and their perception by walking.

Meanwhile, previous studies into the same area, which also linked to space syntax computation. The study conducted by (Ayşe Sema KUBAT, Yasemin İNCE GÜNEY 2014) focused on understanding and evaluating the current situation of Heart of Sharjah through using space syntax analysis. The findings of the study interestingly outline the analytical framework of the area, which is used as a guideline and supporting evidence for this study.

Meanwhile, Hanan Taleb, Mousa A. Musleh (2015), has been used Grasshopper to create a sustainable and healthy community in the UEA, Dubai. This project created a huge opportunity to raise awareness of the advantages of the parametric approach to building more effective cities through the incorporation of algorithms with the grasshopper 3D model and CFD experiments, which provide architects and designers with a more complex and controllable development environment. The simulation result for four generations was the development of the alternative prototype and a better outcome compared to the base case .

### **3.2.3 Qualitative and quantitative method (interviews, public meetings & exhibitions, and ethnographic content analysis)**

(Littke 2015) holds the new inclusive strategies which rely more on the efficiency of green spaces than on quantities. In addition to including several factors related to social and psychological human benefits in green spaces as secondary literature review results. This conducted through interviews and ethnographic content analysis in this article to define and address the issues posed by the planning development programmer and to demonstrate the need for urban green public spaces for human well-being. The new comprehensive plans have been recognised by the input of the community consultation, the public representatives and interviews with the municipal planning office as a whole in the interactive design process. (Zhang & Liu 2019) argued that Parametric methods are successful in generating visual models but are not a perfect planning solution. The studies include a critique of parametric approaches and related instruments in urban programs, as well as useful insights into the study of dynamic form-based planning in high-density social economic-environments. Methodologies include quantitative and qualitative research and experimental modeling on parametric platforms. critically evaluates parametric methods to promote form-based urban planning.

(Karimi 2017), Designers were engaged in constructing their projects on solid foundations and objectively justifying their work. In the space syntax method, a sequence of primary analyzes – guide the design process from the start by defining the issues and potentials found by the spatial configurational analysis. Depending on the scope of urban planning projects, additional layers of knowledge such as accessibility, integration, visibility graph analysis are related to the analysis method to create hybrid models that resolve more specifically particular problems that cannot be solved simply by spatial data. The motivation to use this strategy has been shared by multiple

organizations. These strengths and drawbacks explicitly illustrate the success of the urban environment and allow the design team to see them more effectively.

### 3.3 A summary of Research Approaches

The goal of investigating related research topics is to draw on their findings to study the same research subjects from a different point of view. Or to examine the same methodologies and techniques that have been effective in one area to see whether the same outcomes have been obtained or whether there have been variations that may help us realize the reasons that influence these outcomes. However, this phase aims to build over their outcomes so as not to waste effort on starting from scratch and contribute to human knowledge.

Table 4 demonstrates a list of published papers that have incorporated the methodologies set out in this section with common research aims, and findings that would be properly considered when choosing and justification the right methodology for the case study of this research.

Table 4: Summary of methodologies to enhance the urban regeneration and connectivity among spaces (source: Author,2020)

Paper title	Location	Aim	Research Methods	Findings	Citation
Limits of space syntax for urban design: Axiality, scale, and sinuosity	-Broadway in Manhattan -Amsterdam -Melbourn	Mapping different urban morphologies at different global and local level in three cities	Computer simulation: Space Syntax simulation	Found that a space syntax is a powerful tool. And argued that axial analyses privilege visibility over accessibility	(Pafka & Dovey 2018)

Informed design decision-making: from digital analysis to urban design	Largo da Graça - Italy	Implement iterative design strategies to enhance public open space livability in terms of its urban configuration, functions & materials and outdoor thermal comfort.	Quantitative & qualitative method: Field study, parametric tool (Grasshopper), space syntax simulation	presented the Potential of Space Syntax, Environmental Research, and Public Life Studies to lead to a deeper understanding of urban development squares	(Pezzical & , João Ventura Lopes 2017)
A configurational approach to analytical urban design: 'Space syntax' methodology	Analyzing different case study around the world	To explore the functionality and efficiency of urban design, through studying a real-life project ranging from city-scale to a public place by using analytical design process for evaluation and suggest applicable design solutions	Computer simulation: Space syntax	claimed that the urban planning process can be successfully improved by an analytical approach applied at the particular stage of the design process. The benefit of this strategy is also to minimize the risk of error during the planning process or the implementation of the project.	(Karimi 2017)
Urban Regeneration and the Search for Identity in	Qatar, Doha, Msheireb historical district	examines the role of urban regeneration in revitalizing redundant historic areas and how they	Comprehensive fieldworks	The development of urban identity is considered a	(Boussaa 2018)

Historic Cities		can be used to reinforce their cities' urban identities.		great challenge in Doha and other Gulf cities. Urgent calls for further studies to find a way to regenerate the past sustainably.	
Measuring walkability for distinct pedestrian groups with a participatory assessment method: A case study in Lisbon Filipe	A case study in Lisbon	analysis of walkability based on local framework considering distinct pedestrian groups and trip generators	Computer simulation GIS-based and street auditing indicators	Demonstrate that enhancement of the pedestrian experience can be accomplished by urban design and planning accessibility initiatives, such as introducing safe pedestrian pathways available to all or enhancing the condition of the pavement quality.	(Moura, Cambra & Gonc 2017)
The authenticity of place-making	Qatar, Doha, Mushaireb district	To investigate the significance and authenticity of placemaking for the regenerated historic district in Qatar.	Field study and observations, on-site interviews; and a	showed that the urban regeneration of the historic neighborhood –	(Furlan, Petruccioli & Jamaled in 2019)

			survey conducted during the walk-through studies	formulated by public realm focused on restoration and modernization (hybrid style)– contributes to establishing the authenticity of the place character	
Accessibility and Integration Study of Part of the Abu Dhabi 2030 Master Plan by Using Space Syntax Rim	Abu Dhabi 2030 Master plan	To verify the location of open spaces and facilities, such as schools, concerning the location of public transportation stops (bus, metro, and tram), to check their accessibility within walking distances	Computer simulation: Space Syntax	Found that creating a transit-oriented development will enhance the user's experience, walkability, and improve the connectivity of the public place	(Rim Meziani 2017)
Space syntax method in case of the urban fractures between the historical architecture and the socialist architecture	Historical sites in Romanian cities	Highlighted the conflict between historical urban regeneration and social experience to improve the relationship between them which will introduce livable historical district and enhance the social entertainments.	Computer simulation: Space Syntax	Illustrated the efficiency of the space syntax method not only for the analysis and definition of the urban fractures but also for the regeneration	(Trif 2019)

				and their reconnection of the marginalized historical district to the cities	
The Pedestrianization and Its Relation with Enhancing Walkability in Urban Spaces	Salamis Street in Famagusta town.	To promote connectivity, walkability, and quality of public spaces by applying the pedestrianization strategies	Theoretical and experimental method	The results of this work give to illustrate the significance of street accessibility in relation to the walkability of urban spaces.	(Hussein 2017)
Walkability Design for Urban Public Housing Park	center of Lembah Pantai district in-Kuala Lumpur	The importance of improving connectivity & walkability in the public open spaces in urban community.	Site observation and survey	Found that the most important factors in all pedestrian linkages design are how people tend to walk and stay connected among the spaces visually and physically	(Omar et al. 2016)
Livability and Urban Quality of the Souq	Doha, Qatar	The main aim is to prove the sustainability of the Historical district	Survey, literature review, structured	It was confirmed that the Souq Waqif	(Tannous & Furlan 2018)

<p>Waqif in Doha (State of Qatar)</p>		<p>Through measuring the social aspect of the place where people can live, work and play</p>	<p>questionnaire</p>	<p>considered a sustainable region in both the short and the long term due to many reasons such as a variety of land uses and diverse classes of people</p>	
<p>Parametric modeling for form-based planning in dense urban environments</p>	<p>HongKong</p>	<p>Testing the potentials of the parametric methodology to perform and Improve the quality of the organized planning process.</p>	<p>Quantitative and qualitative method</p>	<p>The complexity of the parametric database makes the planning phase ineffective. Also, parametric approaches can help represent potential behavioral routes as field lines on a simulation model.</p>	<p>(Zhang &amp; Liu 2019)</p>



### **3.4 Chosen Methods and Justification**

Consequently, based on the analysis through the previous studies and based on my knowledge of working in urban planning projects to understand the subject from a particular point of view and its relevant research methods, it has been identified that the mixed-mode approach is considered to be the effective method due to the correlation between the qualitative and quantitative approaches. Interestingly, this method will provide a detailed view and interpretation of the Heritage District case in the heart of Sharjah, UAE, and introduce the best modifications and regeneration aspects in terms of place values and meanings associated with connectivity, incorporation, and cultural and social life among the old and new urban fabric.

The complexities of the urban morphology and the wide range of parameters impacting the built environment demanded a combination of quantitative and qualitative approaches to obtain an enormous amount of data that needs to be evaluated to achieve optimum performance. Although Triangulation has been a common tool and considered a framework, taking into account an inclusive approach to sustainability, which has made the nature of research more dynamic and connected to all urban elements to the whole system. Put another word, confirmation of the research through a triangulation approach that provides multiple possibilities and benefits to enhance the study through a connection between syntactic measures and qualitative findings. Meanwhile, the methodologies that will be carried out in this research mixed-mode method consist of field study, parametric tools, and space syntax simulation tools.

Field study is considered to be an important tool and plays a vital role in urban planning and is considered as an efficient way to understand and interact physically and visually with people and places to create an extensive experience. Informal meetings and interview with varying levels of expertise and discipline, and people on site who will improve the development process in the early

stages of design. At the same time, Urban centers compose of several micro and macro parameters in both physical and visual layers. Therefore, observations constraints relating to safety problems in public places that are difficult to perform all the time to get a range of feedback that can influence the outcome. In addition to the difficulties of handling large quantities of information in terms of defining, collecting, processing, and correlating the data needed.

On the other hand, the significance of computer simulations in the sustainable urban environment approach is implemented by urban planners to improve the efficiency of urban performance instead of the traditional design process. Subsequently, assess the possibility of implementing this approach to improve the integrative design process by involving multidisciplinary and different criteria at an early stage of design. Despite the complexities and challenges, the drawbacks of the method have been illustrated by the participation of various applications in studies such as Grasshopper, Rhinos, space syntax, correlated with mathematical analysis, where several scholars complain regarding technological difficulties owing to the large scale of the software and the simulated files in conjunction with the capability of the computers and the time frame.

In comparison, computer simulation combines input data with a mathematical model that remains restricted to guidance. David Rutten, Robert McNeel & Associates in 2007 developed parametric modeling tools which are Grasshopper. Although the visual programming interface of Rhino / Grasshopper is incredibly useful to imagine and navigate the results of the study as stated by many researchers, to identify effective and desirable layout solutions, and to ensure the desirable configuration features and satisfaction of urban spaces.

However, there are certain drawbacks associated with the use of parametric Grasshopper as claimed previously by (Zhang & Liu 2019) in his study, that parametric approaches have been effective in producing visual models but are not the ideal for planning solution.

Moreover, The Space Syntax approach has encouraged the development of several analytical techniques capable of capturing the configuration properties of urban space at different scales and resolutions. Utilizing advanced approaches, which have been implemented by the use of space syntax theory, which has distinguished urban variables as one unit and the most powerful component in connecting all urban components to all parts of cities. Space syntax technique has been used widely in a wide variety of urban development initiatives, ranging from the size of small public spaces to the size of entire regions.

Also, Hiller (1996) noted that space syntax theory was the most important approach for analyzing pedestrian movements in terms of public space livability and network connectivity. Space syntax integrates many urban variables and is used as a cluster of methods that make it a powerful method to transform urban spaces from missing spaces to existing active spaces with a holistic perspective. While the drawbacks need to be recognized as a large volume of data and timeline. In addition to problems in the site analysis process, either by time or cost. As well as specialist appointments and employees that are found time-consuming in certain situations.

However, the efficacy of the combination between Depth Map X and other applications such as Grasshopper and Autocad has been shown by several peer-reviewed publications to be an important method for urban regeneration. Therefore, software validation needed more studies and review to improve the efficiency and validity of the results to address several issues related to the length of study, file size, input & output data.

### 3.5 Research case study:

The selected case study is situated on the north side of Sharjah at Sharjah Creek, Figure 23. As mentioned in the previous chapter, the chosen case study has a special location with varied geography. It is considered a gateway to the East Emirates and has a splendid coastline. It is located within a heavily developed urban area with many active urban attractive sites, which going to be highlighted in the site analysis part as city landmarks. In addition to that, the Heritage area is now under threat from the nearby mega-developments and transit roads, which are becoming more and more influential and synonymous with limited access to the site and insufficient parking, despite congested traffic in the surrounding neighborhood.

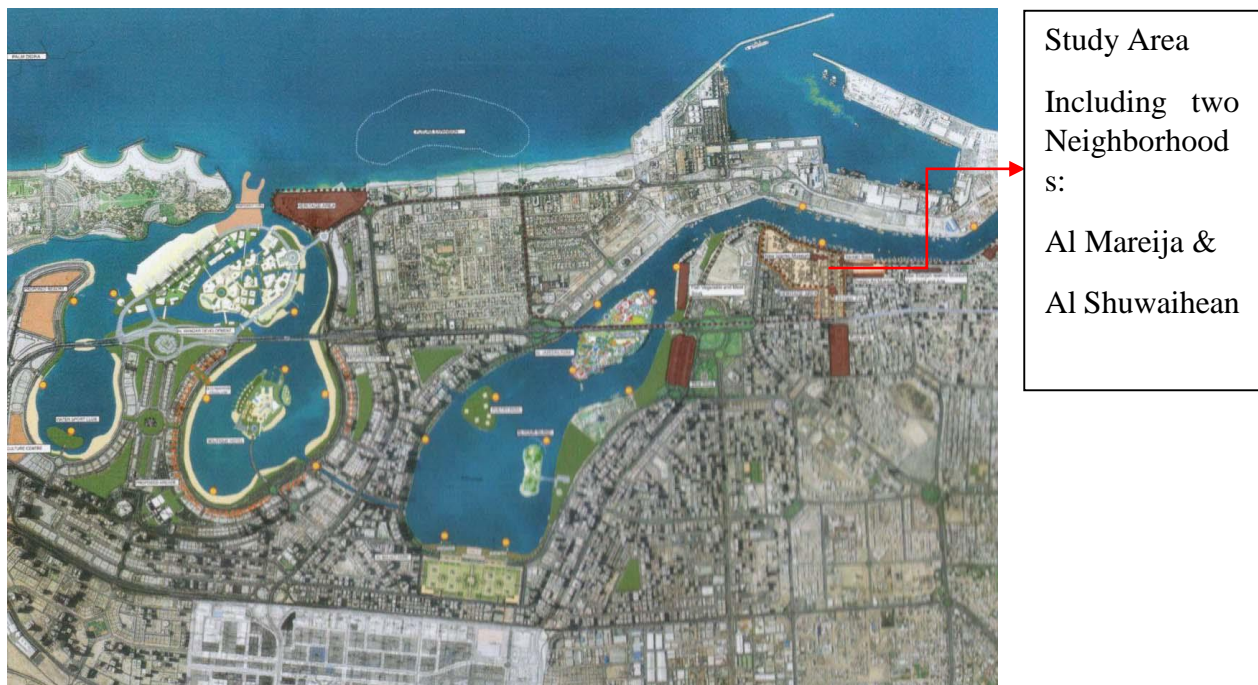


Figure 23: Google map of Sharjah city highlight the study area of Heart of Sharjah, (source: A. Iyer, K. Deboo, Sh. Gandhi, 2019)

Heart of Sharjah considers as a comprehensive historical case study to examine connectivity and regeneration strategies that reflect different phases of multiple historical, cultural, and urban structures. Besides, there also a need for a holistic approach to maintaining the valuable history

and incorporating the heritage area with the new neighborhoods to satisfy the needs of existing users and improve the urban environment for future generations.

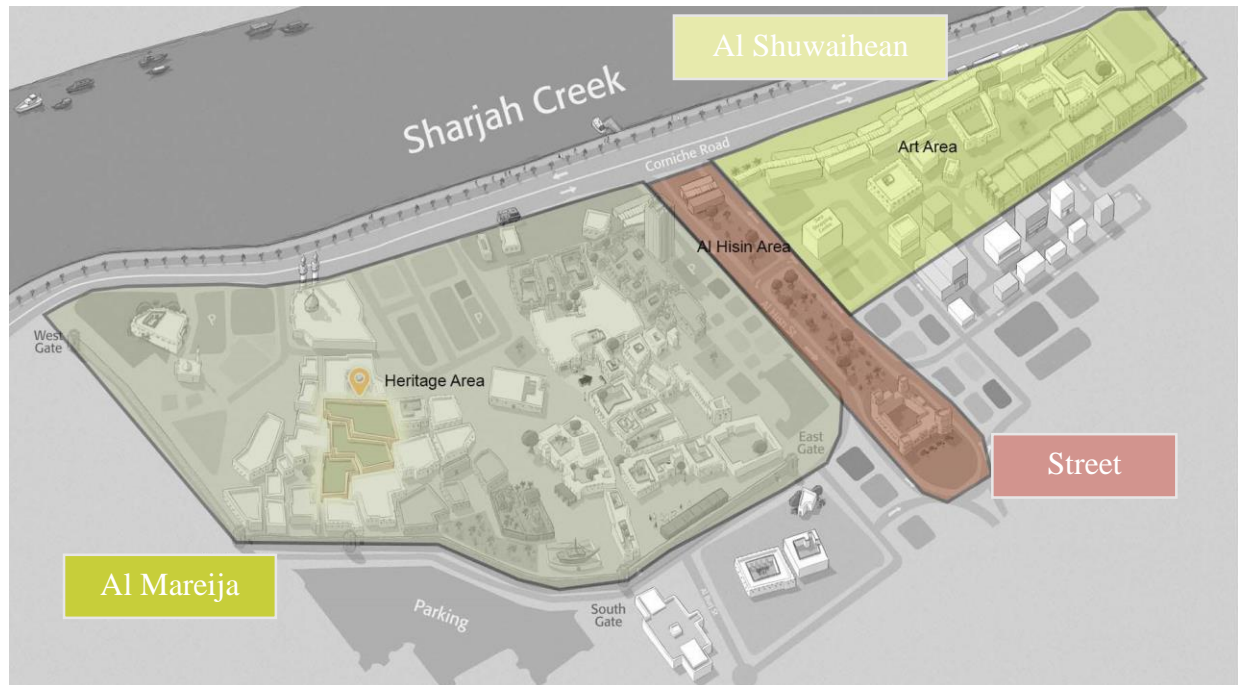


Figure 24: Heart of Sharjah model including three major areas, (source: Agency,2017)

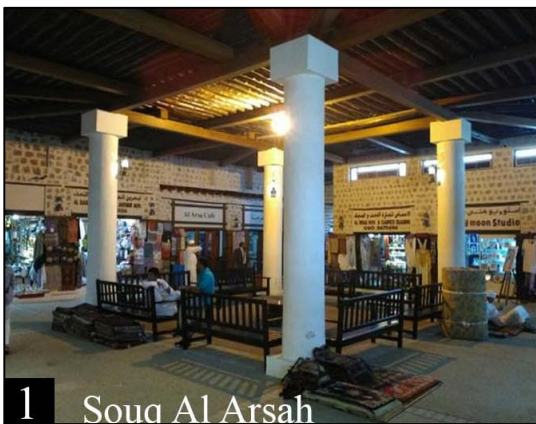
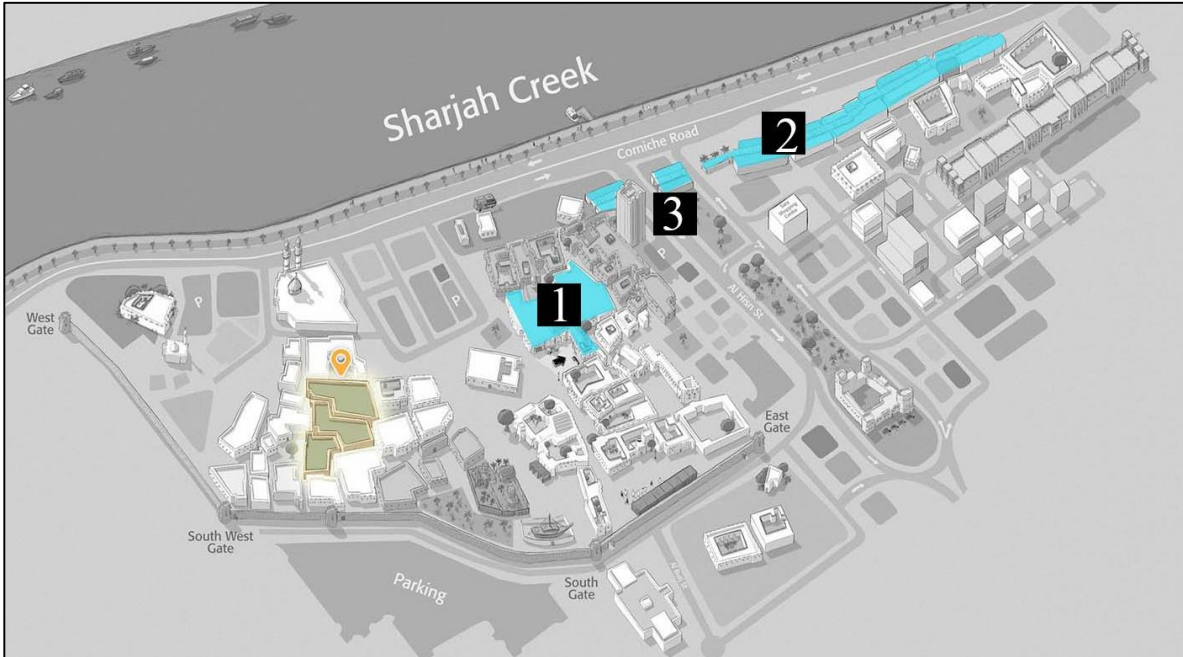
This area is one of the most heritage sites in Sharjah; Figure 24 contains a historical fort (Al Hisin), which was built in 1823 as the head office of the administration, a resident of the royal family (Sharjah Museums. ae, 2017). which nowadays converted into a museum. Some old Souq was located there such as Souq Al Arsah, Souq Alshanasiyah, Souq Saqr, and Old Souq. In the meantime, this study focuses on the physical and visual integration, walking, and living of shared urban areas in the heritage district of Sharjah, UAE, which is considered the Heart of Sharjah. It is also a mixture of traditional and new types of mixed-use, varying heights, and different networks. It has a varied history and socio-economic context. The analysis of the context, for the location, are gathered to explain the properties and parameters of the site.



Figure 25: Google earth photos of Sharjah city between 2000 to 2020, (source: Google earth, 2020)

Based on the Google Earth images seen in Figure 25, showing an interval of 20 years of development in the study area (2000-2020). Many changes occurred to the location; the Creek area changed in 2015 from a commercial port to a corniche road associated with promenade from the

waterside and disconnected historical area and old souq by the corniche highway. Also, the central part in front of Al Hisin fort converted into car parking in 2015 which is also nowadays used during the festival times as a public space with the presence of cars. The urban analysis of Sharjah has presented a wide range of experiences that are in offer to its visitors in the city center. However, To fulfill the requirements of this research, a field study was conducted on the area including two neighborhoods which are Al Muraijah and Shuawaihain (Heritage & Art area) in February 2020. To analyze the site and correlate with collected information through various resources and informal interviews with project managers from Shurooq and the Department of Town Planning and Survey to highlight all strengths and weaknesses on site. By observing the area in terms of pedestrian and vehicle flow and evaluate the opportunities to investigate the current situation and compare it with the proposed master plan by Shurooq. In order to set holistic strategies for the regenerated optimized master plan, to enhance the connectivity in the area and livability of public spaces. The following storytelling boards were created from my visit to the site to understand the current situation of the area. Which will help in creating a visual experience within the site to create a cognitive map and understand the site from a perceptual dimension. The below Figure 26 shows the first board created to highlight the oldest marketplace in the city with its history dating 50 years back. Each one of these traditional markets famous for selling different items such as souq Al Arsah well known as old Bazar sells traditional clothes, antiques, and handmade jewelry. Souq Saqr (Iranian souq), considered a great space for artists, historians, and business seekers. As well, in Souq Al Shanasyeh you can enjoy the traditional Arabic coffee and Sulaimani while shopping.



1 Souq Al Arsah



2 Souq Saqr



3 Souq Al Shanasyeh

Figure 26: Old markets in Heart of Sharjah like Souq Al Arsah, Souq Saqr, and Souq Al Shanasyeh, (source: Author, 2020)



As discussed earlier, a neighborhood can only be considered sustainable if its components and built environment meet the sustainability criteria where several research papers were conducted to study the influence of urban regeneration in historical districts as space where people live, work, and interact. For example, (Tannous & Furlan 2018) focused on their study on one of the interesting historical urban regeneration projects in the Gulf region which is Souq Waqif in Qatar. They investigated how to achieve livability and urban quality in a distinctive heritage site through enhancing many parameters, such as public spaces, integrated networks, and land use along with the importance of landscape and hardscape elements to satisfy the user's experience in urban public spaces. This view meets (Hussein 2017) findings related to increase the quality of the urban environment by increasing safety and organization in urban fabric through enhancing walkability as a part of the pedestrianization theme.

Consequently, Six board themes emerged from the analysis represent cognitive maps created through the field study which will promote the visual perception of public spaces in both Art and Historical area. Starting with the art area the below Figure 27 illustrated the neglected urban space as highlighted by Engineer Eyad Safarini and Engineer Al Anood from the Shurooq office. The walkability in the area is weak due to many reasons such as lack of green spaces, sitting area, shaded area, water features, lack of lighting at night so this resulted in vacant unsafe public spaces. Based on that an urgent call from the government to develop the area not only on the building level but also enhance the user's experience and recall the identity of one of the most important historic districts in UAE.

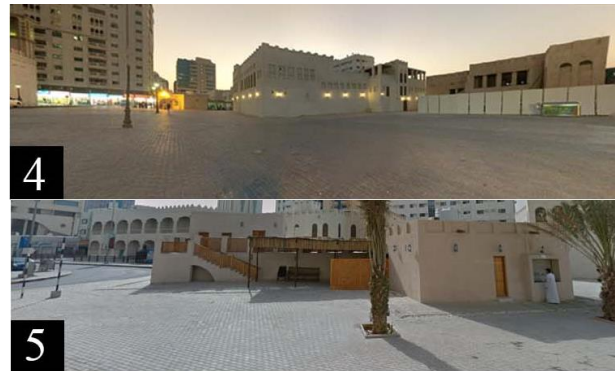
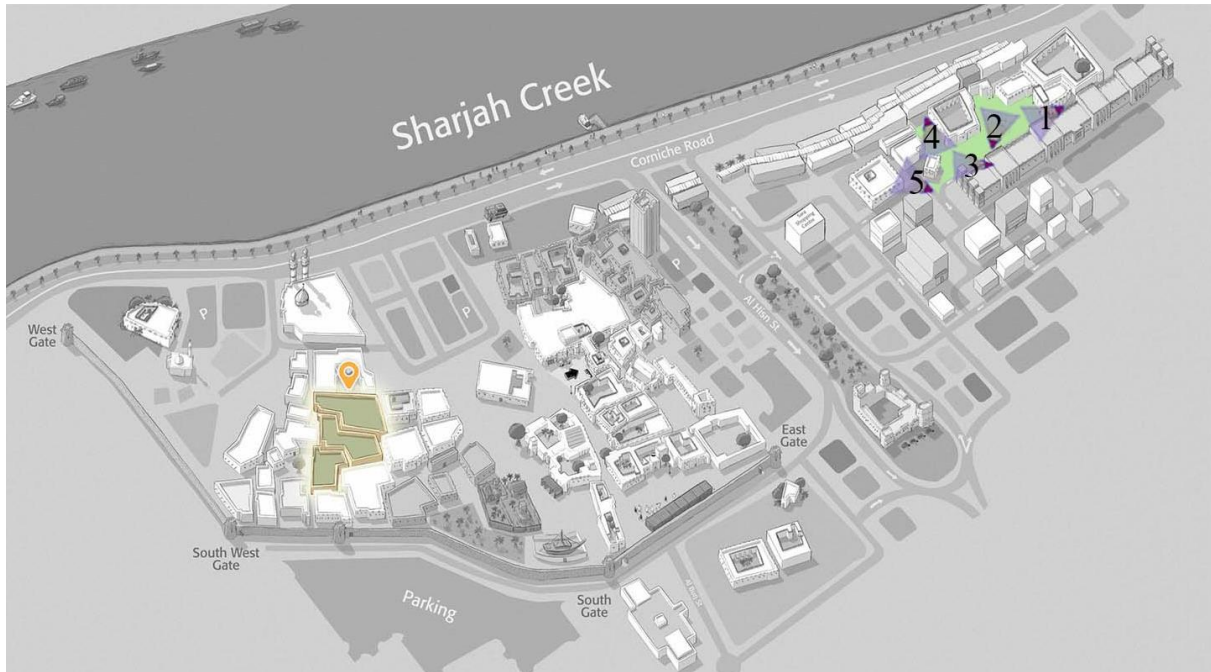


Figure 27: visual cognitive map of the Art area public space, 1<sup>st</sup> board, (source: Author, 2020)

Based on a synthesis of studies and observations on the usage and development of public space, Carr (1992 ) concluded that to create public spaces to be responsive, planned, and controlled to meet the needs of their users can be done by enabling people to make strong links between both the place and their personal experience. They recognize five key needs that people aim to fulfill in public spaces: convenience, satisfaction, passive and active interaction with the place, and exploration. Although effective locations promote and encourage events, the design of urban environments should be driven by the knowledge of how users experience them.

The second board, Figure 28, identified several issues in Al Hisn plaza, or as known nowadays The Bank Street, which divided the area into both visual and physical levels through the intervention of modern architectural buildings and the dominant presence of the cars. Meanwhile, the continuity of the district terms, often based on the loyalties of its initial settlers, memorializes the disrupted Fareej, the Sahil, Souq, and Saht Al Hisn have continued and developed as urban continuity over the history of this outstanding Gulf city.

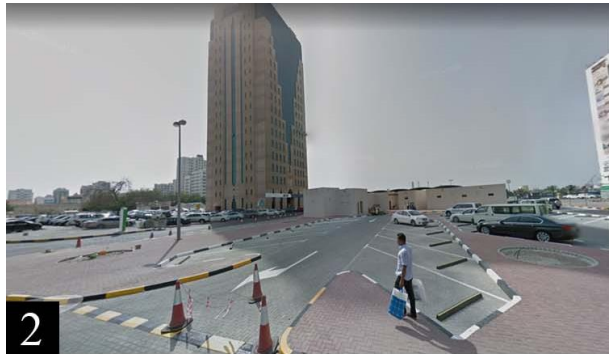
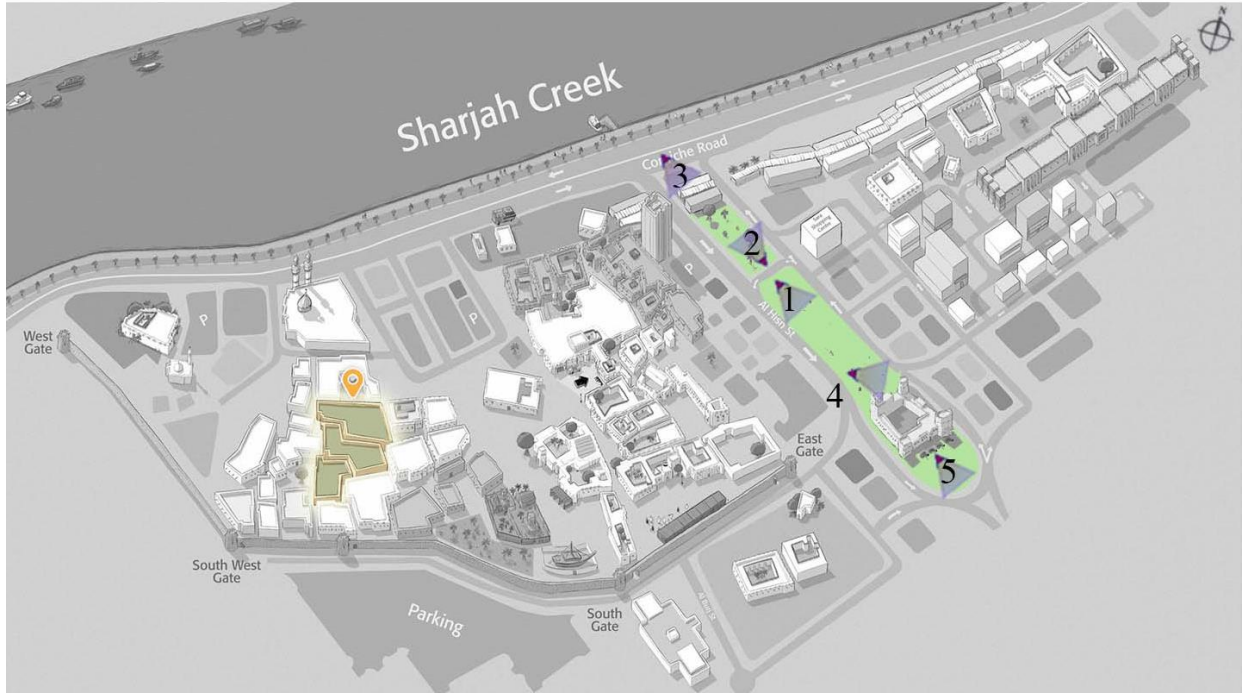


Figure 28: visual cognitive map of saht Al Hisn public space, 2<sup>nd</sup> board, (source: Author, 2020)

In comparison to the previous boards, its apparent from the below Figure 29 an interesting experience was created in this plaza provides a comforting sense of a place by adding some landscape features, steps, and sitting area toward the seafront in front of adapted reuse of an old building in a creative way combining traditional and contemporary theme as Al Bait hotel, Arabian Tea House, and small Masjid. But still, the corniche highway disconnects the user's accessibility toward the waterfront, so this still needs to provide clear and direct access through the project area to the waterfront.

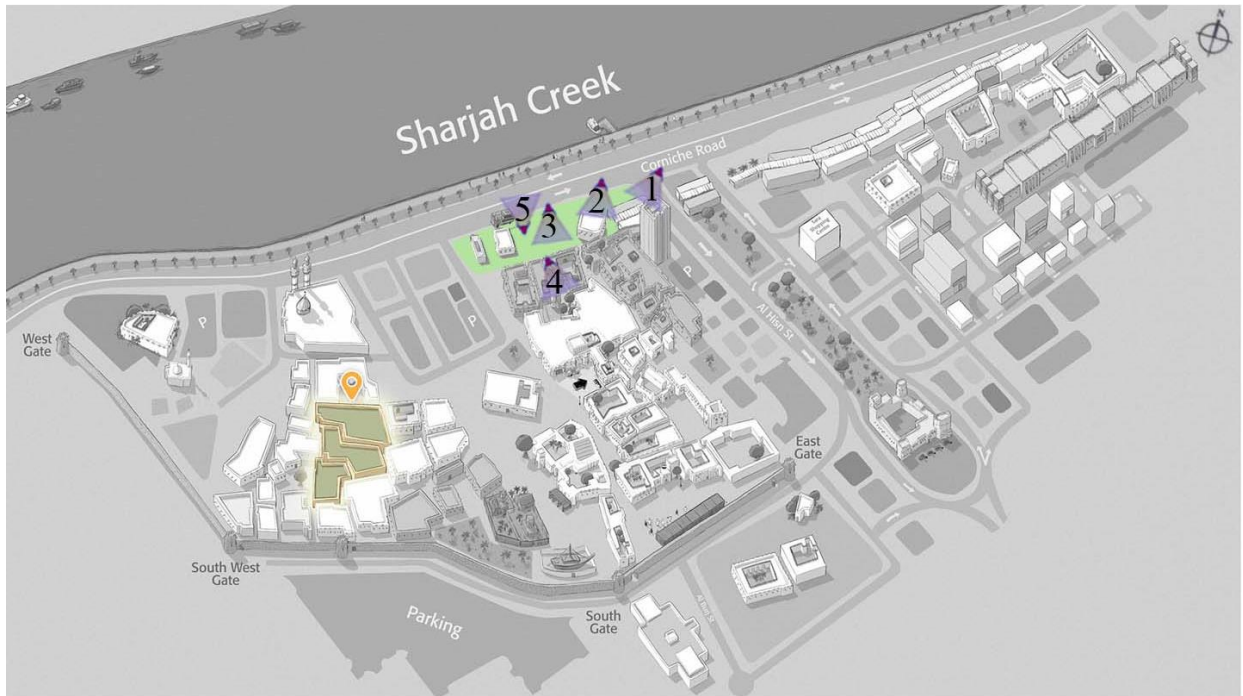


Figure 29: Public urban space in front of Al Bait Hotel and Arabian Tea House, 3<sup>rd</sup> board, (source: Author, 2020)

Consequently, moving through Bank street toward the historical area is shown in the 4<sup>th</sup> board below Figure 30, It was noticed that Modern expansion isolated the area through the new highways and Highrise buildings. Talking about this issue an interviewee said: visual and physical obstructions of connectivity between the two sides of the heritage district resulted in more fragmented urban spaces. This encourages them to priorities walkability, cycling, and public transport over driving. Connected mixed-use neighborhoods over separated, monofunctional enclaves.

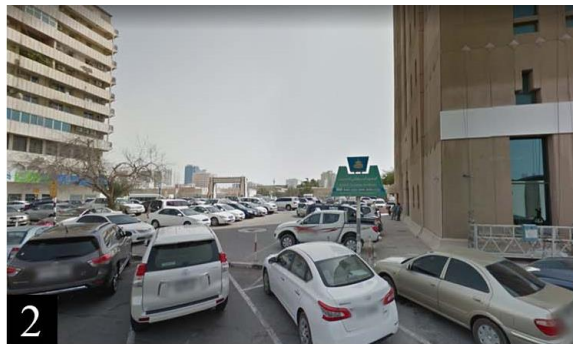
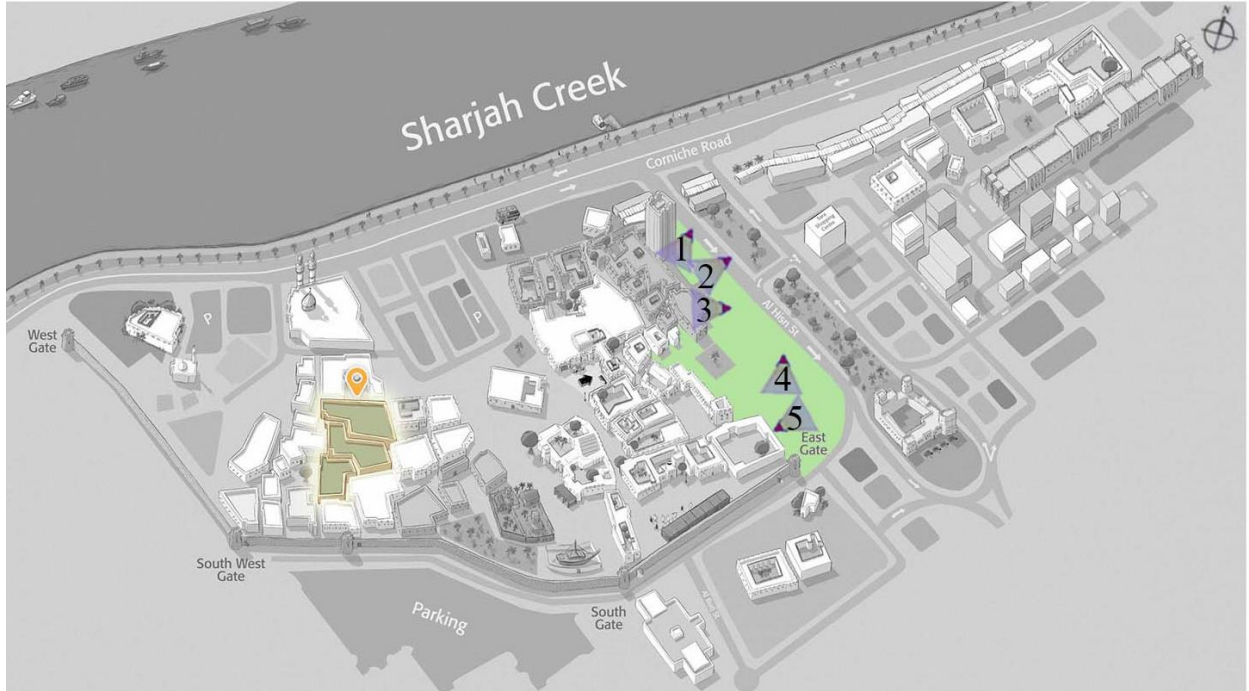


Figure 30: Historical area public urban space, 4<sup>th</sup> board, (source: Author, 2020)



On the other side of the historical area, the historical city walls were the defending and the entry point to the old city from the desert side in the past like many urban spaces Figure 31. This area is demolished and affected by the expansion of inauthentic structures, which can further erode the character of the historic cities that embrace nature over sprawl. In consequence, without adequate revitalization actions to ensure a sustainable future for these historic resources, this may lead to their complete deterioration.



Figure 31: Historical city wall public urban space, 5<sup>th</sup> board, (source: Author, 2020)

Turning now to the center of the historical part which distinguished by the adaptive reuse of old houses and turning them into interactive spaces for creative users and expertise in art, architecture, history, archeology, and many more. For instance, Bait Al Nabodah used nowadays for talks and seminars, Cerami house, Beyoot Al Khatateen, Calligraphy museum. But surprisingly the outdoor skin of these houses still vacant and undeveloped as shown in Figure 32, For example, one interviewee said: the distinguished memories for the local Sharjah people, families (houses owners), and the stories behind this area increasingly seen as valuable tools to promote the users with their different cultures and background to visit the area. Biennial days provide an overview of how the area converted during this event to an active and interesting full of life space. All together provide necessary insights into the importance of heritage conservation to regenerate and enhance the sense of public urban places through creating a car-free neighborhood.

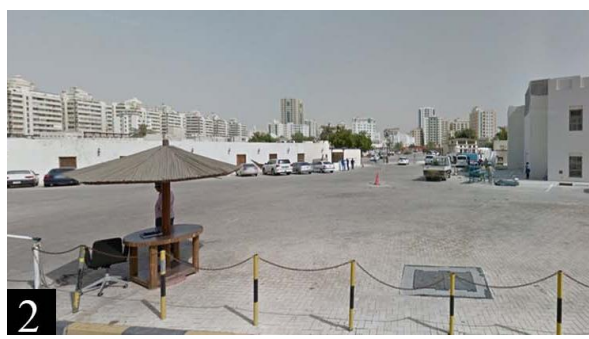
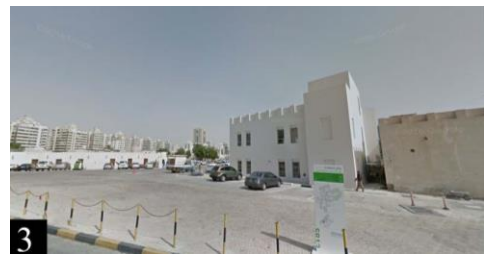
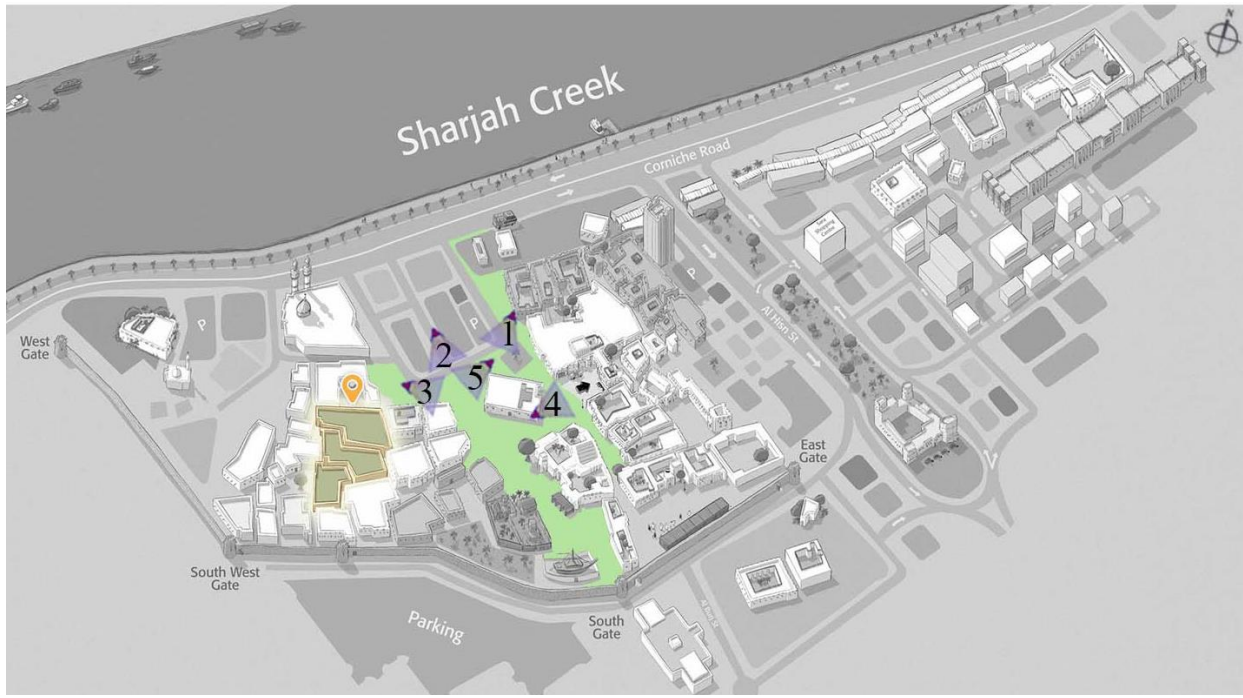


Figure 32: Central public plaza of the Historical part, 6th board, (source: Author, 2020)

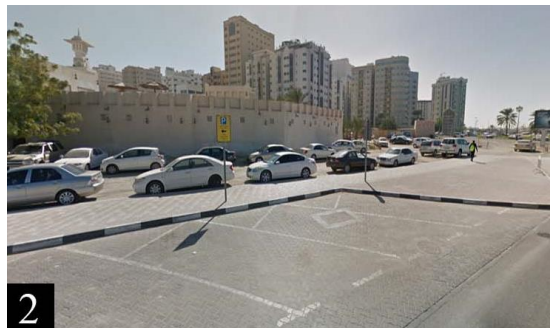
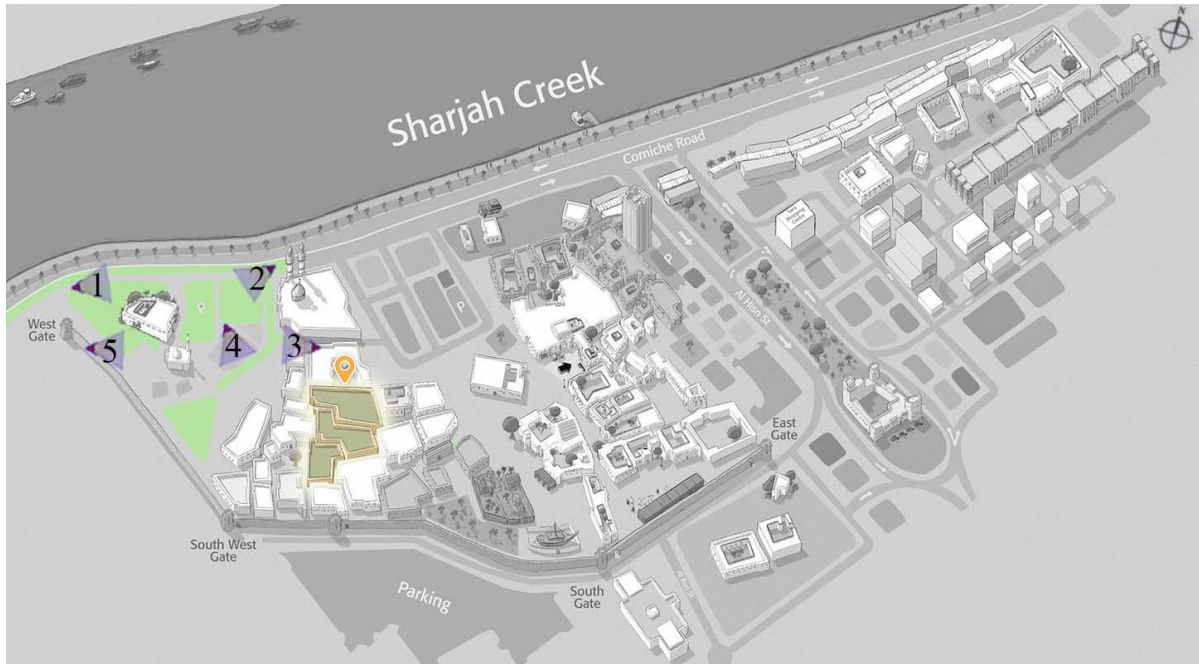


Figure 33: The Western plaza in the Historical part, 7<sup>th</sup> board, (source: Author, 2020)

In the final part of the field study, A huge empty parking area was found at the edge of the district from the western side along the corniche road which remained full of the ruined structure behind the historical wall. In this part of the heritage area, there are no sufficient pedestrian pathways as shown in Figure 33. Unfortunately, from my experience in walking through these spaces especially in the heritage area behind the historical wall, it has many problems associated with safety, clarity, continuity, facilities, and connectivity.

In the end, As explained by people who met through the analysis all agreed on the viability of the area during the Biennale, every other year for a few weeks, Sharjah's urban life becomes spectacular. The artists of the Biennale enjoy the publicity they draw from the diverse inhabitants of the heart of Sharjah, Figure 34 shows the journey access were created by the architects and creative users who participate in the events. When the artists of the Biennale are gone, the gallery and "case" spaces return to the business district character. That's identify the urgent calls of regenerating historical district and the importance of teaching and informing the next generation about the values of their history, which creates the concept of continuity and conserving the social and cultural values which give the identity of each society and community.

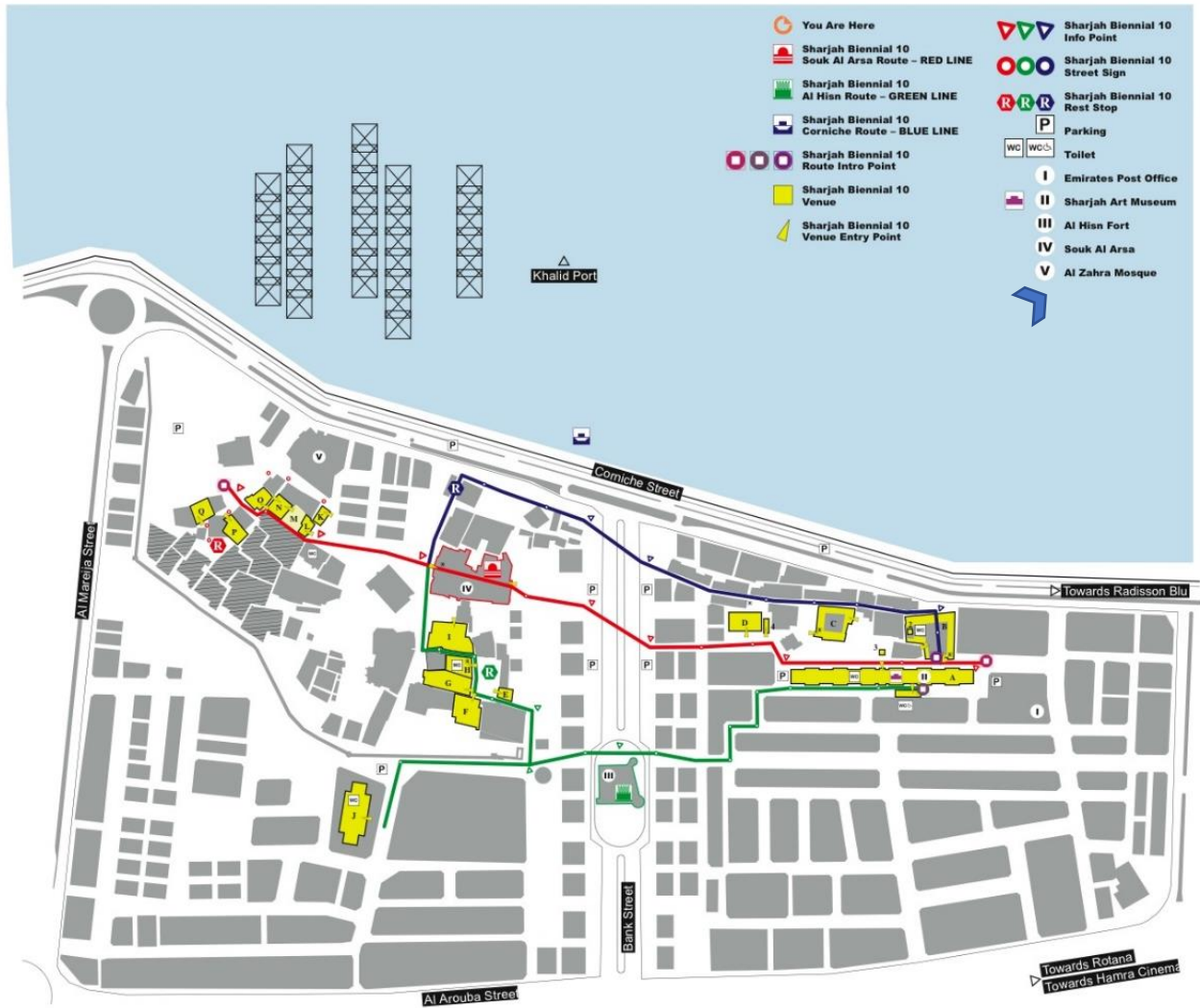


Figure 34: Footpath journey during the Benallie event in Heart of Sharjah, (source: Agency, 2017)

The following chart Figure 35, illustrates the methodological process of this study, beginning from data collection to proposed design recommendations, which are formulated to suggest an optimal analytical approach for the chosen case study.

### 3.6 Methodological framework

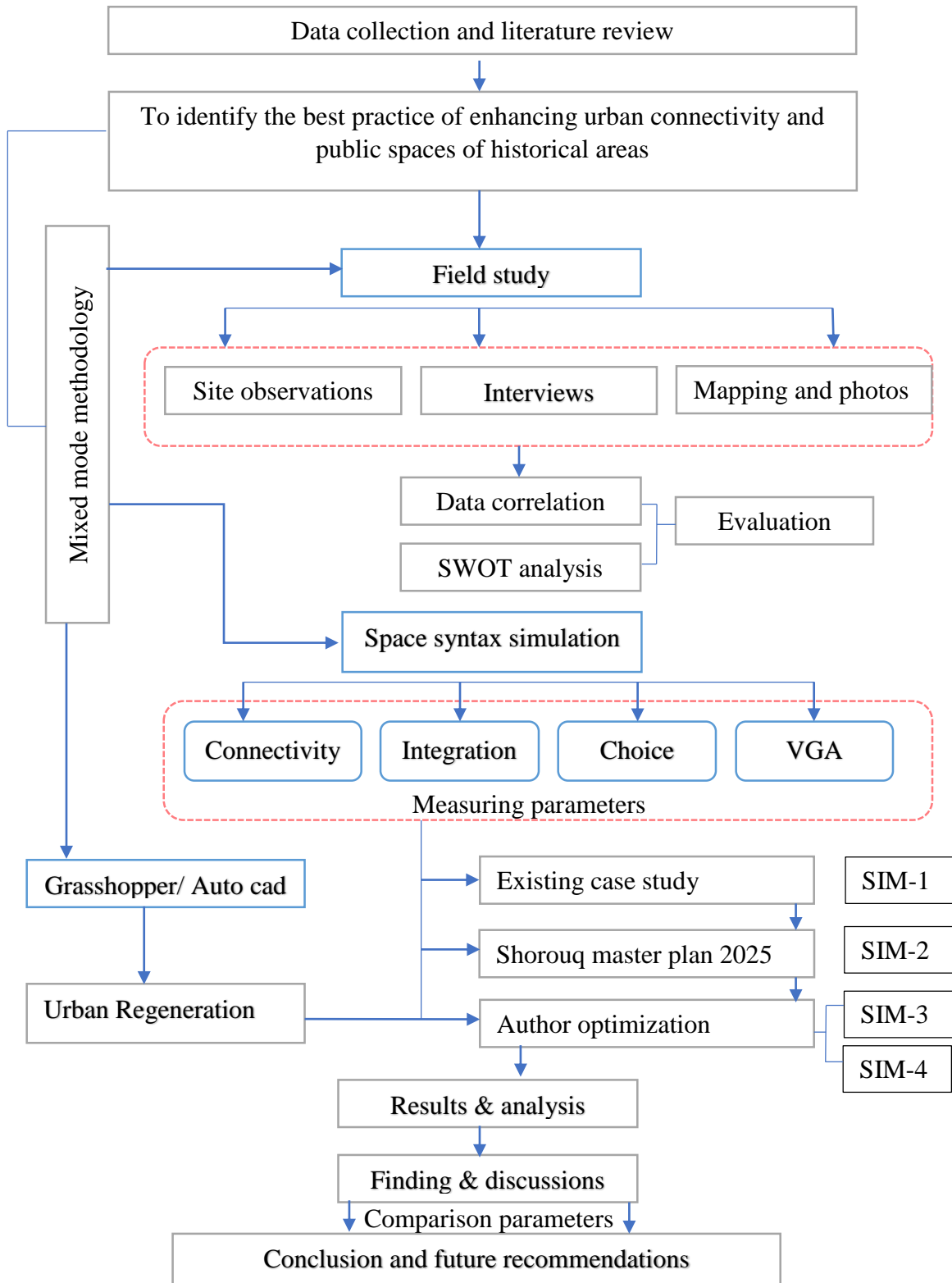


Figure 35: Methodological approach

## **CHAPTER FOUR**

### **CASE STUDY RESEARCH SETUP THE CASE OF HEART OF SHARJAH**



## **4 CHAPTER 4 Case Study Research Setup: The Case of Heart of Sharjah**

### **4.1 Introduction**

The first stage of the analysis presented a macro scale picture of the city of Sharjah to understand the physical and visual aspects of the city in the form of the movement pattern, connectivity, and cultural tourism. It starts with the marking of landmarks that have relevance from the tourism perspective and others major nodes in the city, moving ahead towards Heart of Sharjah to analyze the current status of the area and highlight all the problems in all levels (city, Neighborhood, and between houses) which made the government of Sharjah rethink and decide of regeneration. Then, the next stage involved the analysis of the Heart of Sharjah site through conducting a field study and observing the area in terms of urban configuration, movement flow either pedestrian or vehicles, and network connectivity and integration and how this affects the livability of public spaces in the study area. After that, a computer simulation was used to validate and test different parameters of the selected area as mentioned in the methodological structure and compare the analytical result to reach the optimized design option and sitting answers for all research questions and finally set further recommendations for future studies and research which return with benefits to all humanities and communities of all life meanings and levels.

## 4.2 Urban Morphology of the city

According to historical sources and google maps, a morphological study conducted as shown below illustrates the urban development and the urban sprawl in the city. Al Edrissy – an 11th-century geographer – claimed that there was a port in the present location of Sharjah which had made the city contribute to the growth of trade in the area.

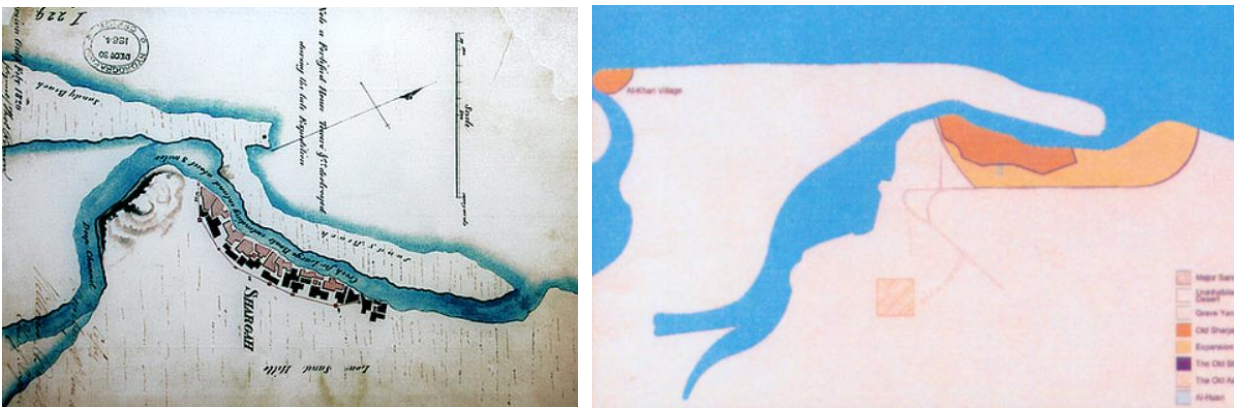


Figure 36: Historical map of Sharjah 1820, 1932, (source: Historical map of Sharjah from 1820, 2020)

In addition to that, Sharjah has been the most powerful port throughout the lower Arabian Gulf. In 1820 AD, Sharjah was destroyed by the British, but it revived quicker than other ports in the Emirates. It was then an important air-station linking the West with India, as seen in the map above, during 1932, which is considered to be the second major gateway to the city by the seaside port Figure 36. At that time, the main sandy road started to appear as the Al Uruba road, that was used as a horse-riding path. The morphological analysis helped to examine how the city of Sharjah has grown and developed. The following spatial physical features can be seen in Figure 37 map 1964, map 1974 after oil production in the region. The largest built-up area of the main city of Sharjah can be composed of five areas from the south to the north, including Jubail, Meraija, Shuwaiheen, Mujarraah, and Sharq, across the edge of the sandspit.

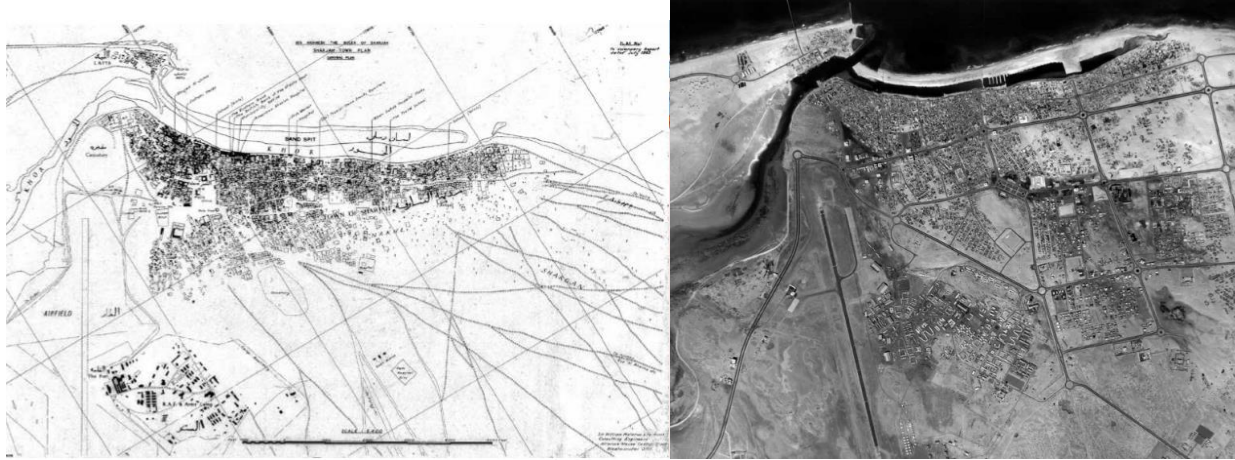


Figure 37:Urban morphology maps of Sharjah between 1964, 1974, (source: A. Iyer, K. Deboo, Sh. Gandhi 2019)

Moreover, morphological development pursuing the grid trend illustrated in the below Figure 38 of Sharjah from 2000 indicates how the region has developed over time. The City of Sharjah, from its old town growth in the heart of Sharjah to Al Mahatta Airport Museum, has lost its historical and cultural history due to the domination of high-rise buildings and facilities constructed during the late 1990s and early 2000.

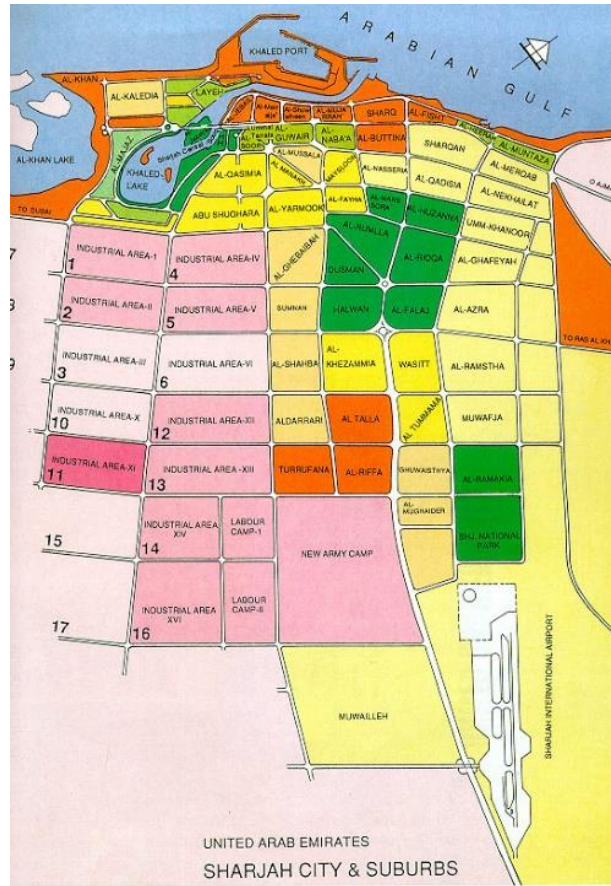


Figure 38: Map of Sharjah in 2000, (source: Government of Sharjah)

The figure-ground analytical map is great to understand the urban configuration development of the cities at a glance. This is an interesting comparison between 1960 and 2020 maps which illustrate the organic vernacular style of the area. Also, it's very clear in the old map the density of the urban fabric and its connectivity to the sea which promotes the sense of a place. However, In the 2020 map, the urban fabric transferred to a rigid grid and the spaces between buildings are large, giving way to larger streets designed for cars which result in fragmented urban spaces Figure 39.



Figure 39: Figure – Ground analytical maps 1960, and 2020, (source: Typologies & Authority, 2019)

#### **4.3 Landmarks on the city level:**

The urban study of Sharjah offered a wide range of attractions such as Khalid Lagoon, Al Majaz waterfront, and Al Qasba is a major addition to the importance of Sharjah's tourism capabilities. The lack of connectivity in the Emirate of Sharjah has been identified through an observational analysis conducted by Gandhi in 2018 on both vehicle and pedestrian access in the tourist area, which is not expressed in a comprehensive master plan to provide tourists with experience.

From its ancient growth in the heart of Sharjah to the Al Mahatta Museum, the City of Sharjah has lost its historical and cultural identity due to the domination of high-rise towers constructed since the beginning of 2000. The problem of traffic is further frustrated as a result of the concentration of people in the city center in residential communities. The nature of the Khalid Lagoon should act as an urban landmark to encourage tourists with the architectural presence of the Central Souq and Al Noor island on its edges. Linkage to Al Qasba and Sharjah Expo from the city center is visually isolated due to the current high growth rate. From a cultural point of view, the center of Sharjah's growth has given more focus to the projection of the culture and history of this Emirate.

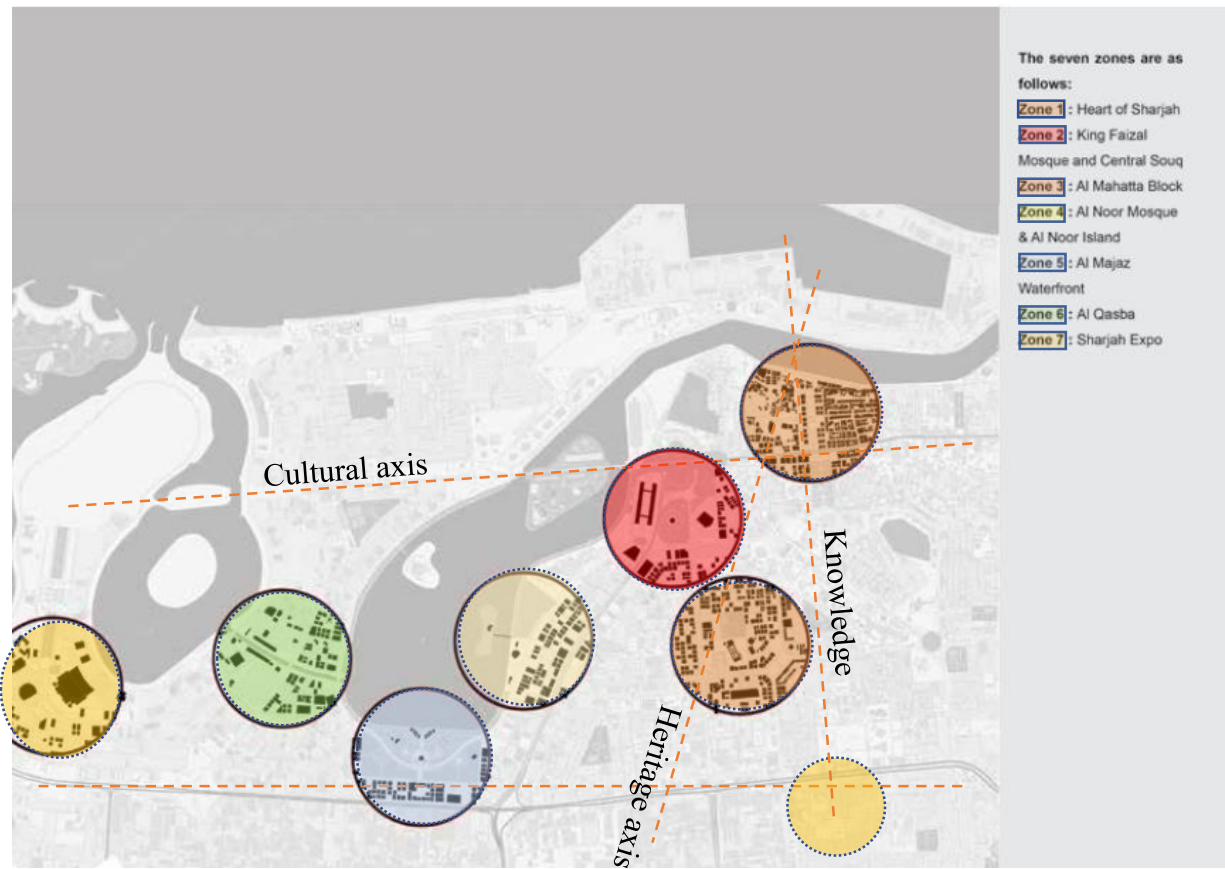


Figure 40: Urban pattern through figure-ground analysis of identified touristic destination

The City of Sharjah, from its Old Town growth in the heart of Sharjah to the Al Mahatta Airport Museum along the heritage axis as shown in Figure 40, has lost its historical and cultural identity due to the domination of high-rise buildings constructed since the late 1990s and early 2000. A new tourism connection with the Sharjah Aquarium and the Sharjah Maritime Museum must be re-aligned to connect Al Qasba and the Sharjah Expo from the city center. the introduction of the Dubai-Sharjah ferry by the RTA in July 2019 enhances the connectivity to the Emirate of Dubai. Heritage sites provide the population with a sense of place and an opportunity to identify with their neighborhood by preserving the facts of their history in a developed tourism urban plan.

#### **4.4 The current status of Heart of Sharjah**

Also, several old houses have been adapted for use as a museum or art school, either as a traditional hotel. Sharjah Investment and Development Authorities are collaborating on a four-stage site strategy to increase the quality of heritage buildings and sites. The proposal will be expanded to 15 years, while it brings new amenities and services that draw visitors to this area. This leads to further developments, including the selection of the Al Shuwaihan Art Spaces for the 2019 Aga Khan Award for Architecture. (Soflaei & Kirchner 2019), highlighted in their study about The Bank street project has a great negative impact on the historical identity of the area, personal memories and stories, which segregate the heritage area (Al Mureija) and art area (Shuwaihan) which resulted in fragmented places and loses the image of this area through adding new modern building and street for cars.

Furthermore, on the opposite side of the Al Arouba highway the open and formal shape of Maidan Rolla made it viable and proximity to a public place in Sharjah, It reflected the demographic composition of the UAE. However, the fenced borders of the Maidan Rolla limit the use of the public space by families and excluding the workers (universes.art, 2020).

##### **4.4.1 Existing site analysis**

This journey is traversed through understanding the urban context and morphology of Heart of Sharjah which is selected as a case study for this research. To encourage the sustainability, accessibility, and walkability of outdoor spaces, efficiency it is a major concern in the region, as previously stated by Shurooq Engineers, not only during summer months but also during the cooler season. Besides, they contend that the master plan does not discuss the isolation of the city from the local neighborhoods that impact the livability of the spaces. In addition to the main problem of

the highway, which separates the city from the seafront, which was opposed to the main purpose of the initiative aimed at changing the area, Sharjah was in the 1950s.

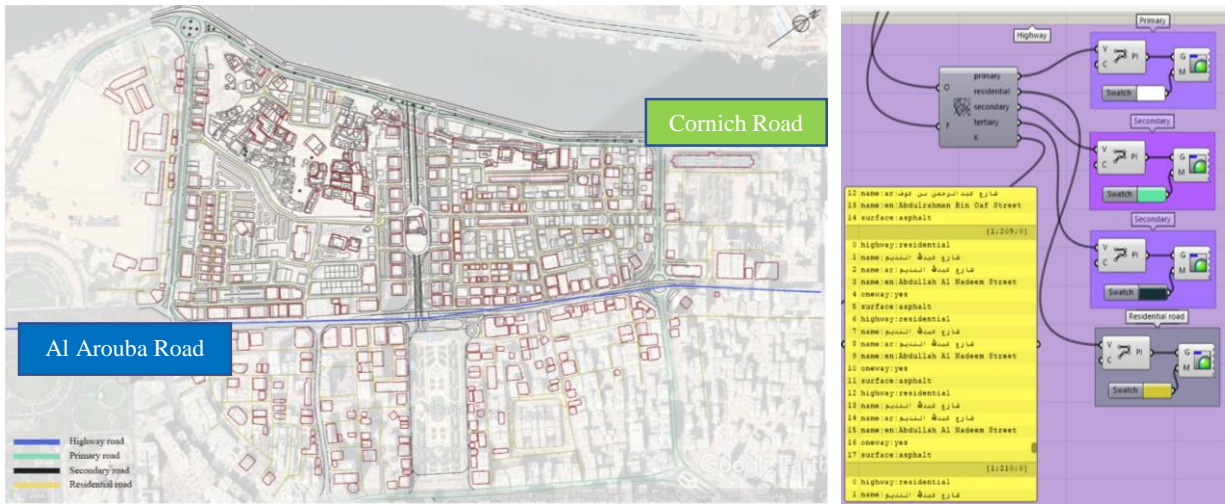


Figure 41: Roads hierarchy and accessibility to the study area as extracted from OSM by Grasshopper, (source: Author, 2020)

Figure 41 shows the extracted map from open street map (OSM), by using Grasshopper which provides detailed information about the road hierarchy and main access points to the selected area from main roads like Al Arouba highway which considered a vivid road in the city, and Corniche road as a primary highway which connect Sharjah city with Ajman. The study area has many access paths connecting both neighborhoods with these two main accesses including residential street and tertiary street like The Bank street. As well, the above map illustrates the road network and hierarchy of streets to the selected area including information about the pathway names and dimensions vary between 6 m to 40 m.



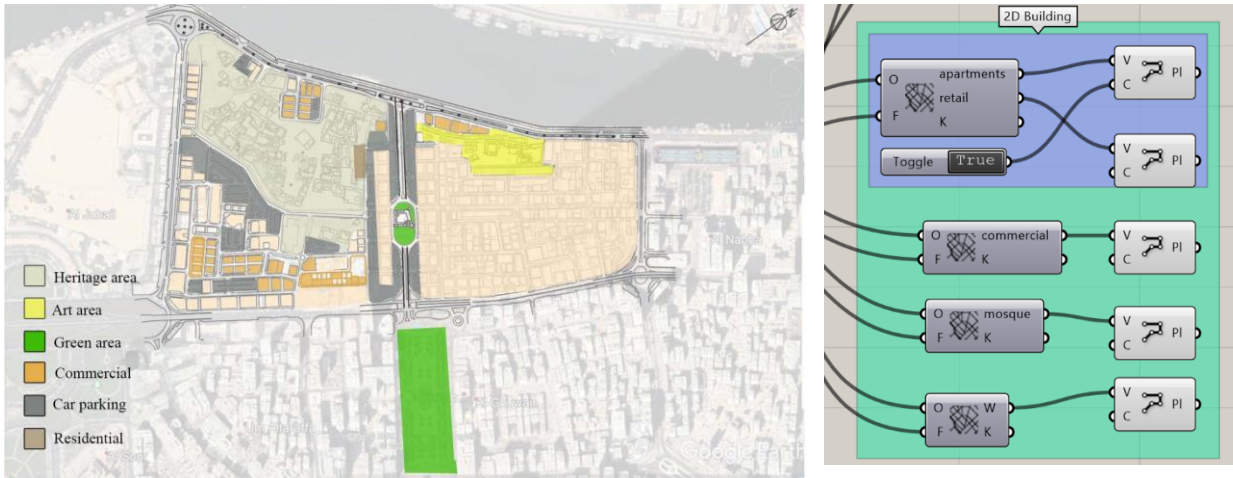


Figure 42: Land use map of Al Maraijah and AL Shuwaihain Neighborhood, (source: Author, 2020)

The study area has a distinct land use as shown in Figure 42 and it has a significant area with a heritage and art district. Generally, the place is characterized by mixed-use functions along with a traditional style Figure 43. Also, building heights ranging from one to twelve floors.

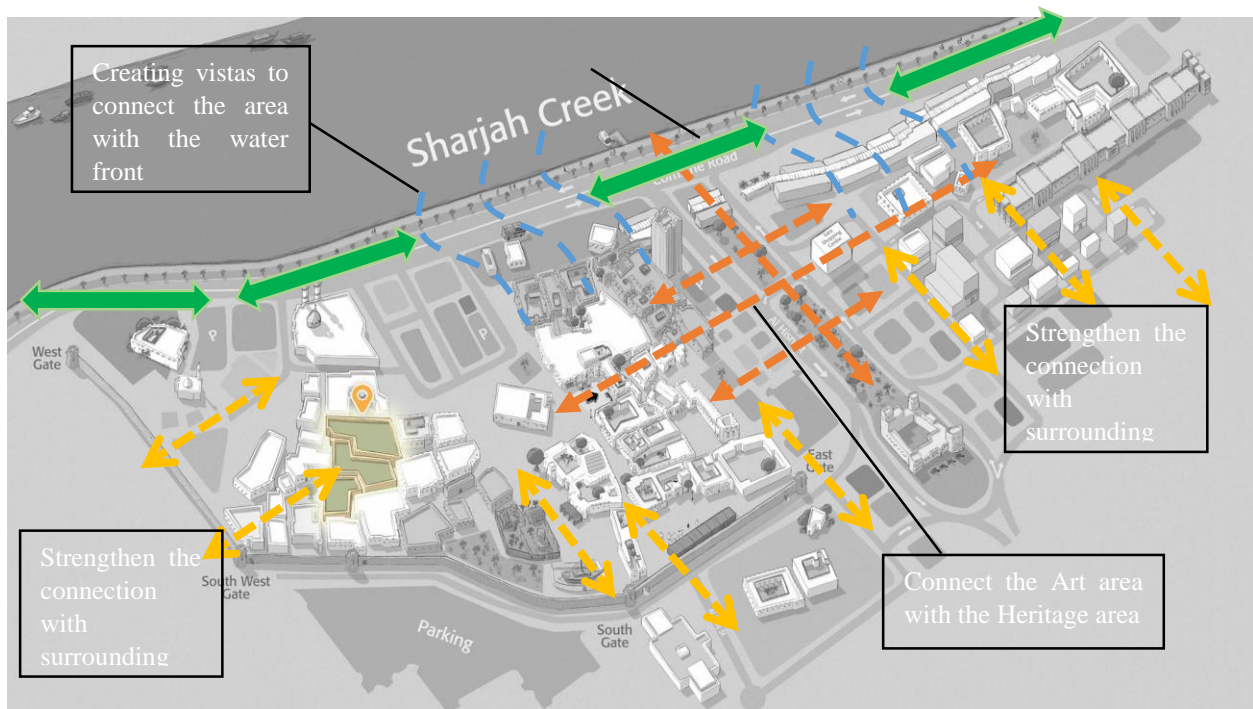


Figure 43: Heritage and Art area land use, (source: Author, 2020)

All of the above mentioned and the following assessments identify the urgent calls from the Sharjah Government to set a comprehensive vision and inclusive approach to flourish the historical identity of the city and bring life back to normal through a more sustainable approach and reconnect the human with nature. Wiedmann, Mirincheva & Salama (2013) point out in their report on the revitalization of the historic district of Doha, Mushirib district, that this goal has become more important due to the general vision of the majority of rulers to turn their cities into regional or even foreign tourism and innovation destinations.

Table 5: Key criteria for walkable pathway (source: Author, 2020)

parameters	Strategies to achieve the goal	Sub strategies
Walkability	Wide, continuous sidewalks	<ul style="list-style-type: none"> <li>-The minimal distance between the sidewalk &amp; most buildings</li> <li>-Mixed land use &amp; facilities</li> <li>-Frequent building entries</li> <li>-Sidewalks along 100% of street length</li> </ul>
	Pedestrian safety	<ul style="list-style-type: none"> <li>-Low design speeds for most streets</li> <li>-Driveway crossings along with no more than 10% of sidewalk length</li> </ul>
	Landscape & hardscape features to improve the pedestrian experience	<ul style="list-style-type: none"> <li>-shading, trees, wind towers to enhance user's thermal comfort</li> </ul>
	Pedestrian oriented community	By implementing mixed land uses within walking distances



The strength of the heart of Sharjah is derived from its hybrid location including both Art and Heritage area. Meanwhile, the historical and cultural values associated with area and people memories. In addition to the vernacular architectural style and the commercial hub. As shown in Table 5 actions need to be urgently enhanced to promote the area through improving connectivity within the existing urban fabric on the city level, neighborhood level, the buildings, and the waterfront. While resilience urban spaces for generations to come to increase the cultural awareness of the public.

On the other hand, weaknesses on-site, result due to the modern expansion which isolated the area through the new highways and Highrise building. Form obstructions of visual and physical connectivity to the waterfront and between the art and heritage area which form the fragmented urban spaces. In this regard, Shurooq proposed the demolishing of the new building and regenerate the old fabric. Also, reestablish the historical waterfront sense which will strengthen visual and

physical connectivity with the surrounding and enhancing the walkability and public gathering places.

Table 6: Strategies to enhance the walkability through the sustainable pavement (source: Author, 2020)

Parameter	Strategies to achieve the goal	Sub strategies
Sustainable pavement	high-reflectance & open Grid pavement	-Solar-reflective roofs or vegetated roofs. -Shade, open-grid pervious paving, or solar-reflective paving for sidewalks, parking areas, and other “hardscape
	Connected pedestrian pathways	recycled Content pavement

Table 7: Strategies to achieve connectivity and integration, (source: Author, 2020)

Parameters	Strategies to achieve the goal	Sub strategies
Connectivity	publicly accessible street nodes per square mile, including street intersections with dedicated alleys relieves traffic congestion	-Does not include cul-de-sacs -includes a street or pathway into the project - lower traffic speed, traffic calming measures
	Parks & recreation facilities Accessible public transport modes Integrate different modes of transit	-located within a safe walking distance of the community -Key mixed land uses as houses, offices, commercial -Designing multiple connected transit mode

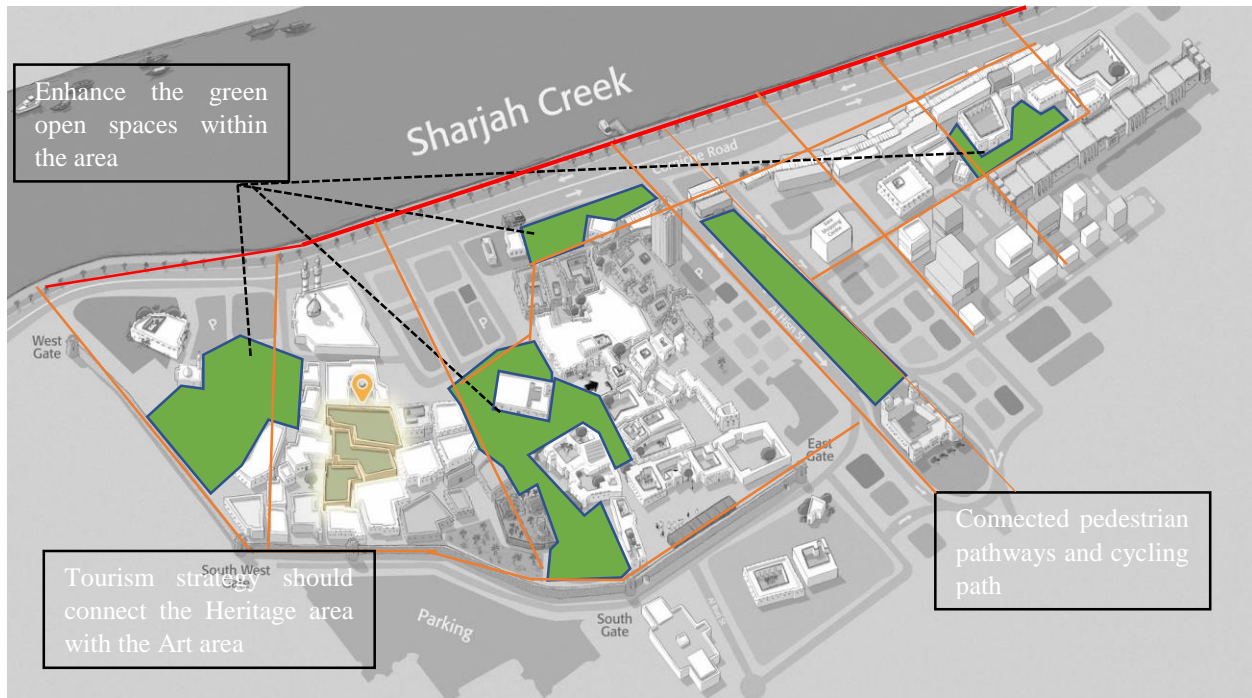


Table 8: Strategies to enhance cycling network & facilities, (source: Author, 2020)

Parameter	Strategies to achieve the goal	Sub strategies
Cycling Network	Cycling pathways	Integration with another transit mode - Connectivity between buildings & major destinations - should not block the pedestrian path

To summarize, the above tables and graphical maps analyze the basic goals to achieve a long-term commitment through enhancing the opportunities in the study area by revitalizing both heritage and cultural sustainability of the area, introduce sustainable tourism strategies to discover the authentic local lifestyle aligned with Sharjah tourism vision 2021. The above design framework was produced from the available opportunities on-site to improve the sense of places and livability of the area through many strategies like but not limited to creation of a green and walkable friendly environment, reconnect the heritage area with the art area, introduce mixed uses and public places, car-free neighborhood, enhance the links between the area and its surrounding neighborhood and

urban nodes, revitalize the traditional souq and its connectivity to the waterfront, establish a link between the historical area and Al Rula park from the other side.

A successful public space is a catalyst for the spaces around it – enhancing and activating entire urban spaces through a comprehensive sustainable regeneration, through the quality of the design and the uniqueness of the ideas that space embodies. As we all aware of how COVID 19 reminds us of how livable neighborhoods matter for our well-being.

#### 4.5 The proposed master plan of Heart of Sharjah 2025

Heart of Sharjah is the largest historical preservation and restoration project in the region planned to be completed by 2025, Shurooq has established a joint committee – consisting of members of leading companies and government sectors – to manage the development of this first process. The Heart of Sharjah will also be implemented in line with universal criteria for sustainable growth and environmental values. As shown in Figure 44. It aims to revitalize the heritage zone as a lively tourism site by unraveling a glamorous history – rebuilding historic buildings, constructing modern structures matches with the traditional style of the area while preserving the feel of the 1950s architecture and converting it into hotels, restaurants, cafes, art galleries and markets where existing users and future generations will appreciate these urban spaces. This section will illustrate the key design strategies and structure applied by consultants to accomplish the client's wish and the major view of the region, these recommendations will form the foundation for future growth on both the micro and the macro scale of the community.



Figure 44: Superimposed the 1950 plan over the 2008 plan design proposal



Figure 45: Proposed master plan, Heart of Sharjah, (source: Dar Al Omran 2008)

Figure 45 represent the proposed master plan 2025 by Shurooq as a conceptual master planning and developing the area based on Dr. Sultan Al Qassimi vision. Shurooq developer divides the project into 4 phases. phase 1 between (2012- 2015), Figure 46, mainly dealt with renovation and adaptive reuse of existing historical houses implemented as a hybrid architectural style through a combination of traditional and modern architectural style to promote the identity and people experience of the heritage area.





Figure 46: Phase one of the heart of Sharjah project, (source: Heart of Sharjah, 2020)

Following the predetermined timetable, Shurooq has completed much of the work for Heart of Sharjah's second phase, which involves the construction of infrastructure and the installation of new utilities and amenities, such as restaurants, cafes, civic facilities, children's playgrounds and car parks. It also includes improving the Center of Sharjah's internal courtyards and squares, which can be used as locations for activities Figure 47.

However, much improvement is still required to revive the relationship between the heritage district and the waterfront to be connected and facilitate the connection. Also, to create an attractive urban center for the city population and city visitors. So far, there has been little discussion about the regeneration of a real extension of the existing inner-city through enhancement of continuous activities and uses not only for three weeks a year during the proposed events such as the Biennale.

Another workflow is aimed at improving the connectivity across the heart of Sharjah and enhancing the overall connectivity of the city. Taxi stands, bus stations, underground parking, and water taxi drop-offs will be easily incorporated to ensure the integration of Sharjah's cultural and

creative landmarks as highlighted previously to achieve touristic sustainable development plans with more accessible ways to enhance the user's experience.



Figure 47: Phase two of the heart of Sharjah project, (source: Heart of Sharjah, 2020)

The third phase of the improvement, project will include demolishing the commercial building in the bank street and regenerate new urban infill from the old fabric following the traditional architectural styles to be used as hotels, restaurants, cafés, art galleries, and markets that will bring renewed vibrancy to Heart of Sharjah. In particular, development action plans should ensure the involvement of all stakeholders in the development process, which builds commitment to a shared vision Figure 48.



Figure 48: Phase three of the heart of Sharjah, (source: Heart of Sharjah, 2020)

Special attention has been given to the creation of a complete master plan to ensure the continuity and credibility of the Heart of Sharjah. The delicate balance and convergence between the cultural context, urban experience, and urban quality inside the heart of Sharjah will distinguish the destination and cultivate a sense of reality, stability, enclosure, security, and well-being Figure 49.



Figure 49: Phase four of the heart of Sharjah project, (source: Heart of Sharjah, 2020)

At the end of the investigation of the context and existing situation throughout the analysis, the results from direct observation are used to achieve an inclusive and comprehensive framework for the selected case study. Also, the main strengths and weaknesses and the available opportunities are defined by criteria, and the public urban spaces' experience, architectural style, and quality of the spaces are evaluated. Then, an urban design framework is outlined to guide and recommend a strategic proposed action plan (Heartofsharjah.ae, 2020).

## 4.6 Urban Design Regeneration

Within the second stage, the author adopts a generative plan logic of the authentic district, which empowers the utilize of the investigation parameters as plan driving variables as well as project limitations. For the production of the models and the extraction of data, many software is required: standard CAD tool, Depthmap X, and Rhino/ Grasshopper together with its plugins like Mosquito which is a suite developed for Rhino, helps to extract buildings, roads, and open street map (OSM) data. Additionally, using ELK 2.2.2 which is a set of tools to generate a map using open street map data (OSM). While, the programming capacity of Grasshopper is particularly useful to develop an algorithm for the storage and the post-processing of the information previously extracted, which could be used later on for further data analysis, Figure 50.

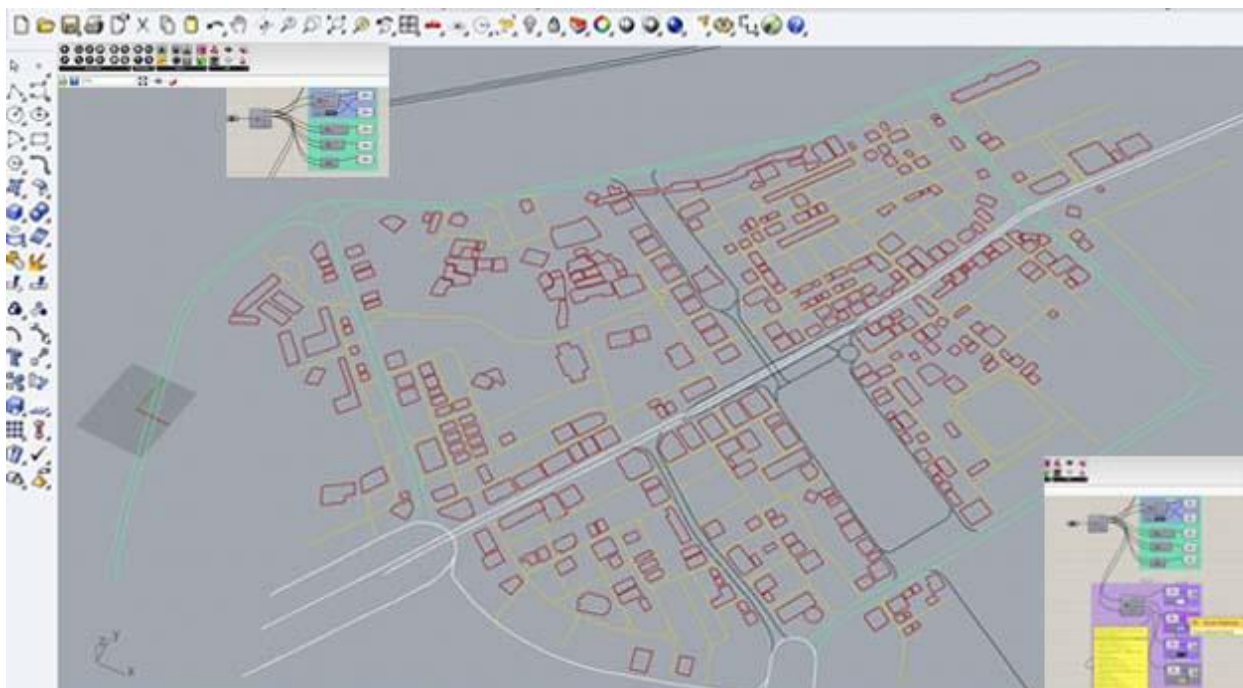


Figure 50: Digital model plan generated by Rhino/ Grasshopper, (source: Author, 2020)

Collecting input data from the parametric tool as road networks, building structure, and land uses in the implementation of new tools as a quantitative process in urban analysis has introduced strong techniques over the conventional qualitative methodology that increase the scholarly interest in this pattern (Ye et al. 2016).

Meanwhile, to be able to regenerate the urban configuration of the area to create the physical layer of the design process, a parametric plan was created by using Grasshopper, which allowed a certain degree of flexibility, especially in the first stages of the design process. The Rhino Visual Programming Interface is incredibly useful for visualizing and accessing the results of the study, for seeking effective and elegant design options, and for ensuring that the district's setup features and comfort are met. However, according to Whyte, the place where the street and public areas intersect is the secret to achievement or failure. The optimized layout proposal is then developed to broaden the spatial views between the heritage building to accomplish the goal of reconnecting living environments on both the spatial and the visible layers. As a result, the removal of visual restrictions has contributed to a substantial improvement in the average value of the Rn integration measure. This approach allows for the structuring of the iterative and collaborative process between research and design.

Nowadays, our cities need a long term commitment to achieve sustainable urban design, Also to maintain the cultural and historical identity across time. This required a clear vision for the entire city and must be context-driven through discovering the values of day to day urban life, social, economic, and environmental aspects.

To summarize, the approach to design was developed in three steps:

1. Brainstorming stage, which characterizes the setup point of the plan based on making a diagnosis of the current situation and evaluates Shurooq proposed master plan.
2. Iterative thinking way, in which key design decisions are embraced, evaluated, and incorporated with the assistance of analyses, and optimized with the benefit of cross-comparisons of design alternatives.
3. A performance evaluation, in which, assessing the quality of the final optimized project and provided a comparative ranking of the before and after configurations.

The results in this Chapter indicate that field study and computer simulation effective tools in urban regeneration. The next chapter, therefore, moves on to discuss the finding and compare the result through testing the generated plans by using space syntax and compare the result between the existing situation, proposed master plan by Shurooq, and the optimized design based on several variables such as connectivity, integration, choice, and visibility graph analysis (VGA) on both global and local level. Along with this growth in the urban city center and the pandemic situation, however, there is increasing concern over our future cities to be resilient and able to absorb, recover, and prepare for future shocks either economic, environmental, and social.

Many researchers confirmed that space syntax is considered a useful tool to compare the similarities and differences between urban spaces at both the global and local levels. Also comparing the reality analytical result as observed from the field study to the extracted maps from depth map x. found that space syntax visualizes the reality associated with all highlighted problems in the SWOT analysis as going to be presented in the next chapter in detail.

**CHAPTER FIVE**  
**SPACE SYNTAX RESULT AND DISCUSSION**



## **5 CHAPTER 5 Space Syntax Result and Discussion:**

### **5.1 Introduction**

As discussed earlier in the literature review, the iterative design process was conducted in this study through quantitative and qualitative methods. An effective framework summarize the layers of thinking through a holistic approach and allow for certain flexibility in deciding the sequence of analysis and design through narrative design way to enhance the social meanings and cultural values of public urban spaces. In fact, the integrative design process is considered a creative way of building ideas and evaluate them to generate and review different design proposals to reach optimized results through the development and critical assessment of solutions, rather than a separate analysis of the problem itself. Consequently, this chapter builds on space syntax technology promoted the development of many analytical techniques based on mathematical techniques and computer simulation to capture the configurational properties of urban spaces at various scales. While DepthMap X software is applied to generate the assessment by conducting axial line analysis and visibility graph analysis. Firstly, examine the axial line analysis of the existing current situation on both the city level. secondly, testing the proposed master plan by Shurooq on the neighborhood level and the optimized options on the global level by using axial line analysis to decide the best scenario of the regeneration options. Then, evaluate the chosen optimized proposed design options and compare it with the previous result of the Shurooq master plan through the running of axial line analysis on the local level to prove the previous result. After that, Forecasts on the future transformations in terms of public life can be made at this point through a visibility graph analysis. In the end, This will provide a sufficient way to understand the nature of the larger space and determine livability within spaces by studying how these unit spaces are connected, integrated on both physical and visible dimensions.

## 5.2 Axial Line Analysis

The current study found that the guiding principle of the analysis is the essence of urban spaces, which means architectural consistency, scale, shape, enclosure, spatial arrangement, which has a spatial impact on social interaction within public spaces. In the meantime, this illustrates Lynch's theory as stated earlier in the literature review chapter, which describes the city as an integrated element of the physical components and functional dimension of the city, which identifies how people integrate with their communities and spaces. However, the results of this study indicate that the vitality and success of the design of the public place relies on the value of integration, connectivity, choice, and visibility graph analysis (VGA) when we converted into space syntax terminology. It is interesting to note that the analysis cases of this study in all levels started by drawing closed polylines for plots and buildings around the city by using AutoCAD software, then proceeding to the depth map x software. These axial lines are generated automatically rather than just manually drawing them. This study produced results that corroborate the findings of a great deal of the previous work in this field. As was pointed out earlier in the Methodology chapter (3), DepthMapX software was confirmed by many researchers in the field as a powerful tool. It has the capacity for predicting social and economic activity, associated with the various scales of measurements to improve the place experience and enhance walkability in the area.

Moreover, this chapter demonstrates many aspects can be derived by space syntax technology like the social principles, and the relation between spatial interventions and the probability of movement and occupation in the layout by examining variables such as integration, which will help to distinguish space from the most integrated to the most separated. It is also an indicative factor of how many people are going to be in or travel across space. Often, the connectivity value refers to the number of immediate neighborhoods that are directly connected to space. While the

choice is known to be the discrepancy value of movement flow through space. It's a very good instrument for estimating the capacity for pedestrian and automobile traffic.

### 5.2.1 Axial Analysis at the City Scale Level

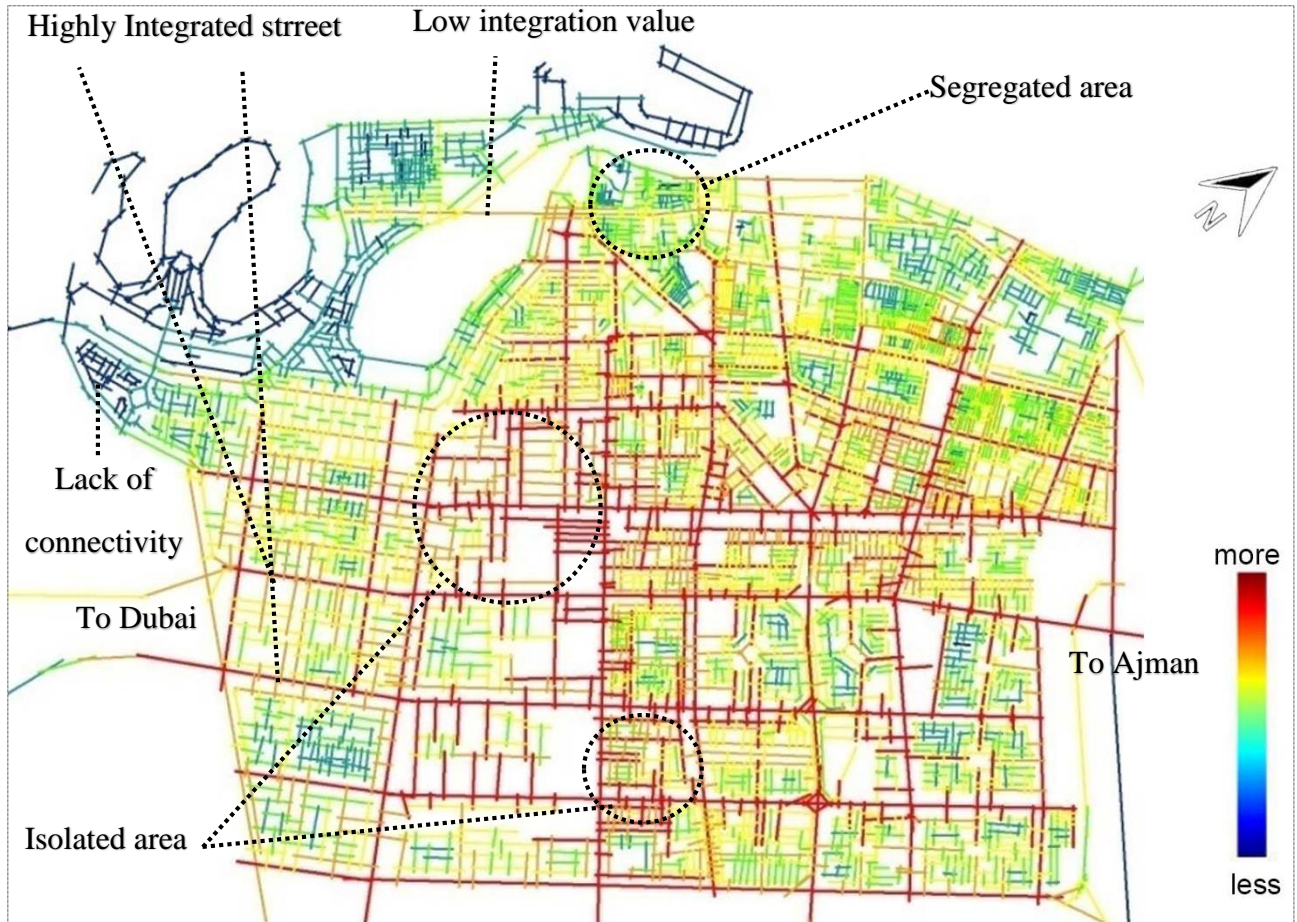


Figure 51: City scale axial analysis of Sharjah: Global integration, Rn,(source: Author, DepthMap X, 2020)

As seen in Figure 51, the axial analysis of integration measure shows that on a city global level, the main highway on the city has the greatest value of integration such as King Faisal Road, King Abdul Aziz Road, and Al Etihad road which connect Sharjah with other cities like Dubai and Ajman from the other side. These highways create highly isolated and fragmented neighborhoods across the whole city.

In general, the integration values are greater in the context of the highways, while most of the collector's roads between neighborhoods are almost ignored, reflecting a high traffic flow on these roads. Which was observed in reality during the field study of the city. These findings might be reflecting the characteristics of the segregated neighborhood from the whole system which cant be reached by walking.

Strong evidence was found on the global scale analysis on the city level, shows predictions of deterioration of the historical site of Sharjah due to the progressive disconnectivity and isolation of the old city center from the newly developed neighborhood. Additionally, at the global level where the lagoons are located which is usually considered as a source of life in the cities shows a disjointed edge with a very low connectivity value. On the other hand, these results also endorse and validate the decision of the Government to build pedestrian overpasses over the major roads to enhance connectivity and decrease the incidence of pedestrian injuries. This confirms the association of all decision-makers who plan to make all new construction within easy reach of jobs, school, retail, and entertainment amenities.

The interesting part of this analysis of the city has highlighted the correlation between the axial analysis at the global level and the local level (R1000). As shown in Figure 52, we can notice through comparing the old part of the city including neighborhoods near the waterfront are more integrated than the new neighborhood towards the desert. This finding is in agreement with many studies results which showed interestingly how the natural settlements were created based on the human's needs and how they connect humanity with nature in a sustainable way. This identifies the significant differences between the historical parts of our cities versus the modern ones in the whole system.

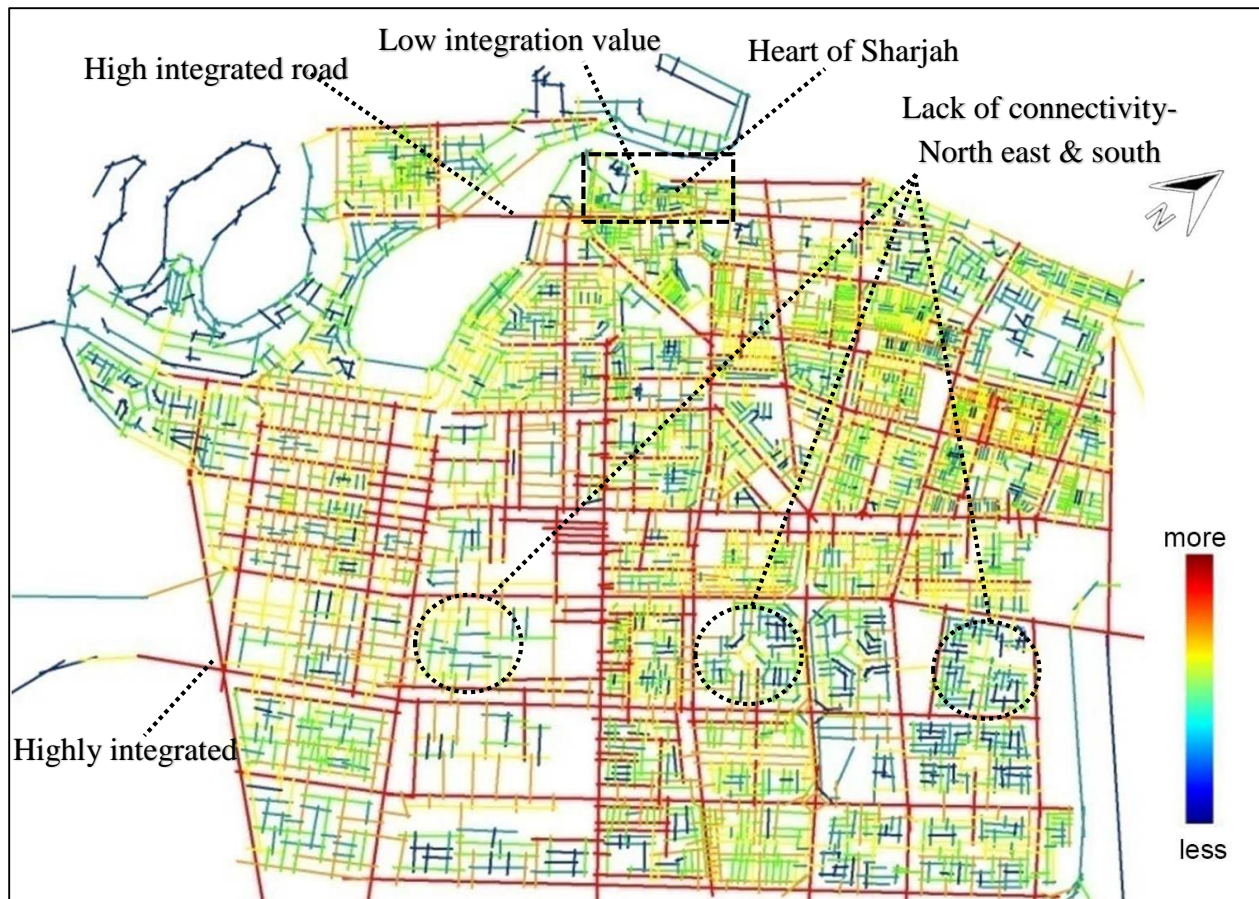


Figure 52: City scale axial analysis of Sharjah: Local integration, R1000, (source: Author, 2020)

This guide to the need to reduce the numbers of highways or minimize its lanes (path for cars) and convert them to pedestrian and active mode transport like cycling path, electrical scooter lanes which start already spreading recently between people to reduce the use of public transport for safety issues due to COVID-19. All these strategies need to be considered as soon as possible to ensure better connectivity on the city level, also to address the problems associated with new urbanism and is an attempt to solve various social, health, energy, economic, aesthetic, and environmental problems with special focus on enhancing the people health and well-being.

Indeed, this cannot be achieved without profound a holistic sustainable approach that ensures the best value for optimum environmental, economical, and socially sustainable design. While, a comprehensive approach for all design possibilities and solutions which might consume time, and additional collaboration between all governmental, private sector, including all stakeholders to end up with inclusive solutions that compromise all the people requirements toward healthier city based on sustainability pillars.

The observations of this study duplicate those of the previous studies which examined the impact of transferring planning from modernist planning law to spatial accessibility planning policy, as reported by Tim Stonor (2009), This also involves greater cross-disciplinary incorporation of the related specialist. In this sense, Space Syntax enables local authorities and the private sector to create spatial data as a strong base for future development and to convey the effect of planning decisions.

## 5.2.2 Axial Analysis on the Global Level:

### 5.2.2.1 Existing Master Plan (Sim1)

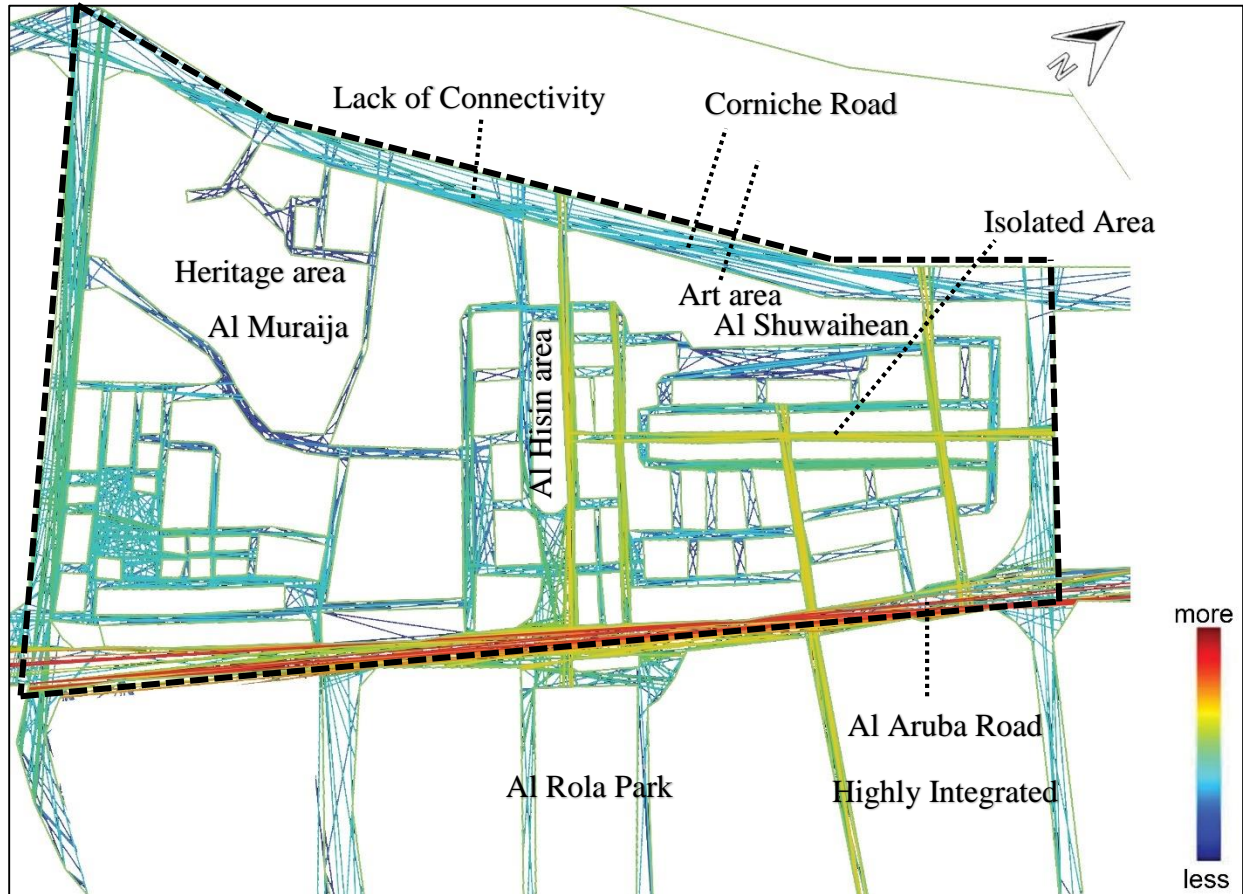


Figure 53: Axial line analysis of Existing master plan (sim1), Global connectivity,  $R_n$ , (source: Author, DepthMapX, 2020)

Further analysis focused on the Heart of Sharjah on the global level  $R_n$  as shown in Figure 53 including three parameters which are connectivity, integration, and choice. When axial maps are generated for those parameters, the highest integration and connectivity value showed in Al Auroba street which reflects the high traffic flow in this highway along the day. But the surrounding street of both Al Muraijah and Shuwaihean neighborhood shows a lack of connectivity which resulted in an isolated area.

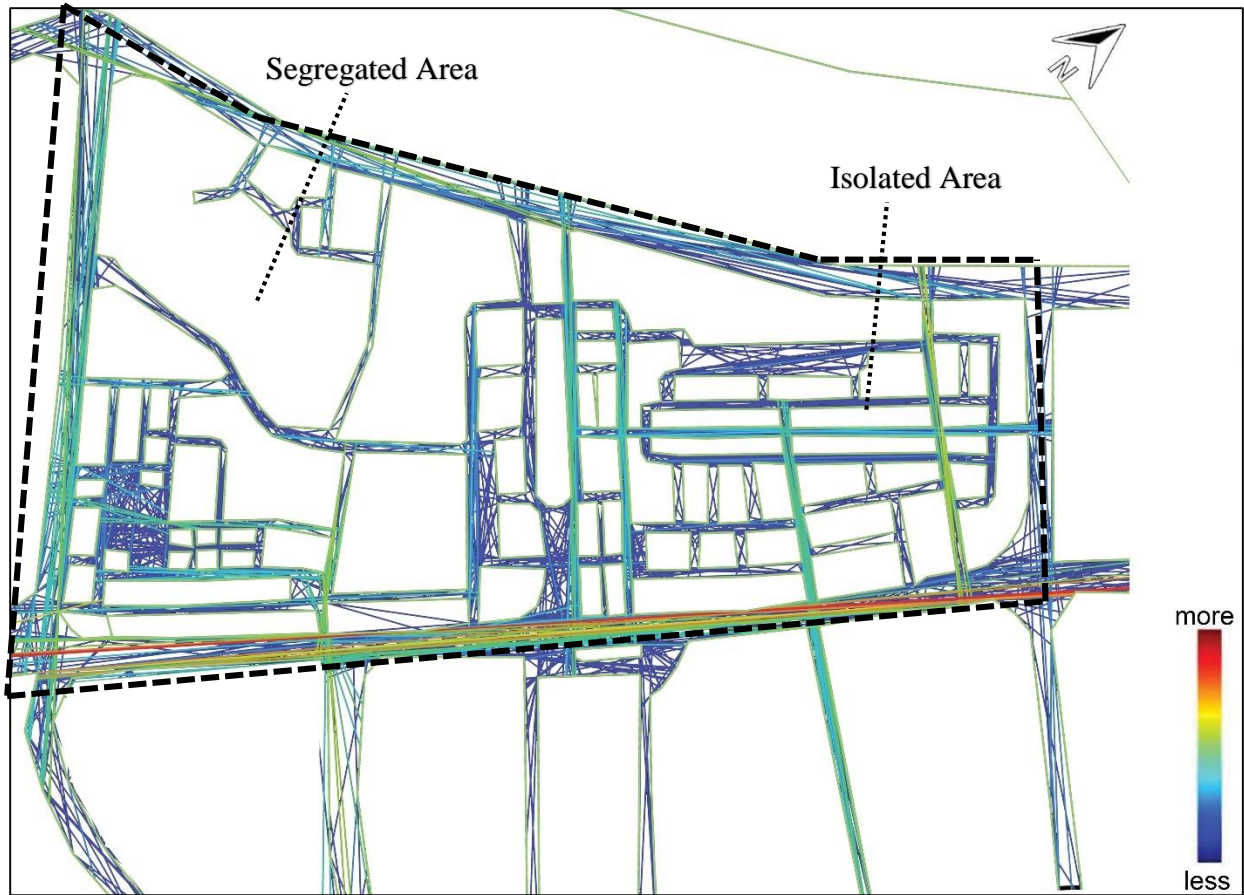


Figure 54: Axial line analysis of Exiting master plan (sim1), Global choice, Rn, (source: Author, DepthMapX, 2020)

When axial maps are analyzed for choice-value which reflects the shortest pathway to get from point a to b still showing high value in Al Auroba street as shown in Figure 54. As well as, AlHisin Avenue was highlighted in lighter yellow and green which means the least movement flow value in comparison with Al Aruba road. Similarly, the Al Shuwaihean neighborhood (Art area), represents better connectivity than the heritage area which still low in its integration value.



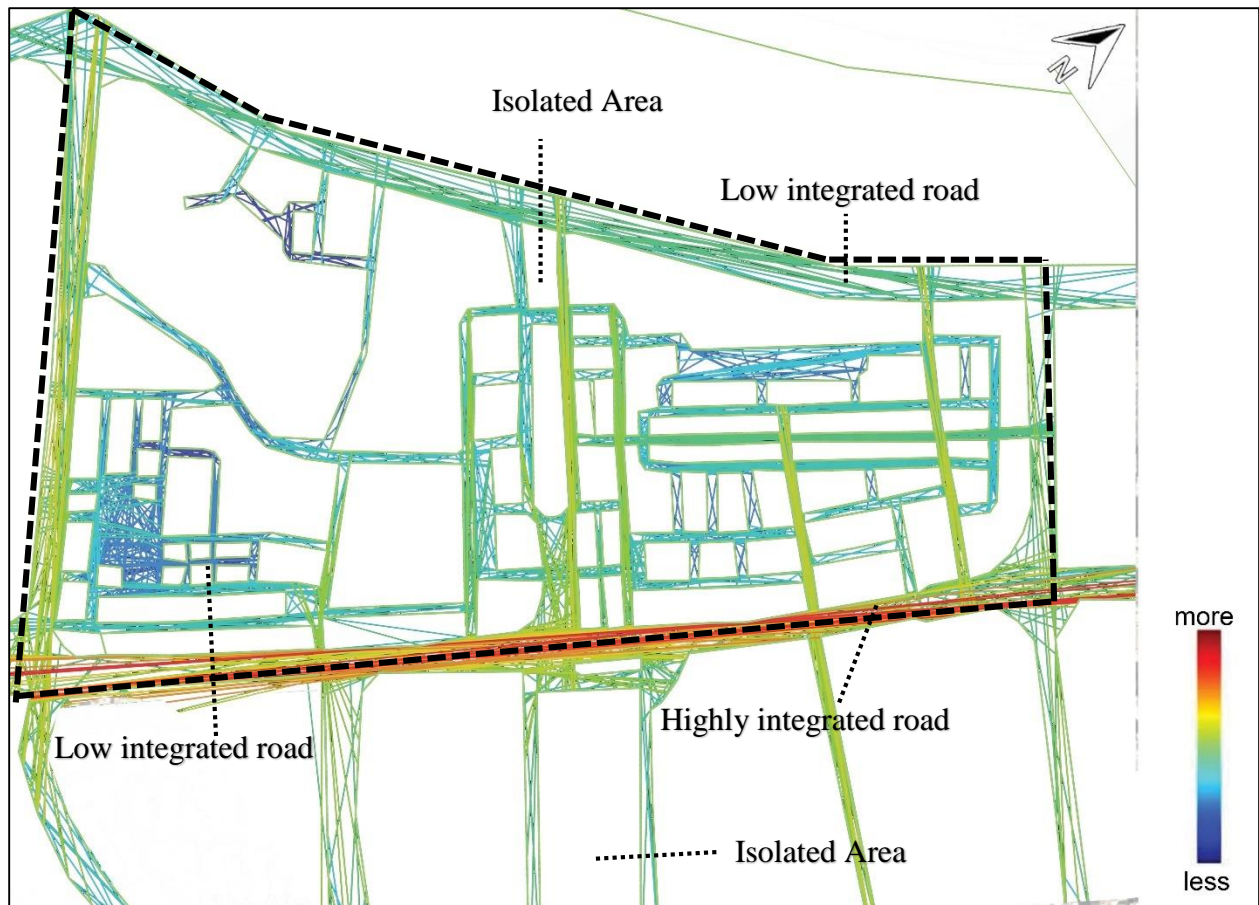


Figure 55: Axial line analysis of Existing master plan (sim1), Global integration, Rn, (source: Author, DepthMapX, 2020)

To compare, as mentioned before in the city scale integration analysis on the local level (R1000) the historical center shows higher integration values than other new neighborhoods. Thus, We can see in Figure 55, the integration values on the neighborhood scale at the global level (Rn) shows a lack of integration on the most area of the maps, except Al Hisn avenue and some collector roads in Al Shuwaihain neighborhood, which result on creating fragmented spaces inside both neighborhoods Al Muraija and Al Shuaihain which make it as an isolated area.

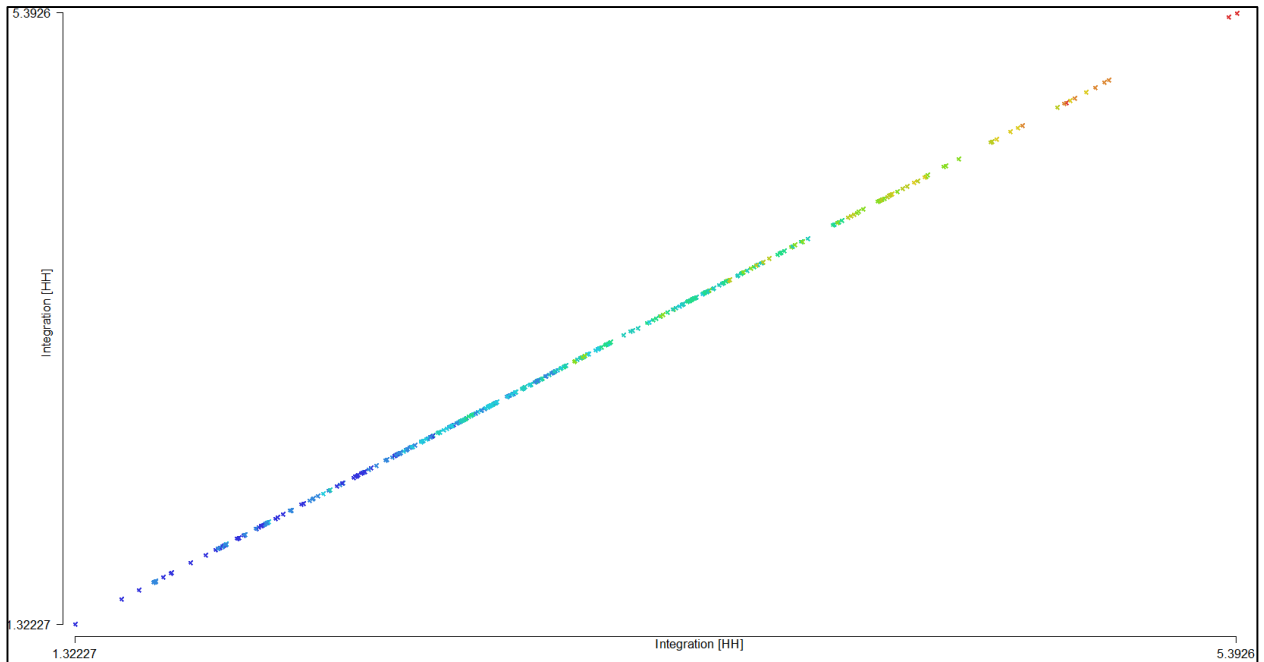


Figure 56: Axial integration value of the existing master plan (sim1), Global integration Scatterplot (Min 1.32, Max 5.39), Rn, (source: Author, DepthMapX, 2020)

The analysis of the existing master plan of the heart of Sharjah shows no difference greater than what was observed during the field study. Generally, lack of connectivity in the area as shown in the scatter plot 56, shows the min value of integration almost (1.32), this value describes the most segregated spaces concerning other spaces. However, the most integrated value in this analysis about (5.39) which considered a very low value as highlighted in the above axial maps. since most of the maps are marked with blue color. This resulted in a segregated unsafe historical area, despite its unique location and the memories of this place and the amazing waterfront which can transform the area into the most connected and livable place in the city and attract more people to the historical city center to flourish the social and cultural values of this area. In addition to that, the effective land use activities such as old souq, museum, café, and art galleries, thus, the heritage area remained with huge vacant spaces for most of the day which makes the area seems unsafe for the pedestrian.

### 5.2.2.2 Shurooq Proposed Master Plan (Sim2)

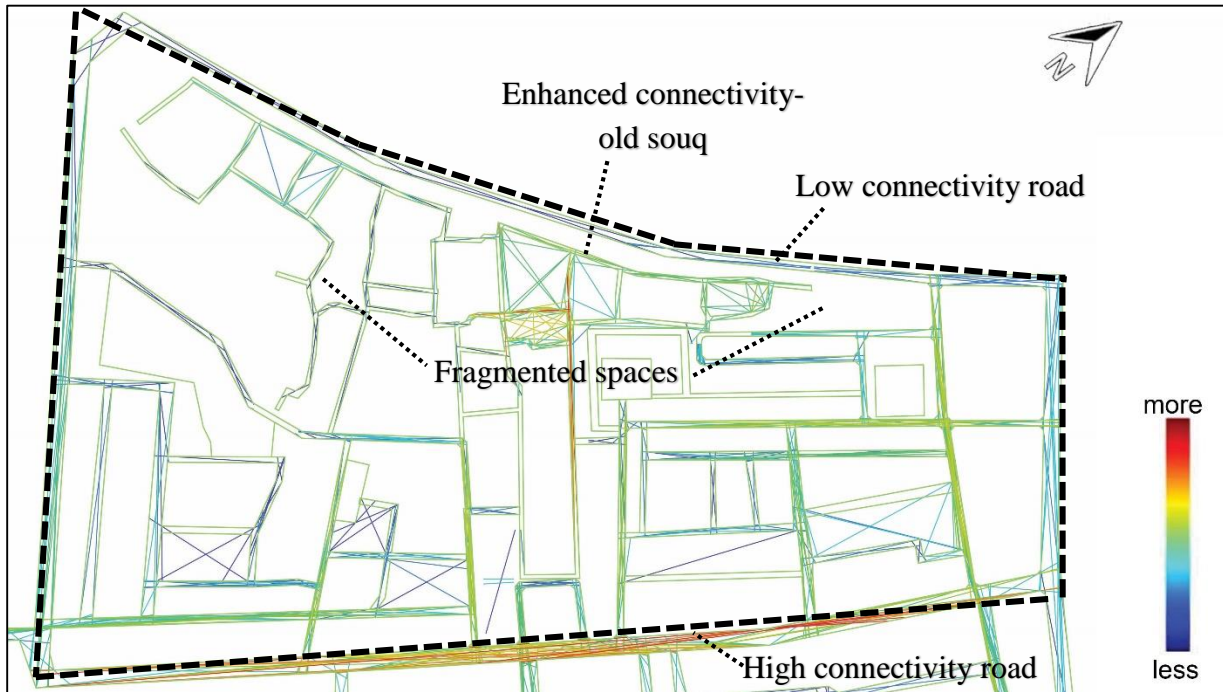


Figure 57: Axial line analysis of Shurooq proposed master plan, (sim2), Global connectivity, Rn, (source: Author, DepthMapX, 2020)

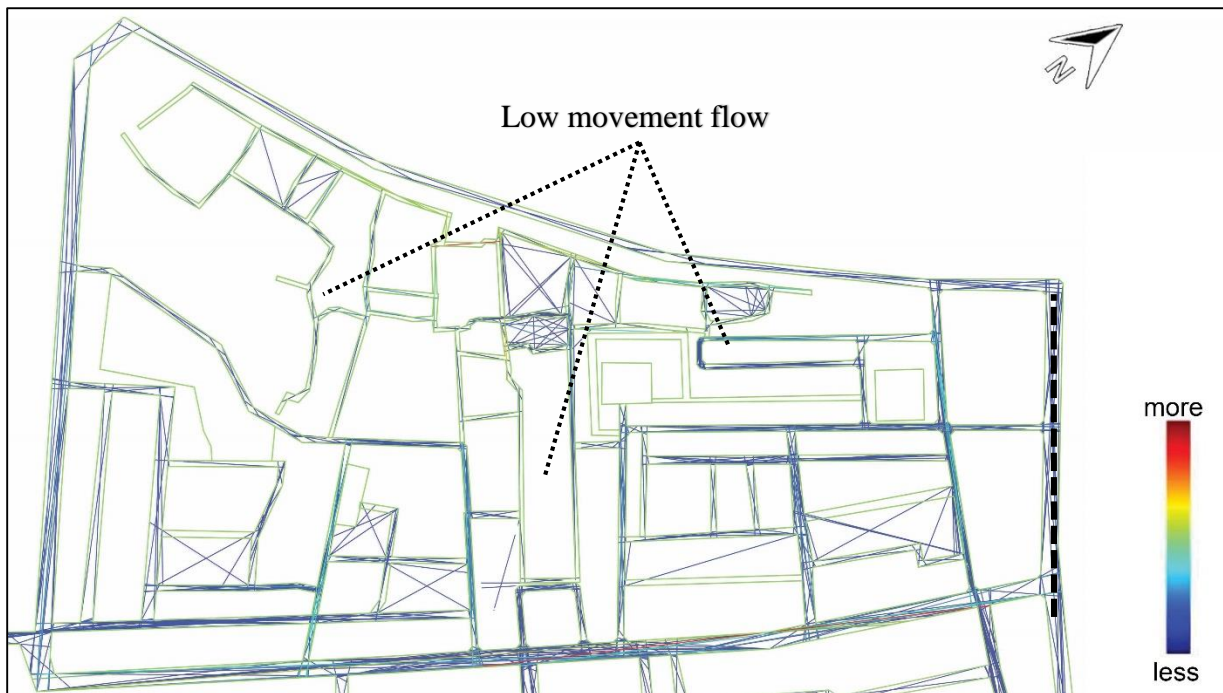


Figure 58: Axial line analysis of Shurooq proposed master plan (sim2), Global choice, Rn, (source: Author, DepthMapX, 2020)

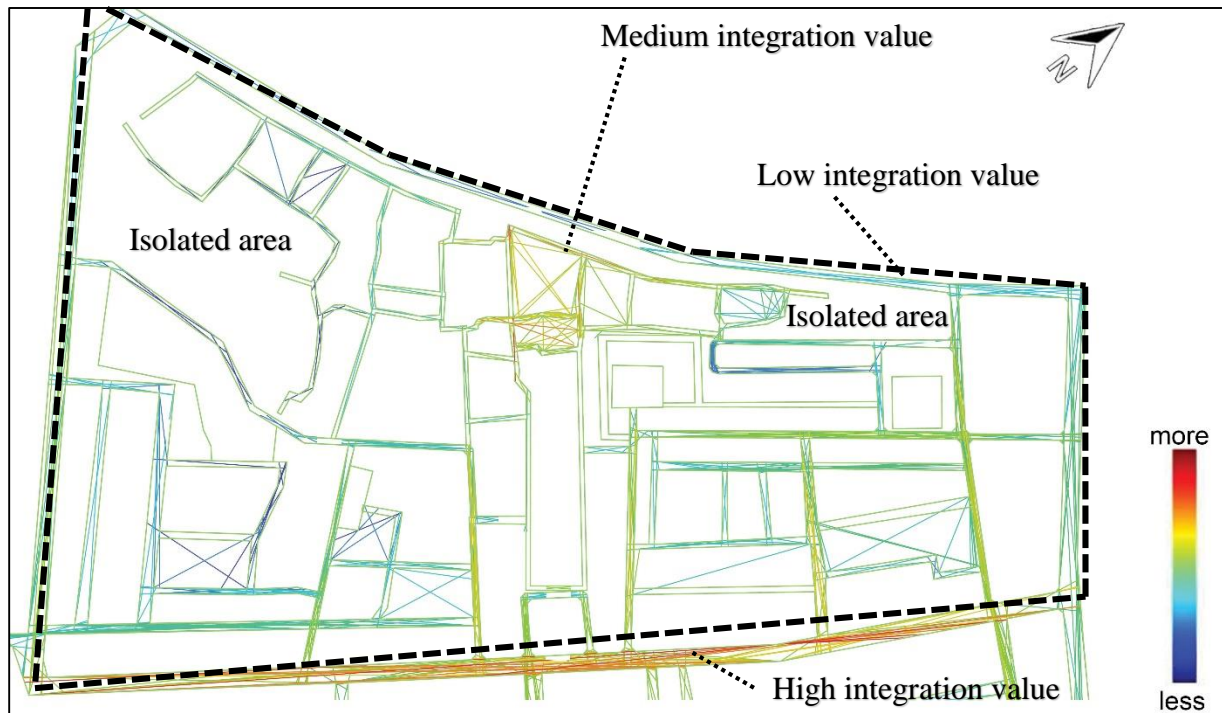


Figure 59: Axial line analysis of Shurooq proposed master plan (sim2), Global integration, Rn, (source: Author, DepthMapX, 2020)

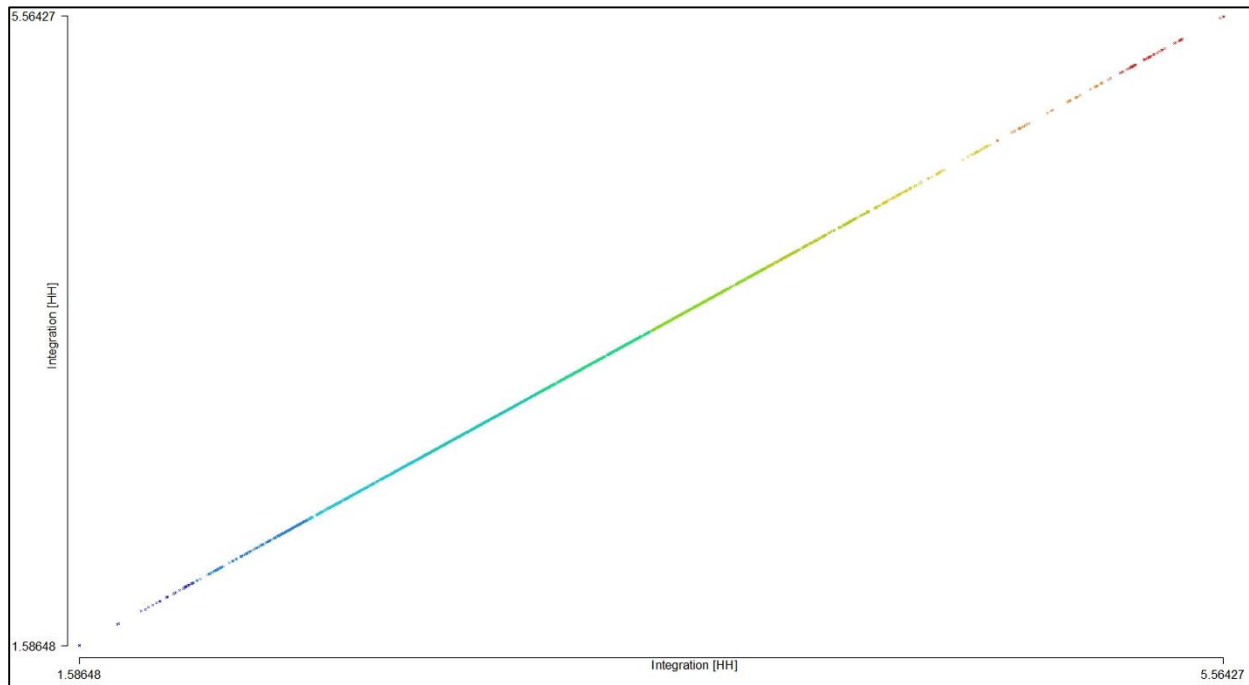


Figure 60: Axial integration value of Shurooq proposed master plan (sim2), Global integration Scatterplot (Min 1.59,Max 5.56), Rn, (source: Author, DepthMapX, 2020)

However, As shown in the above maps figures (58,59,60) provide a colorful presentation of the connectivity, choice, and integration values respectively. The result of the correlation analysis, to observe the difference between the current status of the study area and the proposed master plan by Shurooq was not significant. In comparison to that assumptions, there was no major gap between the integration values at the global level. 1 as shown in the scatter plot Figure 60 which almost increased by a very slight value around (0.17). None of these values were statistically significant. This indicates the lack of connectivity and gives a sense of lost spaces between the buildings. It's noticeable that the integration values in both the art area and heritage area better than the existing situation. At the same time, as per the result still suffer from segregation between its spaces. Might this due to the adding of the old fabric instead of the modern demolished building in the Bank street which from my point of view considered as too much structure infill especially concentrated in front of the Al Hisin area which can be transformed into an amazing central greenery plaza. Although, the old souq being more connected is still isolated from the waterfront elevation due to the presence of Cornich road.

The first set of analyses was tested on the global level  $R_n$ . In the first example, it was helpful to consider the global degree of connectivity of the spaces in the research area in order to define the key access routes from outside the neighborhood.

### **5.2.2.3 The optimized proposed plan- option one (Sim 3)**

One of the main objectives of this study is to improve the connectivity and livability of public spaces in a historical district, through restoring the historical relationship between the old city and the sea. Which has been isolated due to the presence of Corniche road that creates a barrier between land and sea. The first attempt was to break down visual and physical boundaries to promote the creation of visual connections between spaces. This led to the creation of a modern design idea, in

which anatomy is revamped in a way that attracts people inside spaces, giving the form a cleaner look as well as a less fragmented structure. In this regard, two proposed simulations suggested by Author were evaluated in space syntax in terms of its connectivity. According to Whyte, the area where the street and the plaza or open space meet is a key to success or failure. The concept behind the suggested scenarios evolved around eliminating the road lanes, replace the car lanes with pedestrian or cycling pathways. Meanwhile, the urban configuration, in this case, can be regenerated and fill it with old urban fabric only in Al Hisin avenue instead of the Highrise building which going to be demolished. At the same time, other old buildings can be improved by adaptive reuse, renovation, restoration, etc. The process of evaluation and assess the proposed scenario focusing on the main goal of this study which elaborated as reconnecting the two parts of the heart of Sharjah, and the old souq, in addition, to celebrate the ceremonial presence of Al Hisin.

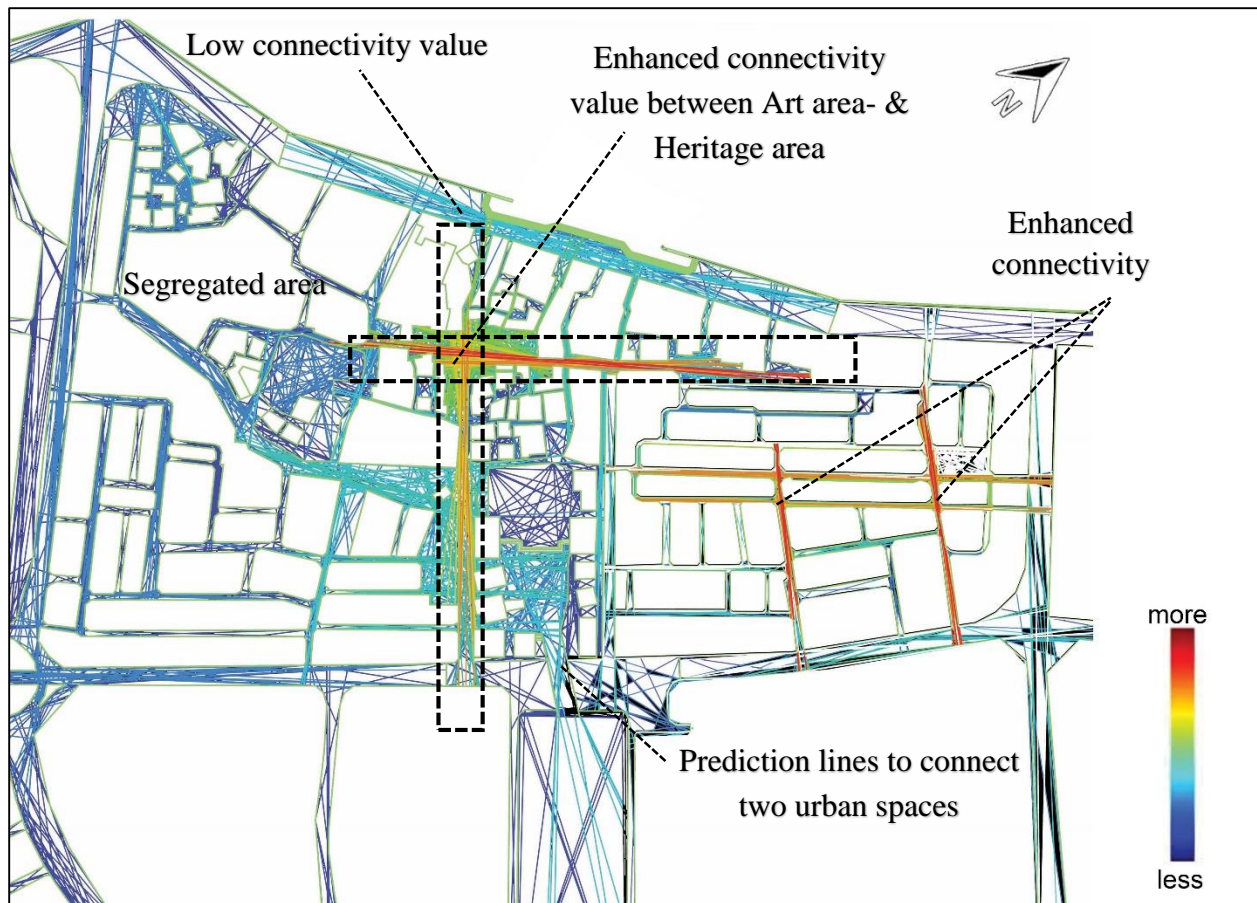


Figure 61: Axial line analysis of optimized proposed master plan- option 1 (sim3), Global connectivity, Rn, (source: Author, DepthMapX, 2020)

The result of the first optimized proposal-option A, extracted from space syntax represents that many spaces are still isolated by the road network as shown in Figure 61. While The historical values and identity of the area are seriously affected by modern urbanization activities. Others are poorly connected with their surroundings even after the demolishing of the highrise buildings. However, the significant observed difference in this scenario (option 1-sim3) concentrated in the middle space where the art area and heritage area being connected through a path. Directly connected to the central square near Al Arsa old market. By replacing the suggested urban infill (old fabric) by Shurooq with a central space surrounded by a historical building with various land use in the Al Hisn area. Consequently, reducing the width of the Al Cornich road to creating more

pedestrian pathways and terraces to enjoy the view. In addition to that, increase the number of vistas linking the old souq area with the waterfront.

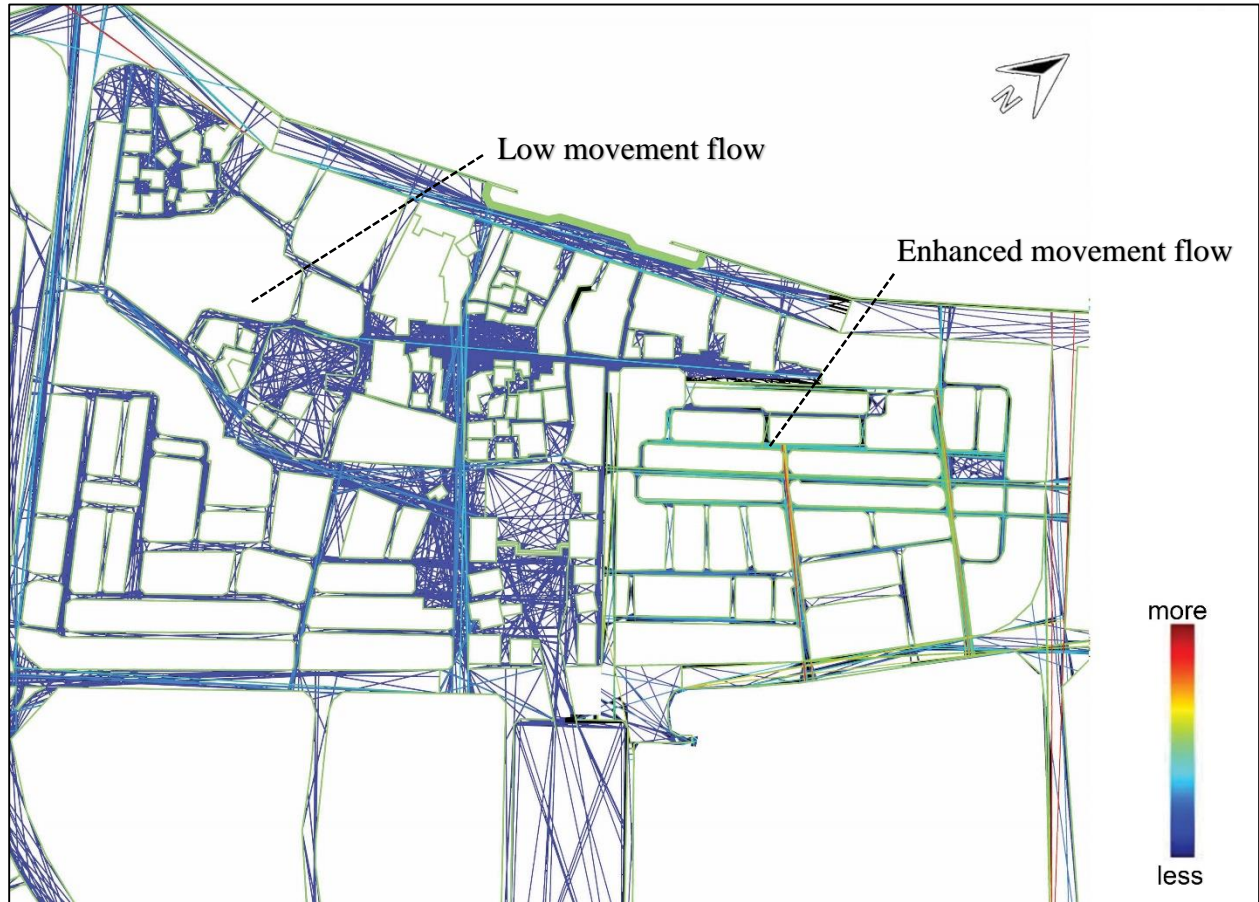


Figure 62: Axial line analysis of optimized proposed master plan- option 1 (sim 3), Global choice, Rn, (source: Author, DepthMapX, 2020)

Despite all of this justification but the result still showing low values of connectivity and choice measures Figure 62. Also, it's interestingly noticed that the collector's roads between the two main highway especially the one located in the Al Shuwaihein neighborhood, well-integrated and connected both sides, this will allow the residents of the adjacent neighborhood to enjoy the places with their kids and creating a safer environment for pedestrian. Thus, a comparison of both art and heritage area results reveals that the connectivity values were promoted in the art area more than the heritage area. Also, the result clearly shows a lack of connectivity in Al Hisin area.



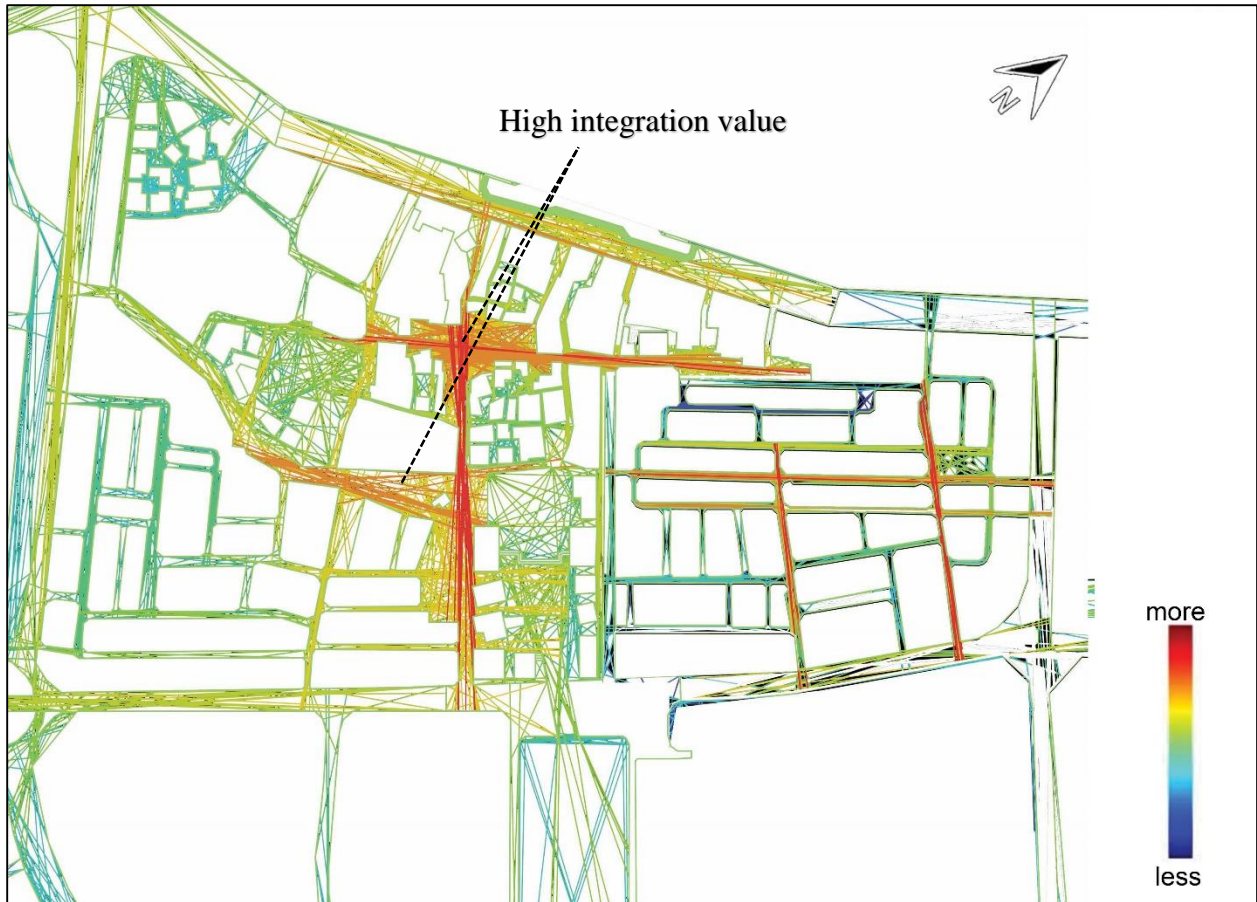


Figure 63: Axial line analysis of optimized proposed master plan- options 1 (sim3), Global integration, Rn, (source: Author, DepthMapX, 2020)

On the other hand, Figure 63, shows that the integration value was significantly improved in optimized option one simulation-3, in comparison to the integration value were tested in the Shurooq proposal (sim2), where the difference between them around 2 degrees as shown in the below scatter plot Figure 64, The integration is measured in this scenario around (7.01). In the eastern part of Al Hisn plaza, it's quite clear the transition space was predicted from the extracted axial lines which can be translated into steps or different level spaces, so it can be designed as an outdoor amphitheater area. All interventions were organized to invite the occupation of the spaces and promote activities that enhance social interaction.

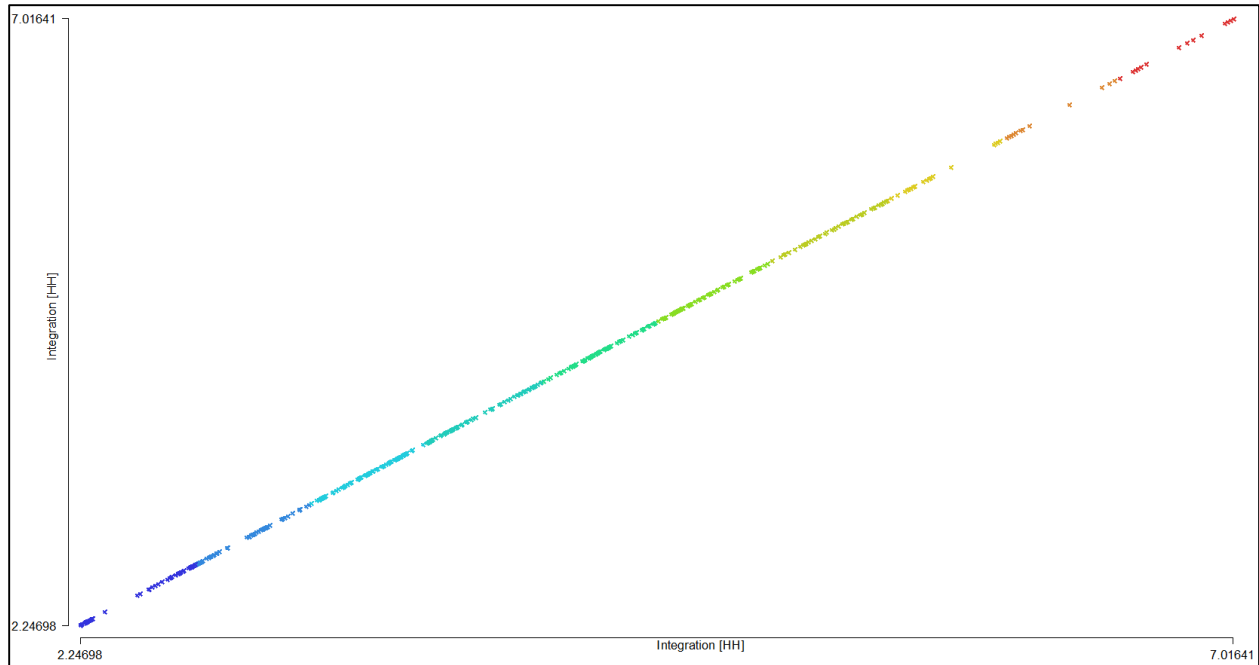


Figure 64: Axial integration value of optimized proposed master plan- option 1 (sim 3), Global integration scatter plot, Rn, (Min 2.25, Max 7.01), (source: Author, DepthMapX, 2020)

Also, as per the space syntax simulation, the predicted axial lines between both sides of Al Auroba street which connecting Al Hisn plaza with Al Rola park, indicates a connected path might be created between them in the next step of the design process. This result, enhance earlier findings of this study, to corroborates the iterative evaluation process as discussed earlier. This finding, while preliminary, suggests that to enhance the design proposal to get better integration and connectivity value, which going to be explored later on in the next optimized simulation- option two.

#### 5.2.2.4 The optimized proposed plan- option two (sim 4)

The design process was iteratively refined until it was possible to get the best values of all measurements evaluated by space syntax technology on both global and local levels and compare the outcomes with the current existing plan and the proposed master plan by Shurooq. To enhance the physical and visual connectivity, Also being integrated within the surrounding neighborhood.

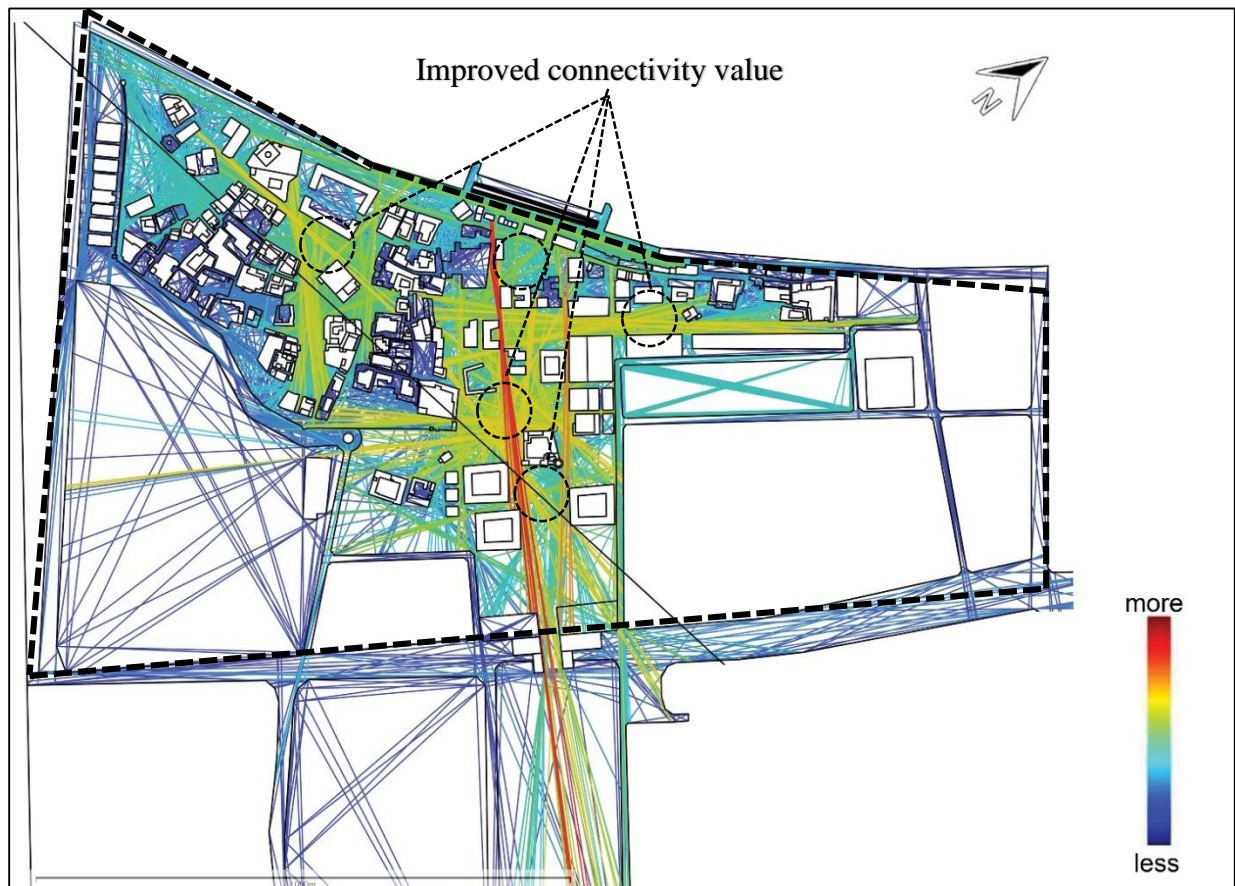


Figure 65: Axial line analysis of optimized proposed master plan- option 2 (sim 4a), Global connectivity, Rn, (source: Author, DepthMapX, 2020)

As presented in the Figure 65, the new design proposal is developed accordingly and structured in a way that increasing livability and to create attractive places in the urban context. The first decision after analyzing the previous options was decided to transform the corniche road into a big platform and interactive plazas. By transferring the corniche road either into an underground tunnel

or to shift the traffic into the other side of Al Khour. This will promote a car-free environment, and attract more pedestrian activities where they can flow easily toward the heritage and art area through organic sustainable corridors, which can enhance the movement flow through these pathways physically and visually. In addition to that, those vistas will enhance the fresh breeze coming from the sea, which will have a good impact on the air quality and thermal comfort for users.

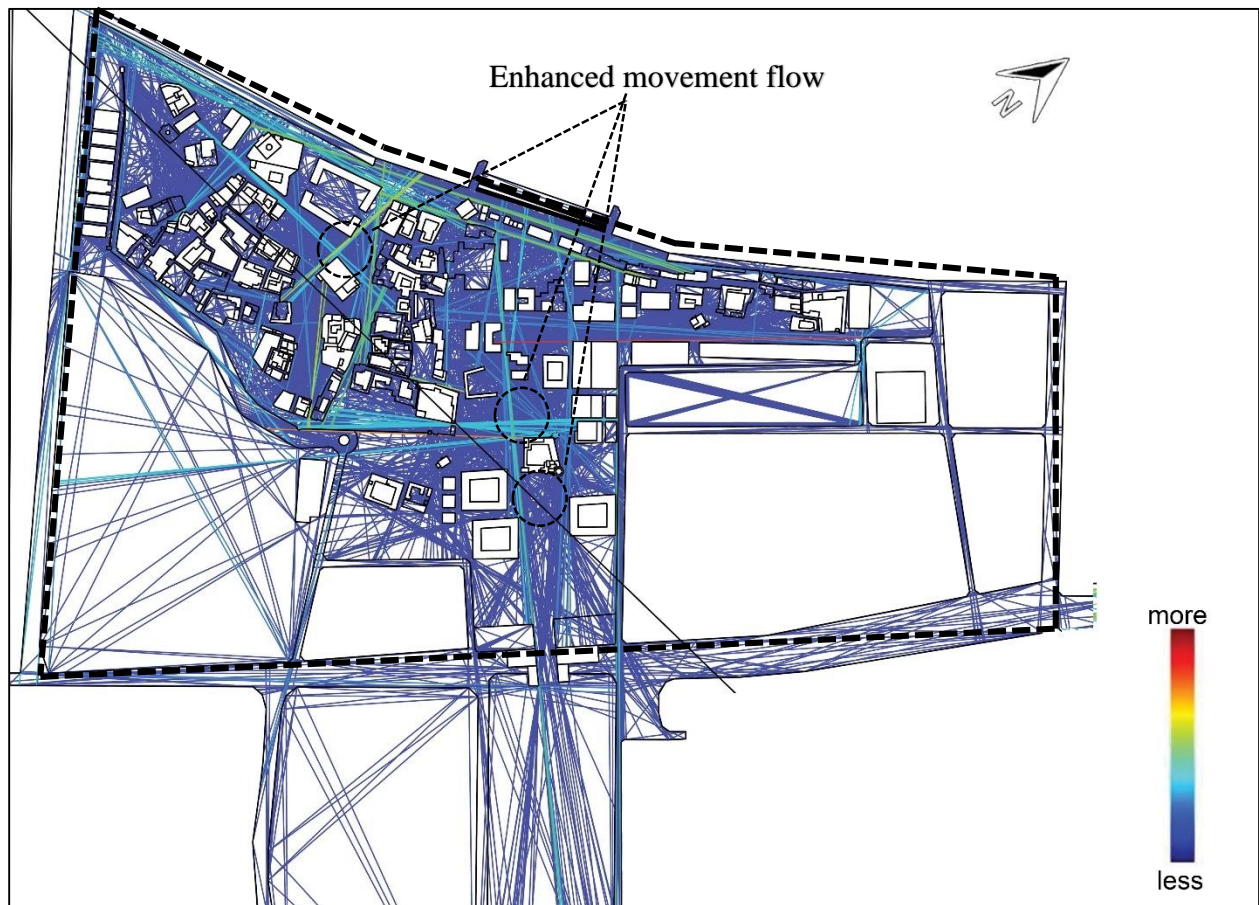


Figure 66: Axial line analysis of optimized proposed master plan- option 2 (sim 4a), Global choice, Rn, (source: Author, DepthMapX, 2020)

Further strategies were implemented in this option. For instance, enlarging and enhancing the traditional boat deck. This improvement will enhance the connectivity and easiest move of people

around the main attractions in the city by using environmentally friendly public transport, in addition to the interesting traditional experience. This alternative will promote the pedestrian experience along the promenade in safe and secured pathways and green spaces. On the other hand, the bank street area which contains the demolished modern buildings as proposed by Shurooq was replaced by regenerated old fabric in the Al Hisn area integrated with interactive spaces. As shown in Figure 66, the choice value was enhanced in the study area which means more flexibility of movement pathways around the area.

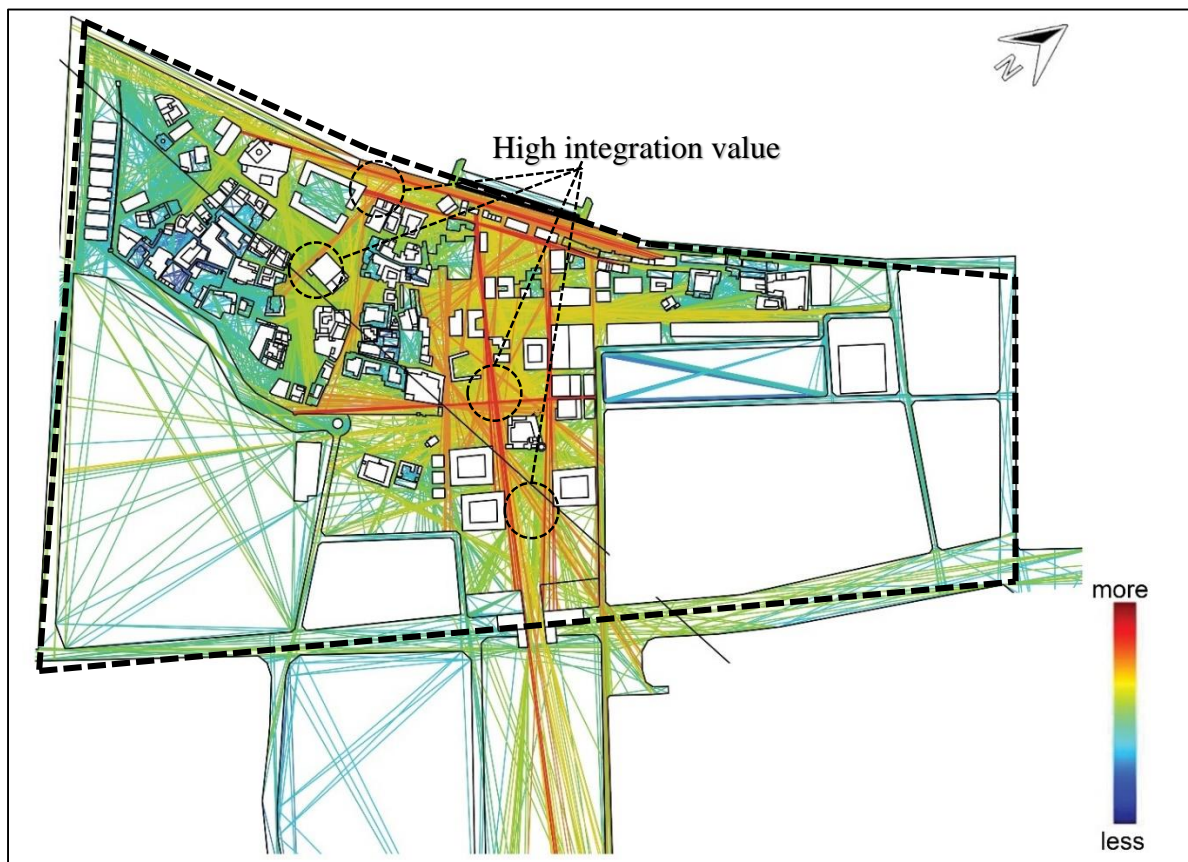


Figure 67: Axial line analysis of optimized proposed master plan-option 2 (sim 4a), Global integration,  $R_n$ , (source: Author, DepthMapX, 2020)

Furthermore, many studies and research were presented Since COVID-19 spreads, about how this pandemic will affect people's behavior in public spaces. Also, as all of us, we experienced the big impact of the lockdown on the way we move in our cities. In this view, Al Hisn plaza will be

designed as a central plaza for special events and ceremonies. Also, create a pedestrian bridge to connect the historical district with Al Rola park as seen in Figure 67. Meanwhile, the integration value was enhanced in this location in comparison with the previous simulations which account for (7.87) at the global level. The result of this analysis proved the final design proposal will lead more agents inside the spaces as shown in Figure 68.

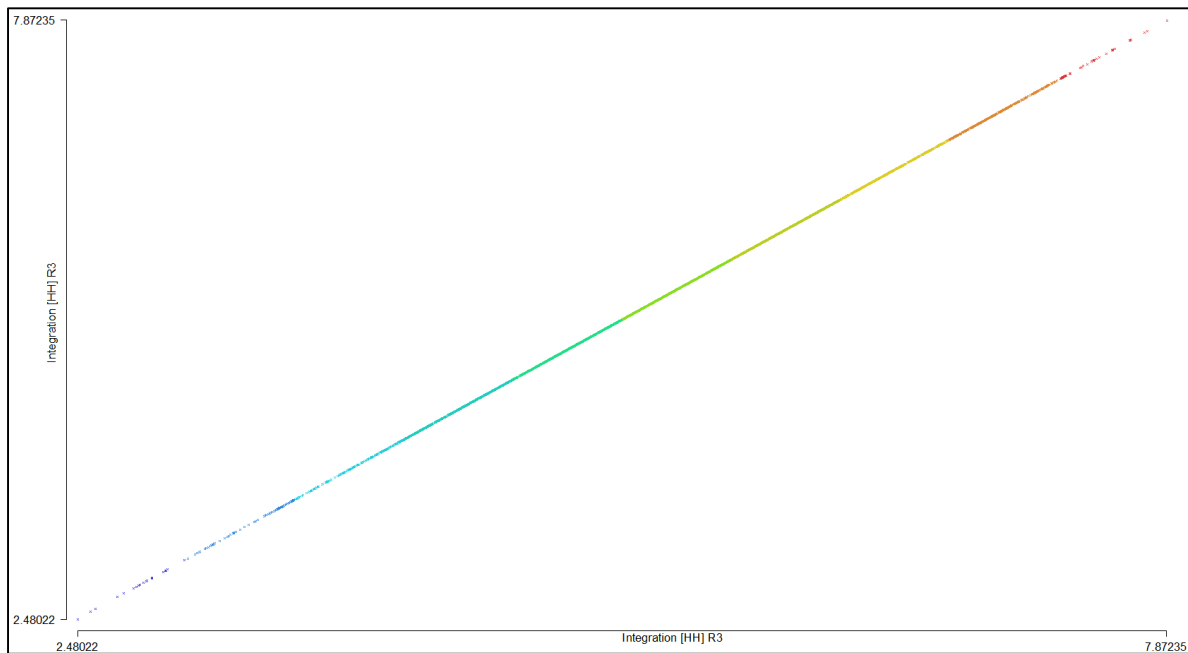


Figure 68: Axial integration value of the optimized proposed master plan- option 2 (sim 4a), Global integration scatterplot, Rn, (Min 2.48, Max 7.87), (source: Author, DepthMapX, 2020)

The final design result represents the possibility of revitalizing the area by implementing the suggested strategies. Meanwhile, the results show the effectiveness of the proposals to strengthen and reconnect the area with the waterfront through huge development works that were required to be implemented in the corniche road from the waterside. Also, the pedestrian bridge connection with Al Rola park from the landside. Consequently, this will require a feasibility study to ensure the sustainability of the solutions. However, leading to an increment in the livability of the historical center, thus promoting an economic and social vital core.

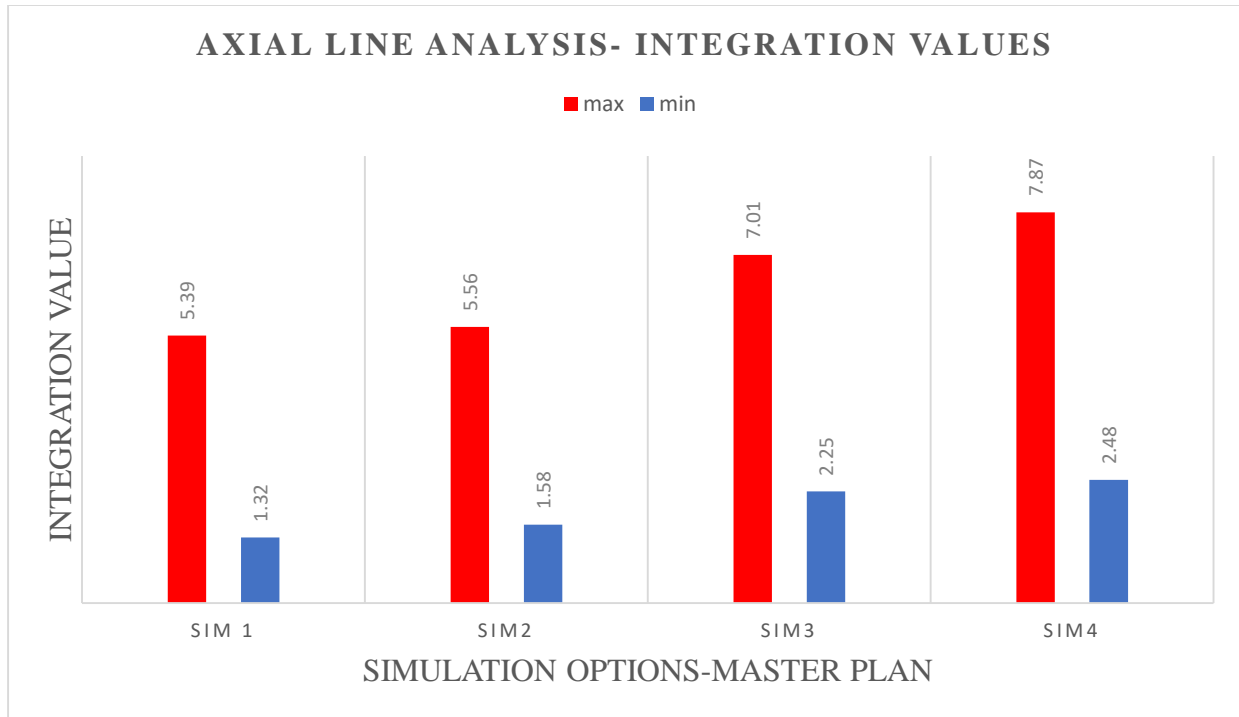


Figure 69: Axial line analysis chart of all simulations at the global level Rn as following: (sim1): existing master plan, (sim2a): shurooq proposed plan, option 1 (sim3): optimized proposed plan, options 2 (sim4a): optimized proposed plan, (source: Author, 2020)

The above chart Figure 69, illustrates the integration value of all axial line analysis results at the global level (Rn) for all master plan simulations of the study area.

Overall, it's evident that the optimized proposed design option two (sim 4a) measured the highest integration value at the global level which almost (7.87). Whereas the least integration value is shown at the existing master plan sim1, (5.39). furthermore, comparing these two measures showed that, the most significant increment in the integration value around half 46% among them. Whereas, the max integration value of the proposed master plan by Shurroq- sim 2a is measured (5.56), which is enhanced by a very tiny fraction just below 4% in comparison to the existing master plan.

However, the optimized proposal plan option one (sim3), was improved by roughly one quarter 26% in comparison with Shurooq proposed master plan (sim2a). On the other hand, the optimized proposed plan option two (sim 4a), its integration value results increased by 41% in comparison with the Shurooq proposal (sim2) at the global level Rn.

Based on the axial analysis results and the predictions provided from space syntax, the selected optimized proposal for this study will be option two (sim 4). Consequently, design validation analysis will be conducted on the local level R800. While the next section will discuss the local level simulations test on both the selected proposed plan option 2 and compare it with Shurooq proposed master plan as part of the iterative design process.

### **5.2.3 Axial Analysis on the Local Level**

The analysis was repeated within a metric radius of 800m as a walking distance within the community which required 10 minutes. The below map Figure 70 shows the result of the local integration value between the buildings. as seen in the heritage area, the spaces were more connected from the waterfront side. But, the historical wall side still isolates the area from the adjacent neighborhood. On the other hand, Al Hisin area and the Art area are still segregated and have a lot of disconnected pathways and fragmented spaces. Which consequently resulted in the segregation of the Art area from the whole site.



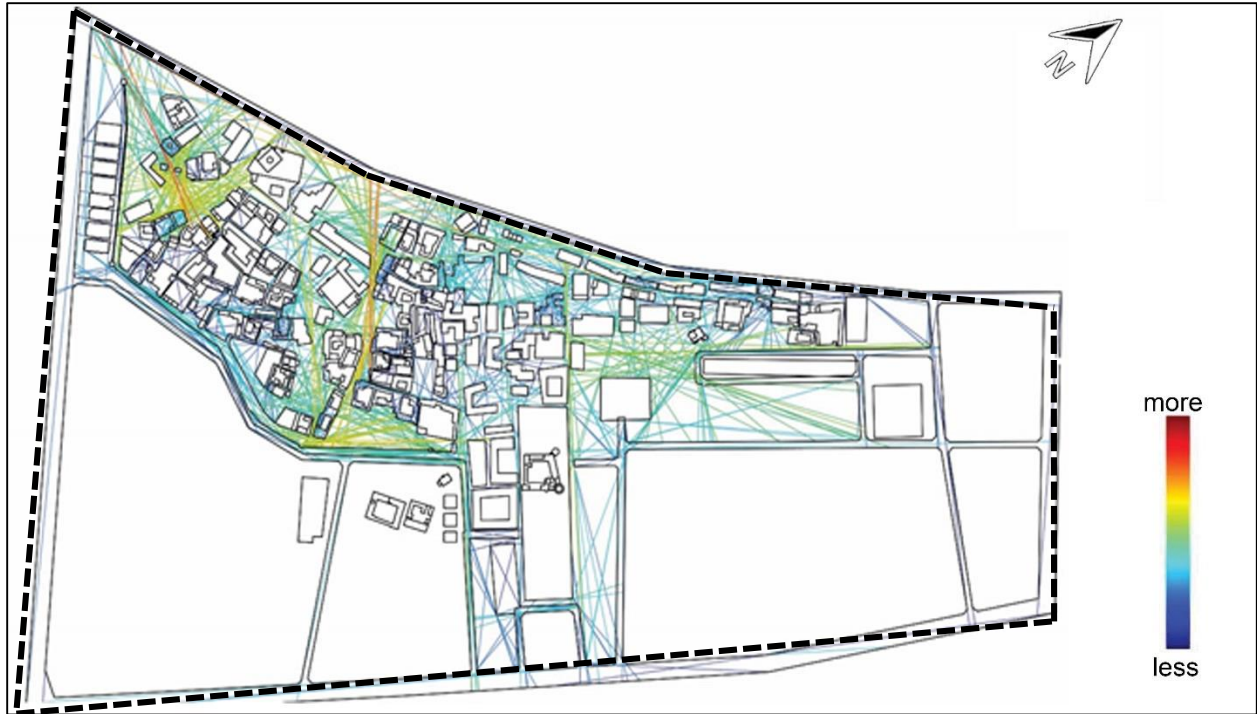


Figure 70: Axial line analysis of Shurooq proposed master plan (sim2b), Local integration, R800, (source: Author, DepthMapX, 2020)

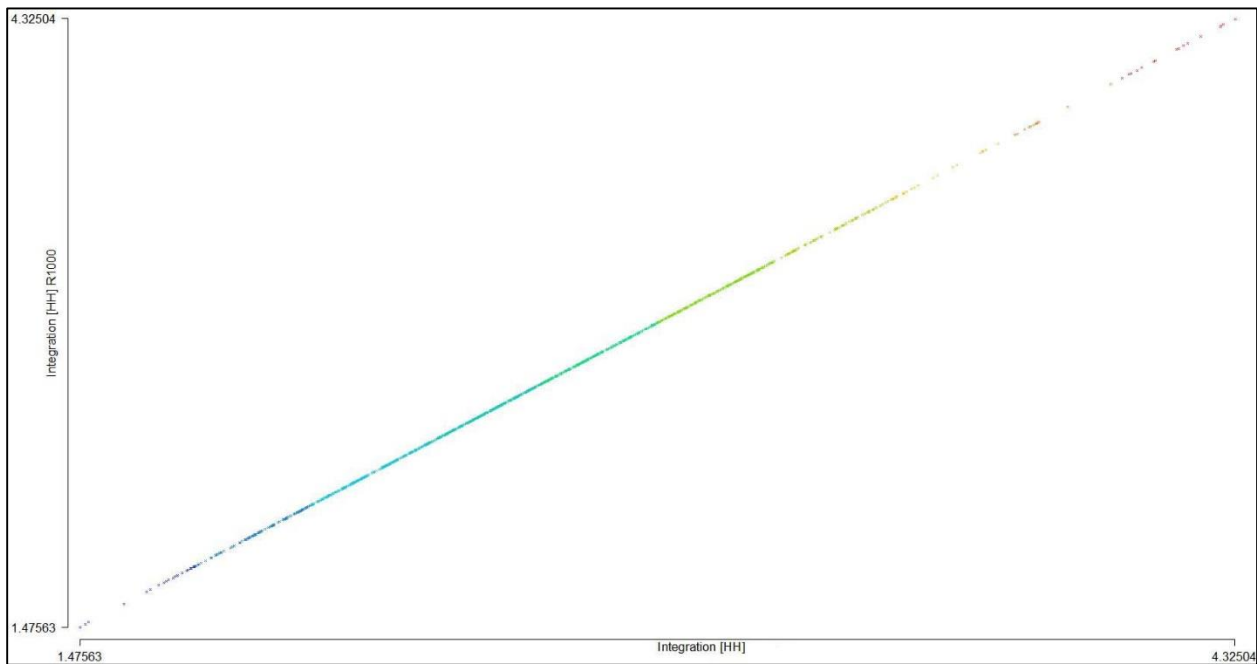


Figure 71: Axial integration value of Shurooq proposed master plan (sim2b), Local Integration Scatterplot, R800, (Min 1.4, Max 4.32), (source: Author, DepthMapX, 2020)

The above scatter plot Figure 71 provides information on the min and max values of the integration of this analysis around (4.32), which is less than the value measured at the global level for the same plan. Together these results provide important insight and predictions from the axial lines where the fragmented area is located, which needs to be enhanced in the future. Also based on the space syntax theory, these lines can be helpful to predict the movement flow, so the optimized options will be built on those analytical forecasting lines. We must entirely rethink this space to enhance the lack of accessibility and congested urban configuration to create more livable spaces and create a better visiting experience.

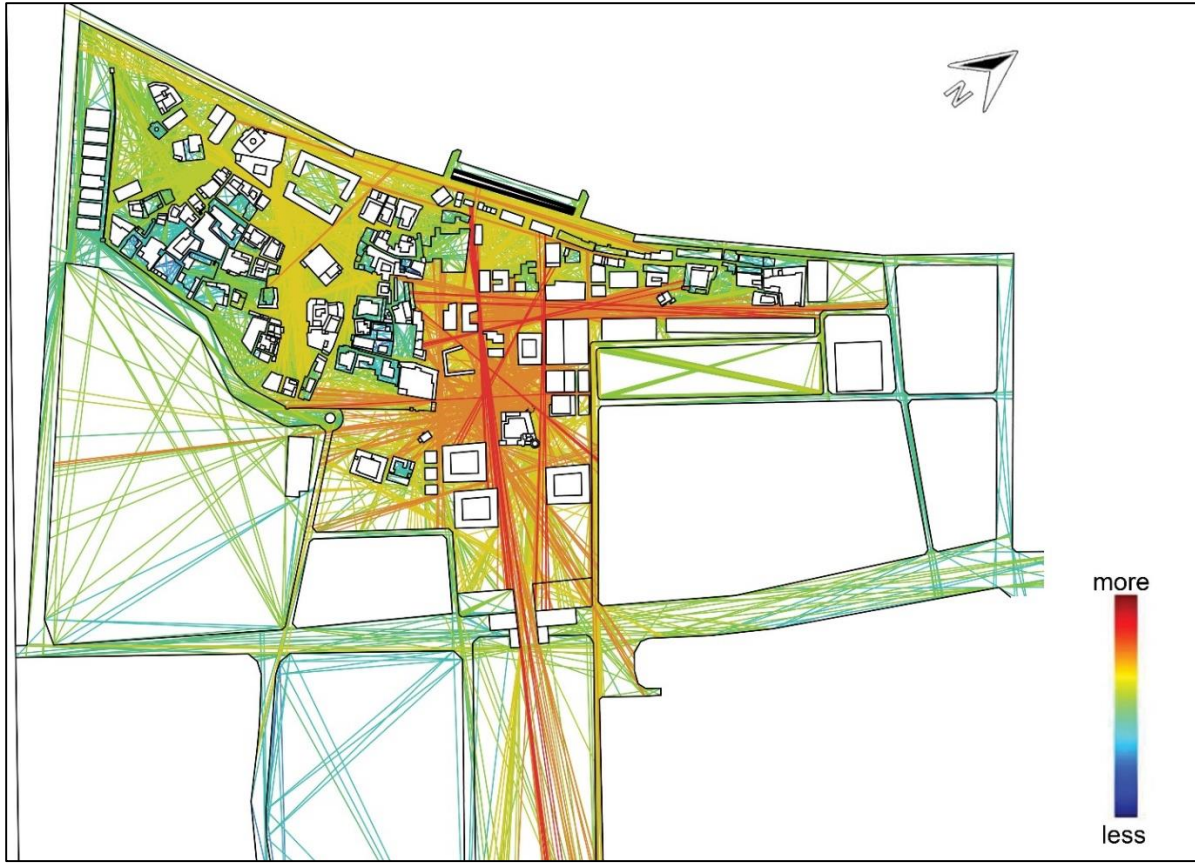


Figure 72: Axial line analysis of optimized proposed master plan- option 2 (sim 4b), Local integration, R800, (source: Author, DepthMapX, 2020)

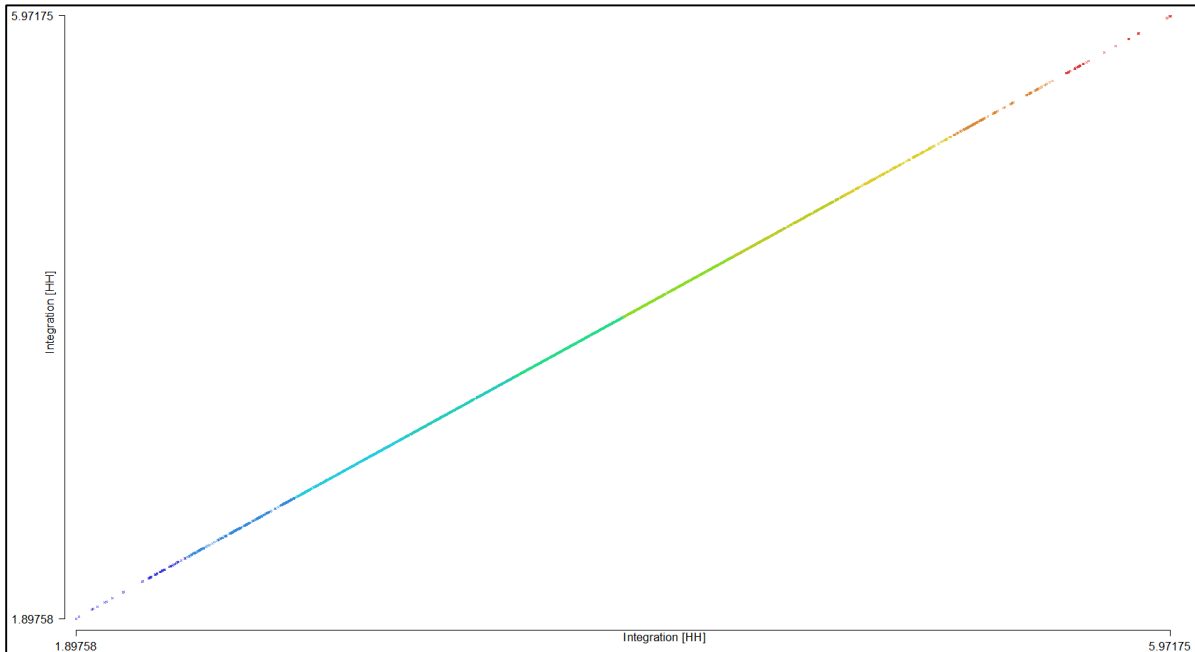


Figure 73: Axial integration value of optimized proposed master plan- option 2 (sim 4b), local integration, R800, (Min 1.897, Max 5.97), (source: Author, DepthMapX, 20)

The above Figure 72 represents the optimized proposed master plan (option 2- sim4b), an axial analysis was conducted on the local level R800 As continuity of the evaluating process for the proposed design. Figure 73, shows that the results are significant at the majority of the area around (5.97), which at the same time still higher than the value was recorded in the proposed design by Shurooq (sim 2b) on the same level (R800) which was almost (4.32).

On the other hand, it's noticed that the integration level near the historical wall in the heritage area still showing low values of integration. The analysis demonstrates that this wall isolates the area from the adjacent neighborhood, as well as from the rest of the heritage area. Also, the urban configuration of the old building which almost ruins as noticed during the site visit needs to be considered in future studies and how can be improved. Unfortunately, the area represents a low potential for pedestrian movement not only due to the spatial structure but also the safety and the quality of the spaces that need to be enhanced through strategic proposed actions. This area required intervention on the building level as well. Indeed, as a heritage area required special collaboration with the Archeological department in the city to evaluate the possibilities of the enhancement of the urban structure in that area.

With regards to this result and to ensure the reliability of the previous results. visibility graph analysis (VGA), to be conducted to continue the evaluation process of the selected optimized proposal option two (sim4) and compare the results with Shurooq proposal subsequently.

### 5.3 Visibility Graph Analysis (VGA):

#### 5.3.1 Heart of Sharjah (VGA)- Global level



Figure 74: Visibility Graph Analysis (VGA),(A) Shurooq master plan, (B) optimized proposed master plan option (2), Global level, (source: Author, 2020)

At the final stage of the analysis and as a follow-up to the iterative process, the final evaluation and concept validation process is carried out using visibility graph analysis for the selected optimized design option (2), as chosen based on the result from the previous analysis and compares it with Shurooq master plan at both the global and local level. This research offers valuable insights into problems relating to spatial awareness and how to locate knowledge in public urban spaces. In addition, figure out the visual experience inside spaces. While the final test of the concept plan helped to examine the consistency of the final project and allowed a comparative pre-and post-configuration rating. However, isovist represents the connectivity value considered to be a complex measure and is thus considered to be a time-consuming analysis.

In the meantime, space measurement study has had a long background in various fields of knowledge as described by (Varoudis 2014). VGA found an attractive way of thinking about the layers of the urban environment, as it addresses spaces from the user's perspective as they experience, communicate with, and pass through it.

As shown in Figure 74, the results of the global level analysis represent a clear difference between the visual experience of spaces. As well as improvement found in the connectivity value in the whole area of the optimized proposed plan in comparison to the Shurooq master plan. Whereas, spaces highlighted with red showing a high level of connectivity and visibility, which can be used as spaces for events or sitting areas, as well as for gathering and social interaction. On the other hand, spaces highlighted with yellow represent the lowest value of connectivity or the least visibility. Further analysis was conducted at the local level for each area of the site separately, defined as Heritage area, Art area, and Al Hisin area.

### 5.3.2 Heritage Area (VGA)- Local level

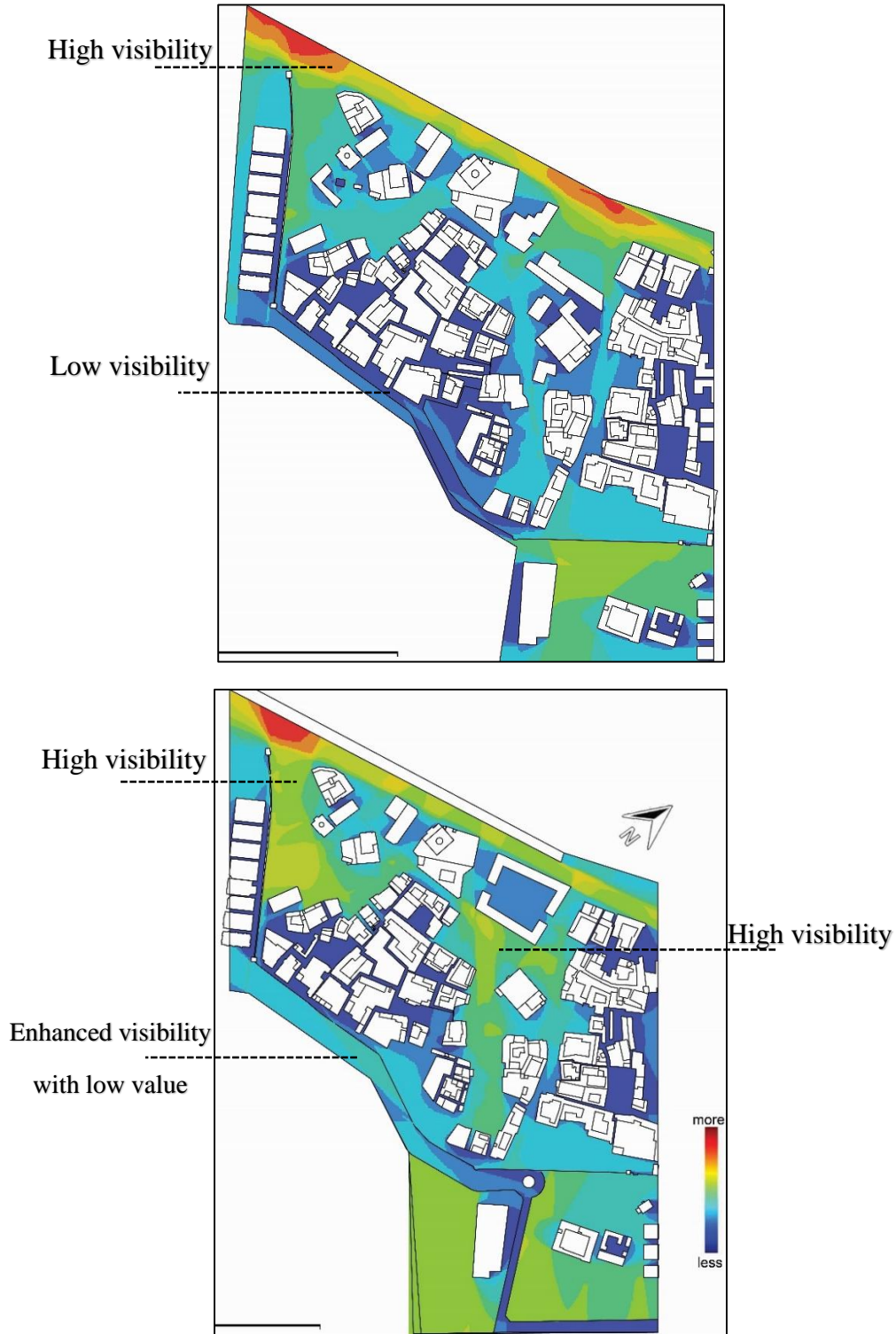


Figure 75: Visibility Graph Analysis (VGA), Heritage Area (A) left map Shurooq master plan, (B) right map optimized proposed master plan, Local level, (source: Author, 2020)

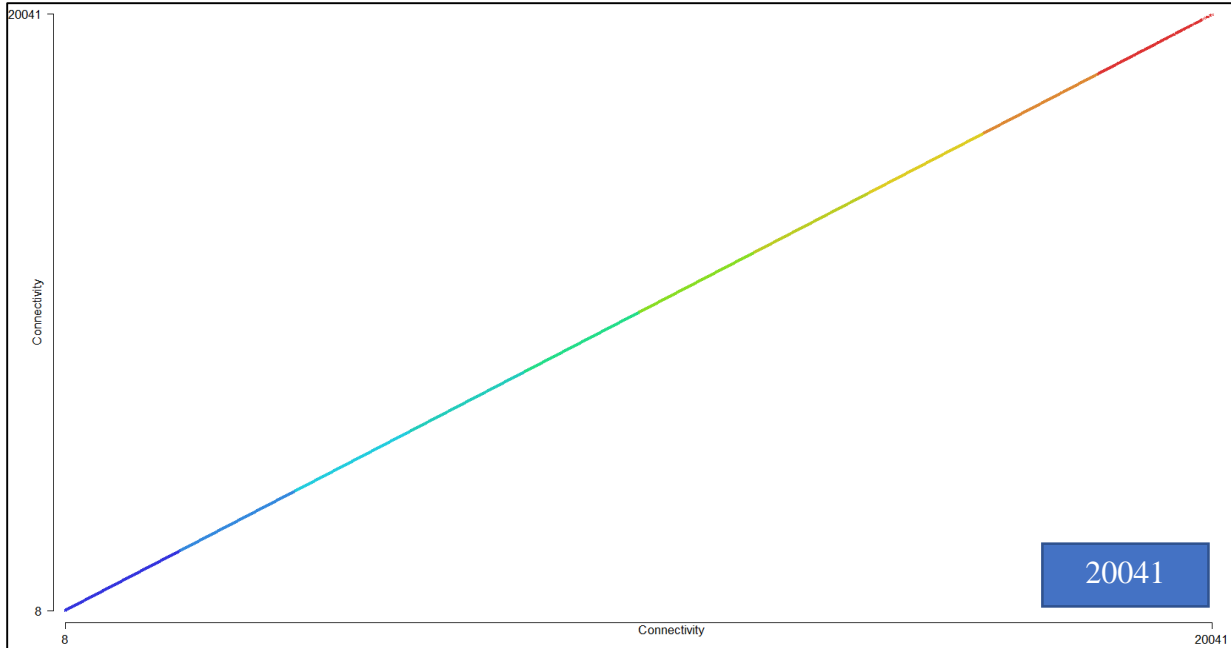


Figure 76: Visibility Graph Analysis (VGA), Heritage Area, Shurooq master plan connectivity value (Max:20041), Local level, (source: Author, 2020)

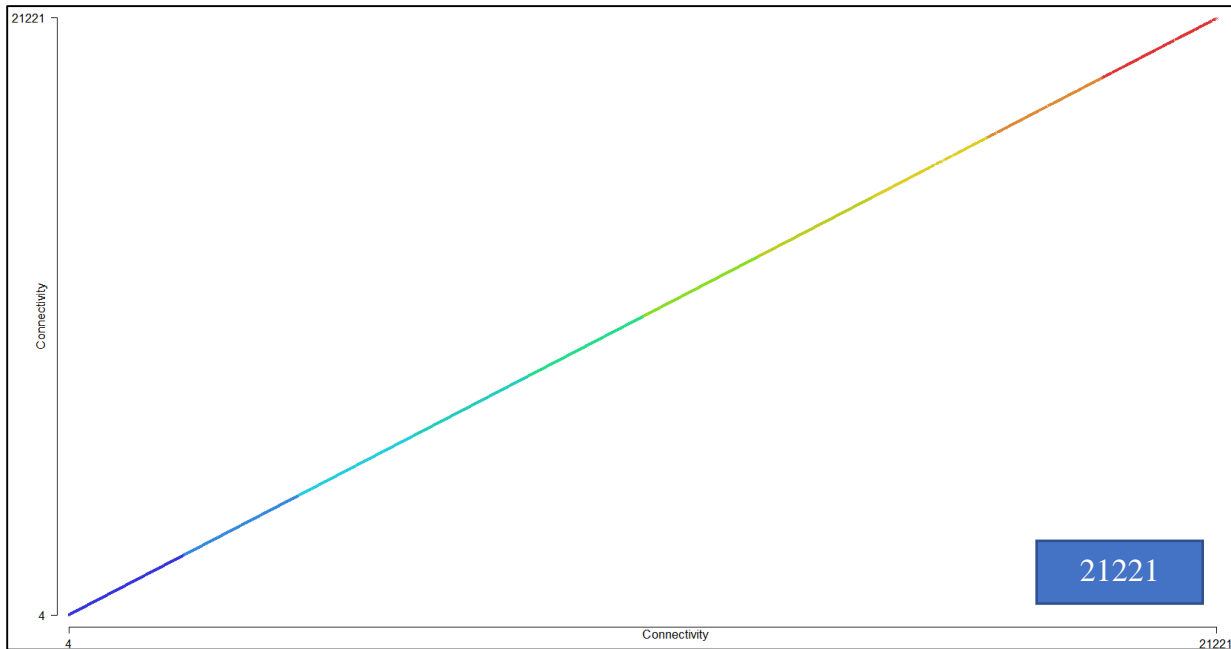


Figure 77: Visibility Graph Analysis (VGA), Heritage Area, optimized proposed master plan- option 2, connectivity value (Max 21221), Local level, (source: Author, 2020)



Interestingly, the Heritage area was improved in terms of visual connectivity as shown in the above Figure 75. Meanwhile, the connectivity value slightly increased by a tiny fraction (+6%) in the optimized proposed design as shown in the above scatter plot figure (76,77). This led to strengthening the safety in this area, also enhance the experience of the creative users either working or visiting this area which already rich in historical buildings used as art galleries, calligraphy centers, museums, and many more creative spaces to encourage people to share knowledge and ideas by adding landscape elements, sculptures, sitting area to improve social interaction among them. However, no significant difference was found in the historical wall area which forms a physical barrier disconnecting the heritage area from the adjacent neighborhood. In this regard, a collaboration to be invested with the archeological department in Sharjah city to discuss the opportunities to enhance the visibility in this area as well as the physical connectivity to ensure the safety, and the quality of spaces for all users.

### **5.3.3 Art Area (VGA)- Local level**

as shown in the below Figure 78, the map represents a gradual enhancement of the connectivity between the old souq area and the art public space This will have a great effect on improving the movement flow through these spaces, which will be more flexible toward the shops, café, and other services. Subsequently, will enhance the walkability in the area and sense of the place. As well as, provide the users the opportunity to decide their movement flow in an accessible way.

It is interesting to note the reality of the analysis, by highlighting the public space surrounded by Sharjah Art Foundation and Sharjah Art Museum in red color which represents a highly visible space that can be improved to be an outdoor exhibition for art pieces and sculptures.

Also it can be an amazing space for the creative users and the visitors of this area to share knowledge and ideas through enhancing the landscape and hardscape features of the space to convert to a creative place.

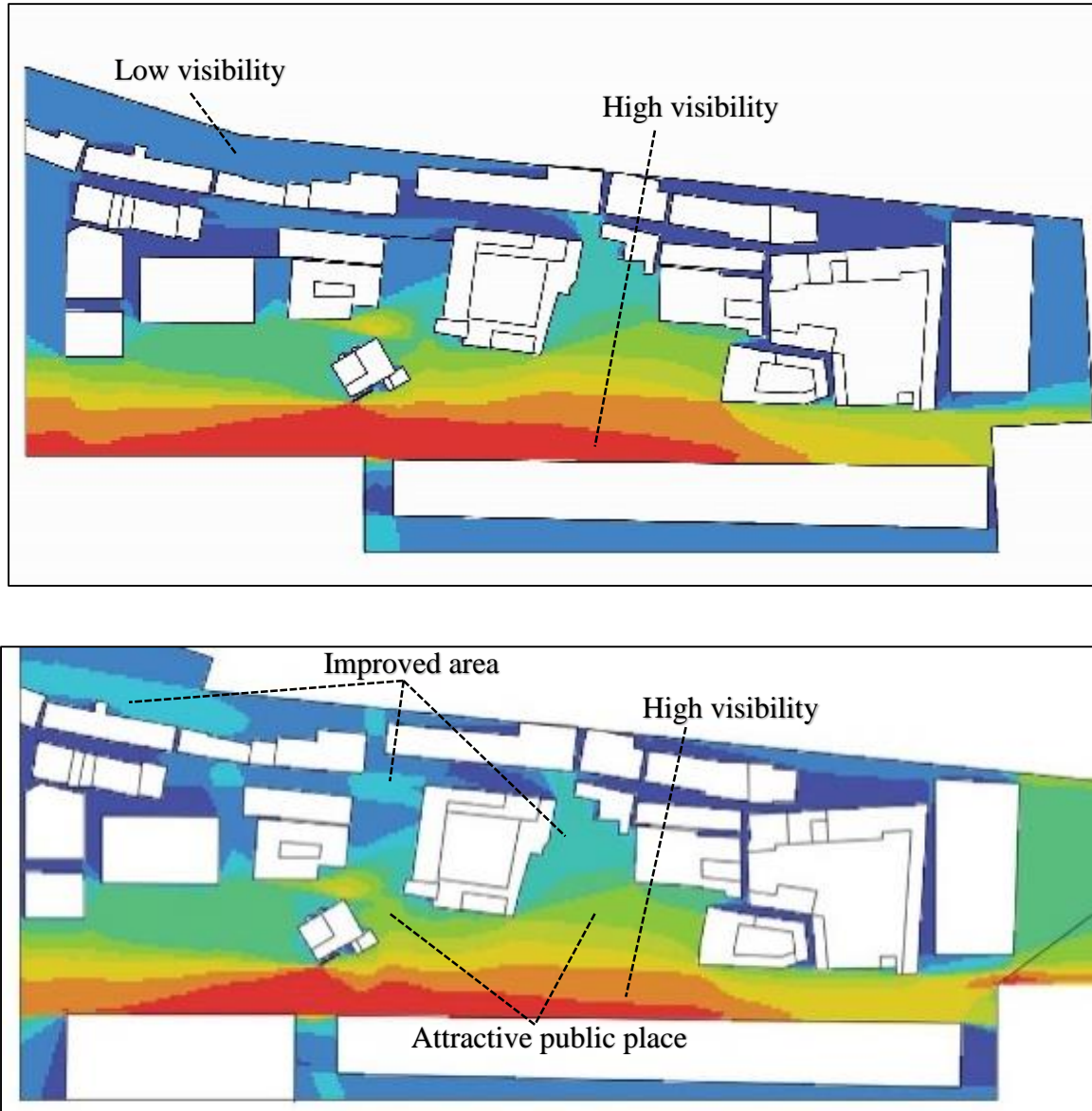


Figure 78: Visibility Graph Analysis (VGA), Art Area, (A) Shurooq master plan (sim2), (B) optimized proposed master plan option-2 (sim4), Local level, (source: Author, 2020)

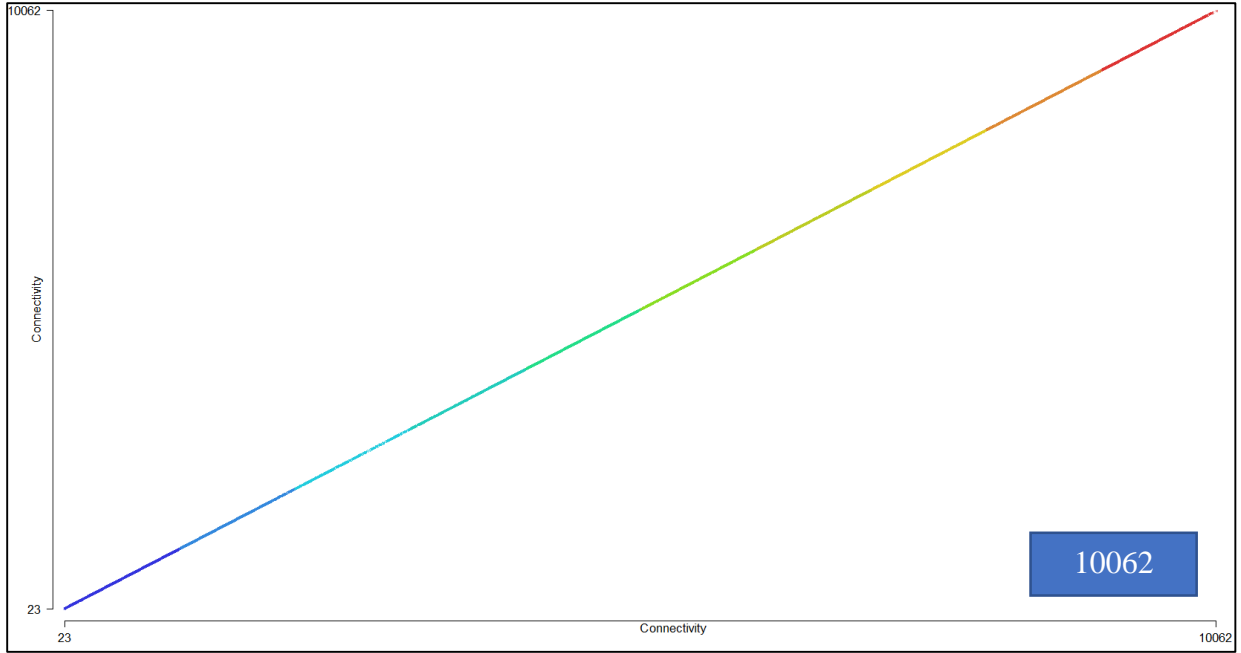


Figure 79: Visibility Graph Analysis (VGA), Art Area, Shurooq proposed master plan connectivity value (Max 10062), Local level, (source: Author, 2020)

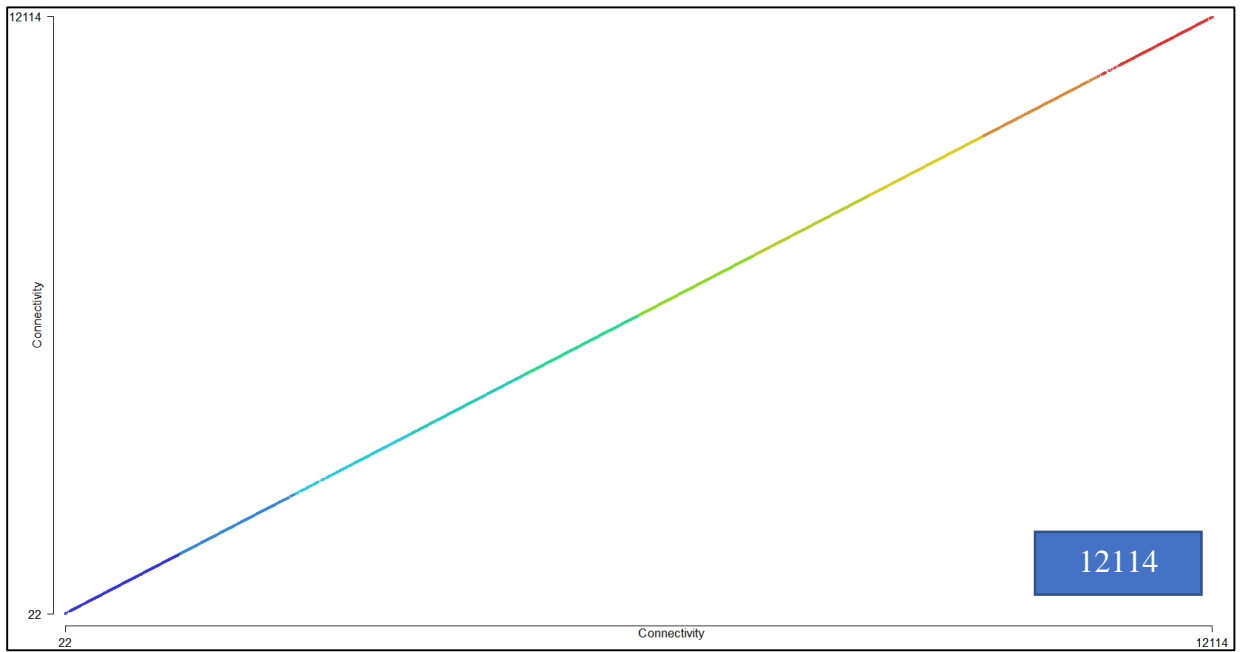


Figure 80: Visibility Graph Analysis (VGA), Art Area, optimized proposed master plan connectivity value (Max 12114), Local level, (source: Author, 2020)

Furthermore, as shown in the above figures (79,80), The scatterplot represents a small portion of the improvement in the connectivity value of the optimized proposed plan which almost (16%), Meanwhile, this analysis can be useful for forecasting the identity of the place through adding landscape, and hardscape features, lighting, signage system, trees, shading elements, as well as predict the best pathway for walking and cycling pathways to be connected to the adjacent neighborhoods. It can help the designers to decide the best places to locate these features which will activate public spaces for a healthy lifestyle by keeping in mind physical distancing.

#### **5.3.4 Al Hisin Area (VGA)- Local level**

A notable development in the connectivity value has been demonstrated, As shown in the below Figure 81. Al Hisin area reported significant visibility than in the other two areas. The connectivity value measures nearly a third in the local level of the optimized master plan as shown in the below figures (82,83). This significant result of this analysis proved that the final optimized design proposal option two will lead more agents inside the Al Hisin central plaza. Due to the pathway was created between Al Rola park and Al Hisin plaza over one of the most integrated highways in the area which is Al Aruba street.

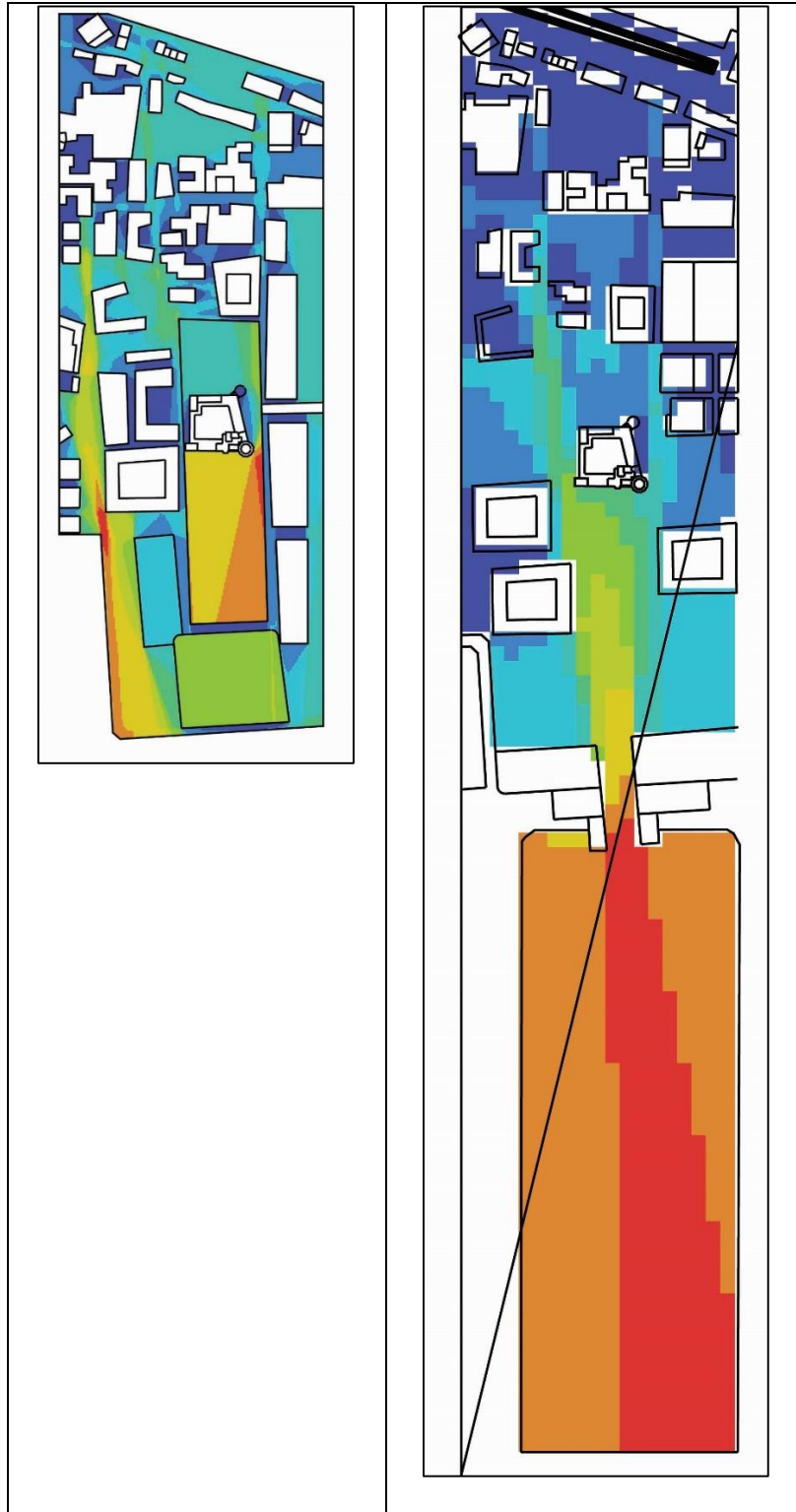


Figure 81: Visibility Graph Analysis (VGA), Al Hisin Area,, (A) left map Shurooq master plan, (B) right map optimized proposed master plan, Local level, (source: Author, 2020)

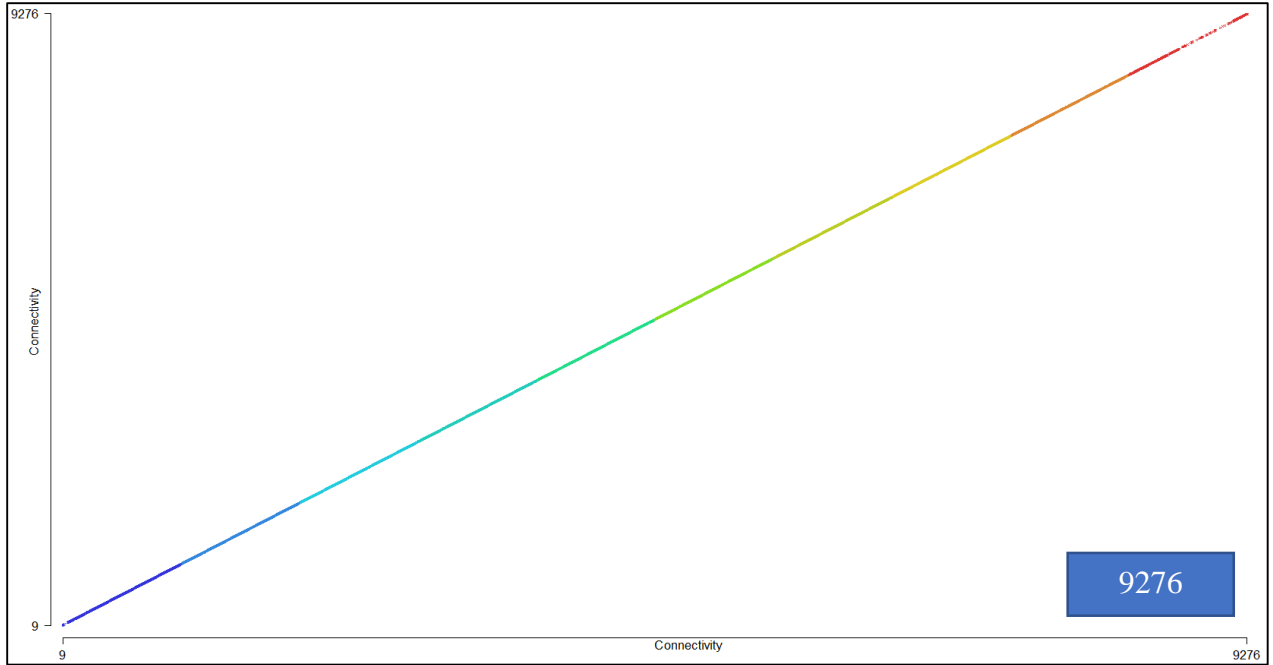


Figure 82: Visibility Graph Analysis (VGA), Al Hisin Area, Shurooq proposed master plan connectivity value (Max 9276), Local level, (source: Author, 2020)

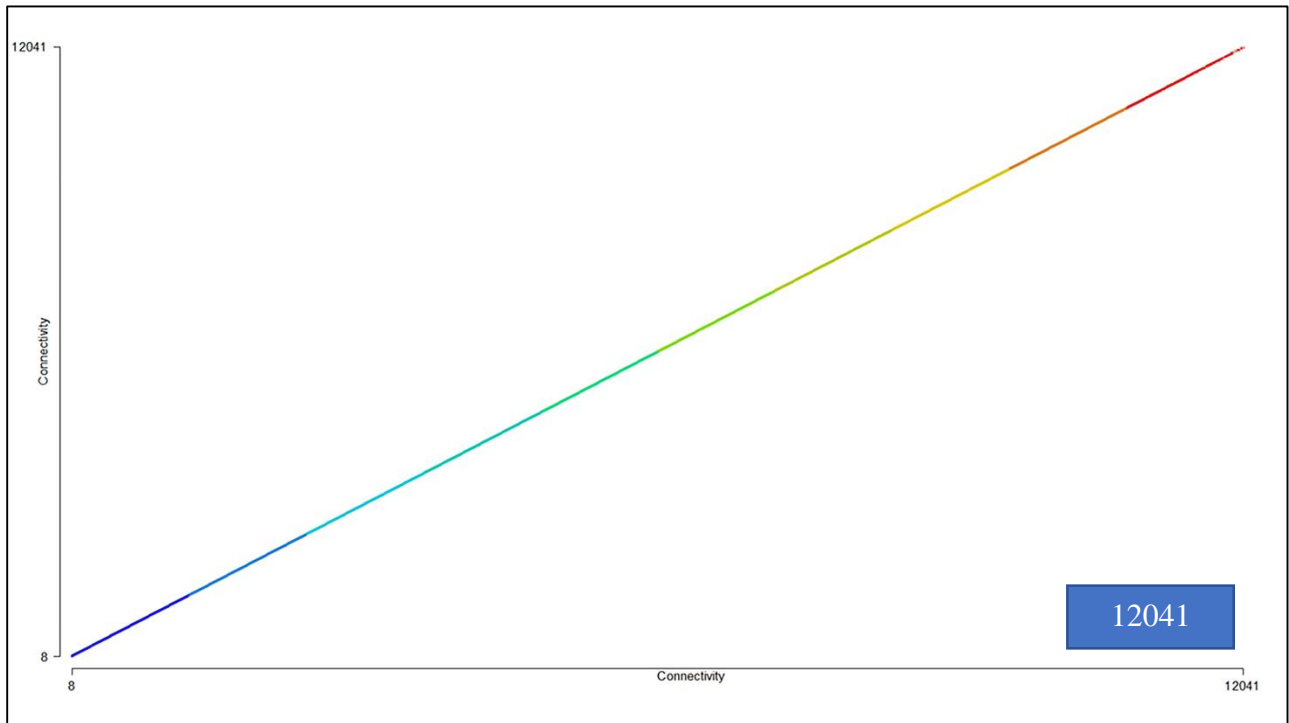


Figure 83: Visibility Graph Analysis (VGA), Al Hisin Area, optimized proposed master plan connectivity value (Max 12041), Local level, (source: Author, 2020)

#### **5.4 Summary of Chapter 5: Space Syntax Result**

To conclude, its appearance in this analysis that the waterfront area showing the least connectivity in the local level simulation in this area specifically. But as revealed in the global level analysis it was visually connected in comparison to the Shurooq proposal. Therefore, as noted earlier, this result due to the concept of isovist size which represents the number of connections that the node has with other nodes in the system. Overall, to summarize, as highlighted through the results that the optimized proposed design option (2), significantly improved in terms of the level of connectivity, integration, and visual and physical accessibility in comparison with Shurooq proposal. Meanwhile, The visibility graph analysis represents that the area compromises a tangible improvement resulted in an increment of just over half of the connectivity value.

The findings of the current study are consistent with Hillier (2007) knowledge, It has been shown that the rational view is that the urban environment adds to the movement flow, such that it can draw travel attractors, such as supermarkets, to places where they can take advantage of the flow of movement and thereby attract extra people to shops. The informal chains between the trip generator and the trip attraction are, nonetheless, the maker of the urban configuration. Space syntax discusses these structures using contemporary mathematics and computational science techniques. These technologies have been used to examine and visualize the various dimensions of the physical condition of the city's space network at different levels and to research how different structures are connected as individuals and societies through everyday movement.

**CHAPTER SIX**  
**CONCLUSION**



## **6 CHAPTER 6 CONCLUSION:**

In this investigation, this project was undertaken to regenerate the historical district in Sharjah city in UAE, to promote, revitalize the old city center, and recall the social and cultural identity of the study area. While this can be done by achieving the main aim of the study to enhance the connectivity of the Heart of Sharjah on the global urban level and local level.

However, during the first stages of the study understanding and assessing of relevant cases for other urban designer and researcher that address similar objective a profound base was established for the significance of the mixed-mode methodology for the urban projects due to its complexity which required a comprehensive approach to achieve the desired goals. This research builds overusing a quantitative and qualitative method by applying field study observations which add depth and richness to a research narrative, in addition to that, presented the potential of Space Syntax simulation process which in turn provided valuable guidance for applying integrative design process, which potentially made these research contributions serve as a base for future studies.

The study set some questions in which the answer would contribute to the ongoing research that focuses on sustainable urban regeneration practice for the historic district in the United Arab Emirates which significantly provide a progressive addition to the UAE vision 2021 to make UAE among the best cities in the world with taking in consideration the SDGs as an inclusive framework.

## **6.1 Research Summary**

Through analyzing and recognizing related cases with other scholars that discuss similar problems Subject to the latest proposals, there is no doubt that they have a growing impact on the development of a new vision of the old center. Field study and interviews were undertaken by the author have shown that many Emarati and other high-income classes are now visiting the old center due to modern social attractors, such as the Al Bait hotel, restaurants, art galleries, and museums. Tourists, who mostly stick close to the old hub, are encouraged to visit new culture and hospitality destinations. Another challenge in this context is the integration of low-income groups within the revitalization process. Subsequently, grown economic networks will be dissolving and many social groups are forced to give up their small shops and entrepreneurial initiatives.

Through literature review, it was found that the public spaces represent each stage of the city, groups of people, memories, light, colors, smells, all these factors we can experience in the old city centers in general, which improve our understanding of the past and visualize it to get the sense of place. This lead to design the spaces for different groups of people and users such as creating users, passive users, and reactive users. While the design of our built environment can enhance the user's creativity when it's arranged and designed in a way that promotes people to interact within those spaces to share knowledge and ideas.

The main purpose of this study is to regenerate the old center as one of the key historical hubs in Sharjah city. This objective will mainly depend on the successful implementation of an efficient comprehensive approach including strategies for enhancing the connectivity of public spaces to secure the accessibility of certain areas. However, the ultimate viability of Sharjah's old center will rely profoundly on more coherent and interconnected trends. To avoid fragmented projects, the infrastructure network and the construction of interlinked social spaces, as well as consistent

building standards, must become the key priority of future urban development. Whereas, Many scholars have concluded that decentralized spaces are a key component in our communities, along with mixed-use areas, so that residents can find their daily needs on foot without the need to use their vehicles to drive beyond their neighborhoods. Thus, reducing CO2 emissions and greenhouse gasses (GHG) inside our communities to build a friendly walking environment, improving people's health and well-being.

As well, the parametric grasshopper software adopted to generate and extract information, maps, and design elements was a very helpful tool during the lockdown in the city because of COVID-19 And has been successful in dealing with the complexities of the design activities in terms of design performance. Then the extracted information through the field study and using the parametric design was structured in a strong framework to be analyzed by Space Syntax technology through adapting various variables as introduced previously to regenerate the urban structure in an integrative process.

The results of the study described Sharjah City's actual picture, which indicates that much of the city's land area filled by wide lanes of traffic infrastructure, high-rise towers, retail outlets, and residential neighborhoods were scattered over the entire system and segregated from each other. Which needed further effort at the city level. In the meantime, the research findings have shown that it is very important for Sharjah's historic area to be carefully built as a connected, integrated, and interactive place that can dramatically change the social, economic, and environmental conditions of Sharjah's entire area. The heritage area has a lack of services and facilities between the galleries and the museum which affects the vitality of these places.

Additionally, As investigated through the visibility graph analysis, the livability of public spaces can be improved through the concept of narrative design experience which concentrating on social,

and cultural values through juxtaposition of events, experience and space movement. Activating green spaces for a healthy lifestyle, designing parks, and public spaces with keeping in our minds the physical distancing.

Finally, sustainable urban regeneration is an iterative process that is designed to investigate cities from a holistic perspective. To outline the work steps that provide this study with more flexibility and continuity in the design process and the findings, including major steps: identify and structure the work, assess the current situation, determine key problems and objectives, create alternative ideas, evaluate strengths and weaknesses, set up a strategic framework.

## **6.2 Research contribution**

This study was designed to analyze the importance of the connectivity and livability of public spaces in the old city center, and hence the quality of their performance based on possibilities to determine and identify the effect of significant variables introduced by space syntax which is (connectivity, integration, scatter plot, choice, VGA, global scale, local scale). Meanwhile, these parameters customized the research to focus on the main aims and objectives of the project and thus helped to simplify the iterative evaluation process to achieve optimistic design goals. Additionally, this work shows how to illustrate the effects of urban configuration on the movement flow either for pedestrians or vehicles are strongly correlated with certain measures through a few axial line maps that convey its ability to predict the movement rates, Linked with the core principles of urban configuration.

In the end, providing a solid foundation at any phase of the planning process, the incorporation of a broader set of inputs, and hence the application of any kind of further study for assessment purposes. Besides, help policy decision-making in urban planning and design initiatives and provide useful input for urban development proposals.

### **6.3 Linking Research Findings with Previous Studies**

Through researching and examining related cases with various scholars, it has been found that sustainable urban regeneration in historic districts generally requires the renovation or preservation of historic buildings. But the secret to fostering the spirit of life of these places is to be resilient enough to revitalize the social and cultural identity of these places. For this reason, Heart of Sharjah is a special case study in the UAE that was chosen to undertake this research to introduce a progressive regeneration with the needs of a new standard of life while preserving the uniqueness of the community and local values.

Meanwhile, this aligned with Sharjah tourism vision 2021 and with H.H Sheikh Sultan Bin Mohammad Al Qassimi as mentioned previously in the literature review. Through a literature review, it has been found that synergy between tourism and heritage sites makes it possible to achieve a systematic relationship. Since heritage tourism is considered to be an essential and attractive practice for both the tourist and the community. However, heritage tourism should not only be planned for international tourists but must, in the first place, be designed to raise awareness within local communities. This should encourage them to understand the value of their urban heritage, to be aware of the need to conserve it, and to pass it on to future generations.

Moreover, the complexity of urban design involving many variables which found to be the most effective factors in enhancing the connectivity and the livability of the historical district spaces and ensure its integration with the surrounding neighborhood in the whole system. Therefore, it was found, that applying the iterative design process as proved by many researchers that is the most effective approach to deal with the complexity of the urban design to achieve the holistic design framework and inclusive strategies. The applied process aligned with previous studies and researchers of space syntax theory specifically, where it was stated that creating future cities must

involve the concept of the intervention between the physical layers demonstrated in the urban configuration, along with the social layer which reflects the placemaking idea. Starting in small scale elements and ending up on the city level. As well, this thinking layer of the comprehensive approach meets the concept that promotes small steps on the microscale level to be repeated and enhanced to achieve the desired goals at the macro scale. Which will contribute to future research and the sustainable development of the area either on a microscale or on a macro scale. As part of the national strategy and vision of the UAE, 2021 sets the goal of being a leading regional and international model for a sustainable urban growth revolution that responds to the objectives of a united nation and guarantees stability for future generations.

#### **6.4 Future Recommendation**

In conclusion, this research seeks to use the problem of ambiguity of public open spaces as a motivation to encourage the creation of innovative methodologies for the restoration of urban spaces. It suggested a fully collaborative modeling approach to iteratively analyze the outcomes of the project and to generate forecasts. Accomplish better-informed recommendations for urban regeneration that acknowledge values of quality, safety, security, and equality. Further study will include future evaluation of the approach in other public open spaces, and community involvement would lead to the creation of cognitive strategies that making people an effective part of the community.

This thesis provides the basis for further studies to be investigated, concerning the various sectors discussed in this report, some of which are:

1. Active mode transport strategies as we are all aware of COVID-19 and its huge impact on the way humanities move in their cities.

2. Forecasting the correlations between movement, space, and lighting, to enhance pedestrian safety and urban spaces quality.
3. Proposing landscape and hardscape design strategies within each public space, in terms of materials, programs, shading elements to improve the sense of a place and user's experience.
4. A comprehensive study of the water ferry station design, and its accessibility to most of the touristic attractions in the city.

## 7 References

A. Iyer, K. Deboo, Sh. Gandhi, D. P. (2019). *ARCHITECTURAL & URBAN DEVELOPMENT OF SHARJAH: SPATIAL ANALYSIS OF MUSEUMS TYPOLOGY* [online]. Available at: <https://www.researchgate.net>.

Al\_Sayed, K., Turner, A., Hillier, B., Iida, S., Penn, A. (2014). *Space Syntax Methodology* [online]. Available at: [Bartlett School of Architecture, UCL, London](http://www.bartlett.ac.uk/SpaceSyntax/).

Ayşe Sema KUBAT, Yasemin İNCE GÜNEY, Ö. Ö. (2014). Historic city centers under threat : The case of, pp. 131–151. [online]. [Accessed 17 June 2020]. Available at: <https://www.researchgate.net>.

Batty, M. (2004). of Space Syntax. *Syntax*, vol. 44(0) [online]. Available at: <http://www.casa.ucl.ac.uk/>.

Boussaa, D. (2017). *Urban Heritage and Tourism in the Gulf: The Case of Dubai in the UAE*, (April 2014).

Boussaa, D. (2018). *Urban Regeneration and the Search for Identity in Historic Cities*.

"Corporate Profile - Vision & Mission". (2020). [Accessed 17 June 2020]. Available at: <https://sharjahtourism.ae/en-us/Corporate-Profile/Vision-Mission>

Department of Economic and Social Affairs. (2013). *World Economic and Social Survey 2013: Sustainable Development Challenges*. United Nations, Department for Economic and Social Affairs, pp. 1–181 [online]. Available at: [http://esa.un.org/wpp/documentation/pdf/WPP2012\\_KEY\\_FINDINGS.pdf](http://esa.un.org/wpp/documentation/pdf/WPP2012_KEY_FINDINGS.pdf).

Douglas, F.(2009): *Sustainable Urbanism: Urban Design ith Nature*, John Wiley & Sons,Hoboken, New Jersey.



Dursun, P. (2007). Space Syntax in Architectural Design. *The Journal of Chemical Physics*, vol. 69(3), pp. 1207–1212 [online]. Available at: <https://www.researchgate.net/publication/228646158>.

Dwimirnani, P. (2017). Space Syntax at Night : Measuring the spatial configuration in green open spaces by the influence of artificial light Space syntax at night : Measuring the spatial configuration in green open spaces by the influence of artificial light Putri Dwimirnani Se, (September 2016).[online]. Available At: <https://www.researchgate.net/publication/313719898>

Estidama. 2010. The Pearl Rating System for Estidama Community Rating System Design & Construction, Version 1.0: ABU DUABI URBAN PLANNING COUNCIL, UAE

Fawzi, R., Ameen, M., Li, H. & Mourshed, M. (2014). Sustainability assessment methods of urban design : A review Sustainability assessment methods of urban design : a review, (July).[online]. Available At: <https://www.researchgate.net/publication/277570536>

*Festival Gallery*. (2020). image [online]. [Accessed 17 June 2020]. Available at: <https://www.sharjahlightfestival.ae/en/gallery/>

Furlan, R. (2016). Urban Design and Social Livability: The Revitalization of the Corniche in Doha. *American Journal of Environmental Engineering*, vol. 6(3), pp. 73–87.[online]. Available At: <http://journal.sapub.org/ajee>

Furlan, R., Petruccioli, A. & Jamaledin, M. (2019). The authenticity of place-making. *Archnet-IJAR: International Journal of Architectural Research*, vol. 13(1), pp. 151–168.[online]. Available AT: <https://www.emeraldinsight.com/doi/pdfplus/10.1108/ARCH-11-2018-0009>

Gharaibeh, A. (2019). Impact of the Engendered Fo ' raa Square on the City Expansion ; Square Efficiency and Attraction, (April).[online]. Available At: <https://www.researchgate.net/publication/332274489>

Gwilliam, K. (2013). Research in Transportation Economics Cities on the move e Ten years after q. *Research in Transportation Economics*. Elsevier Ltd, vol. 40(1), pp. 3–18.

Haapio, A. (2012). Towards sustainable urban communities. *Environmental Impact Assessment Review*. Elsevier Inc., vol. 32(1), pp. 165–169.[online]. Available At: <https://www.sciencedirect.com/buid.idm.oclc.org/science/article/pii/S0195925511000849>

Hadjri, K. & Boussaa, D. (2015). ARCHITECTURAL AND URBAN CONSERVATION IN Karim Hadjri & Djamel Boussaa, (February).

*Heart of Sharjah*. (2020). image [online]. [Accessed 18 May 2020]. Available at: <https://www.heartofsharjah.ae/heart-of-sharjah-project.html>

*Heart of Sharjah*. (2008).. Dar Al Omran (Planners, Architects,Engineers).2008

"Heartofsharjah.ae". (2020). [Accessed 18 June 2020]. Available at: <https://www.heartofsharjah.ae/>

*Historical map of Sharjah from 1820*. (2020). image [online]. [Accessed 17 June 2020]. Available at: <https://universes.art/en/art-destinations/sharjah/tours/sharjah-creek/02>

Hillier, B. (2007). *Space is the machine* [online].Available at: [www.spacesyntax.com](http://www.spacesyntax.com) Copyright.

Hussein, N. (2017). The Pedestrianisation and Its Relation with Enhancing Walkability in Urban Spaces. *Contemporary Urban Affairs*, vol. 2(1), pp. 102–112.[online]. Available At: <https://doi.org/10.25034/ijcua.2018.3666>

Karimi, K. (2017). A configurational approach to analytical urban design : ‘ Space syntax ’ methodology, (December 2012).[online]. Available At: <https://www.researchgate.net/publication/263324768%0AA>

Köppen-Geiger. (2018). "World Maps of Köppen-Geiger climate classification". Koeppen-geiger.vu-wien.ac.at [online]. [Accessed 8 October 2020]. Available at: <http://koeppen-geiger.vu-wien.ac.at/>

LEED ND, (2009):*Technical Guidance Manual for Sustainable Neighborhood: How to Use the LEED for Neighborhood Development Rating System to Evaluate and Amend Local Plans, Codes,*

*and Policies*, US.Green Building Council [online] [Accessed 1 october 2020] Available at: [www.USGBC/nd](http://www.USGBC/nd)

Littke, H. (2015). Planning the green walkable city: Conceptualizing values and conflicts for urban green space strategies in Stockholm. *Sustainability (Switzerland)*, vol. 7(8), pp. 11306–11320.[online]. Available At: <https://www.mdpi.com/2071-1050/7/8/11306/htm>

Mathew, C.,Tim,H., Taner, Oc. And Steven,T., (2003): *public Places – Urban Spaces: The Dimention of Urban Design*[online]. Available at : [www.sciencedirect.com](http://www.sciencedirect.com)

Montalto, V. & Saisana, M. (2019). *The Cultural and Creative Cities Monitor*.[online]. Available at: <https://op.europa.eu/en/web/general-publications/publications>

Moura, F., Cambra, P. & Gonc, A. B. (2017). Measuring walkability for distinct pedestrian groups with a participatory assessment method : A case study in Lisbon Landscape and Urban Planning Measuring walkability for distinct pedestrian groups with a participatory assessment method : A case study in. *Landscape and Urban Planning*. Elsevier B.V., vol. 157(January), pp. 282–296.[online].Available At: <http://dx.doi.org/10.1016/j.landurbplan.2016.07.002>

Nation, U. (2017). *New urban a genda*. 2017th edn. Edited by H. I. Secretaria. London: United Nations [online].Available at: [www.habitat3.org](http://www.habitat3.org).

NATION, U. (2018). *World Urbanization Prospects : The 2018 Revision* [online].Available at: <https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf>.

Oliver Wyman. (2019). Achieving sustainable development goals in the uae [online].Available at: <https://fcsa.gov.ae/en-us/Documents>.

Omar, D., Omar, K. A., Othman, S. & Mohd Yusoff, Z. (2016). Walkability Design for Urban Public Housing Park. *Environment-Behaviour Proceedings Journal*. e-IPH Ltd., vol. 1(3), p. 311.[online].Available At: <http://dx.doi.org/10.21834/e-bpj.v1i3.375>

Pafka, E. & Dovey, K. (2018). Limits of space syntax for urban design : Axiality , scale and sinuosity. [online]. Available At: [journals.sagepub.com/home/epb](http://journals.sagepub.com/home/epb)

Pezzica1, C. & , João Ventura Lopes, A. C. R. P. (2017). INFORMED DESIGN DECISION-MAKING : FROM DIGITAL ANALYSIS TO INFORMED DESIGN DECISION-MAKING : FROM DIGITAL ANALYSIS TO URBAN DESIGN, (November). [online]. Available At: <https://www.researchgate.net/publication/321350396%0AINFORMED>

pps.org. (2020). *What Makes a Successful Place? Proceedings of the 32nd eCAADe Conference* [online]. Available at: <https://www.pps.org/privacy>.

Publishing, C. A. E., Collection, B., Officials, C. T., Bikeway, U., Guide, D. & Edition, S. (2020). For each treatment in the Guide , the reader will find three levels of guidance : Required Features. *National Association of City Transportation Officials* [online]. Available at: <http://web.b.ebscohost.com/buid.idm.oclc.org/>.

Rab, S. (2005). Sharjah 1 : Seascape Urbanism in a Khaliji 2 Port City SAMIA RAB American University of Sharjah, pp. 791–800 [online]. Available at: <https://www.acsa-arch.org>.

Rim Meziani. (2017). Accessibility and Integration Study of Part of the Abu Dhabi 2030 Master Plan by Using Space Syntax. *Journal of Civil Engineering and Architecture*, vol. 11(1), pp. 81–90.

Rose A., Stonor T. (2009) Syntax — Planning urban accessibility. In: Christ W. (eds) Access for All. Birkhäuser Basel. [https://doi.org/10.1007/978-3-0346-0379-9\\_6](https://doi.org/10.1007/978-3-0346-0379-9_6)

SEWA 2020: Roadmap towards a brigher future. (2018) [online]. Available at: <https://www.sewa.gov.ae/>.

"Sharjah Airport becomes the first carbon neutral airport in GCC". (2020). [Accessed 17 May 2020]. Available at: <https://www.gulfoday.ae/business/2020/08/16/sharjah-airport-becomes-the-first-carbon-neutral-airport-in-gcc>

*Sharjah Tourism vision 2021*. (2020). image [online]. [Accessed 17 May 2020]. Available at: <https://sharjahtourism.ae/en-us/Corporate-Profile/Vision-Mission>

"Shurooq - Sharjah Investment and Development Authority". (2020). [Accessed 17 May 2020]. Available at: <https://shurooq.gov.ae/>

Soflaei, F. & Kirchner, S. R. (2019). Middle Eastern maidans : the role of interactive and integrated public squares in urban social sustainability, (June).[online]. Available At: <https://www.researchgate.net/publication/333732068>

"SUPC | initiatives". (2020).[Accessed 17 July 2020]. Available at: [https://supc.shj.ae/initiatives\\_new.aspx?id=12](https://supc.shj.ae/initiatives_new.aspx?id=12)

Taleb H and Musleh M.A (2015) “*Applying Urban Parametric Design Optimisation Processes to a Hot Climate: Case Study of the Uae,*” Sustainable Cities and Society, 14(1), pp. 236–253

Talen, E., Allen, E., Bosse, A., Ahmann, J., Koschinsky, J., Wentz, E. & Anselin, L. (2013). Landscape and Urban Planning LEED-ND as an urban metric. *Landscape and Urban Planning*. Elsevier B.V., vol. 119, pp. 20–34.

Tannous, H. O. & Furlan, R. (2018). Saudi Journal of Engineering and Technology ( SJEAT ) Livability and Urban Quality of the Souq Waqif in Doha ( State of Qatar ), vol. 6272.

Telford, T. (2001). the value of urban design [online].Available at: [https://www.designcouncil.org.uk/sites/default/files/asset/document/the-value-of-urban-design\\_0.pdf](https://www.designcouncil.org.uk/sites/default/files/asset/document/the-value-of-urban-design_0.pdf).

"The Environmental Awareness Campaign for the Wilderness Areas Goer in Sharjah". (2020). [Accessed 17 November 2020]. Available at: <http://www.epaashj.ae/events/the-environmental-awareness-campaign-for-the-wilderness-areas-goer-in-sharjah/>

Trif, A. (2019). SPACE SYNTAX METHOD IN CASE OF THE URBAN FRACTURES BETWEEN THE HISTORICAL ARCHITECTURE AND THE SOCIALIST ARCHITECTURE IN THE, vol. 14(1) [online].Available at: <http://sorging.ro/jideg/index.php/jid/article/view/456/428>.

Turner, A. (2004). Depthmap 4, (June) [online].Available at: <https://discovery.ucl.ac.uk/id/eprint/211/1/paper75.pdf>.

UN-Habitat. (2009). *World's cities*. London: Earthscan Ltd [online].Available at: <https://unhabitat.org/sites/default/files/download>.

UN-Habitat. (2019). SDG Project Assessment Tool User Guide, vol. 2(November) [online].Available at: <https://unhabitat.org/sites/>.

*United Arab Emirates map*. (2020). image [online]. [Accessed 17 June 2020]. Available at: [https://legacy.lib.utexas.edu/maps/united\\_arab\\_emirates.html](https://legacy.lib.utexas.edu/maps/united_arab_emirates.html)

United Nation. (2016). Transforming our world: the 2030 agenda for sustainable development [online].Available at: [wedocs.unep.org](http://wedocs.unep.org).

United Nation. (2019). The future is now [online].Available at: <https://sustainabledevelopment.un.org/globalsdreport/2019>.

United Nation. (2020). SUSTAINABLE DEVELOPMENT GOALS GUIDELINES FOR THE USE OF THE SDG LOGO, (May).

"universes.art". (2020). [Accessed 18 June 2020]. Available at: <https://universes.art/en/art-destinations/sharjah/tours/sharjah-creek/02>

"Urbis | Planning". (2020). [Accessed 17 June 2020]. Available at: <https://urbis.com.au/service/planning/>

USDM. (2014). Abu Dhabi Urban Street Design Manual [online].Available at: <https://www.upc.gov.ae/en/publications/manuals-and-guidelines/abu-dhabi-urbanstreet-design-manual>.

USGBC. (2009). A Citizen ' s Guide to LEED for Neighborhood Development : How to Tell if Development is Smart and Green.

*What Makes a Successful Place?*. (2020). image [online]. [Accessed 17 November 2020]. Available at: <https://www.pps.org/article/grplacefeat?utm-medium=website&utm-source=archdaily.pe>

Ye, Y., Yeh, A., Zhuang, Y., Nes, A. Van & Liu, J. (2016). ““ Form Syntax ”” as a contribution to geodesign : A morphological tool for urbanity-making in urban design, vol. 22, pp. 73–90.[online]. Available At: [www.palgrave.com/journals](http://www.palgrave.com/journals)

Zhang, Y. & Liu, C. (2019). Parametric modeling for form-based planning in dense urban environments. *Sustainability (Switzerland)*, vol. 11(20), pp. 1–14.