Appraisal of Sustainable Urban Development in Shaqra City, Saudi Arabia

Dissertation

der Mathematisch-Naturwissenschaftlichen Fakultät

der Eberhard Karls Universität Tübingen

zur Erlangung des Grades eines

Doktors der Naturwissenschaften

(Dr. rer. nat.)

vorgelegt von

Ahmed Alhomaidhi
aus Alqasab/Saudi-Arabien

Tübingen
2024

Gedruckt mit Genehmigung der Mathematisch-Naturwissenschaftlichen Fakultät der Eberhard Karls Universität Tübingen.

Tag der mündlichen Qualifikation:	16.05.2025
Dekan:	Prof. Dr. Thilo Stehle
1. Berichterstatter/-in:	Prof. Dr. Dr. Olaf Kühne
2. Berichterstatter/-in:	Prof. Dr. Volker Hochschild

Acknowledgment

In the beginning, I would like to express my indebtedness and deepest sense of gratitude to Almighty Allah for making things and situations pleasant and favorable for me for the task undertaken. I am grateful to Almighty Allah for this kindness, benevolence, and mercy to me and the successful completion of this thesis. During the long journey of my research work, many people have contributed in their particular way, and for that, I want to give them special thanks.

Firstly, my supervisor *Prof. Dr. Dr. Olaf Kühne and Prof. Dr. Volker Hochschild.* There are no proper words to convey my deep gratitude and respect for you. You have created the invaluable space for me to do this research and develop myself as a researcher in the best possible way. I greatly appreciate the freedom you have given me to find my path and the guidance and support you offered when needed.

My sincere thanks must also go to my thesis advisory and exam committee members. They generously gave their time to offer me valuable comments toward improving my work and providing constructive criticism, which helped me develop a broader perspective on my thesis.

Finally, I deeply thank my parents, *my wife,* and *children,* for their unconditional trust, timely encouragement, and endless patience. It was their love that raised me again when I got weary.

Ahmed Alhomaidhi
November 2024

Abstract

This study thoroughly explores sustainable urban development in Shaqra City, Saudi Arabia. It examines the challenges, opportunities, and solutions needed to promote sustainability in environmental, economic, and social areas. Using thematic and interpretive analyses, the study identifies key factors shaping the city. In terms of the environment, Shaqra City can enhance sustainability by improving agricultural spaces. However, issues like the lack of systematic garbage sorting in waste management reveal the need for focused solutions. In the economic dimension, the city shows potential in family-based businesses and seasonal activities like the Red Pepper Festival. However, challenges such as high fees and operational costs hinder commercial investments. Compared to neighboring regions, Shaqra City's economic growth is relatively slow, emphasizing the need for targeted economic measures. On the social front, efforts to reduce corruption and build trust in municipal institutions show progress. Opinions about gender equality vary, but community well-being is supported by initiatives like educational campaigns and local events. Despite these efforts, challenges such as limited social community initiative and proximity to larger urban centers persist. Opportunities for environmental awareness, cultural understanding, and partnerships can address these issues. The study offers recommendations to address these challenges and harness opportunities. These include environmental conservation, economic diversification, and governance reforms. With collaboration among stakeholders, Shaqra City can progress toward a more sustainable and resilient urban future.

Zusammenfassung

Diese Studie befasst sich eingehend mit der nachhaltigen Stadtentwicklung in Shaqra City, Saudi-Arabien. Sie untersucht die Herausforderungen, Chancen und Lösungen, die zur Förderung der Nachhaltigkeit in den Bereichen Umwelt, Wirtschaft und Soziales erforderlich sind. Mithilfe thematischer und interpretativer Analysen werden in der Studie die Schlüsselfaktoren identifiziert, die die Stadt prägen. Im Hinblick auf die Umwelt kann Shaqra City die Nachhaltigkeit durch die Verbesserung der landwirtschaftlichen Flächen verbessern. Probleme wie das Fehlen einer systematischen Mülltrennung in der Abfallwirtschaft machen jedoch deutlich, dass gezielte Lösungen erforderlich sind. In wirtschaftlicher Hinsicht zeigt die Stadt Potenzial bei familienbasierten Unternehmen und saisonalen Aktivitäten wie dem Red Pepper Festival. Herausforderungen wie hohe Gebühren und Betriebskosten behindern jedoch kommerzielle Investitionen. Im Vergleich zu den Nachbarregionen ist das Wirtschaftswachstum von Shaqra City relativ langsam, was die Notwendigkeit gezielter wirtschaftlicher Maßnahmen unterstreicht. Im sozialen Bereich sind Fortschritte bei der Bekämpfung der Korruption und der Stärkung des Vertrauens in die kommunalen Institutionen zu verzeichnen. Die Meinungen über die Gleichstellung der Geschlechter gehen auseinander, aber das Wohlbefinden der Gemeinschaft wird durch Initiativen wie Aufklärungskampagnen und lokale Veranstaltungen gefördert. Trotz dieser Bemühungen bleiben Herausforderungen wie begrenzte soziale Gemeinschaftsinitiativen und die Nähe zu größeren städtischen Zentren bestehen. Möglichkeiten für Umweltbewusstsein, kulturelles Verständnis und Partnerschaften können diese Probleme angehen. Die Studie enthält Empfehlungen zur Bewältigung dieser Herausforderungen und zur Nutzung von Chancen. Dazu gehören Umweltschutz, wirtschaftliche Diversifizierung und Reformen der Verwaltung. Durch die Zusammenarbeit aller Beteiligten kann Shaqra City Fortschritte auf dem Weg zu einer nachhaltigeren und widerstandsfähigeren städtischen Zukunft machen.

Table of Contents

List of Table

List of Figure

Chapter One: Introduction

1.1 Background of the Study

Among many other Arab countries, Saudi Arabia has been the most urbanized country in the last fifty years due to its economic development. Therefore, this study focuses on urban development planning that will help decision-makers in Saudi Arabia. This study tackles concepts such as physical development, urban development indicators, and urban challenges.

Development is a relative concept that has prompted researchers to dig deep to find a concise, accurate definition (Abuiyada, 2018). Different researchers have offered a huge range of definitions; however, all of their definitions have agreed that development in urban planning must include collective efforts, change, and a final target (Yigitcanlar & Teriman, 2015). These different perspectives have resulted in various development types, including development as an economic concept, human development, cultural concept, social development, and political development (PRIA International Academy, 2014, p.16).

Tackling the evolving definitions of development, the need for urban planning has emerged to manage urban growth. Urban planning is defined as the professional efforts of planners to achieve development through scientifically well-structured plans (Healey & Williams, 1993). Urban development is an arrangement of compatible land use such as residential, industrial, commercial, recreational, and administrative expansion, among others, based on measures that planners consider while planning. Scholars have further researched urban development theories, such as modernization, dependency, world systems, and globalization.

Urban planning discipline appeared with the emergence of cities, expanding over time to assist in building cities. It considers the various challenges facing cities and has evolved into a modern approach to achieving urban sustainability (Vaggione, 2013). In urban planning, sustainability extends to poverty, famine, unemployment, education, transportation, industrialization, and access to clean water (Urbanization and Urban Development, 1966). Sustainable urban development is usually divided into three dimensions, i.e., environmental, economic, and social. These dimensions have become integral to urban planning policies (Basiago, 1998).

Given the complexity of sustainable development and the uncertainty surrounding future growth, creating resilient cities has become important (Liu et al., 2014). Cities can go extinct and cannot adapt to issues like resource shortages and climate change. Due to increased competition and industrial development, sudden political shifts can significantly impact countries that consume resources (Liu et al., 2014). Urban planning will need to adapt to meet such a demanding situation. It will need to analyze the effects of resource utilization and encourage energy saving, recycling, low-resource lifestyles, and environmental preservation in

cities and the surrounding rural regions. Therefore, sustainable urban development has emerged as crucial to ensure the future of our cities.

1.2 Problem Statement

The Ministry of Municipal and Rural Affairs states that around 82.1% and 17.9% of Saudi Arabians are living in urban and rural areas respectively (Alahmadi & Atkinson, 2019). Smaller cities, such as those outside Riyadh, have also grown rapidly. Urbanization is expected to increase rapidly by the year 2030. It has witnessed unprecedented rapid growth in the last 50 years, as its rank has moved from the third lowest Arab country in urban population to the third largest country. The country's urban population increased from 26% (665 thousand) in 1950 to 80% in 2000 and 24.8 million in 2015 (Abou-Korin & Al-Shihri, 2015). This rapid growth creates a massive problem for the government. To cope with this rapid growth, the government needs to build 44 new cities with a capacity of 250,000 residents by 2050, at the rate of a city every nine months (Gadou & Quazi, 2009).

Another urban issue in Saudi Arabia is access to infrastructure and services. Rapid urbanization and increased industrialization have resulted in the high consumption of natural resources, such as water. It poses problems in environmental protection, solid waste management, and pollution and causes water scarcity (Niemelä, 1999). Rapid urbanization pressures the government to provide proper housing, quality services, electricity, water, and even telephones. Although urbanization is a significant factor in the country's path toward achieving economic growth, it also negatively impacts the country. Around 50% of the population comprises people below 24. The increase in the youth population has put pressure on the government.

The first factor of rapid urbanization in Saudi Arabia is the rapid economic growth. The growth of the petroleum sector in Saudi Arabia has played a major role in the economic expansion. The expansion in the petroleum field, its exploration process, related industries, and investment have created new employment opportunities, increasing demand for housing and services (Abou-Korin & Al-Shihri, 2015). The second reason is the private sector's activity in Saudi Arabia. One of the major dominant sectors in the Saudi Arabian economy is the private sector, which has witnessed rapid growth lately.

Several agricultural lands have been damaged, and the marine life in the coastal areas of the Arabian Gulf has been destroyed. There was a rapid increase in urban expansion on the agricultural lands between 1982 and 2003, including 420 hectares of the most productive agricultural land in Dammam and 2,200 hectares in Qatif (Abou-Korin & Al-Shihri, 2015).

Moreover, landfilling in coastal areas is another destructive activity. The main drive behind coastal landfilling is the high prices of the properties allocated by the sea. Between 1982 and 2003, land-filling expanded to include 6500 hectares in the Arabian Gulf (Abou-Korin & Al-Shihri, 2015). Also, the rapid population has resulted in what is known as "urban sprawl." This

problem has emerged due to the extensive usage of urban areas. For instance, in 2003, the population rate was 64 persons/ha in the Dammam Metropolitan Area (DMA), which is considered low compared to cities in neighboring developing countries. This urban sprawl has resulted in conflicting land uses, such as oil and gas lines, military bases, and livestock markets. These conflicting uses negatively affect the environment and urban sustainability (Abou-Korin & Al-Shihri, 2015).

The land use resulting from urban sprawl is building residential areas without considering the need for future developmental plans for more land. Also, most of these residential areas are vacant, which will restrict future urban expansion planners due to the lack of suitable vacant lands (Gadou & Quazi, 2009). Many large-scale projects emerged in the last 40 years, creating what is known as "cities within cities." When studying the case of DMA, it was discovered that some new cities are larger than already existing cities in DMA. This overlapping of cities will severely and negatively affect the environment, the traffic, and the infrastructure in the urban areas (Abou-Korin & Al-Shihri, 2015).

Rapid urbanization has created housing un-sustainability in terms of the patterns and costs of housing. This means that the housing units are not meeting the current needs of the Saudis because the housing units exceed the financial capacity of the youth and the middle class. Lately, the average size of Saudi families has decreased; therefore, the designed villas and wide apartments surpass their needs (Gadou & Quazi, 2009). Several types of research have been carried out on urban development (Niemelä, 1999; Abou- Korin & al- shihri, 2015; Alahmadi & Atkinson, 2019), but little or no study has been centered on the appraisal of sustainable urban development in Shaqra city, Saudi Arabia.

1.3 Aim and Objectives of the Study

This research is to discuss the rationale behind and methods by which various concepts and approaches to sustainable urban development have been proposed, examine a few pertinent cases in which strategies, targets, and indicators for sustainable cities have been proposed, and Talk about the creation of a more comprehensive approach to support the sustainable urban development practice in Shaqra City, Saudi Arabia. The literature review serves as the primary foundation for the analysis. The development of indicators and objectives connected to various ideas is examined based on the field data. In a nutshell, this research has focused on achieving the following objectives:

i. To highlight the elements of natural and human geographic development in the region.
ii. To examine the level at which the city meets the needs of its residents.
iii. To analyze the indicators of development and assess the current level of urban development in Shaqra city.
iv. To examine how sustainable urban development can be achieved in Shaqra City and identify the basic requirements.

v. To identify the constraints preventing sustainable urban development in the city.

1.4 Research Questions

Urban area development is a complex process involving the interaction of several geographical elements that are both natural and human-made. Comprehending these constituents is vital in evaluating the requirements of inhabitants and the general sustainability of metropolitan settings. This study aims to examine Shaqra City's urban development. This study particularly focuses on analyzing Shaqra's existing urban environment, the demands of its population, and the obstacles to attaining sustainable development by answering the research topics listed below. The results will guide initiatives for improving the sustainable growth of the city. This study's research questions are as follows:

i. What are the natural and human geographical components of development in Shaqra city?
ii. How well does the city meet the needs of its residents?
iii. What urban indicators can be used to assess the current situation within the city?
iv. How can Shaqra City achieve sustainable urban development, and what are the basic requirements to do so?
v. What are the current constraints preventing sustainable urban development in the city?

1.5 Scope of the Study

The discussion of sustainable urban development has gained currency recently to make our cities safer, livable, and robust. The prime goal of sustainable urban development is to strike a balance between economic, environmental, and social attributes. To ensure sustainability, cities need to focus on social and economic structures without damaging the environment and attain a balance between development initiatives and natural resources. However, a comprehensive sustainability analysis is absent in Shaqra, Saudi Arabia. Therefore, this research is framed to contribute to this segment of knowledge through gathering scientific knowledge provided by statistical analysis.

This study will highlight the key elements of natural and human geographic development of Shaqra City, which will help administrators, planners, and decision-makers choose the best policy for achieving sustainability. Secondly, it will identify the existing needs and dynamics of the citizens, which will help improve the quality of existing services and facilities. Thirdly, this study will assess the current level of urban development along with the prospects and drawbacks to provide a comprehensive overview of sustainability in Shaqra city. The findings of this research will be helpful for development authorities to guide Shaqra City towards a more sustainable future.

1.6 Limitations of the Study

The potential limitations to this research include validity and reliability concerns often levied at academic research. However, these concerns are grounded in a realist perspective, which conceptualizes a finite number of objective truths. Instead, this research embraces multiple realities, and the data reflect the researcher's and participants' mutual constructions of such realities. As such, concerns surrounding truthfulness and validity are replaced by an understanding of communicated, shared, experiential realities (Holstein & Gubrium, 1995).

It is necessary to delve deeper into these concerns to elaborate on the conceptual basis of this work. Ordinarily, reliability in research is rooted in the concept of replicability. In research such as this study, it cannot be expected that answers will be replicable across temporal, geographical, or social spaces. The responses obtained will emerge from distinct circumstances of production. Reliability (is the piece meaningful or convincing?) Ethics (has the dignity and privacy of all participants been ensured?); Verisimilitude (are the accounts contained therein believable?) (Garman, Leech, & Grable, 1996).

1.7 Structure of the Thesis

It is a quick overview of the different chapters of this thesis, which gives a summarized understanding of the whole research. This research is completed in 7 chapters. The detailed structure of this thesis is given below.

Chapter 1: Introduction

This chapter outlined the study's background, including its research aims, objectives, questions, problem statement, methodological approaches, limitations, and overall structure. It highlighted the opportunities identified during the review of secondary information on the topic. Relevant objectives and research questions were developed based on the selected subject and contextual details. Finally, the rationale for choosing the research topic was explained.

Chapter 2: Literature Review and Theoretical Framework

This section distinguished and analyzed the secondary information collected in the literature portion. Therefore, the entire literature review section was conducted on a thematic analysis. This is where all the secondary details, such as the past literature and theory, were collected and evaluated critically, considering the contrasting opinions of different scholars. Relevant sources supported the information to increase the reliability of the data.

Chapter 3: Research Methodology

The research methodology section addressed the criteria established for guiding the data collection process. The researcher discussed several sampling techniques and procedures,

among others, in data collection. The chapter also discussed the research design, i.e., data collection and analytical methods.

Chapter 4: Dynamics of Land Use/Land Cover Change and Urban Expansion of Shaqra City

This chapter investigates Shaqra City's evolving urban fabric and its impact on the surrounding environment using a GIS and remote sensing-based analytical approach. The chapter looks into the changes observed in land use and land cover (LULC) through understanding built-up and vegetation due to the city's expansion. The chapter also examines the spatial dynamics of urban expansion, highlighting the directional trends of the city's growth and relating the LULC change due to changes in land surface temperature (LST).

Chapter 5: Sustainable Urbanism: A Closer Look at Shaqra City's Progress

This chapter uses a quantitative approach to explore Shaqra City's sustainable development landscape, focusing on social, economic, and environmental sustainability. It uncovers the relationship between these dimensions and factors affecting urban quality of life. Through analysis of the Sustainable City Index in Section 4.2 and synthesis in Section 4.3, the chapter offers a holistic view of Shaqra's sustainability. As Shaqra aims to balance growth and livability, this chapter provides a comprehensive guide to its sustainable evolution.

Chapter 6: Qualitative Appraisal of Sustainable Development in Shaqra City

Chapter six employs a qualitative research approach to comprehensively explore Shaqra City's developmental landscape, emphasizing its physical geographical aspect. It scrutinizes urban infrastructure, analyzing its role in fostering a conducive environment for residents. The chapter examines various sustainable development strategies to integrate economic growth with environmental preservation and social development. Addressing residents' needs underscores the importance of accessible healthcare, education, and recreational amenities. By leveraging insights from past experiences, the chapter outlines a strategic roadmap for achieving sustainable urban development and confronts the challenges and opportunities inherent in this pursuit within Shaqra City's unique context.

Chapter 7: Conclusion and Recommendations

Based on the analysis and findings, the discussion delves into the multifaceted pursuit of sustainable urban development in Shaqra City. Moreover, recommendations for future growth are derived from these analyses, offering insights into challenges, opportunities, and pathways toward sustainable urban development in Shaqra City. The chapter includes the key findings of this research, the research argument with prior research work, the implications of this research in policy formulation, and further research ideas.

Chapter Two: Literature Review and Theoretical Framework

2.1 Introduction

This chapter analyzes relevant literature to conceptualize the relationship between planning, development, and sustainability, beginning with an overview of urban planning and its different components. Then, it introduces the concepts of urban development traced in research worldwide in different fields. It also reviews the literature on sustainable urban development to identify social, economic, and environmental indicators.

2.2 Urban Planning

Planning is a highly ambiguous and complex word to define (Friedmann, 1998). Different planners have come up with different definitions based on their area of specialization. The main challenge is that the planners are involved in multiple activities, so it would be hard to ascertain the definite meaning. According to Niemelä (1999), urban planning is identifying the best or optimum technical solution to a physical problem that respects public interest. Adams (2012) defines urban planning as producing a better living environment for the inhabitants based on empirical evidence. According to Allmendinger (2017), urban planning is founded on competing, diverse, and evolving theories and ideas. However, any type of planning is equally essential despite the variance in state and sequence (Levy, 2016). A plan should, therefore, have a positive impact on a particular problem. Other researchers have defined planning as thinking before the action takes place. This is attributed to achieving the desired objectives from a given entity. Consequently, planning prepares the planners for future uncertainties and how to solve them amicably.

Urban planning could be defined as the professional work of guiding development by laying down physical plans and development regulations. Additionally, the urban planning process focuses on designing land use and the built environment, encompassing elements such as water, air, and infrastructure systems that flow into and out of cities (Levy, 2016). Urban planning also considers environmental sustainability by ensuring the designs and plans are laid down and environmentally friendly (Silver, 2018). It is made possible by connecting urban planning and urban designs, which present a feasible city layout. Concisely, the research will focus on urban planning in Saudi Arabia. Following the rapid increase in the urban population, it is essential to adopt urban planning measures. This will help identify the major areas that need development, thus facilitating sustainability. Schindler, Dionisio, and Kingham (2018) emphasized the importance of considering the visions of different stakeholders and ensuring integration between them throughout the planning process.

2.2.1 Origin of Urban Planning

The history of urban planning is closely interconnected with the history of cities, as planning is considered the result of the earliest known urban sites. In appreciating the significance of urban development, it is worth understanding the historical struggle that led to the elevation of town planning to the current state. As settlements grew and different land uses emerged, the need for planning grew. At first, cities like Rome and Athens, then Islamic cities were designed according to land use and distance to the center. Later, between the 16th and 17th centuries, security was the main factor affecting how cities were built as forts and fences were set. As for the 18th century, trading gained importance, port cities evolved and were of great significance, and they were established as capitals for their strategic location. As the Industrial Revolution contributed to drastic changes economically, it also affected the distribution of land uses and the standards of life negatively, which was why the need for urban planning to organize the development of cities in this era was dire (PRIA (Participatory Research in Asia) International Academy, 2014).

The modern origins of urban planning could be linked with the social movement for urban reforms that began in the 1900s as a reaction against the downfalls caused by industrialization. Most visionaries sought to have ideal and sustainable cities with adequate infrastructure and sanitation. The drive towards such amenities was a major drive towards the desire for planning (Yang, Ouyang, & Tian, 2018)—consequences of planning led to the development of a formal master plan to be used later in creating the cities. Urban planning was later used as a scholarly discipline. Urban planning was first used in Britain in 1906 as a statutory practice of town planning based on the Town Planning Act 1909. The local government regulated the land layout, development density, and land reservations for building highways.

2.2.2 Roles of Urban Planning

The importance of urban planning came from the constant need for the development and regeneration of communities. Urban planning is considered a means that helps actors attain their future objectives. However, these plans for cities should have certain characteristics, such as integration between different sectors, better usage of resources, and pragmatic solutions, ensuring the plan’s feasibility (Vaggione, 2012). The balance between providing the needs of the citizens and preserving the city's resources is one of the main objectives that urban planning tries to achieve. Furthermore, urban planners usually create a platform to join stakeholders and decision-makers in development. Vaggione (2012) summarized the importance of planning as:

1) A way of becoming a prospering community,
2) Helps stakeholders to make advancements in their city,
3) Helps actors to have an insight into the future and prepare for upcoming issues,
4) Analyzing and improving the urban fabric contributes to the quality of service provision,

5) Planning is concerned with fulfilling employment needs and increasing the flow of investments,
6) Strategic planning of cities emphasizes the participatory approach to include those who are concerned with their community's development,
7) Certifying coherence between different regions in hopes of achieving the highest benefit,
8) Urban plans have the feature of having a time frame that makes them reliable through different leaderships,
9) Planning is more effective and sensible in the usage of resources and lastly, and
10) Planning ensures connectivity between multiple actors and participants.

The emergence and evolution of urban planning in Saudi Arabia can be divided into two eras. The first era is said to have begun in the late 1930s and proceeded to the early 1970s. The first era was profoundly significant for the country following the response to day-to-day needs and problems faced in Saudi Arabia's cities. This attempt aimed to solve urban issues, such as Doxiadis devised a master plan for Riyadh City (Al-Hathloul, 2017). The era was vastly comprised of measures to deal with specific situations prevalent in urban centers. The second era started in the early 1970s and is present to date. This is considered to be adopting comprehensive urban planning approaches with an interdisciplinary emphasis (Shalaby & Shalaby, 2018). Since urban planning is inclined to the building, compositional, and social and political concerns, it is usually a differently specialized calling; therefore, it needs an undertaking that includes a political will and the cooperation of people living in the cities.

2.2.3 Pioneers in Urban Planning

Traditionally, a Greek philosopher, Hippodamus, is regarded as the first town planner of the fifth century. He was an inventor and developed an orthogonal urban layout. However, until the beginning of the 19th century, urban planning gained many emphases that witnessed the development of multiple and appealing urban plans. Among the most renowned pioneers of urban theory and planning is John Friedmann. (Silver, 2018). Together with other thinkers, they contributed to the emergence of multiple urban planning developments.

According to Hall (2014), urban planning was ranked as an important social movement in the early twentieth century. Over the years, it became a story of achievement, resilience, failure, and adaptation to place, culture, and circumstance. Its modernized achievement is a progression of the history of both continuities (health, justice, environment) and discontinuities (in response to technology, economics, and politics). Since the nineteenth century, the scope of planning has expanded dramatically and been modified to a modern form through a series of changes to address the challenges of the 21st century.

2.2.4 Types of Urban Planning

There are various types of urban planning: land use planning, regional planning, Master Planning, Economic Development, Strategic urban planning, urban revitalization, and Transport planning. Land use planning is a process where land use is regulated to achieve more social and environmental objectives (Silver, 2018). The main objectives of land use planning may incorporate ecological preservation, the limitation of endless suburbia, and the minimization of transport costs; avoiding land use clashes also leads to a decrease in the introduction of toxins (Silver, 2018). Therefore, the implementation of land use is a different financial exercise that happens in a particular zone. Another type of urban planning is the master plan, generally a document that provides guidelines for future growth and development in a space (Thakuriah, Tilahun, & Zellner, 2017).

A master plan creates a viable relationship between the building and the things around it. A master plan analyzes transport, the economy, and land use. These master plans usually have the responsibility to determine how an urban setting will look, and these plans must be well-calculated so that future problems can be avoided. Because city regeneration projects can be long-term, it is usually advisable that a master plan is used.

Economic development planning is a set of activities or policies to create long-term and self-sustaining economic growth. When planning for economic development, creating and maintaining a stable local economy (Parr, 1999). Economic development planning summarizes the economy and the policies set for economic growth. Also, it identifies projects and strategic programs that help improve the economy. The main purpose of planning is to control an economy's private sector; this control is exercised over scarce economic resources. Therefore, a country's rational arrangement of economic resources can be described as economic planning. There are many types of economic planning, ranging from indicative, functional, decentralized, and demographic planning.

Regional planning is the proper placement of land use activities, settlement growth, and infrastructure across a large land area. Regional planning involves creating laws that will help adequately plan and manage regions (Pauleit & Duhme, 2000). A region requires various land uses to protect cities, industrial space, farmlands, infrastructure, and military bases. Therefore, regional planning can be described as the science of proper infrastructure placement and zoning to achieve sustainable growth in a specific region.

2.2.5 Factors in Urban Planning

Urban planning considers the opening of new places and the Regeneration of the existing layouts of a particular area. This could include erecting permanent structures and temporary others (Boulton, Dedekorkut-Howes, & Byrne, 2018). Despite the distinct nature of urban plans, every urban plan needs to consider the following factors:

2.2.5.1 The Environment and Climate

Adding a new space to a community should mean being considerate of the region's environment. This could be defined by three essential categories: the physical, social, and economic environment. The physical environment includes the location of a city and its geologic, vegetation, landforms, soils, and climatic history. For instance, a desert city in Saudi Arabia will have different needs from cities near the Red Sea, such as Abha (Abubakar & Dano, 2019). Climate plays a key role in regional development; thus, planners must watch for these essentials. The second essential is the social environment, which involves the composite demographics of an area. This is a crucial component in the expansion and revitalization of an area. The planners should note the social fabrics: wealth, employment rate, education level, and regional values. The economic environment is another essential that planners should consider. This happens by noting the economic factors that can hinder urban development.

2.2.5.2 Residents

Today, most urban developers involve the residents in understanding their needs. This could be termed as an effective move that has a positive impact on urban planning. Previously, planners relied solely on hand-drawn plats to set up cities, but they are considering other disciplines that define the goals of a particular area. However, involving the public would not act as a resistance to the planning but rather give the residents the knowledge of whatever is coming their way.

2.2.5.3 The Future

In urban planning, city planners need to look to the future. This could be done by monitoring the population trends to determine the space needed for future developments. Since the early 1950s, Saudi Arabia has continuously experienced speedy urbanization. As of 2018, the urban population in Saudi Arabia represented 83.84% of the country's total population. However, the numbers are expected to increase due to births and rural-urban migration (Alsaif et al., 2019, pp. 396-401). For instance, developers should focus on building high-rise buildings in the cities of Saudi Arabia because of the constant population increase. Such a decision will see more residents being accommodated and less land used.

2.2.5.4 Areas in Need of Regeneration

Many struggling cities in Saudi Arabia are identified in urban renewal and development trends. Some of these cities have fallen in this state due to poor planning and management (Thakuriah et al., 2017). In such a case, the planning should involve renovating or demolishing the existing structures to make way for new and improved buildings. The deserving areas that need regeneration could include those affected by disasters, thus requiring the planners to clearly understand any historical significance in the region. Therefore, it is the role of profesionals to

identify new ways of improving areas and making them more attractive and environmentally sustainable.

2.2.5.5 Resource Availability

In addition to education, urban planners must have the relevant conceptual and technical skills to create effective current and future residents. This is highly dependent on obtaining the right data. Adopting a Geographic Information system (GIS) can also help planners acquire information about a particular area (Abdelkarim, 2019). For instance, developers in Saudi Arabia may fail to recognize historical sites such as the Masmak Fortress and end up demolishing them to develop the city. Such plans could lead to conflicts or even hinder urban development.

2.2.6 Process of Urban Planning

In most cases, urban planners must adopt the key planning instruments of cities, such as land use plans or zoning plans, when developing new projects. However, planners must show the official steps that led to the adoption of the zoning and land use plans rather than present the final plan (Lichfield, Kettle, & Whitbread, 2016). This is achievable by considering the following phases of an urban planning process:

i. Preparatory planning phase. The phase involves exploration and scoping. Before planners start working on an urban development plan, it is recommended that they first conduct assessments regarding their plan of interest. This can be done by analyzing the basic data and repeated pre-checks. The Geographic Information System presents a major tool that planners can use to determine the viability of their plan (Abdelkarim, 2019). The first phase will also consider the visions and agreements for the desired plan.
ii. Feasibility and master planning phase. Planning for the future is among the important factors of development. Therefore, planners need to learn about the possible variants, making room for future developments. A master plan presents a dynamic long-term planning document with notional guides for future growth and development. These could be considered distinct themes, such as mobility.
iii. Formal planning phase. This will major in zoning, a process of dividing the land into industrial and residential zones. In this phase, the planners are expected to present a full plan comprising the land use and zoning plan, building regulation plan, and the formal steps defined by law. As such, the plans should be approved by the city council.
iv. Design and implementation phase. In this phase, the planners should have the final design of the ideal plan and their respective features. The design should also be environmentally friendly and considerate of sustainability. The planners should acquire the necessary permits as approval for the planned design.

v. Operational phase. In this last phase, the planners should monitor the overall urban plan. Quarter management will also be involved in maintaining and continually optimizing the execution of the plan in the desired location.

Schonwandt (2008) summarized the urban planning process in four stages, as cited in (Yigitcanlar & Teriman, 2015). The first stage is assessing the current condition. The second is to set desired objectives. Next is the stage of providing different steps that could be taken. Lastly, it is to decide how successful the outcome of these steps was.

However, analyzing the model of Berke (2006), as cited in (Yigitcanlar & Teriman, 2015), eight steps were established for the planning process. The first is recognizing the problems confronting society. Agreeing with the Sconwandt model, the second step also included setting goals. Then, gathering information is needed to plan and assess them. The fourth step is choosing the objectives, assessing possibilities, and appraising them. Then, the process of selecting a suitable plan takes place. Following the previous step is the execution of the selected plan. The last stage is monitoring and evaluating the implemented plan.

2.2.7 Issues in Urban Planning

One of the challenges confronting urban planners in developing countries is balancing the expected population increase and increasing economic growth while fulfilling the needs of the current citizens and solving their problems (Freire, 2006). Vaggione (2012) pointed out five main issues confronting the process of urban planning. Decision-makers can often mistake the pressing issues that face society, which creates a faulty plan that fails to fulfill its objectives. Second, how the plan is formed and executed can affect its feasibility, as following theoretical approaches to planning a region and ignoring the reality and nature of the community creates a gap that obstructs the execution of the plans. Thirdly, it can limit the freedom of urban planners to develop and execute their plans. Inaccuracy in spatial data can obstruct urban planning, affecting the validity of the decisions built on these data (Schindler et al., 2018). As the need for spatial data may vary in type according to the purpose it is used for, the availability of these different data can prove to be challenging (Schindler et al., 2018). Another issue confronting urban planners is the incompatibility of regulations and policies with the development plans. Lastly, master plans can be interrupted due to political change among decision-makers (Vaggione, 2012).

Naess and Vogel (2012) pointed out that urban development presents challenges because of cities' scale and complex context-dependency, the motive of the existing urban built environment, cultural norms and lifestyles of the city inhabitants, unsustainable niche technology, and transport requirements. Therefore, integrating diverse domains is necessary for sustainable urban development, such as land-use planning, transport planning, housing policies, and economic planning (Naess & Vogel, 2012).

2.2.8 Effects of Urban Planning

Urban planning is a very complex and multi-branch issue. Urban planners need to address public socioeconomic demands and environmental concerns. It has to manage the citizens' employment, housing, law and security, healthcare, transport, and other national needs. In addition, it ensures environmental balance in environmental conservation, resource management, disaster management, land use planning, and the like. In addition, town planning provides civic amenities such as water supply, electricity distribution, waste management, and similar services. Planning to improve and ensure citizens' quality of life often has unintended consequences or adverse effects on society. Measuring and mitigating the potential negative effects of the Social Impact Assessment (SIA) plan is useful. Finland is a strong developer of SIA (Sairinen, 2004a). Their Land Use and Building Act, 2000, assessed the impact as an integral part of urban planning (Sairinen, 2004b). Since 1990, social dimensions in urban planning have become very important in Finnish urban policy. Changes in legislation, structural changes in urban development, socio-economic and spatial differentiation, and urban political debate are some reasons for emerging concern for urban social sustainability, which is perceived as a precondition to urban development.

Urban planning is good but often has unintended side effects if SIA is not assessed properly. The most common effect is an increase in the cost. Any policy implementation requires funding, thus increasing the living cost of the inhabitants. Most often, the city administration manages this excess cost by issuing additional taxes, discouraging citizens from living in the city. Some cities have stricter rules or additional regulations for central urban areas. That encourages citizens to settle farther away from the city center and commute to the city for work. Especially when urban amenities are accessible far away from the city center, these phenomena create urban sprawling problems. Urban sprawling increases the environmental footprint and puts pressure on natural resources.

Environmentally sustainable housing affects affordability, especially low-budget housing (Randolph, Kam, & Graham, 2012). Therefore, citizens try to move outside the city where affordable and sustainable housing regulations are relaxed or absent. These factors, along with car-based transport network design, more accessible commuting facilities, far-reaching urban amenities, and higher taxes in central business districts, encourage developing satellite urban settlement development, formally called urban sprawling. Many American and Chinese cities are experiencing such problems where the core of the cities is emptying. Usually, these satellite cities started developing on cheaper land and emphasized low-density residence. Therefore, these cities seek gap-filling policies in their vacant core cities.

Excess regulation and policy also create a red tape phenomenon for entrepreneurs and businesses. Many businesses have to move their operation elsewhere because of these financial regulations. Many businesses had moved from California to Texas primarily due to taxation

and relaxed rules in the USA. Many of California's environmental regulations create economic concerns (Thomas, 2009).

In the urban sprawling problem, satellite cities are becoming a gated community for wealthy people. On the contrary, poor people have to live in urban areas or commute long hours from the city's outskirts. In this way, social segregation is developing, too. Additionally, sustainable housing generates newer businesses, such as the solar energy industry. Emphasizing low-carbon transport network systems is encouraging battery-run electric vehicles. (Nanaki & Koroneos, 2016). Therefore, battery-run electric automobile companies are booming while traditional combustion engine-based industries are struggling.

2.2.9 Urban Planning in Saudi Arabia

Lying in the middle of the Arabian Peninsula, Saudi Arabia's boundaries extend to more than 2 million square kilometers. The kingdom has different weather conditions, varying from harsh summers in most areas to rainy weather in the mountains. Saudi Arabia's potential lies in its natural resources, the most important being its share in the gas reserves. Since the 1970s, efforts have been made to benefit from natural wealth and dependency on the petroleum industry in the economic development plan (Zahid, 1996).

Since the discovery of crude oil, the population in the kingdom has increased notably in large settlements such as Riyadh, Jeddah, and Makkah for multiple reasons (M A Gadou & MA Quazi, 2009). As the quality of services increased, mortality rates decreased, thus contributing to population growth. Furthermore, the number of migrants to Saudi Arabia grew as job opportunities were being offered in different sectors (Zahid, 1996).

The origin of urban planning in Saudi Arabia dates back to 1937, when the ministry assigned organizations to take responsibility for cities in terms of maintenance and planning. Land use transportation network plans were made in Dammam city, considered the earliest city in Saudi Arabia to have been scientifically planned. Later, in 1958, the government adopted a regional planning approach to link master and deliberated plans (Zahid, 1996). These plans were carried out by the Minister of Interior and Municipal Affairs and its Deputy. However, the economic boom in the 1970s was not in the government's account, which resulted in several issues that emerged due to a lack of planning (M A Gadou & MA Quazi, 2009).

Before the evolution of the petroleum industry in Saudi Arabia, the economic structure was mainly dependent on basic activities such as agriculture and ranching. In some areas, trading was their main source of income. However, after the development in the economic sector took place, different fields, such as the services and housing industry, flourished. This compelled decision-makers to search for methods to organize the development process and avoid predictable issues, establishing the Higher Planning Council and the Ministry of Municipal and

Rural Affairs. The ministry's main role was summarized as controlling the urbanization of communities, providing services, and monitoring land use (Zahid, 1996, pp. 35-36).

The Ministry of Planning set the first plan with a time frame of 5 years from 1970 to 1975; it was made to cover different fields. Later, in 1983, a spatial integration approach was used in planning, concerned with different levels of the urban system (M A Gadou & MA Quazi, 2009). Due to the availability of more job opportunities, the emergence of many tertiary institutions in Saudi Arabia cities, and many other reasons, there has been an inflow of people into urban areas. So, to accommodate the population, the government of Saudi Arabia has made plans such as expanding infrastructure and utilizing (utilisation) of resources available through urban planning (Madanipour, 2006). The expansion of road networks, the building of new hospitals, and the expansion of residential areas due to urban planning have seen cities growing rapidly (which has led to the rapid growth of cities) without a toll on the economy of Saudi Arabia.

The history of urban planning in Saudi Arabia, from 1958 to 1992, can be divided according to the types of planning. The division includes 1) Directive plans, 2) Master plans, 3) Action master plans and action area plans,4) National settlement strategy, and 5) National spatial strategy and Urban boundary (Zahid, 1996). The first type of plan executed in the Kingdom was applied to main cities such as Dammam and Jeddah. This plan targeted the organization of activities and different land uses within the boundaries of the city. The time frame for these plans was estimated to be from 20 to 30 years (Zahid, 1996). Secondly, between 1960's and 1970's, master plans were designed on a larger scale. Master plans were made to cover different regions of the Kingdom and the main cities, such as Riyadh. Like the directive plans, master plans had a time frame of 20 to 30 years but included detailed plans of roads and land cover, and they targeted planning for the built area and the predicted population (Zahid, 1996).

Doxiadis is a pioneer of urban planning who was behind the master plan of Riyadh City in Saudi Arabia (Pérez, 2018). Following his great participation in planning major cities, the Greek architect and town planner's vast efforts will remain unforgotten. These plans mainly focused on the most pressing issues these cities face, including rapid urbanization. This type of plan held the advantage of accuracy and ability to deal with emergencies. As for master directive plans, they were more concerned with the different aspects affecting the development of rural areas. Ha'il, Mecca, and Al-Baha were examples of areas where master directive plans were executed. Hence, the Deputy Minister of Town Planning first proposed a national settlement strategy. This strategy aimed to determine a clear path to urban evolution and the placement of the predicted population (Zahid, 1996).

The national spatial strategy aims to link different urban levels. The main elements that the strategy was built on were the appropriate usage of the current public potentials, full usage of the predicted financial advantages in the settlements, and the integration of development in urban centers and rural areas. Urban Growth Containment was concerned with establishing

boundaries that would control urban expansion and imposing policies that would ensure the provision of the citizens' needs (Zahid, 1996).

The spatial form of the urban system in Saudi Arabia has always taken a scattered shape as settlements were distributed randomly in the desert. The main factor that caused a significant leap in urban development was the transportation system's connectivity between settlements in Saudi Arabia. Beforehand, land uses were being disconnected from each other and from the city's center, which held all the privileges. After the discovery of oil, the growth rates increased rapidly, transforming the urban form from small towns with one-story houses to tall residential apartments. Nevertheless, this rapid urbanization led to the expansion of the housing sector at uncontrolled rates, thus reducing informal settlements and slums. This called for effective actions to be taken concerning this issue by applying regulations managing the constant urbanization, standardizing settlements' area and structure, and spatially connecting existing land uses on the outskirts and the planned projects. Lastly, these actions were taken to organize the development process and lessen its adverse effects in parallel with the city and the countryside.

2.3 Concepts of Urban Development

The term ‘development’ is a concept that continues to evolve with relative definitions over time, in accordance with the context and discipline where it is used. The ultimate goal of a concept is to guide the thinking and actions (Koponen, 2020). There is no definite definition of development. According to Ting (1989), a word could mean whatever we use in any given context, and not every word is a concept, but every concept is expressed in words. Development has descriptive and normative concepts, which could refer to something happening or evoke an idea or an ideal. Thus, there are combinations of words in the context of the concept, which could change individually or collectively over time, with relative meaning. According to Koponen (2020), development evolves in three basic senses: the ideal goal, the process of change toward the goal, and the action to produce such a process.

Development, from its conception, was about the collaborative effort of humans to achieve a common goal, which is what distinguishes “development” from “evolution” or “progress.” According to Koponen (2020), the first appearance of the word development was in Indo-European languages, around the 12th century, which might be construed as French – *desveloper.* Furthermore, around the 17th century, other languages regarded it as a verb – *developer, develop, entwickeln.* All these connote something becoming unfolding or elementary. “Development” later resorted to being used as a noun after it was generally used as biological and later social vocabulary.. In this contemporary period, development has not lost its valor, as it still connotes bringing something that already existed out, in the form of germ (Koponen, 2020).

Oberle, Stowers, and Darby (1974) explained that urban development is in stages, and it should respect the social structure of the society where it would be implemented, not forgetting to inform the decision-makers that their actions should take care of the present social challenges and those of the future. However, Oberle et al. (1974) cautioned that for every member of the society to benefit from development, every member–powerful and less powerful should ensure that they fulfill their social contract so that social ethics and social structure are enhanced for overall developmental benefits. Furthermore, Rabie (2016) also defined development as a comprehensive developmental process to change the economic position of nations from slow sociocultural change and economic backwardness to sustainable economic growth and political and social transformation of the people, thereby improving the quality of life of the people. This definition highlights that development is in stages and multifaceted, i.e., political, social, cultural, and economic, with the people being its fulcrum and the receiving end.

In the medieval period, the notion of the Christians about advancement revolved around ideas such as: utopian millennialism and the need to make adequate preparations for the next life (Nisbet, 1980). Worster (1993) submitted that during the Industrial Revolution, the perception of the people changed in the sense that they felt it was the appropriate time for them to dominate the economic landscape of production, as what are valuables are anything produced in the industry and placed in the market for sale. The 19th century was claimed to be a period of increased enlightenment, with gradual advancement in successive stages towards the golden age on earth (Nisbet, 1980).

Koponen (2020) believed that development is only a concept. He opined that development should be observed as an enduring human tendency to act intentionally towards altering existing conditions and following how it emerged and re-emerged in different guises. Koponen (2020) submitted that there is a relationship between development and colonization. The ultimate intention of the colonizers was to conquer foreign lands and initiate the development of the resources left behind by the natives. It is important to state that the colonizers perceived the development of the fallow resources as a right and duty. John Locke had this in mind when he colonized North America, although a term such as ‘improvement’ was used. European countries also colonized African and Asian countries, and the resources exploited were used to advance industries in these metropolitan countries. The benefits of ‘extractive’ development of the colonized area, such as Africa, later turned out to be beneficial, as the colonizers, in return, provided missionaries and humanitarian services for the natives, as it was even enacted in the British Colonial Development and Welfare Acts of 1940 and 1945 (Constantine, 2005). In an attempt for the colonies to be self-sufficient, some assistance was given to the colonized countries through loans and colonial railways by His Majesty’s government.

The nationalists, especially the Afro-Asian, saw development as an unbridged difference between the colonizer and the colonized (Koponen, 2020). Thus, the colonizer's claims of benefits such as education, health, and many others were not accepted as development. The

nationalists argued that the colonizers denied the natives the capacity to govern themselves, with no amount of claimed development that could erase the exploitative effects of the colonizers (Koponen, 2020). In a swift response to the claims of the nationalist, the U.S, and Western soft power devised the use of aid for the development of the decolonized countries in accordance with what would suit them, as well as to fulfill the ultimate purpose of colonization – development. This later led to the institutionalization of complex organizational structure, such as Official Development Assistance (ODA), under developmentalism (Koponen, 2020). Additionally, the concept of development in the West has evolved over several years. Today, it can depict qualitative improvement, quantitative growth, and expansion in groups, states, or individuals' capabilities, capacities, and choices. This leads to a conception of development that is more than a quantitative change in some index, which includes per capita income.

As a result of industrialization, there was inequality between the rich and the poor societies. Also, during industrialization, environmental degradation was common, which resulted in the exploitation of raw materials (Goudie, 2018); thus, there was an urgent need for the sustainability of the environment. Argricola (1950, p. 51) submitted that up to the 18th century, wood was an important raw material for fuel and construction.

In the West, the first development phase was between 1700 and 1945, during which there were capitalist economies. With capitalist economies, there was an increase in the wealth of the capitalist but reduced wages of the working class; thus, capitalism has its foundation in selfishness and greed (Mirakhor & Askari, 2010). As a result of its familiarity with German bureaucracy, Karl Marx opined that the state cannot function as an agent of development, as the structures of the civil society promote their economic and social interests through the apparatus of the state. Thus, the state is perceived as capitalist, with poor and no intention of improving their well-being by the state. This, in turn, leads to class conflict. The resultant effect of this would be to jettison capitalism and replace the capitalist leaders with those who know the shortcomings of capitalism (Mirakhor & Askari, 2010). There is a good relationship between capitalism and development, as the former's ultimate goal is to maximize profit, which is usually achieved through unhindered preferences of individuals permitted by the government to perpetuate the act (Sardar, 1996).

The concept of development has always been coined from the perspective of the Western nations, and thus becoming a model for other nations, especially the non-west to pursue, indicating that the non-west nations must jettison their scared and religious values, cultural and traditional heritage, in a bid to become 'progressive' and modernized (Sardar, 1996). Sardar (1996) claimed that development is not a universal concept that can be applied to all societies at all times, as argued by Western nations. With the advent of development, especially in non-western nations, there has been demeaning and suppression of traditions and the proliferation of urbanization, thereby weakening rural communities, introducing debt finance, and displacing traditional agriculture (Sardar, 1996). In Islam, development is not limited to

economic and social aspects only. Instead, Islam encourages the all-encompassing development of human life, including economic, social, and, most importantly, spiritual development.

The concept of development in Islam revolves around *tazkiyah* (Sardar, 1996), where the basic needs of Muslim societies are met by matching needs with acceptable resources and sourcing for the realization and implementation of alternatives. The Islamic development concept also focuses on encouraging economic development with social injustice. Thus, economic development is based on a welfare concept. Based on this perspective, economic development is considered necessary to attain power and might for an Islamic state. A key revelation is that economic development should be accompanied by planning, making it an indispensable means of development. Therefore, from an Islamic perspective, development should include all aspects of Muslim life besides material, moral and spiritual.

The definition of development is vague and has changed based on what it is being defined (Hodder, 2005). Some concepts of development in various disciplines are discussed below to get different perspectives on development.

2.3.1 Concept of Economic Development

Economic development refers to the implementation of specific economic and technical strategies aimed at optimizing the use of available resources to drive economic growth and enhance people's quality of life. (Rabie, 2016). Around the 1950s and 1970s, more emphasis was laid on the quantitative changes in economic growth, which might be due to the dominance of developing countries in agricultural production. Hence, developed nations encourage developing countries to navigate qualitative economic growth by diversifying into the qualitative economy through industrial production and trade (Rabie, 2016). Edwards (1993) made a distinct difference between economic growth and development, as he argued that although economic growth could bring material gain to the people, to be developed economically, there should be an enrichment of lives of all the people living in the society. In agreement with Edwards (1993), Todaro and Smith (2006) argued that economic growth and political stability are insufficient if they do not result in meaningful improvements in people's quality of life. They emphasized that growth without inclusive participation is merely economic expansion without true development. Similarly, Sumners (2011) defined economic development as the process by which a community generates, retains, and reinvests wealth to enhance the quality of life. In contrast, economic wealth is quantified as the annual total value of goods and services produced within a country, measured in GDP (Gross Domestic Product) in US dollars. (Davison, 2015).

Economic wealth can be divided into GDP per person, which does not reflect an individual's purchasing power within a country. However, in 1993, the purchasing power of an individual is now measured through purchasing power parity (PPP) by the IMF. Notably, the PPP tends

to overemphasize the cost of fuel and imported manufactured goods and services while simultaneously over-emphasizing locally manufactured goods and services in its calculation. Therefore, Davison (2015) argued that the per capita GDP measurement of PPP does not reflect the even distribution of economic development within a country. Jones (2004), when comparing economic wealth to economic development, argued that the latter is more inclusive than the former, as it is more focused on developing people than things.

Porter (1990) described economic development as the long-term process of supporting more advanced forms of competition by ensuring several independent microeconomic capabilities and incentives are built. According to Berlin et al. (2010), there is no single definition that would be inclusive enough to accommodate all the different strands of economic development, as the primary strands revolve around community well-being, which includes job creation and retention, tax base enhancement, improvements in a business environment and many others. Another aspect of economic development is called the Human Development Index (HDI) (Roser, 2014). HDI is a social indicator that measures health, average life expectancy, diet diversity, population structure, number of people per doctor, energy consumption, and education attainment. In countries with huge control over the resources, key productive industries, and finances of the majority, especially in developing countries, there would be an increase in the GDP/PPP. In contrast, the HDI would increase (Davison, 2015). The resultant effect of this is the product of economic development is just within a few minorities. Conversely, some countries have a poor economy with lower GDP but higher HDI. Such countries would have citizens with improved well-being, as the wealth of the countries is shared among its citizens.

For an economy to develop, it needs to become heavily industrialized (Gerschenkron, 1962). However, heavy industrialization could threaten the environment; thus, there is a need to be sensitive to the damage to our environment. This led to the emergence of sustainable economic development, where the current generation's needs would not be sacrificed over the future generation (Waugh, 2009). This is in agreement with modernization theory that encourages the course of an open market the influx of multinational corporations, and privatization of the economies of less developed nations to enhance their development (Du Pisani, 2006). Davison (2015) opined that for an economy to be developed, developing countries should increase cash crop cultivation commercial production, improve monetary flow, communication & transportation infrastructure, sanitation and energy services, etc. Additionally, developing countries should encourage increased investment, remittances, rural-to-urban population drift, improving life expectancy, reducing greenhouse gas emissions, etc.

Some key drivers are necessary for the realization of economic growth. One of these factors includes technology and science, which form a strong basis for the next phase of knowledge and innovation, a recipe for economic growth. Another key component is research and

innovation, which makes Research & Development (R&D) vital in promoting economic development.

2.3.2 Concept of Human Development

Todaro and Smith (2006) argues that society ensures wealth acquisition and mental enrichment growth because of improved quality of life. Society thus strives to acquire improved living conditions through social, economic, and instructional processes. Gran (1983) defined development as a social and practical process aimed at empowering individuals and unlocking their potential to gain socially sustainable and practical control over available resources, ensuring the fulfillment of basic human needs and security.. Thus, human development enables people to control their future with effective participation in the whole procedure. In this context, it is important to state that the poor within the society are free to meaningfully participate in social, political, and economic interaction, with the ultimate goal of economic advancement. One could submit that human development is about unleashing the innate potential of people to have absolute control of resources in meeting basic human needs.

When describing development from the perspective of people-centered development, Korten (1990) described development as a process through which members of a society enhance their personal and institutional capacities to effectively mobilize and manage resources, fostering sustainable and equitably distributed improvements in their quality of life, aligned with their aspirations.From this definition, Korten (1990) tried to explain that what could be described as people-centered development is when people as individuals attempt to improve their quality of life through mobilization and management of available resources, such that resources would be legitimate and equally distributed among the members of the society, for their benefits.

John Rawls (1999) conceptualized fairness and justice in society and the equal distribution of assets and fundamental rights among citizens as essential parts of human development. Amartya Sen (2000) describes human development as being better understood through the five freedoms people enjoy daily. These freedoms include social opportunities, transparency, political liberties, protective security, and economic facilities. According to him, human development is the ability of an individual to assist themselves, which further depends on freedom, individual effort, and the effectiveness of society. Martha Nussbaum (2000) introduced the feminist philosophy of human development and portrayed the struggles of poor women. She argues that economics, society, and politics need to be gender-sensitive to address all the problems of women.

Furthermore, Burkey (1993) defined development as a process in which individuals cultivate self-respect, self-confidence, self-reliance, tolerance, and cooperation by recognizing their limitations and potential for positive change. This emphasizes that personal development is not achieved in isolation but through active engagement in the economic, social, and political growth of their communities.(Swanepoel & De Beer, 2006). The process of development is not

solely about increasing human potential. It is also about the enhancement of institutional capacity to control resources. This means the community members should be actively involved in the development process without coercion from outside forces. It is noteworthy to state that it might be a long process to achieve this feat, whereby the participating parties would develop the capacities (De Beer, 1997). Development is also not solely about empowerment; it entails building institutional capacity to ensure the sustainability of the improvement in the people's standard of living.

Human development focuses on improving people's lives by expanding choices and opportunities. Three key components are involved in human development: people, opportunities, and choice. Firstly, human development focuses on improving people's lives rather than assuming economic growth would lead people there. Secondly, human development is concerned with giving people more freedom to live the lives they value most by giving them opportunities. In this concept, people develop abilities that they use in the chances offered to them to better their lives. Lastly, human development focuses on allowing people to have the freedom to choose among the various opportunities that have been presented to them. This means no one should be coerced to use an opportunity presented to them, but they should rather have the chance to make an option.

2.3.3 Concept of Cultural Development

For every nation's economy, institutions, relationships, organizations, and goals exist to serve the people of society. People cannot function or survive without their participation in the economic activities of society. According to Rozbicki (1998), culture is the "framework of socially established and inherited practices, meaning, values and norms shared by members of a society". The culture of the people within a society affects how their economy is organized and how they function. Andah (1982) defined culture as both the material and non-material expressions of a people and the processes through which these expressions are conveyed. Rabie (2016) affirmed that no traditional society emerged as industrialized without experiencing social and cultural transformation. For instance, Fukuyama (1995) submitted that Confucianism has existed for over two and a half millennials in China and has been fundamental in social relations. Conversely, Sowell (1994) claimed that the Chinese culture was responsible for its delayed modernization and change, as China ought to have developed hundreds of years ago. It was after the Chinese transformed its culture by accepting the principle of burrowing cultures from other nations before it began to enjoy societal development (Rabie, 2016).

It is important to state that some third-world countries' leaders are reluctant to transform their traditional culture and socio-political structure. Yet, they want economic development solely for material gain. Western social and political scientists have contended that for development to take place, certain values, work ethics, and attitudes supportive of modern economic organization are essential—elements they argue are often lacking in third-world countries. On

their paths, the economists of the third-world countries promote economic, social justice, and political freedom, thereby hesitating to encourage the transformation of their traditional culture and seeing it as a force inhibiting their development. Rabie (2016) argued that economists from third-world countries are just running from the obvious, as cultural preservation is no longer possible because of the prevalence of the internet and instant communication technologies. Hence, there is a need for an institutional approach to champion cultural transformation in third-world countries.

As no amount of money could develop an economy without considering the culture of the people, the thinking of the people would determine the success or failure of the proposed developmental strategies and programs (Rabie, 2016). Hence, the first step in improving people's social and economic well-being is participation and involvement in knowledge development, political participation, project design, and freedom (Rabie, 2016; Rozbicki, 1998). If a region or sector is affected by economic change, it creates a gap and causes differences between sociocultural and socioeconomic classes. In addition, when one region or group is affected by sociocultural change, there is a corresponding social fragmentation, which widens the socioeconomic gap. Hence, there is a close relationship between culture and economy. A change in one would affect the other. For instance, the rapid cultural change in America around the 1970s resulted in the acquisition of lands in colonized areas, which led to abundant food and an improved standard of living than the Europeans in the 18th century (Rozbicki, 1998). In summary, culture has a huge significance on economic development. Having huge consideration of the cultural aspects of a given country or community forms a strong basis for developing effective development policies that can lead to positive results.

2.3.4 Concept of Social Development

Social development is a concept with a relative definition based on the context of its use. The concept of social development could be tilted towards the economic dimension, as opined by Filgueri (2001). They claim that the concept of social development can be divided into three: (1) the improvement in the condition and quality of life of the people (2) the distribution of wealth that the societies generate, and (3) social differentiation and social complexity associated with capitalist and industrial transformation, which eventually leads to the modern world. The inclusion of ‘social’ into development is an attempt to spite the economist, who is always conscious of the relationship between economy and development (Van Nieuwenhuijze, 1979).

Developmental studies always strive to construe social development to the provision of social services to developing countries – Third World development. The colonial countries attempted to introduce programs that would improve the social welfare of their various colonies. The social welfare introduced can be divided into two: (1) remedial social work services and (2) community development programs (Midgley, 1995). Social development became widespread in the 1950s and 1960s, with Third World countries and non-governmental organizations

adopting it. Having the Department of Social Welfare is still very common in some developing countries. The emergence of the concept of social development was during the aftermath of WWII, which was characterized by the establishment of democratic regimes, social order, and natural autonomy (Filgueri, 2001).

Social development is seen as both a goal and a process aimed at achieving integrated, balanced, and unified social and economic progress within a society. A key principle of social development is the equality of all human beings.(Omar, 1979). Hence, regardless of race and social class, human beings deserve the right to quality health, employment, education, social protection schemes, justice, and participation (Warna, Halfani, & Rodriguez, 2009). Midgley (1995) defined social development "as an approach to social welfare that effectively responds to a current social problem." Social welfare is a term that has been abused, especially in the United States, where the recipients of social welfare are perceived to be lazy and exploiters of government services. Furthermore, social welfare has been construed to connote charity given by philanthropic individuals or public assistance provided by the government to meet the needs of low-income families and children.

Historically, it is the responsibility of an individual and family to provide for their social welfare; in some cultures, neighbors, relatives, and kin are obliged to offer social welfare support to families and individuals who need it. Furthermore, it is also a religious duty to make charitable provisions for those needing social welfare (Midgley, 1995). The institutionalized charity by religious organizations in the 19th century motivated Europe and North America to become involved in social welfare. The three institutionalized approaches for the promotion of social welfare are (1) social philanthropy – donations, voluntary effort, and support from non-profit organizations; (2) social work – professional personnel involved in offering social services to individual groups and communities; and (3) social administrations or social service – intervention of the government through statutory social services (Midgley, 1995).

Social scientists have attempted to enhance the comprehension of social welfare by listing some of its indicators, such as unemployment, crime, school enrolment, life expectancy, and many others. It is important to state that if there is an increase in the prevalence of the highlighted indicators above, such a community or society requires a high degree of social welfare. No country or society is insulated from social problems, but they differ in measures to manage them. A situation whereby a society's social problem is not well managed could lead to social ill fare (Midgley, 1995). The social needs of a community or society vary from one another, and any society that manages its social problem adequately would enjoy a collective sense of well-being.

A society where social welfare exists would have the social opportunity for its inhabitants to advance and realize their potential. Conversely, a society marred with social fare, such as unemployment, would experience a high prevalence of crime and violence, as people would become discontented, seeking alternatives and illegitimate means of improving their social

position. Hence, for a society to attain improved social well-being, there is a need to (1) manage its social problem, (2) ensure that its social needs are met, and (3) ensure that opportunities are created. Social development is broad, encompassing, and universalistic, as it involves the provision of social welfare to an entire population with social welfare (Midgley, 1995). However people cannot enjoy improved well-being without addressing their economic issues. For instance, if a country has an economic recession, people would require more social welfare, albeit from a dwindled governmental revenue.

When the delivery of public goods to society is lagging, the politics or government should ensure that these lapses are bridged. However, claims from the Western hemispheres have projected liberal democracy as the best form of government. Smith (2009) argued that liberal democracy accommodates some tints of irresponsibility and ignorance, such that (1) in the process of electioneering, there is confusion regarding who is in charge – the elected or the electorates, in pushing for people-oriented policies; (2) the process of election causes division among the electorates, such that the eventually elected representatives neglect the course of developing good policies, but rather zest for retention of power; (3) the elected enjoys the ignorance of the majority of the disengaged citizens in terms of equality of vote in decision-making process.

Smith (2009) insisted on a new institution called People's Forum. He argued that through this medium, "leadership would be clarified by placing unambiguously in the hands of the people" with the opportunity of enforcing the politicians to implement public opinions (Smith, 2009). Hence, this Forum would discourage politicians from advocating for policies that are not people-oriented. Furthermore, the politician's role would be reduced to mere executives, as the people would now call the shots, reducing the zest for elective positions. Furthermore, issues paramount to the people would be on the ballot every year, and their results would be publicized Smith (2009).

2.3.5 Concept of Political Development

The emergence of government came from the Roman Emperor, who had all political power within him, with little or no participation from the citizens (Dodd, 1972). After the death of the emperor and the collapse of the empire, the barbarians invaded Europe. Later, there was an upspring of agricultural communities. In an attempt to protect their lives and properties, the European communities surrendered their land in exchange for tenancy rights to guarantee their protection. This laid a foundation for feudalism in Europe, where laws and customs were available to guide the people's behavior (Dodd, 1972). After that, feudalism progressed into the institution of kingship under the moral guidance of the Roman Catholic Church. Dodd (1972) expressed that some perceived the church was to keep the peasants lowly in their proper stations.

Between the 14th and 16th centuries, the rule collapsed in the Church and feudal lords (Dodd, 1972). The emergence of a new state took over all the local courts, estates, and many others from the feudal lords. In Britain, the central power was shared between the monarch and the Parliament. Around the 19th century, there was an increase in economic and social development, such that there was a need for power to control the Industrial Revolution. Around this period, there was also a boost in science and technology.

Dodd (1972) defined political development as the process involving the expansion and centralization of governmental power, the differentiation and specialization of governmental functions, the populace's identification with the political system, and their increased participation in governance. Pye (1965) argued that there is still ambiguity and precision in understanding political development. For instance, there is a general assumption that political development is a prerequisite to economic development. However, Pye (1965) abandoned this idea as it does not agree with the economic situation of underdeveloped countries. Furthermore, this assumption does not focus on the common theoretical considerations, as political development varies according to particular economic problems. Pye (1965) argues the emergence of a new role of the citizenry and new standards of loyalty and involvement, where its citizens now engage in active political participation. Furthermore, within the realm of government, there are some limitations in the functions of government offices and agencies, thus resulting in differentiation (Pye, 1965).

The concept of political development is perceived differently by third-world countries and developed countries, as the former sees political development as a means of national self-respect and dignity in international affairs. In contrast, the latter perceives political development as the era of post-nationalism, where the basic unit of political life will no longer be the nation-state (Pye, 1965). The developed country perceives that the mass participation of its citizens in politics often devolves into the decision-making of politicians. In third-world countries, the major means of mass political participation is through electoral processes, usually marred with manipulations by the elites (Pye, 1965). In a bid to also repute some assumptions about the definition, Pye (1965) argued against the dogma of being solely for the developed and industrialized societies and that any other society could adopt its model of political development. In the developed world, effective participation that leads to equality is rather challenging to achieve, as organizations such as political parties and trade unions create barriers between the contributions of an individual and the government (Dodd, 1972).

Both Pye and Dodd agreed that there is a relationship between political development and political modernization. Although they could be used in the same context, Dodd (1972) argued that political development is seen as a measure to solve challenges through modernization. Some challenges include a preference for equality in a state where monarch ruling is by divine right, a problem of nation-building, a problem of participation and distribution, a problem of practical administration and integration, and many others (Dodd, 1972).

2.3.6 Urban Development and Cities

Since the advent of the Industrial Revolution, the size of the global urban population has increased exponentially. Thus, many workers and families are attracted to the urban centers and are looking for opportunities for better health, employment, education, and quality of life. Currently, 50% of the world's population lives in the cities, and based on the projection, it will be 66% by 2050. Therefore, urban development in cities needs to be more robust, justified, and sustainable.

Haughton (1997) classifies early models of sustainable urban development for cities into four main approaches. Firstly, a self-reliant city approach where local resource uses are emphasized with building the local economy. It also suggests decentralizing settlements as a land use policy. Therefore, with smaller settlements, the environmental footprint remains low. Secondly, redesigning cities and their regions emphasizes compact cities with mixed land use development and more dependence on public transport. This approach focuses on reducing energy consumption to achieve sustainability. Thirdly, externally dependent cities have a policy that is opposite to the first approach. It also focuses on market-oriented solutions from external rather than local resources to fulfill urban demands. Finally, fair share cities are a mixed approach of all the previous three approaches.

Naess (2001) derived five main elements from the Brundtland Commission's report that emphasized achieving sustainable urban development in cities. These include reducing per capita energy consumption, limiting the conversion and encroachment of natural resources for food production, minimizing the use of environmentally harmful construction materials, transitioning to closed-loop systems, and ensuring a healthy environment for the city's residents.

2.3.7 Urban Development in Saudi Arabia

Rapid economic growth has led to rapid urbanization in Saudi Arabia. The growth of the petroleum sector in Saudi Arabia has played a major role in the economic expansion. The expansion in the petroleum field, its exploration process, related industries, and investment have created new employment opportunities, increasing demand for housing and services (Abou-Korin & Al-Shihri, 2015).

The second factor is the activity of the private sector in Saudi Arabia, which has witnessed rapid growth. This private sector is interested in land use for urban expansion and city planning regardless of sustainable]planning. Many agricultural, coastal, and environmentally sensitive lands have been part of the development plans. Furthermore, overcoming this problem is still unattainable because the Kingdom facilitates and supports the private sector's activity through planning regulations and policies (Abou-Korin & Al-Shihri, 2015).

2.4 Indicators and Observatories of Urban Development

This section focuses on identifying the indicators of urban development. The review consists of multiple case studies and articles to justify the research. Urban development deals with the expansion and improvement of the quality of cities. Brooks (2017) denoted that large cities and towns do not just come into existence overnight. Development projects are undertaken and eventually lead to city planning by environmental planners, architects, civil and design engineers, and project managers. The focus of urban development is on residential expansion, which facilitates the expansion of cities. Urban development also occurs due to expanding low-populated areas and renovating decaying regions (Elmqvist et al., 2013). Considering that cities are increasingly becoming engines of economic development and contribute to the national growth of the economy, there is a need to identify development stages and indicators.

According to Wong (2006), urban development depends on development indicators, which present a numeric measure of the quality of life in a country. Indicators are essential in illustrating a country's progress in fulfilling economic, social, and environmental goals (Wong, 2006). The indicators serve as effective measures that can be used to assess the development gap. The rate of development is uneven. For developed countries, the rate of development is higher than that of developing countries. Urban development indicators can assess such a difference in the development rates.

However, since distinct data collection methods represent the indicators, there is a need to select appropriate metrics to evaluate relevant primary sources. The indicators are to be generated through the development of a ranking table, which will help compare medium-sized Middle East countries (Kitchin, Lauriault, & McArdle, 2015). Saudi Arabia, a big country in the Middle East, will be significant in identifying such indicators. Thus, this research aims to identify some indicators that will show the current level of development in Shaqra, Saudi Arabia.

2.4.1 Sustainable Urban Development Indicators

The United Nations' (UN) sustainable development goals provide a layout towards achieving a better and sustainable future for all. According to a UN report, 55% of the world's population resides in cities, expected to rise by 70% by 2050 ("Sustainable Development Goals," 2015). Cities have to be developed to create space for the continuously increasing numbers. In the context of urban development indicators, the sustainable development goals include but are not limited to the following: elimination of poverty, zero hunger, good health and well-being of the city residents, quality education, and clean water and sanitation. Other essential goals include infrastructural development, clean and affordable energy, industrialization, economic growth, innovation, and life on land ("Sustainable Development Goals," 2015). Generally, the sustainable development goals will focus on creating a sustainable city to provide the best environmental conditions for its residents. The sustainable development goals also contribute

to a just and peaceful city, thus strengthening its institutions. Sustainable indicators are also used to measure the rate of development without the depletion of the available resources.

The indicators of urban development typically revolve around three broad dimensions, which are environmental, economic, and social indicators. Sustainable development aims to establish a balance between human needs and the preservation of the environment (Klopp & Petretta, 2017). Urban developers are recommended to maintain sustainable development while expanding and renovating urban areas. The urban development indicators should also focus on sustainable measures such as stopping pollution, increasing the availability of recycling facilities, and focusing on clean energy sources. A good example involves natural expansion, where developers must clear up the wildlife regions in developing the cities (Gould, 2016).

However, in the renovation of cities, developers should integrate alternative energy sources and eliminate pollution-producing facilities. However, it is important to conserve natural resources despite the overwhelming urge to clear up forests to create human habitats. Sustainable development indicators reflect the reality of three major segments that are vastly interconnected (Pupphachai & Zuidema, 2017). These three segments include water quality, air quality, and natural resources, which have played a key role in urban development, making them the key drivers.

Fitzgerald, O'Doherty, Moles, and O'Regan (2012) developed a Sustainability Evaluation Metric for Policy Recommendation (SEMPRe) method to measure settlement sustainability. This study measured four sustainable development indexes (SDI): environment index, quality of life index, socio-economic index, and transport index. Each of these indices has ten indicators to quantify them. See Table 1 from Fitzgerald et al. (2012) for more information.

Stossel, Kissinger, and Meir (2015) developed the urban biophysical sustainability index (UBSI), which includes urban environmental quality, resource consumption, and effects on climate change. This study argues that previously developed similar indices have many shortcomings, such as difficulty measuring complex interactions between urban activities and the environment. They used a relative rather than an absolute evaluation approach and measured at a single regional scale rather than a different spatial scale. This study differentiates environmental sustainability issues based on three spatial scales – local, regional, and global. Environmental quality, effects on climate change, and resource consumption are three topics evaluated in this study.

Lynch et al. (2011), in their technical report for the United States, compile and improve sustainable urban development (SUD) indicators. This report mainly focused on three aspects of Urban sustainability – environmental quality, economic opportunity, and social well-being. They classified the variables and indicators and measured the single or plural elements required to quantify these indicators. Table 1 shows the results of the number of indicators identified.

Table 2.1: Coverage of SUD framework, their elements, and quantifiable indicator numbers.

Coverage SUD framework	Variables	Single Element Indicators	Multi-Element Indicators	Total Indicators
Environmental Quality	Efficient Land Use	0	27	27
	Efficient Resource Use	1	22	23
	Waste/ Pollution Minimization	2	29	31
	Climate Change	0	25	25
	Efficient Transportation	0	22	22
	Diverse Natural Environment	2	19	21
Economic Opportunity	Diversified Economy	14	1	15
	Coordinated Infrastructure	2	0	2
	Growth Plans that Leverage Assets	0	0	0
	Access to Capital and Credit	5	1	6
	Access to Jobs, Education, and Training	13	0	13
Social Wellbeing	Health	9	15	24
	Safety	8	5	13
	Local Identity or Sense of Place	8	3	11
	Access to Affordable Housing and Services	13	12	25
	Access to Recreation and Open Space	0	7	7
	Access to a Variety of Transportation Options	2	3	5

Many variables have single-element indicators and multi-element indicators. Depending on the broadness of the indicators, several indicators are required to cover a specific SUD framework. For example, the social well-being framework involves health, safety, and local identification of a sense of place. It is worth mentioning that this study by Lynch et al. (2011) was conducted before the SDG development was set up in 2015. Moles, Foley, Morrissey, and O'Regan (2008) study urban sustainability at the settlement level and adopt an indicators category for measurement. the other hand, Morrissey, Iyer-Raniga, McLaughlin, and Mills (2012) classify urban infrastructures as intra-urban and extra-urban civil infrastructures.

To have a basic knowledge of comparing the efficiency level in fostering development, there is a vast need to develop indicators that measure the performance of different cities. As such, there are multiple urban development indicators, but they vary according to their respective countries. Based on the UN's sustainable development indicators, such indicators include the following:

2.4.1.1 Economic Urban Development Indicators

The economic indicators include various indices and economic summaries contributing to a country's economy or cities. The economic activities are linked with the major operations that generate the source of wealth for a particular region (Wong, 2006). The major economic indicators include:

Inflation: Inflation measures the cost of services and goods in a given area. Inflation has a significant impact on urban development. With high inflation, the asset prices in a city are likely to increase, thus discouraging the urban growth limits. This could discourage investors from investing in the city and lower its growth chances (Fedulova et al., 2019). Consequently, inflation could lead to a reduced population due to the migration of people to areas with stable economic conditions.

Employment: Employment is essentially significant not only for developing but also for developed cities. It is the key reason most people will be willing to move to a particular city. Employment creates an environment where people can invest and spend. Ultimately, both of these actions lead to the growth of an economy, which further expands urban development (Klopp & Petretta, 2017). An increase in employment opportunities would increase the population. An increase in population is a direct indicator that developers would improve the facilities in the city.

Housing: Given a state where houses are in high demand and with increased house prices, banks lend more, and the economy booms. As such, the developers are motivated to build more housing to meet the high demand. However, in cases where there are weaknesses in the housing sector, the banks are less willing to give out their money, limiting the flow of resources in an economy (Parnell, 2016). An improvement in the housing sector can be directly linked to urban development indicators. Concisely, the developers take advantage of such opportunities and invest in building more houses.

Spending: It is highly evident that people currently live in a consumption-based society. An increase in consumers presents a major impact on economic growth. Many surveys have attempted to make consumers feel about the state of the economy, but behavior is what counts most. Looking at the monthly retail sales makes it easier to analyze the spending rate through the consumer's activity. For instance, most consumer products have been updated based on global evolution, and everyone wants to be equally updated (Fedulova et al., 2019). Take the case of tech products; consumers further update the product to enjoy the latest advancements despite having functional products. Therefore, spending is a major indicator that can weigh the level of urban development.

2.4.1.2 Social Urban Development Indicators

Social indicators are statistical measures that denote the social trends and conditions that impact the well-being of humans. Consequently, the social indicators are subject to the roles, which include monitoring and evaluating policies and providing information for decision-making (Kilijoniene & Simanaviciene, 2009). Moreover, social indicators also search for a common good and provide effective means of reaching such objectives. In urban development,

social indicators play a crucial role in measuring the success of a city based on its current social levels. Some of the most common social indicators include the following:

Life expectancy: This can be used to indicate several social sectors, such as healthcare quality. Major concerns about improving healthcare standards have been raised in developing and undeveloped cities. If a city lacks adequate healthcare facilities, it indicates its development state. Urban development is closely interconnected to better healthcare services following its necessity to the public. Life expectancy also includes, but is not limited to, providing care to the elderly.

Literacy rate: This presents the rate at which people living in a particular area can read. This is a significant indicator of identifying an educational state in a state or city. A high level of female literacy equates to the general correspondence of a steep increase in knowledge, hence reducing birth rates. With high levels of literacy, there are higher chances of development following the application of different conceptual and technical skills in the city's development. Cities with low literacy levels could be highly linked with crime and thus discourage their growth.

Gross National Product (GNP) per capita: GNP per capita is calculated by dividing the Gross National Product (GNP) by the total population. GNP per capita is a common indicator used to measure the development of cities. By acquiring such data, the developers are able to determine the urban development level of a state.

Birth and death rates: Birth and death rates can be used to measure the state of healthcare and education in relation to urban development. The number of deaths could be closely associated with the infant mortality rate, which inadequate health facilities impact. A high birth rate present could be associated with decreased development. Consequently, increased deaths denote the level of urban development, which is relatively low.

Urban poverty: This is another indicator used to measure the state of residents living in urban areas. In India, over 25% of people in urban areas are below the poverty line. This accounts for more than 81 million people as of 2017. Such high figures are vital indicators that deliver information concerning urban development in such areas (Zhang & Li, 2018). However, in the central cities in developed countries such as the United States, the poverty levels in the urban areas are attributable to their great success. When urban poverty is high, urban development can be drastically low.

2.4.1.3 Environmental Urban Development Indicators

Urban environmental indicators involve set parameters urban developers and stakeholders employ to measure, monitor, and evaluate a city’s environmental conditions. Such indicators mainly focus on the ecological sustainability development of cities. This is based on the factors

that significantly impact the quality of life and healthcare conditions. In the last two centuries, the world has witnessed an anonymous population concentration in urban areas caused by rural-urban migration in search of greener pastures. Following the industrial revolution's culmination in the 1800s, the Western world experienced rapid urbanization, which later extended to developing countries (Stern, 2004). According to a United Nations report, slightly over half of the global population now resides in urban areas. Therefore, based on the increase in urban population, it is essential to determine whether the available resources are being utilized effectively. The environmental indicators play a vast role in analyzing whether the city can balance its huge population with sustainable environmental standards. Below are the common environmental indicators of urban development.

Freshwater: This is a common indicator that defines the state of cities. The absence of water in a city would be linked with multiple adverse effects, as water is a basic necessity. Fresh water may not only be used for human consumption but also for running the industry. Recently, it has been established that the availability of fresh water is currently a global issue that needs to be addressed. This has been noted through indicators such as the alteration of rivers, rivers running dry, and water pollution. Such indicators lead to environmental water scarcity, which can profoundly affect the residents of a city (Burgass, Halpern, Nicholson, & Milner-Gulland, 2017). This can further contribute to poor hygiene and sanitation. It is possible to identify sanitation challenges in developing and developed cities. A good example is Riyadh or Jeddah cities, which have well-designed sanitation systems, as discussed by Burgass et al. (2017).

Atmosphere: Urban atmospheres play a significant role in ensuring city residents have a quality life. Ozone depletion is considered in the cities and is mainly affected by industrial waste emissions in the atmosphere. The developed countries should be well enlightened about such implications and thus find amicable measures to control such pollution. The adoption of electric vehicles in a city is among the significant indicators demonstrating their sustainable efforts. Also, forests are a good indicator of environmental development (Stern, 2004). Unfortunately, trees are increasingly being cut to provide space for development. However, there are developed cities that have maintained natural resources such as trees. The indicator of land use could also be incorporated as it denotes the land used against carbon emissions. With the current consumption and land use rates, the United Nations has established that humanity is using more than two planets to sustain itself.

Living conditions: In developed cities, residents are more likely to be high- and middle-income earners. The reason is that the living standards in such areas are relatively high. Thus, living standards play a significant role in establishing the level at which a city has developed. The high purchasing power of consumers or the considerable number of people driving could also be denoted as an indicator of urban development.

2.4.2 Urban Development Observatories

An urban observatory is an interactive evidence that compares statistics and data of cities worldwide from a central station. An observatory aims to make the accumulated data easy to work with and understand (Caiaffa et al., 2014). Urban observatory monitors urban development at the local, national, and regional levels. Local urban observatories are found in a non-governmental or tertiary institution, such as a city. The local urban observatory is used to produce, manage, and analyze information about the performance of a city, specifically the urban indicators and the other relevant issues in decision-making at the local level. The failure or success of any urban policy is majorly determined by how local priorities are being responded to. Local priorities in this context refer to a given local government's intended spending on development projects.

The national urban observatories are responsible for organizing and merging the data collected by the local urban observatories in a country. They can also develop their regional, national, and local data. This global urban observatory usually encourages the formation of national urban observatories, which helps keep an eye on national trends and helps in decision-making. The nation's urban observatories act and serve as bodies used in consultations on issues related to national policies. It takes many forms, including being part of an existing national agency and a national coordinating body for the local urban observatories. National urban observatories also act as part of research or academic institutions.

Regional urban observations exist because they assist the local and national urban observatories through capacity building, the localization of monitoring tools, and policy guidance through evidence in providing knowledge. The regional urban observatories are usually hosted in academic institutions. Regional urban observatories also guide national and local urban observatories through standardizing indicators and information (Prastyo & Herdiwijaya, 2019). The most useful urban development observer is the global urban observation led by the UN-Habitat, whose first inception was in 1996. The World Bank developed a plan associated with UNHABITAT's wide knowledge, forming an urban observation database. The information and statistics found on UN-HABITAT should contain a wide range of readily available information that can be used for future city observation in developing countries, mainly in Africa, Asia, and some parts of the Caribbean and South America. The first phase of this project includes a study and financial donations by the Japanese government.

Urban observatories have several purposes, including creating sustainable urban monitoring systems with the support of the local management and planning process. The urban observatory is also used to strengthen the capacity of the locals to develop and use urban indicators to facilitate the collection and dissemination of information at the city level. It also promotes the ownership of local urban indicator systems and monitoring and assessment in the urban sector. Urban observatories aim to provide timely and high-quality information. Urban observatories are driven by the need to improve coordination when measuring and monitoring urban

indicators, such as environmental, urban, and socio-economic development (Welty et al., 2007). Urban observatories are also driven by the need to develop knowledge-based information systems. It cooperates with others in the global network to share resources and methodological knowledge and disseminate national, global, and regional information.

Goal 11 of the Sustainable Development Goals (SDGs) indicates the need to ensure that human settlements are resilient, safe, and sustainable. This has a total of ten targets, and it is measured with 15 indicators ("Sustainable Development Goals," 2015). The targeted outcome of this goal includes the creation of inclusive and sustainable urbanization, a transport system that is affordable and sustainable, a protected cultural and natural heritage, reduction of environmental effects of cities, a housing system that is safe and affordable, as well as the provision of public spaces that are safe and green.

2.5 Sustainable Urban Development and Planning

Sustainable development goes beyond economic and social issues concerning natural resources. Sustainable development was coined by Barbara Ward, at the 1972 United Nations Conference on Human Environment, held in Stockholm (Ward & Dubos, 1972). The popularization of sustainable development resulted from the Brundtland Report in 1987. The Brundtland Report reaffirms securing global equity for future generations and redistribution of economic resources, especially to the poorer nations, to enhance the inclusive achievement of the basic needs of human beings globally. The report also highlighted the triple bottom line of sustainable development: (i) environment, (ii) economy, and (iii) society (Brundtland, 1987). As efforts to ensure the sustainability of development are laudable, there are mixed reactions from some of the less-developed countries that perceive sustainable development as just a ploy by the developed countries to sustain their economic hegemony over them. Others also claim that sustainable development is just a means to provide stringent conditions for aid to them (Mitcham, 1995). According to Adams (2012), urban planning influences the development process through three main instruments: plans, control, and promotion. However, land policy, taxation, controversy, and political consensus often impact such activities.

2.5.1 Sustainable Urban Planning

Sustainable urban planning focuses on development strategies and practices that promote livable, self-sustaining communities over the long term. Sustainable urban planning involves architecture, engineering, technology, transportation, and economic development disciplines. This could be related to America's first urban planning conference in 1898 in New York. A question was asked by a British planner on whether he and his colleagues were striving for beautiful cities or beautiful people. Further, the planner wondered whether urban planning was about physical design or making the lives of urban residents easier. This was an essential question that wasn't accorded much weight until the early 20th century. It was then that urban development was said to entail more than just designing beautiful cities and protecting people's

lives. This led to the development of environmental sustainability, which is concerned with multiple variants in the maintenance of the environment (Abubakar & Dano, 2019). Urban sustainable development is limited to addressing the ecological, economic, political, social, and other cultural aspects of different communities.

It is recommended that urban planners consider the essential parameters necessary for sustainable urban development. Environmental sustainability emphasizes the conservation of biodiversity hot spots. Following the high climatic temperatures in Saudi Arabia, planners can consider allocating more space for tree plantations to increase shade and climate control. Economic sustainability presents another parameter that developers should consider (Mikovits, Rauch, & Kleidorfer, 2018). This involves considering the practices that will support the cities without adversely affecting the social, environmental, and other aspects related to the community. Consequently, social responsibilities are essential and should be incorporated into urban planning. Social sustainability issues include human rights, living conditions, safety, community engagement, diversity, and work-life balance (Basiago, 1998).

The history of the term "sustainable development" can be attributed to Thomas Malthus, a political economist, as he emphasized that human growth would exceed the regeneration of resources, thus leading posterity to starvation and poverty. However, economists had often disregarded these theories as their main concern was resource efficiency. This approach was then deemed unsuccessful as the pressing environmental issues grew. The term ‘sustainability' was then addressed by urban planners, as they felt the need to conclude the preservation of the resources within the city's development. Due to the different perspectives of planners, the sustainability concept was viewed differently. For instance, economists perceived it as a means to maintain higher economic growth levels in the long term. Ahmadi and Toghyani (2011) and Basiago (1998) agreed that meeting the needs of society, including services while conserving resources, is the approach used by economic analysts to apply sustainability in urban planning. Environment activists, however, contributed to the development of sustainability in urban planning to achieve the renovation of cities while protecting natural resources from depletion (Basiago, 1998). This can be achieved by respecting the biophysical environment and applying policies and regulations that present a land suitability map for different land uses. Using renewable resources and maintaining low levels of pollution emitted from different activities are means to apply sustainability from the environmental aspect (Ahmadi & Toghyani, 2011).

Social sustainability is associated with the concept of communication, public participation, and increasing life standards without jeopardizing the existence of natural resources. Basiago (1998) summarized the application of social sustainability in the equity of provision while maintaining lower consumption levels regarding limited resources. Ahmadi and Toghyani (2011) defined social sustainability as reducing the contrast between social classes in society. Ultimately, the dynamics and integration between the three aspects- economic, social, and

environmental development- intertwine to achieve the prospect of "urban sustainability" (Basiago, 1998).

According to Healey and Williams (1993), urban planning has adopted a broader perspective when tackling planning strategies, as the planners' main concerns have extended to include the environmental conservation aspect. Before this development, planners concentrated on cities' extension, infrastructure, and renovation, considering environmental sustainability (Healey & Williams, 1993). The Commission's Environment Directorate (Directorate-General of the Environment, Nuclear Safety, and Protection (DGXI) states that environmental sustainability positively affects the economy of the cities. This positive effect is derived from the cities' marketing strategies that use their environmental concern, reflected through the clean urban surroundings, as a strength point to attract investment and services development (Healey & Williams, 1993).

According to Healey and Williams (1993), planners have started considering cities' geographical and cultural diversity. The best example to illustrate the idea of diversity is the European countries. For instance, Northern European countries value the neighborhood lifestyle; therefore, planners have concentrated on developing the residential landscape and reducing traffic. Furthermore, the British government has conserved green belts while implementing urban extension plans (Healey & Williams, 1993).

According to Fallanca (2020), there is a strong linkage between urban planning and people's right to well-being, which is reflected by ensuring green areas away from any sources of pollution. This approach not only guarantees an extension in life expectancy but also ensures the cities' self-sufficiency in the long term. Therefore, well-being is defined in urban planning as modeling cities to be sustainable, environmentally clean, healthy, and socially comprehensive (Fallanca, 2020). In addition, a new concept, "Urban well-being," has emerged to reflect planners' approach to building cities with public places that serve different cultures and ethnic groups. Implementing urban well-being is complimented by assuring the linkage between different spatial fragmentations, creating connectivity and transportation fluidity between the central and peripheral areas (Bevilacqua, Calabrò, & Della Spina, 2020).

2.5.2 Rapid Urbanization and Sustainable Urban Planning in Saudi Arabia

Rapid development has caused about severe damage to the environment, which contradicts the goal of achieving sustainability. Many agricultural lands have been damaged, and the marine life in the coastal areas of the Arabian Gulf has been destroyed. According to the Ministry of Petroleum and Mineral Resource, Kingdom of Saudi Arabia MPMR, KSA (1982) and Quick Bird (2003), between 1982 and 2003, there was a rapid increase in the urban expansion on the agricultural lands, as this expansion has included 420 hectares of the most productive agricultural land in Dammam 2,200 hectares in Qatif (Abou-Korin & Al-Shihri, 2015).

Moreover, landfilling in coastal areas is another destructive activity. The main drive behind coastal land-filling is the high prices of the properties allocated by the sea. Between 1982 and 2003, land-filling expanded to 6500 hectares in Arabia (Abou-Korin & Al-Shihri, 2015). Also, rapid urbanization has resulted in a phenomenon known as "Urban Sprawl." This problem has emerged due to the extensive development and expansion of urban areas exceeding the growth of the population. For instance, in 2003, the population rate was 64 persons/ha in the Dammam Metropolitan Area (DMA), which is considered low compared to cities in neighboring developing countries. However, these low rates are still decreasing; for example, between 1972 and 2003, the population density of Dammam city fell by 46%. This urban sprawl has resulted in conflicting land uses, such as oil and gas lines, military bases, and livestock markets. These conflicting uses negatively affect the environment and urban sustainability (Abou-Korin & Al-Shihri, 2015).

Moreover, the major land use resulting from the urban sprawl is building residential areas without considering the need for future developmental plans for more land. Also, most of these residential areas are vacant, which will restrict future urban expansion planners due to the lack of suitable vacant lands (Abou-Korin & Al-Shihri, 2015). In the last 40 years, many large-scale projects emerged, creating what is known as "Cities within Cities." When studying the case of DMA, it is found that some new cities are larger than already existing cities in DMA. This overlapping of cities will severely and negatively affect the environment, the traffic, and the infrastructure in the urban areas (Abou-Korin & Al-Shihri, 2015). Also, rapid urbanization has created housing un-sustainability in terms of the patterns and costs of housing. This means that the housing units are not meeting the current needs of the Saudis because the housing units exceed the financial capacity of the youth and the middle class. Lately, the average size of Saudi families has decreased; therefore, the designed villas and wide apartments surpass their needs (Abou-Korin & Al-Shihri, 2015).

2.6 Theories of Development

The theory explains why the research problem exists. This study is hinged on the theories of development. The theories of development came into existence around the middle of the twentieth century, when there was an obvious disparity between the developed and the third-world countries. During this period, decolonization was rampant (Todaro, 2000).

2.6.1 Theory of Modernization

According to Reyes (2001), modernization theory is a systematic process targeted at underdeveloped countries to encourage them to move into the development era. Hence, the U.S. and the European countries can describe it as the normative development model. The emergence of modernization theory was because of the response of the political scientists of North America about the feature of the prescription of developmental economics (Rapley, 1997). Although the theory of political development enhances the economic standings of the

nations, it also affirms the need for social and cultural reforms. It is important to state that as modernization is appropriate for political development, it also applies to any liberal modernization theories targeting third-world countries, especially after 1945 (Berger, 2019). Peet (1999) argued that modernization theory encourages the development of third-world countries by rationalizing the mental model of the West, their institution and goals, and their culture of worshipping commodities. Hence, any society interested in becoming developed should open its market, encourage the influx of multinational companies, integrate advanced technologies in its productive activities, and privatize its economies (Peet, 1999).

Haque (1999) argued that one of the reasons for the emergence of modernization theory was to prevent countries from being controlled by the Communist government during the Cold War and the freedom of third-world countries from Western countries. Hence, the U.S. government attacked the erstwhile USSR in a bid to prevent the spread of its communist ideology and targeted modernization theory. Another reason for the emergence of modernization theory was the resultant weakness of Great Britain, France, and Germany after WWII, allowing the U.S. to become the world leader. The US emerged as powerful after WWII, thereby implementing the Marshall Plan to reconstruct affected areas of Western Europe by war (Chirot, 2013). Furthermore, Chase-Dunn (2000) opined that modernization theory was developed to enable institutions and labor to complement industrial production and impact families, a modern belief of people and society.

Rostow (1960) stated that modernization theory can be divided into five stages: the traditional society, the preconditions for take-off, the take-off, the path to maturity, and the age of mass consumption.A limited scope of productive activities characterizes the phase of traditional society. Such a society has a shallow understanding of technology and advancement in equipment that would facilitate mass production and the protection of the environment. Hence, Rostow (1960) claimed that this stage of modernization represents an unbalanced societal pattern of classification, whereby a specific region is a political focus. In Europe, the pre-conditions for take-off occurred in the Middle Ages by developing modern science and ideologies. This resulted in land discoveries and trade expansion through the quest to avoid stiff competition from within European countries (Rostow, 1960).

The take-off stage occurs whenever there is an integration and application of new industrial techniques into production, i.e., lumbering, railroad industry, and cotton textiles (Rostow, 1960). The stage of maturity witnessed total automation of productive activities, whereby there was huge expansion, such that the newly developed field rivals the old sector (Rostow, 1960). The age of mass consumption led to massive durable goods consumption against the background of increased welfare, leisure, and security for the laborers. Furthermore, there is a quest for power and international dominance, especially for the developed countries (Rostow, 1960). Notably, as more countries reach the age of mass consumption, they are more willing to extend foreign aid, especially to underdeveloped nations (Guilhot, 2005). There is also the

practice of democracy among the developed countries; however, Shareia (2015) argued that the U.S. undertook the conservation of its hegemonic beliefs in the rights of human beings. Another criticism of the modernization theory is that modern and traditional values are not always mutually exclusive. For example, despite China and Japan's economic and technological advancement, they still operate traditional values (Redfield, 1965).

2.6.2 Theory of Dependency

Dependency theory complements modernization theory, adopting some elements from the new Marxist theory. The crux of this theory is the totality of the society and social system in the periphery, which states the differences between developed and third-world countries. The dependency theory emerged in the 1950s. According to Prebisch (1962), a representative author proposed a model that sought the conditions for development within a country. The objectives of the model include:

i. To control the monetary exchange rate, thereby ensuring that the government prioritizes fiscal policy rather than monetary policy;
ii. To encourage effectiveness in the role of the government towards national development;
iii. To encourage the creation and development of an investment platform where national capital would be prioritized;
iv. To enable the inflow of external capital as a result of the established national plan for development;
v. To encourage coherent domestic demand for markets in a bid to facilitate the process of industrialization of Latin America;
vi. To boost the demand for the domestic market in waged and salaries of workers;
vii. To boost efficiency in social services, especially within the impoverished sector, thereby making them more competitive;
viii. To facilitate the development of national strategies per the import substitution model, thereby protecting national production by establishing tariffs and quotas on external markets (Bodenheimer, 1970).

Falleto and Dos Santos affirmed that it failed to meet its expectations, which resulted in establishing a dependency model. Keynes' economic theory was the response to the depressive years of the 1920s by Europe and the U.S. It is important to state that Keynes' economic approach has four main points in the theory of dependency (Santos, 1970):

i. To develop an effective internal demand for the domestic market;
ii. To realize the importance and the relationship between the agricultural sector and the industrial sector, in the form of their provision of value-added products;
iii. To increase the aggregate demand in the natural market through increments in the wages and salaries of workers;

iv. To encourage improvement in the national standard of living and reinforce national development through various governmental roles.

The classical movement perceived that there would be a bourgeois revolution at the introduction of the process of national transformation. At the same time, the neo-Marxists believe it is important to have a socialist revolution, as the national bourgeoisie strongly associate themselves with elitist positions rather than nationalist ones.

In addition, the classical Marxists believe that the industrial proletariat possessed more strength and vanguard for social revolution, as the revolutionary class must comprise the peasants to achieve armed revolutionary conflict (Foster-Carter, 1973). While the classic orthodox Marxist movement claimed that the 'surplus' enjoyed by the developed countries was a result of the relationship between the capital and labor in the production process, the neo-Marxists argued that the paucity of 'surplus' in the third world country was as a result of lack of equality in the exchange between the capitalist and the third world countries (Haque, 1999).

The dependency theory perceived that the developed countries caused labor imbalance, which was detrimental to the economies of the third world countries, by decreasing its economic growth rate and inequality of income (Reyes, 2001). Furthermore, the inhabitants of the third world would experience poor social welfare. This act further widened the gap in trade dependency between the two entities, such that there was no equality in the processed goods and raw materials. The resultant effect of price inequality in goods would affect third-world countries, as accruable taxes would be grossly diminished, leading to an inability of the government to fund health and other social programs.

The following are the similarities between the school of thought in modernization and dependency: (i) both focused on the development of the third world country; (ii) there was an abstraction in the methodology, which focuses on developmental processes, examining nation-state as a unit of analysis; (iii) the choice of polar theoretical structural vision, viz.-a-viz. Tradition, modernity, and core and periphery-dependency (Friedrichs, 1970). Critics of dependency theory, however, claim that its theoretical position is abstractive in its analysis. Furthermore, Santos (1970) claimed that the dependency movement opined that the association with transnational corporations would always have detrimental consequences for third-world countries. In contrast, it propelled technology transference, as the U.S. was once a colony that successfully broke the vicious cycle of underdevelopment.

2.6.3 Theory of World System

The world system theory argues that resources are transferred from third-world countries (the periphery) to developed countries (the core) through international trade, thereby leading to peripheralization and dependence of the third world country on the developed country (Szymanski, 1982). The emergence of the theory of the world system was common in the 1960s

in response to the prevalence of capitalism around the world. In return, the third world countries now have new conditions to improve their living and social conditions. However, the national governments of third-world countries are experiencing lesser influence due to the new conditions posed by the international financial and trade systems. As a result of this new development in the capitalist world, Immanuel Wallerstein and other scholars highlighted new factors that influence underdeveloped nations, arguing that the study of development cannot be fully understood at the nation-state level. Key elements contributing to the development of third-world countries include new trade mechanisms, the global communication system, the transfer of knowledge, and military connections, and the international financial system. It is important to state that these elements mediate between each third-world country's global level and internal aspects.

Wallerstein (1987) posited that the world capitalist system is volatile and generally unstable, and it could only function if there is a dominant power that could manage any conflict between the economically hegemonic powers. In the 1970s, the world system theory was appealing. Firstly, there was remarkable economic growth in East Asia, including Taiwan, South Korea, Hong Kong, Japan, and Singapore. Therefore, this region could be called a manufacturing imperialist. Secondly, the signal of the end of revolutionary Marxism was caused by the widespread crisis among socialist states. Thirdly, there were crises in North American capitalism, including the 1975 oil embargo, the Watergate crisis, stagnation and inflation of the late 1970s, and the widening trade gap of the 1980s.

2.6.4 Theory of Globalization

Based on the quest for economic transactions, the theory of globalization emerged from the global mechanism of greater integration. This perception is somewhat similar to the approach of the world system. It is noteworthy to state that the position of globalization is tilted toward global communication and cultural exchange (Meyer, 2007). The submission of globalization scholars is that globalization is far beyond financial, political, and economic ties; rather, it connotes development across cultural links among nations. One of the fundamental avenues through which cultural exchange occurs is technology flexibility (Kaplan, 1993). Secondly, even in the final degree of salt in the developed country, communication systems enter this very small leading country because of the access to bilateral globalization with global space communication. Thirdly, structural changes have occurred in the economic and cultural communication patterns. Thus, the virtual monitoring mechanism creates a new environment where economic transactions have become efficient. Fourthly, although the minorities in some nations have not fully keyed into this new communication approach, the business and the political elites in the third world are making the best use of the new communication channels. They are usually the decision-makers. Finally, cultural elements would determine each country's economic and social structure (Moore, 1993).

Both the theory of globalization and the theory of modernization agree that the path of development must be from the capitalist nations – U.S. and Europe, towards the third-world countries. Furthermore, both theories agreed that the development model for any nation, especially the third countries, should be models approved by the U.S. and Europe.

2.7 Theories and Guiding Concepts of Sustainable Urban Development

Due to global climate change and environmental degradation challenges, cities are on the front line of achieving sustainability by promoting sustainable urban development. Several theories and concepts have been introduced and implemented over the past decades for this purpose. All the theories and concepts have unique approaches to making cities more sustainable and resilient. This section aims to understand the major theories of sustainable urban development and adopt a particular theoretical approach to complete this study.

2.7.1 Ecological Modernization Theory

As a theoretical approach, ecological modernization (EM) arose in the 1980s to explain the relationship between innovation, intervention, and economics to achieve the desired environmental results (Mol & Sonnenfeld, 2000). It is also addressed as an important shift to the ecological consciousness, which values nature and environment over development (Howes, 2010; Mol & Sonnenfeld, 2000; Sonnenfeld, 2000). It has gained attention for environmental policy analysis due to its more rational environmental framework for exploring the roles of different social actors to achieve the best environmental outcomes (Christoff, 1996; Howes, 2010; Spaargaren & Koppen, 2009). Though it emerged in the social and political sciences, it has printed significant credentials in sustainable urban development and planning through influencing environmental policy, shaping environmental politics, and guiding environmental management.

Frederick Buttel (2000) defined ecological modernization (EM) theory as a well-developed and highly influential social theory shaping politics and states. However, according to Spaargaren & Koppen (2009), EM theory requires more researchers to support broader political, economic, and cultural implications. According to Mol & Sonnenfeld (2000), EM has much to contribute to economic development and sustainable planning. Ecological modernization is a theoretical approach with enormous support for guiding the 21st-century sustainable development (SDGs) commitments, especially in a world where ecology is most hampered due to inconsiderable development initiatives.

2.7.2 Sustainable Urbanism Theories

The degradation of the environment and the changing nature of the climate due to the increasing pollution level in the cities started to raise concerns during the 20th century. To tackle this situation and promote awareness about environmental conservation, the United Nations Environmental Programme (UNEP) nominated 5 June as the World Environment Day in 1973

(Tang & Lee, 2016). The day they have circulated several themes to guide our future development perspectives, such as “Green Cities” in 2005, “Time for Nature” in 2020, and “Ecosystem Restoration” in 2021. Every year, a special theme on the urban environment, development, and planning is promoted through this day, such as “Shelter and Urbanization” in 1990, “Cities and Climate Change” in 2011, “Housing for All: A Better Urban Future” in 2020, and “Accelerating urban action for a carbon-free world” in 2021. Though these initiatives were small, they established the building blocks to pave the sustainable development pathway.

The prime progress towards sustainability was achieved by adopting Millennium Development Goals (MDGs) (Loewe, 2012). In this summit, the leaders of 189 countries signed the Millennium Declaration, whose goal number 7 was to “ensure environmental sustainability. MDGs showed substantial progress in meeting the commitment and contributed to the development in several sectors. However, the breakthrough came through the initiative of Sustainable Development Goals (SDGs) in Rio de Janeiro in June 2012 (Loewe, 2012). It offers more people-centric policy instruments to guide 21st-century development for a sustainable future.

Over the past decades, these initiatives have boosted the development of theories and concepts focusing on sustainable urbanism as well as sustainable development, including the “Green City,” “Healthy City,” “Low-Emission City,” “Compact City,” “Smart City,” “Sustainable city” etc. The Green City concept focuses on a city's environmental performance by concentrating on governance, consumption, environmental management, and greenhouse gas emissions (Jedliński, 2014; Tang & Lee, 2016). The Healthy City emphasizes the impact of society, environment, and economy on human health and promotes sustainability through public health protection (Barton & Grant, 2013). Low-Emission City, or Low-Carbon City, aims to mitigate CO2 emissions through new technologies, renewable energy, achieving energy efficiency, and changing management practices (Tang & Lee, 2016; Yang & Li, 2013). However, Compact City promotes compactness among streets, roads, land use, and neighborhoods to ensure walkability and energy efficiency (Burton, 2000). Smart City is all about using the Internet of Things (IoT) and more informed technologies to achieve sustainability (Lombardi et al., 2012). Lastly, the vision of a Sustainable City is to create a healthy and vibrant city in terms of governance, decision-making, development, and environment for the benefit of all (Haughton, 1999). All these theories and concepts have improved thoughts of sustainable urban development over the years and guided the world towards a better future.

2.7.3 Theory of Ecosystem Services

In 1972, an influential report was published in the Club of Rome, describing the limits of economics and population growth (Meadows, 1972). Afterward, Gretchen Daily published the first article explaining ecosystem services in 1997 (Daily, 1997). Since then, several definitions have been adopted to explain ecosystem services and relate them to different disciplines (see

Figure 2.2 for details). Over the past years, the concept has become popular in the academic and public spheres and has contributed to securing a sustainable society by shaping the future and reducing environmental and ecological risks.

The ecosystem provides four major services: 1) ***Supporting services*** such as nutrient cycle, water cycle, life cycle, biodiversity, soil formation, and photosynthesis, and 2) ***Provision services*** such as food, fiber, biomass, fuel, freshwater, natural medicines, raw materials, biochemicals, genetic resources, etc. 3) ***Cultural services*** such as existence value, aesthetic value, recreation, ecotourism, spiritual, religious, mental well-being, health, arts, education, etc. 4) ***Regulating services*** such as soil fertility, pollination, purification, and detoxification, etc.

Due to unregulated development and environmental degradation, we are putting pressure on the biosphere and risking the future of our planet Earth. According to Naeem (2013), the biosphere is not only for human beings, and it will collapse if we don`t consider the contribution of the other species. Therefore, to secure the future, it is high time we concentrate on the sustainability of our urban system (in terms of social, economic, and environmental perspectives) to maximize the ecosystem services.

In summary, the theory of ecosystem services is all about respecting the wide range of goods and services provided by the ecosystem. Though we do not pay for their services or provisions, they are equally and sometimes more important than our traditional goods and services. This theory is to put it back into the discussion as it was invisible to global leaders, policymakers, and decision-makers for a long time.

2.7.3.1 Conceptual Background for Assessing Ecosystem Services

In the 21st century, all nations are driving towards assessing ecosystem services to guide sustainable urban development and achieve a sustainable future (Cimon-Morin et al., 2013). The ecosystem services assessment includes social, economic, and environmental decision-making for human well-being (Costanza et al., 1997). The fundamental concepts regarding this process are described in several scholarly works of literature (Meraj et al., 2021). However, a clear pathway toward the assessment procedure of ecosystem services is still vague and unsettled to be operationalized in the field (Meraj et al., 2021). Therefore, this sub-section is dedicated to building a solid conceptual background by addressing the definitional dynamics, debate, and methodology for assessing ecosystem services.

The definition and assessment procedure of ecosystem services has been conceptualized in various ways by scholars from different disciplines. Daily (1997) defines ecosystem services as direct and indirect benefits humans extract from nature and the environment. According to Jax et al. (2013), the ecosystem services concept precisely informed the dependencies of human well-being on nature and illustrated the negative consequence of environmental degradation.

Kroeger and Casey (2007) observed the scarcity of ecosystem services definitions from the monetary perspective and denoted a market-based approach to ecosystem conservation. They also proposed a market incentive for the landowners who protect the ecosystem. As scholars of different disciplines conceptualize ecosystem services differently, the assessment procedures also vary.

Meraj et al. (2010) introduced a trait concept for assessing ecosystem services, where the main focus is to identify the critical characteristics of the ecosystem using trait-service clusters. Besides, De-Groot et al. (2010) analyzed land use and load cover dynamics using spatial analysis tools for assessing ecosystem services that contributed to policymaking, resource conservation, environmental management, and ecosystem-sensitive land use planning. Further, Martín-López et al. (2014) introduced the concept of value pluralism for the assessment of ecosystem services. Zhu and Stackpoole (2010) studied the impact of climate, demographics, and land use on greenhouse gas and carbon reserves to analyze the health of the ecosystem of the United States. Chee (2004) set the foundation for using the Multi-criteria Decision Assessment (MCDA) method for ecosystem services. Some selected works of literature that broaden the vision and build the conceptual foundation of ecosystem services assessment are summarized in **Table 2.2** for a brief overview.

Table 2.2: A brief overview of research articles that used various methods for assessing ecosystem services.

Authors	Ecosystem Services Assessment Method
Li et al. (2016)	The authors used GIS and remote sensing-based methods to identify the impact of urbanization on ecosystem services such as food production, water supply, and carbon sequestration.
Burkhard et al. (2015)	The authors used GIS, remote sensing, and expert-based scoring methods to assess ecosystem services. The study contributed to increasing the supply of ecosystem services by enabling the capacity of the local communities.
Hoerbinger et al. (2018)	They used GIS and remote sensing-based integrated methods to assess ecosystem services.
Hattam et al. (2015)	They used an integrated method for the assessment of ecosystem services. One method is the willingness to pay (WTP), and another is the contingent valuation method (CVM).
Villa et al. (2009)	They used artificial intelligence and web-based tools and techniques to assess ecosystem services.
Nelson and Daily (2010)	They implemented the InVEST model and artificial intelligence to assess ecosystem services. It also targeted motivating stakeholders to create a conservation plan.

Busch et al. (2012)	They highlighted the importance of carefully selected and scrutinized methods for ecosystem services assessment based on the characteristics of the study area.
Bagstad et al. (2013)	The author used 17 ecosystem services methods (i.e., InVEST, EcoAIM, InFOREST) and analyzed their decision-making efficiency.
De Groot et al. (2002)	The authors identified the requirements for conducting an ecosystem services assessment.

This section provides a glimpse of different methods, tools, and techniques other researchers use to assess ecosystem services. However, the assessment procedures of ecosystem services are more dynamic and include various approaches that may depend on the problems a researcher is solving, the area of intervention, the scope of the research, disciplinary focus, etc.

2.7.3.2 Linking Ecosystem Services with Sustainable Urban Development

Our world is urbanizing at a tremendous rate, and it is projected that the proportion of the urban population will be 68% by 2050 (United Nations, 2018). Although urbanization has a significant impact on the development of humankind, it also has a severe effect on the environment and ecosystem (Seto et al., 2011). Due to unplanned urbanization, urban areas face problems like poor air quality, climate change, disaster, urban heat island effect, and environmental degradation (Arnfield, 2003; Grêt-Regamey et al., 2013; Shi et al., 2020). Therefore, awareness is rising worldwide to respect the environment and ecosystem services to secure a healthy planet, particularly in the cities.

Cities cover only 2.7% of the surface area; however, they consume 75% of the global energy (Ash et al., 2008). Thus, it is high time to focus on ecosystem and environment-sensitive urban planning to achieve sustainable development in urban areas or cities (Grêt-Regamey et al., 2013). It also requires specific attention to make development initiatives eco-friendly and hazardless for the environment. For example, Singapore emphasizes urban greening to increase the supply of ecosystem services to achieve sustainable urban development (Construction Climate Challenge, 2019). Urban designers seek nature-based solutions to align the development initiative with the environmental requirements (Nesshöver et al., 2017). Engineers use ecological engineering techniques and blue infrastructure to integrate the development activities with the natural environment (Nesshöver et al., 2017). Urban planners are introducing the Green Towns Program (GTP), guided by a biophilic approach to increase the genuine connections between development and the environment (HBD, 2018). They also define the requirement for a significant proportion of the area to be protected for greenery, agriculture, and plantation. Moreover, at the global level, policy instruments like the SDGs focus on increasing the vegetation coverage of urban areas to ensure an environmentally just, healthy, and sustainable future (United Nations Economic and Social Council, 2016).

In this rapidly urbanized situation, sustainable solutions are strongly needed worldwide to protect the ecosystem and environment (Grêt-Regamey et al., 2013). Respecting the ecosystem is one of the significant pathways/indicators to achieve sustainable urban development. Therefore, the Sustainable Development Goals (SDGs) of the United Nations have made the inclusion of information on ecosystem services compulsory for the governments of all countries (Biermann et al., 2017; Meraj et al., 2021). Besides, all the conservation organizations are also integrating the concept of ecosystem services with their agendas to address environmental issues into mainstream policymaking (Loc et al., 2020). However, to protect the environment and preserve the ecosystem, the focus should be given to all the aspects of an area (social, economic, and environmental) to achieve sustainable urban development. Thus, sustainable urban development is all about protecting the ecosystem, respecting nature, and valuing the ecological quality to meet the demand of the future generation without compromising the existing demand.

2.7.3.3 Challenges and Limitations of Ecosystem Services Theory

Ecosystem theory-based research focuses on developing a more sustainable future through linking the environmental and social systems (Daily et al., 2009). Although this theory looks somewhat oversimplified, its multidisciplinary nature made it challenging in terms of definition, conceptualization, methodology, and operation (Früh-Müller et al., 2015; Garibaldi et al., 2013; Lundin et al., 2013). Understanding the challenges and limitations of ecosystem services theory is the key to implementing it for any research work (Birkhofer et al., 2015; Kühne & Duttmann, 2020). Therefore, this sub-section highlights the challenges of ecosystem services theory and the recommendations to tackle those challenges.

According to Kühne and Duttmann (2020), the ecosystem services approach has vague definitional coverage and inconsistent terminology, making it difficult to comprehend. Birkhofer et al. (2015) highlighted the problem of methodological diversity in the assessment of ecosystem services. Lavorel et al. (2017) raised concern regarding treating uncertainties and technical practices to quantify ecosystem models. Some literature that noted the significant challenges of ecosystem services theory is summarized in **Table 2.3** for a brief overview.

Table 2.3: A brief overview of the challenges and limitations of ecosystem services theory

Authors	Limitations/Challenges of Ecosystem Services Theory
TEEB (2010)	Understanding the temporal dynamics of ecosystem services provision for making policies and strategies is challenging.
Lavorel et al. (2017)	A significant challenge is the lack of high-resolution geospatial data, poor data quality, and unavailability of required data.
Grunewald et al. (2013)	No defined criteria for assessing ecosystem services at different scales make it challenging to analyze.

Carpenter et al. (2009)	Methodological instruments like quantification, mapping, and modeling are always disputed in ecosystem research.
Nelson and Daily (2010)	The models of multi-ecosystem services linked with provision and trade-offs have emerged as a questionable matter.
Birkhofer et al. (2015)	Analyzing the relationship between multiple ecosystem services through visualization and statistical testing is challenging.

Although there are several challenges and limitations to implementing ecosystem services theory, they are not impossible to tackle or avoid. Furthermore, the researcher has a lot of opportunities to contribute to this segment of knowledge to make the ecosystem services theory more robust, prompt, and convenient (Wang et al., 2021). In terms of conceptual, definitional, and methodological issues, a researcher can focus on a more specific area (i.e., biology, forestry, urban planning, engineering) to avoid unnecessary nuisance (Birkhofer et al., 2015). The issues of undefined criteria could be solved by identifying reliable indicators, and uncertainties can be minimized by executing advanced statistical analysis methods (Birkhofer et al., 2015).

2.7.4 Synthesizing the Theoretical Approaches

Theories are a simplified form of explaining reality. A series of theoretical approaches can be adopted to define and conceptualize sustainable urban development in the context of a city. However, selecting a particular theoretical framework depends on that specific theoretical approach's limitations, challenges, feasibility, appropriateness, and depth (Varpio et al., 2020). A suitable theoretical approach must have logical consistency in the proposition, construction, and assumption (Lynch et al., 2018). Besides, it should have enough strength and power to guide a particular research work and generate new knowledge (Lynch et al., 2018).

Several theories and guiding concepts of sustainable urban development are discussed in section 2.7. The ecological modernization theory concentrates on getting maximum environmental output through policy guidelines. However, the theoretical approach is not strong enough to guide sustainable urban development due to an extensively narrow focus on policy (Christoff, 1996; Spaargaren & Koppen, 2009). Therefore, most researchers recommended additional research on ecological modernization theory to make it applicable to broader implications (Spaargaren & Koppen, 2009). After that, sustainable urbanism theories mainly focus on a specific field like health, greenery, emission, compactness, etc. (Tang & Lee, 2016), which does not cover the extensive subject matter of sustainable urban development. Therefore, choosing these theoretical approaches for analyzing sustainable urban development will lead to a narrow focus, loss of depth, and viability.

However, the ecosystem services theory covers almost all drawbacks of ecological modernization theory and sustainable urbanism theories. It also incorporates a substantial area of sustainable urban development. It is a recommended approach for measuring sustainable

urban development by the United Nations (Biermann et al., 2017; Meraj et al., 2021). Besides, it is becoming popular among conservation organizations to prepare policy guidelines for a robust theoretical approach (Loc et al., 2020). Although it has some challenges and limitations, all of those challenges and limitations can be addressed by taking necessary measures. Therefore, the ecosystem services theory has been adopted as a significant theoretical approach for completing this research.

2.7.5 Theoretical Framework

This research will adopt a theoretical approach supporting the ecosystem services theory to analyze sustainable urban development in Shaqra City, Saudi Arabia. The higher the development initiative is responsive to the ecosystem, the more sustainable it will be. However, in most cases, our development initiatives are destroying our environment and ecosystem. Therefore, our climate is changing, and the future is at risk. According to IPCC, in the next 20 years, global warming will break the threshold of 1.5◦C. If greenhouse gas emissions continue, global warming will be above 2◦C by 2050. Recent data shows that the sea-level rise has been the fastest in the last 3,000 years, and ocean warming has increased by 2-8 times since the 1970s. Moreover, there exists some change in the climate we can't reverse anymore, at least for the next 1000 years.

According to the ecosystem services theory, the urban system impacts the environment and the ecosystem (Lyu et al., 2018). The urban system combines social, economic, and environmental attributes (Frank et al., 2017). Positive change (i.e., afforestation, pollution control, respecting nature) in these attributes has a positive effect on the ecosystem, and negative changes (i.e., slums, CO_2 emission, waterbody encroachment, urbanization, pollution, waste generation, deforestation, and habitat destruction) have negative effects. Any negative impact of the urban system on the ecosystem further limits and hamper ecosystem services (Lyu et al., 2018). Moreover, the sustainability of a city firmly depends on the functioning of its ecosystem services, which ensures resource availability, environmental quality, quality of the built environment, human well-being, urban nature, livability, etc. (Peter, 2020).

Therefore, to measure the level of sustainability of the urban development of a city, the focus should be given to the attributes of the urban system. The level of responsiveness of the urban system for ecosystem services will be the key indicator of sustainability. Besides, the existing outcome of sustainable urban development further influences the policy and action of a city, which further influences the urban system. The whole process is connected through a circular loop where each component impacts another component

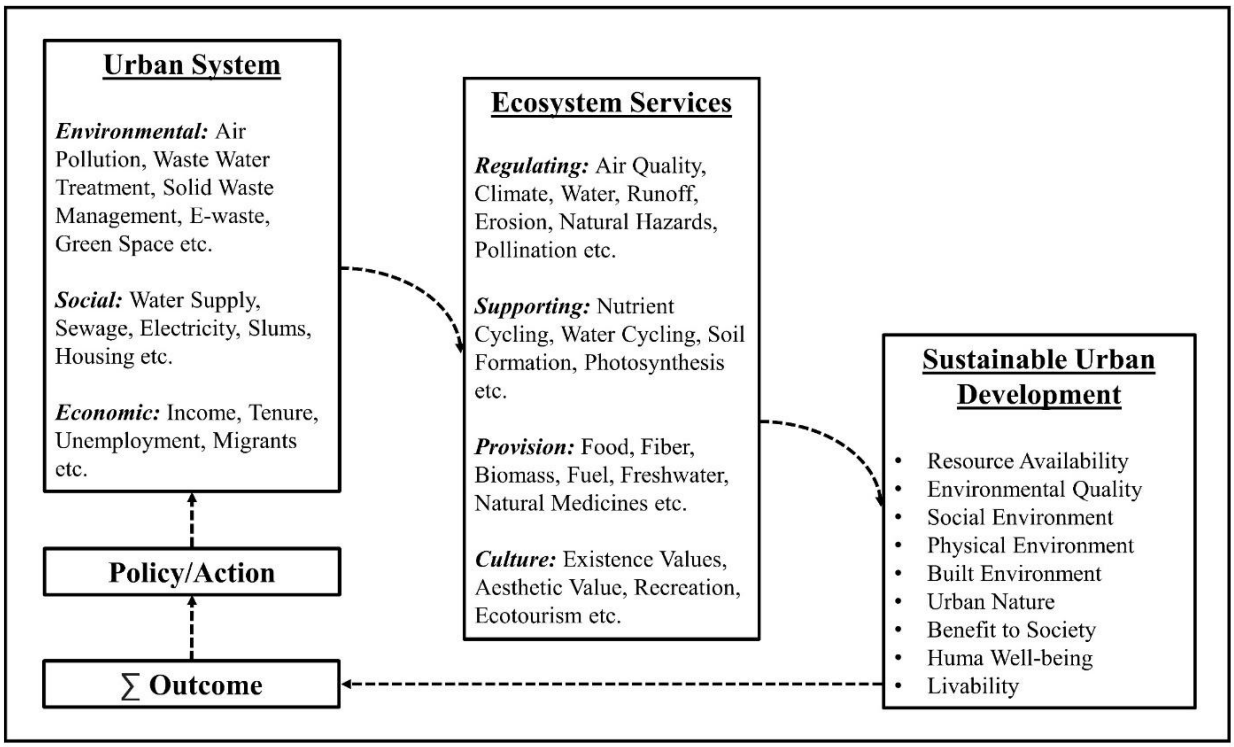

Figure 2-1: Theoretical framework.

(Source: Own representation)

2.8 Conclusion

Recent concerns have been raised about urban expansion, with a notable scarcity of literature focused on sustainable urban development, especially in the cities of Saudi Arabia. There are few publications on the history of the country and its environmental policies. For instance, Al-Gilani and Filor (1997) indicated that the Saudi Arabian government has attempted to use administrative structure and policy documents to enhance the decision-making process regarding protecting the environment. Furthermore, Al-Gilani and Filor (1999) indicated that the country's government is also proposing strategies to foster the improvement of the framework for environmental policies. The frameworks suggested include new institutional structure, political culture and the public role, new institutional structure, and environmental decision-making procedures. With the review of literature on urban development and planning, there is scarce literature on the elements of natural and human geographic development in Shaqra City, the level at which the city meets the needs of its residents, indicators of development to assess the current level of urban development in Shaqra city, the ways in sustainable urban development can be achieved in Shaqra city and the basic requirements to

do so as well as the constraints preventing sustainable urban development in the city. Therefore, this study will bridge these identified gaps.

This research will be guided by a popular theoretical approach known as the ecosystem services theory. Ecosystem services directly relate to conservation, biodiversity, and urban sustainability. It is also possible to measure an area's sustainability level by analyzing the condition of ecosystem services. Therefore, this theoretical framework has been selected for this research with due consideration. It will help to operationalize a practical analytical approach to understand the sustainability dynamics of Shaqra City.

Applying ecosystem services theory to assessing sustainable urban development in Shaqra City will be a novel approach. This approach includes assessing the health of urban areas based on the three pillars of sustainable development, which are social, economic, and environmental, integrating these pillars into urban planning and involving stakeholders in the process. It also requires establishing monitoring systems to track changes and implementing adaptive management practices. Shaqra can balance environmental health and human well-being by embedding ecosystem services into policies and governance, ultimately leading to a more sustainable and resilient urban environment.

Chapter Three: Research Methodology

3.1 Introduction

This chapter details the procedures of this mixed-method research strategy, starting with the research philosophy to understand the issues that need to be incorporated. Then, it detailed the approach along with the selection of the study area and the selection of variables for this study. This research includes a household questionnaire survey, interview survey, spatial data collection, and collection of secondary data along with necessary issues related to sample size determination. This chapter concludes with the data analysis method incorporated for this research study.

3.2 Research Onion

The research onion is a tool that helps guide the research process by emphasizing six key steps for creating reliable research (Saunders et al., 2012). These steps are organized into six layers: philosophy, approach, strategies, methods, time horizon, and techniques and procedures This study follows the research steps accordingly. Armitage (2012) states that the researcher must begin by selecting a research philosophy, which forms the outermost layer of the research onion The subsequent layers include the research approach, strategies, choices, time horizons, and techniques and procedures, in that order.

3.2.1 Philosophy

Philosophy is known as different views and perceptions of people in the world. It focuses on understanding the working nature of the surroundings. Philosophy is important in defining existence, reality, and knowledge in academia. A series of philosophical standings exist to conduct research, such as positivism, post-positivism, constructionism, realism, idealism, feminism, etc. Each of these philosophies has its way of looking at and interpreting the reality. Thus, a researcher needs to identify the best philosophical standing for their research to look at the world. According to Walliman (2017), research philosophy enables researchers to discuss every research topic, bring out various hidden facts and information, and evaluate them successfully within the allocated time. It also allows the reader to understand the researcher's worldview (Saunders et al., 2012).

Among the various philosophical worldviews, positivists focus on understanding reality based on observation and without bias. Using a standardized approach, this philosophical worldview analyzes a single objective reality (Crossan, 2013). In contrast, naturalists and constructionists believe that the existing reality cannot be measured directly. It varies based on the perception of people and their prior knowledge, interests, and experiences (Holden, 2004).

Besides, post-positivism provides a focused understanding of real-world problems through a more justified way of examination (Crossan, 2013). It is broad, brings theory together, and recognizes that many correct techniques can be applied to collect and analyze data (Holden, 2004). It enabled the researcher to analyze research topics in a standardized manner and with minimal error. It also helps to understand better the way of life of people in the study area and interpret the dynamics. Therefore, a post-positivist research philosophy is adopted in this research.

3.2.2 Approach

According to Creswell and Creswell (2017), two approaches could be followed in research: deductive and inductive. The deductive approach assumes a predefined hypothesis for conducting the research, and after getting observations based on data, it either accepts or rejects the hypothesis. In contrast, the inductive approach does not have any hypothesis. After collecting the necessary data, it identifies patterns and develops a theory based on the observation. This research doesn't have any predefined hypothesis to prove. The prime aim is to reach a conclusion based on data. The third approach is called abductive research, where a cyclical process of theory and data is used to generate hypotheses and develop theories. However, the inductive approach is the best choice for this research.

3.2.3 Strategy

A survey research strategy is employed to collect necessary data from the field. The survey research strategy provides a broader option for the researcher to design a questionnaire based on their requirement. Therefore, all the necessary data are collected with a limited chance of error. Moreover, this research collects required spatial and secondary data from the responsible authority.

3.2.4 Choice

This research has adopted a mixed-method research strategy. Both qualitative and quantitative data are collected and analyzed to complete the research. The main quantitative data sources are the questionnaire survey, secondary data, and spatial data. Qualitative data is also collected through interviews. The mixed method strategy helps validate and cross-check the data and findings. It also increased the accuracy of this research.

3.2.5 Time Horizon

There are two primary time horizons for conducting research: the longitudinal time horizon and the cross-sectional time horizon (Saunders et al., 2012). This study employs a cross-sectional time horizon due to the limited time available for research. In contrast, a longitudinal time horizon is typically used when the researcher has more time to conduct the study and intends to make multiple observations of the same sample over an extended period. However,

this research is regarded as a cross-sectional time horizon because of the limited time required to collect samples and organize the study. It also helped to conduct this research more conveniently and within time.

3.2.6 Techniques and Procedures

The research techniques and procedures part of Research Onion mainly incorporate the data collection and data analysis framework. It is important to identify the required data and analysis techniques to complete the research successfully. This crucial part of the research onion is elaborately discussed in the 'Research Design' section for detailed understanding.

3.3 Research Design

This section detailed the location of the study area and the process of data collection and data analysis in four major steps: (i) selection of the study area; (ii) integration of theoretical and methodological approach; (iii) Geographic Information System (GIS) and Remote Sensing (RS) based analysis; (iv) quantitative analysis techniques and (v) qualitative analysis techniques.

3.3.1 Selection of the Study Area

The selection of Shaqra city in Saudi Arabia as a case study area for analyzing the dynamics of land use/land cover changes and urban expansion is justified for several reasons. Firstly, the city is strategically located 190 km northwest of the capital Riyadh, and historically, it is the largest and most important city in the Al Washm province. Therefore, understanding the land use and urban expansion dynamics of Shaqra is crucial for the region's future development. Secondly, the city is experiencing significant growth due to the recent opening of Shaqra University, which has attracted many students and faculty members (Allinson, 2006). This growth is expected to continue, making Shaqra a potential hotspot for urban development.

Thirdly, analyzing the dynamics of land use/land cover changes and urban expansion can provide important insights into the impacts of human activities on the natural environment, particularly in urban areas where such changes are more pronounced (Madugundu et al., 2014; Mallick et al., 2022). This can inform decision-making processes related to land use planning, urban development, and environmental management in the region (Alqurashi et al., 2016; Rahman et al., 2017). Finally, temperature is an important factor in urban planning and management, particularly in arid regions like Saudi Arabia, where high temperatures can impact the health and well-being of urban residents (Aina et al., 2021; Miky, 2019). By analyzing temperature dynamics alongside land use and urban expansion, this research can provide important insights into the potential impacts of urban development on local temperature patterns.

Overall, the selection of Shaqra City as a case study area for this research is justified by its strategic location, growth potential, and the potential insights it can provide into the impacts of human activities on the natural environment and local temperature patterns. The map of Shaqra city is presented in **Figure 3.2.**

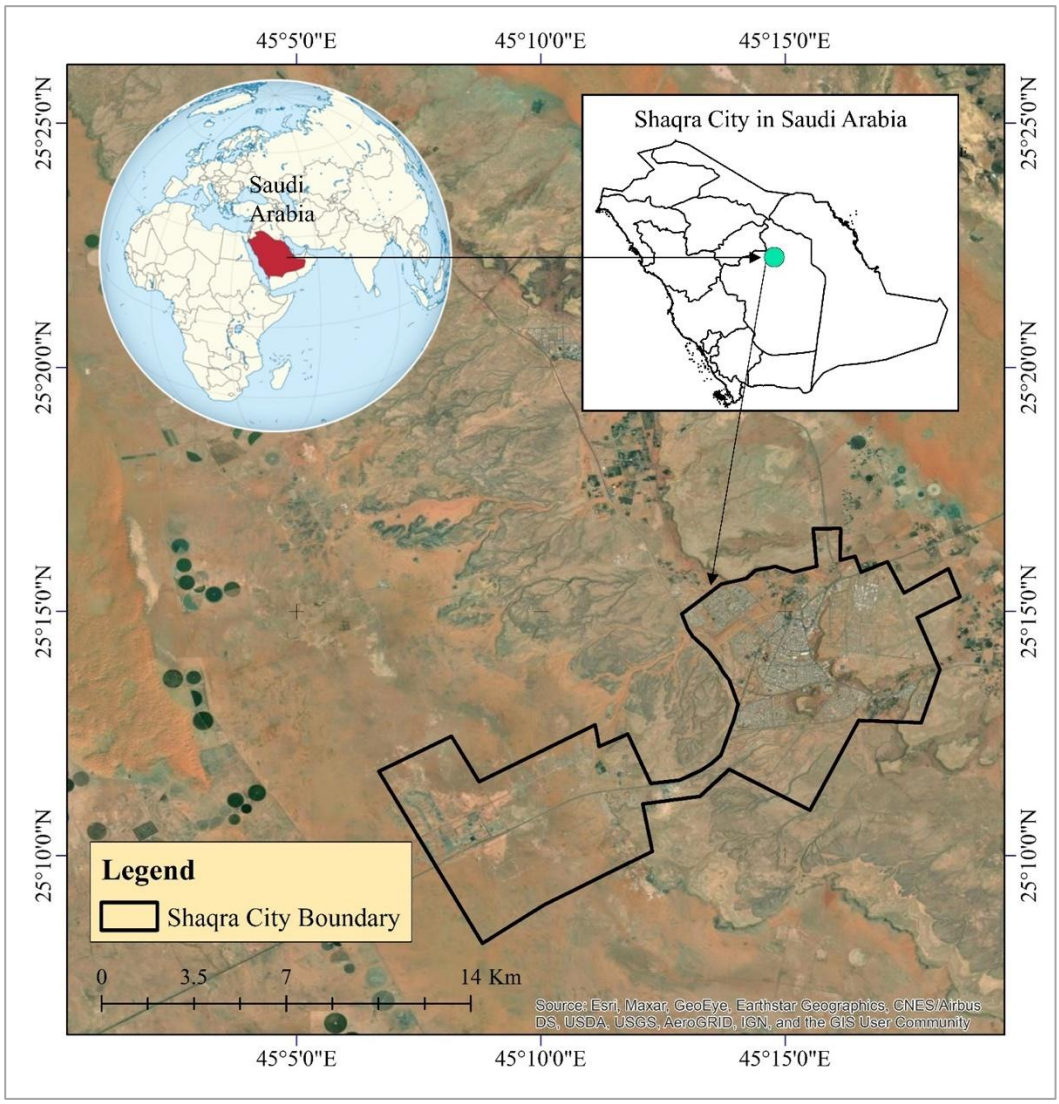

Figure 3-1: Map of the study area. (Source: Own representation using the data provided by the Ministry of Municipal and Rural Affairs and ESRI)

3.3.2 Integrating Theoretical and Methodological Approaches

The ecosystem services theory and ecosystem service-based tools, techniques, methods, and approaches have gotten significant attention from national and international researchers (Dunford et al., 2018). Among all the methodological approaches, Geographic Information System (GIS) and Remote Sensing mapping and analysis have the utmost priority from a sustainability perspective (e.g., De-Groot et al., 2010; Chee, 2004; Li et al., 2016; Burkhard

et al., 2015; Hoerbinger et al., 2018). Some authors used the contingent valuation method (CVM) as an analytical tool to assess ecosystem services (e.g., Hattam et al., 2015; Phuong & Gopalakrishnan, 2003), but the method is not suitable from the perspective of urban sustainability. Besides, some authors used artificial intelligence and a modeling-based approach in their research (e.g., Nelson and Daily, 2010; Bagstad et al., 2013), which requires high data availability and secondary information.

This research uses a GIS and remote sensing integrated method to analyze the dynamic of sustainable urban development in Shaqra City. It also concentrated on the social, economic, and environmental dimensions of ecosystem services to measure sustainability. The social dimension mainly focused on health, housing, water, electricity, sanitation, sewage, etc. In contrast, the economic dimension concentrated on unemployment, business, tenure status, income, access to the Internet, etc. Lastly, the environmental dimension incorporated greenery, waste collection, temperature, population, etc., to analyze sustainable urban development. However, selecting indicators under each dimension is subject to data availability and accuracy. Besides, the qualitative part of the analysis method has added significant value to this research.

3.3.3 GIS and RS-Based Analysis Techniques

3.3.3.1 Overview of Analytical Approach

This section overviews the activity to generate the necessary GIS and RS-based findings for this research. Firstly, satellite images of Landsat 5, Landsat 7, and Landsat 8 were collected from USGS for the years 1992, 2002, 2012, and 2022. The images were downloaded in multiple bands. Therefore, the layer stacking tool of ERDAS Image software was used to combine all the bands. After that, the area of interest was clipped through the geo-referenced shape file of Shaqra city. This research used the supervised classification method to classify the land use/ land cover (LULC) into four categories: built-up, vegetation, bare soil, and water body. Lastly, ground validation points are collected from Google time series data to validate the results of the classified images.

The GIS and RS-based methodological approach used in this research, which involves collecting and analyzing satellite images using geospatial techniques, is well-suited for analyzing the dynamics of land use/land cover changes and urban expansion in Shaqra City, Saudi Arabia. Using satellite imagery enables obtaining a synoptic view of the study area at different points in time, which allows for the detection of changes in land use/land cover patterns and the assessment of urban expansion's spatial and temporal dynamics. Using supervised classification methods also allows for the accurate and objective identification of different land cover types, which is crucial for analyzing LULC change and urban expansion. Additionally, using ground validation points obtained from Google time series data provides a

means of verifying the accuracy of the classified images, thereby enhancing the reliability of the findings.

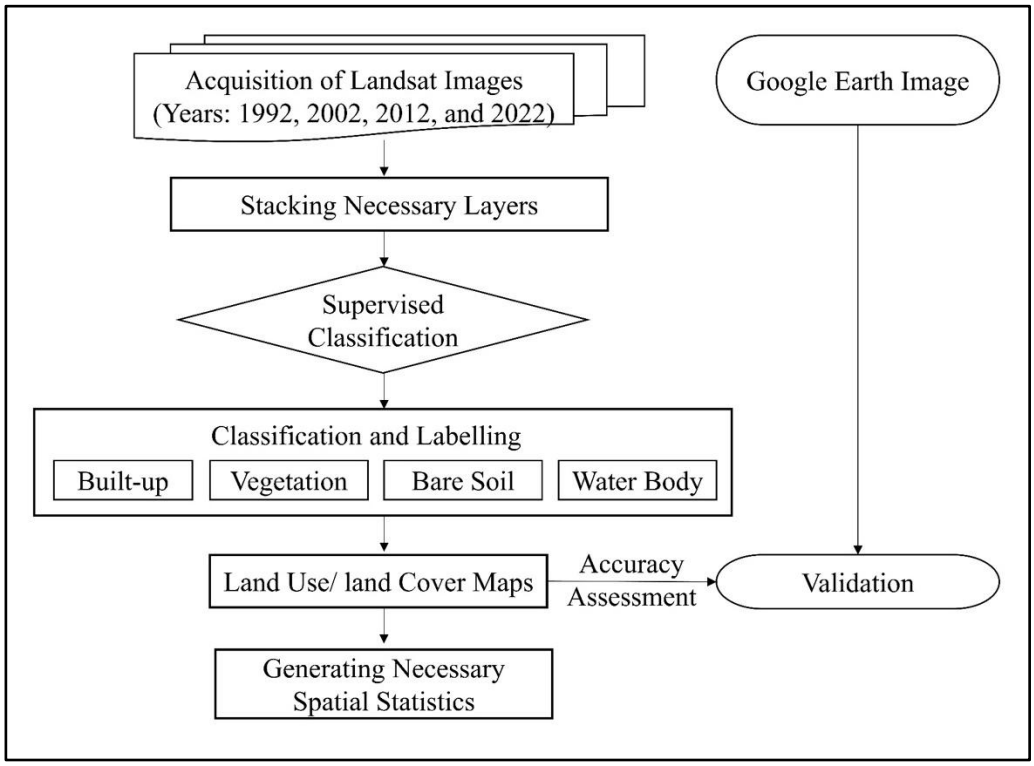

Figure 3-2: Analytical approach followed in this study to generate findings. (Source: Own representation)

However, there are some limitations to this approach. For instance, remote sensing techniques may not capture all the subtle changes that occur on the ground, especially in areas with complex terrain or land cover types. Additionally, the analysis of satellite imagery can be influenced by atmospheric conditions and cloud cover, which may degrade image quality and impact the accuracy of the results.

Other methods that could have been considered include field surveys, which involve collecting data on the ground using handheld devices such as GPS and digital cameras. This approach can provide detailed and accurate information about the study area. Still, it is time-consuming and may not cover a large enough area to capture the spatial dynamics of urban expansion. Another alternative method is using unmanned aerial vehicles (UAVs) or drones, which can capture high-resolution images of the study area and provide more detailed information than satellite imagery. However, this approach can be expensive and requires specialized skills and equipment.

Overall, the methodological approach used in this research is well-suited for analyzing the dynamics of land use/land cover changes and urban expansion in Shaqra City, and its limitations have been taken into account in the study design.

3.3.3.2 Data Sources

The research region was covered by four sets of cloud-free Landsat TM, ETM+, and OLI data, each obtained free from the USGS Earth Explorer website for 1992, 2002, 2012, and 2022. The Landsat images were used for this investigation because of their moderate to high geographic resolution and free access. **Table 3.1** provides major attributes of the dataset used in this research. Many researchers prefer radiometric adjustments of all remote sensing imagery. The USGS processed and provided level one terrain-corrected (L1T) Landsat data for this investigation in the WGS84 geodetic datum and north-up image orientation. The radiometric and geometric aberrations were previously adjusted before distribution because of the L1T nature of the data.

Table 3.1: Major attributes of Landsat datasets collected from USGS.

Date of Acquisition	Sensor	Spatial Resolution	Cloud Coverage	Total Bands	Format
07 June 1992	Landsat 5 TM	30m	0%	7	GeoTIFF
12 June 2002	Landsat 5 TM	30m	0%	7	GeoTIFF
06 June 2012	Landsat 7 ETM+	30m	0%	8	GeoTIFF
10 June 2022	Landsat 8 OLI	30m	0%	11	GeoTIFF

3.3.3.3 Image Classification and Accuracy Assessment

This research used the Anderson classification level I scheme to identify the land use/land cover categories (built-up area, vegetation, bare soil, and water bodies) in the study area (**Table 3.2**) (Anderson et al., 1976). Four LULC maps were obtained for 1992, 2002, 2012, and 2022 using the traditional maximum likelihood classifier (MLC) method. LULC is divided into four classes: built-up area, vegetation, bare soil, and water body. Approximately 2500 pixels from each year were chosen as training samples based on the size of the research region and the requirements of conventional MLC techniques. In order to smooth the results and maintain the predominate classes inside the moving window (3×3), the post-classifications were carried out using a majority statistical filter.

Table 3.2: Descriptions of land use/land cover classes.

LULC	Description
Built-Up Area	All types of physical structures (e.g., buildings, roads, parking)
Vegetation	Trees, gardens, grassland, vegetated lands, agricultural lands, and crop fields.
Bare Soil	Sand, mountains, rocks, and uncultivated lands.
Water Body	Lakes, ponds, and artificial reservoirs.

Moreover, to analyze the accuracy of the classified images, 1500 points of ground truth data were collected from Google Earth for each image. After that, error matrices were generated to show accuracy. Error matrices are preferred for disclosing site-specific categorization mistakes (Campbell, 2011). By displaying the "contingency of the class to which each pixel genuinely belongs on the map unit to which the specified analysis allots it" (Myint et al., 2011), they demonstrate the classification of each pixel. The kappa coefficient, producer's accuracy (PA), and user's accuracy (UA) were also computed using the error matrix for each categorized dataset. For the years 1992, 2002, 2012, and 2022, the maximum likelihood method's overall accuracy for LULC classification was 91%, 92%, 94%, and 95%, with kappa coefficients of 0.87, 0.89, 0.92, and 0.94, respectively (see **Table 3.3** and **3.4** for details). The resulting accuracy level is higher than the 85% approved overall accuracy level for LULC categorization set by Anderson's standard (Anderson et al., 1976).

Table 3.3: Accuracy assessment of LULC maps for 1992 and 2002.

LULC	Producer's Accuracy		User's Accuracy		Overall Accuracy		Kappa Coefficient	
	1992	2002	1992	2002	1992	2002	1992	2002
Built-Up	92.21%	94.74%	92.21%	93.51%	91%	92%	0.87	0.89
Waterbody	95.45%	90.48%	100%	90.48%				
Vegetation	90.91%	92.31%	90.91%	93.51%				
Bare soil	88.16%	90.91%	87.01%	90.91%				

Table 3.4: Accuracy assessment of LULC maps for 2012 and 2022.

LULC	Producer's Accuracy		User's Accuracy		Overall Accuracy		Kappa Coefficient	
	2012	2022	2012	2022	2012	2022	2012	2022
Built-Up	93.42 %	94.81 %	92.21 %	94.81 %	94%	95%	0.92	0.94
Waterbody	95.00 %	95.24 %	90.48 %	95.24 %				
Vegetation	93.83 %	95.00 %	98.70 %	98.70 %				
Bare soil	94.67 %	97.30 %	92.21 %	93.51 %				

3.3.3.4 Annual Urban Expansion Rate

To determine the yearly expansion rate of Shaqra City during the last 30 years, the annual urban expansion rate (AUE_a) was calculated for the research area. AUE_a clearly depicts the temporal trends of urban expansion in the city (Rifat & Liu, 2019). Standardized annual urban expansion rate (AUE_s) was also estimated in addition to AUE_a. Given that AUE_s do not take into account the effects of the starting sizes of the area, therefore, they may be used to compare the urban expansion rates (Sun et al., 2015). The following are the equations that were used to calculate the AUE_a and the AUE_s:

$$AUE_a \left(\frac{Km^2}{year}\right) = (UA_{n+i} - UA_n)/i$$

$$AUE_s\ (\%) = ((UA_{n+i}/\ UA_n)^{1/i} - 1) \times 100\%$$

where AUE_a and AUE_s are, respectively, the annual urban expansion rate ($km^2 year^{-1}$) and the standardized annual urban expansion rate (%) from the years n to $n+i$, i is the difference between the years $n+i$ and n, and UA_{n+i} and UA_n are the total urban land areas (in km^2) at those times (years).

3.3.3.5 Calculation of Land Surface Temperature (LST)

Retrieval of LST from Landsat 5 TM and Landsat 7 ETM+

In the first step, using equation 1, digital numbers (DNs) were converted to at-sensor spectral radiance (L_λ).

$$L_\lambda = (\frac{L_{max}-L_{min}}{Q_{calmax}-Q_{calmin}}) * (Q_{cal} - Q_{calmin}) + L_{min} \quad (1)$$

Where,
L_λ is the at-sensor spectral radiance (Watts/(m^2 * srad * μm))
L_{max} is the maximum radiance ($Wm^{-2}\ sr^{-1}\mu m^{-1}$)
L_{min} is the minimum radiance ($Wm^{-2}\ sr^{-1}\mu m^{-1}$)
Q_{cal} is the DN value of pixel
Q_{calmax} is the maximum DN value of pixels
Q_{calmin} is the minimum DN value of pixels

In step two, using the thermal constants from the metadata file, the data was converted from Spectral Radiance (SR) to BT using Eq. (2)

$$BT = \frac{K_2}{\ln(\frac{K_1}{L_\lambda}+1)} \quad (2)$$

Where, K1 and K2 represent the band-specific thermal conversion constants, BT = Brightness temperature in Celsius.

Finally, after deriving the LST in Kelvin unit, it was converted to degree Celsius using Eq. (3).

$$LST = BT - 273.15 \quad (3)$$

Retrieval of LST from Landsat 8 OLI

In the first step, satellite-based digital number (DN) is converted to at-sensor spectral radiance (L_λ) using equation Eq. (4).

$$L_\lambda = \left(\frac{L_{max} - L_{min}}{Q_{calmax} - Q_{calmin}}\right) * (Q_{cal} - Q_{calmin}) + L_{min} \quad (4)$$

Where,
L_λ is the at-sensor spectral radiance (Watts/(m^2 * srad * μm))
L_{max} is the maximum radiance ($Wm^{-2}\ sr^{-1}\mu m^{-1}$)
L_{min} is the minimum radiance ($Wm^{-2}\ sr^{-1}\mu m^{-1}$)
Q_{cal} is the DN value of pixel
Q_{calmax} is the maximum DN value of pixels
Q_{calmin} is the minimum DN value of pixels

In step two, using the thermal constants from the metadata file, the data was converted from SR to BT using Eq. (5).

$$BT = \frac{K_2}{\ln\left(\frac{K_1}{L_\lambda} + 1\right)} - 273 \quad (5)$$

Where, K1 and K2 represent the band-specific thermal conversion constants, BT = Brightness temperature in Celsius.

Moreover, the calculation of NDVI is an essential factor in estimating the LST for Landsat 8 images. Thus, Eq. (6) was used for calculating NDVI.

$$NDVI = \frac{NIR\ (Band\ 5) - R\ (Band\ 4)}{NIR\ (Band\ 5) + R\ (Band\ 4)} \quad (6)$$

Where, the Range of NDVI is: -1 < NDVI < 1.

After that, using the minimum and maximum NDVI value, the Proportion of Vegetation (PV) was estimated by Eq. (7).

$$PV = \left(\frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}}\right)^2 \quad (7)$$

After calculating the *PV*, the Land Surface Emissivity (LSE) was calculated by Eq. (8).

$$LSE = 0.004 \times PV + 0.986 \quad (8)$$

LST was calculated in degrees Celsius for band 10 using Eq. (9) and (10).

$$LST = \frac{BT}{\{1 + [\lambda BT/\rho] \, ln(LSE)\}} \quad (9)$$

Where λ is the wavelength of emitted radiance, and ρ was calculated as Eq. (10)

$$\rho = h \frac{c}{\sigma} = 1.438 \times 10^{-2} \, mk \quad (10)$$

Where σ (Boltzmann constant) = 1.38 × 10− 23 J/K, h (Planck's constant) = 6.626 × 10− 34 J s, and c (velocity of light) = 2.998 × 108 m/s.

3.3.4 Quantitative Analysis Techniques

3.3.4.1 Data Collection

An in-depth structured questionnaire survey was conducted to collect necessary data for sustainability appraisal from the inhabitants of Shaqra.

3.3.4.2 Sample Size and Sampling Techniques

Taro Yamane's equation is used to determine the required sample size for the questionnaire survey that has supported the quantitative analysis of this research. Several researchers also use this sampling technique in a similar field (e.g., Ha-Mim et al., 2020; Mudasser et al., 2020, Ha-Mim et al., 2019).

According to the Formula of Yamane (1979):

$$n = \frac{N}{1 + N.e^2}$$

Where, N = Total Population of Shaqra City

n = Sample size

e = Error margin

$$n = \frac{22809}{1 + (22809 \times .8^2)}$$

$$n = 155.186$$

$$n \cong 154 \; (for \; the \; study \; purpose)$$

So, at a 92% confidence level with an error margin of 8%, a total of 156 questionnaire surveys is required for this study. However, to avoid any uncertainty, a total of 174 samples were collected.

3.3.4.3 Sustainable City Index (SCI)

The indexing method is based on 36 indicators (see **Table 3.5**) under three major components for developing the 'Sustainable City Index (SCI).' The methodology used in this research is developed for the calculation of the 'Sustainable City Index' by several scholars (Choon et al., 2011; Mori & Christodoulou, 2012; Wang Penglong, 2018). At the initial indexing stage, all the indicators are normalized to make them comparable, as indicators are in different units or scales. Two possible types of functional relationships can normalize the data. There is a positive functional relationship if the sustainability increases with the indicator's value. Alternatively, a negative functional relationship is established if sustainability decreases with an increase in the indicator's value. The first equation (see Eq. 1) is used for the normalization of the indicators with positive functional relationships, and the second equation (see Eq. 2) is used for the normalization of the indicators with negative functional relationships. It ensures that the higher index value means high sustainability and vice versa.

$$Index_{N_s} = \frac{X_s - X_{min}}{X_{max} - X_{min}} \quad \text{..... (1)}$$

$$Index_{N_S} = \frac{X_{max} - X_s}{X_{max} - X_{min}} \quad \text{..... (2)}$$

Where, $Index_{N_S}$ is the normalized index value and X_s is the original value of the indicator for Shaqra City, X_{max} and X_{min} are the maximum and minimum values of the indicator. After normalization, equation 3 is used to obtain the value of the major components.

$$M_s = \frac{\sum_{i=1}^{n} Index_{N_S{}^i}}{n} \quad \text{... ... ... (3)}$$

In the above equation, M_s is the value of one of the major components (i.e., social, economic and environmental) for Shaqra City, *n* is the number of indicators under the major component, $Index_{N_s{}^i}\ is$ the normalized value of the *i*th indicator for Shaqra City.

Once values for each of the major components are calculated, Equation 4 is used to obtain the SCI value for Shaqra City.

$$SCI_s = \frac{\sum_{i=1}^{m} M_{S^i}}{m} \quad \text{... ... ... (4)}$$

In the above equation, SCI_s is the Sustainable City Index (SCI) value for Shaqra City where m is the number of major components and M_{S^i} is the value of the *i*th major component.

Table 3.5: Indicators to measure sustainable urban development in Shaqra City

Major Components	Indicators	Unit of Measurement	Author Source(s)
Social components (15)	Level of gender equity	Likert scale	(Rodrigues & Franco, 2020)
	Trust in public officials	Likert scale	(Rodrigues & Franco, 2020)
	Trust in local leaders	Likert scale	(Rodrigues & Franco, 2020)
	Quality of educational facilities	Likert scale	(Tanguay et al., 2010)
	Having electricity connection	Percentage	(Patel et al., 2019)
	Having internet connection	Percentage	(Patel et al., 2019)
	Having sewage connection	Percentage	(Patel et al., 2019)
	Using mass transit	Percentage	(Patel et al., 2019)
	Having social insurance coverage	Percentage	(Lu et al., 2017)
	Quality of healthcare facilities	Likert scale	(Patel et al., 2019)
	Level of safety and security	Likert scale	(Tanguay et al., 2010)
	Level of good governance	Likert scale	(Tanguay et al., 2010)
	Participation in community meetings	Percentage	(Tanguay et al., 2010)
	Availability of parks and playgrounds	Likert scale	(Patel et al., 2019)
	Participation in municipal elections	Percentage	(Tanguay et al., 2010)
Economic components (14)	Having unemployed family members	Percentage	(Lu et al., 2017)
	Household savings	Percentage	(Huang et al., 2015)
	Housing ownership	Percentage	(Munda, 2005)
	Affordability of housing unit	Likert scale	(Patel et al., 2019)
	Having self-employed family members	Percentage	(Rodrigues & Franco, 2020)
	Level of income	Likert scale	(Lu et al., 2017; Patel et al., 2019)
	Affordability of transportation means	Likert scale	(Patel et al., 2019)
	Satisfaction regarding job opportunities	Likert scale	(Patel et al., 2019)
	Affordability of services and facilities	Likert scale	(Patel et al., 2019)
	Government support for entrepreneurship development	Likert scale	(Rodrigues & Franco, 2020)
	Level of corruption	Likert scale	(Rodrigues & Franco, 2020)

	Level of favorable business condition	Likert scale	(Rodrigues & Franco, 2020)
	Having health insurance	Percentage	(Lu et al., 2017)
	Having access to loan or credit facilities	Percentage	(Rodrigues & Franco, 2020)
Environmental components (7)	Interest in gardening	Percentage	(Caldatto et al., 2021)
	Interest in tree plantation	Likert scale	(Caldatto et al., 2021)
	Reuse of generated waste	Percentage	(Lu et al., 2017)
	Noise level	Likert scale	(Tanguay et al., 2010)
	Quality of water	Likert scale	(Tanguay et al., 2010)
	Awareness of ecological degradation	Likert scale	(Lu et al., 2017)
	Awareness about climate change	Percentage	(Lu et al., 2017)

3.3.5 Qualitative Analysis Techniques

3.3.5.1 Data Collection

The study employed a semi-structured interview as one of the methods of collecting primary data for qualitative analysis. This conforms with Mark Saunders, Lewis, and Thornhill (2009), who made it known that an interview is a purposeful discussion between two or more people tailored towards the collection of rigorous qualitative data appropriate to the research questions and the research objectives; the interview is conducted in a semi-structured manner.

3.3.5.2 Sample Size and Sampling Techniques

A total of 20 local residents were interviewed for the interview survey. A purposive and convenient sampling method is used to get more accurate answers from the informants. The respondents' and interviewees' selection criteria are based on the depth of knowledge of the development of the study area (Silverman, 2020). The interviews and the questionnaires are conducted in the population's mother tongue, Arabic, to facilitate participation and obtain the maximum amount of information.

3.3.5.3 Overview of Qualitative Analysis Process

This chapter adopted an exploratory qualitative research approach that seeks to understand underlying reasons, opinions, and motivations. This approach is particularly suitable for some research objectives, as it allows us to delve into Shaqra City's urban development, capturing the residents' perspectives.

3.3.5.3.1 Inductive Reasoning in Qualitative Research

This study also adopted inductive reasoning, starting with observations (in this case, the interview data) and seeking to generate patterns, themes, or theories from these observations. This bottom-up approach is especially valuable when venturing into relatively uncharted territories, as it allows new theories and insights to emerge from the data rather than imposing pre-existing frameworks onto it.

3.3.5.3.2 Interpretive Patterns Analysis

This analysis focused on identifying interpretive patterns within the interview data in response to the feedback received. Interpretive patterns refer to recurring combinations of statements or views that participants consistently link together. By identifying these patterns, the analysis gains insights into how different individuals perceive and approach urban development in Shaqra city. For instance, if multiple participants consistently link the lack of infrastructure with poor administrative planning, this forms an interpretive pattern that reveals a common perception of the city's governance. Furthermore, by examining these patterns, the analysis can understand how norms are derived within the community. For example, if most participants believe sustainable development is synonymous with economic growth, this belief becomes a normative view within that community. Such insights are invaluable as they shed light on the collective mindset of the community, guiding policymakers and stakeholders in their future endeavors.

3.3.5.3.3 Data Collection and Analysis

Data for this study was primarily collected through in-depth interviews with residents of Shaqra city. The open-ended nature of these interviews allowed participants to express their views freely, providing rich and detailed data. Once collected, the data was subjected to a rigorous analysis process. I combed through the interview transcripts using inductive reasoning, identifying recurring themes, patterns, and insights. Special attention was given to frequently linked statements, as these formed the interpretive patterns central to the analysis.

3.3.5.3.4 Data Organization

During the initial phase of data organization and familiarization, several meticulous steps were undertaken to ensure the integrity and accuracy of the collected data. Firstly, data was gathered from participants via audio recordings, ensuring that their consent was duly obtained. The audio recordings were listened to multiple times to gain a thorough understanding of the participants' perspectives. Subsequently, these recordings were transcribed into Arabic text. To guarantee the fidelity of the transcription, the audio was replayed alongside the written text, ensuring that the transcribed data accurately reflected the recorded content. Once this was achieved, the identified themes, sub-themes, and codes were translated and incorporated into the MAXQ 2022 system in English.

3.3.5.3.5 Coding and Downsizing Process

The primary objective of the coding and downsizing phase was to extract meaningful insights about the degree to which Shaqra City fulfills the needs of its inhabitants, the current status of sustainable urban development, the challenges hindering its achievement, and to propose viable solutions.

- Data Collection and Initial Coding: The process commenced with data collection through interviews. A total of 20 comprehensive interviews were conducted, providing a rich tapestry of perspectives and experiences. Each interview was coded to identify preliminary topics, which would be elaborated upon in subsequent chapter sections.
- Qualitative and Thematic Analysis: The interviews underwent a rigorous qualitative analysis with a specific focus on thematic analysis. This is visually represented in **Figure 3.4**, which delineates the structure and flow of the analysis.
- Primary and Secondary Coding: Both primary and secondary coding techniques were employed to distill the essence of the interviews. A staggering 505 symbols were identified during this phase, encompassing a wide range of topics such as changes in land use, population dynamics, security concerns, peace initiatives, and internet accessibility.
- Grouping and Naming Themes: Codes that shared thematic similarities were grouped together to streamline the analysis. For instance, codes like corruption, trust, and equality were clustered under the broader sub-theme of "Social Development." This aggregation facilitated a more organized analysis and ensured that each theme was adequately captured.
- Focal Coding and Theme Identification: The subsequent stage, focal coding, delved deeper into the relationships between the various codes. This was achieved through a continuous comparison methodology, where codes were juxtaposed, scrutinized, and interrelated. This iterative process was instrumental in identifying the most salient themes.
- Interpreting Themes and Drawing Conclusions: Upon the identification and thorough examination of the interdependencies among the themes, a clearer picture emerged regarding the state of sustainable urban development in Shaqra City and its challenges. To provide a more tangible understanding, select quotes from participants were incorporated, encapsulating the essence of specific sub-themes. These quotes testify to the lived experiences and perspectives from the interviews, as illustrated in the subsequent figure.

Through this detailed and systematic approach, the research captured the current state of urban development in Shaqra City and illuminated the path forward, highlighting both the challenges and potential solutions. Figure 1 below depicts the coding process considered in this study through qualitative analysis and thematic analysis.

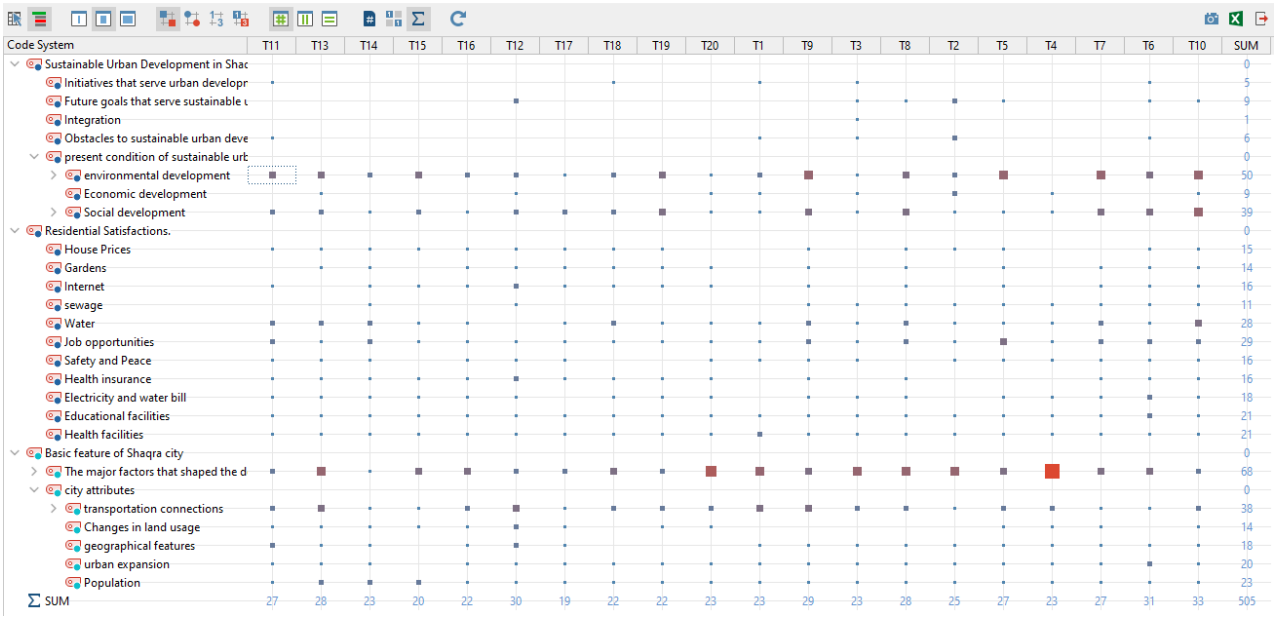

Figure 3-3: Coding process with themes development (Source: Own representation).

3.4 Potential Limitations

This research tried to incorporate the most recent methodological approach to analyze sustainable urban development in Shaqra, though none of the methodologies are out of the limitations. This section elaborately describes the limitations of methods that can considerably impact this research.

One limitation of the study is the potential bias associated with purposive sampling. Although the aim is to gather data through questionnaires and semi-structured interviews, ensuring that the participants or samples accurately represent the population can be challenging. However, the researcher took care to ensure that an appropriate number of respondents and participants were selected from the study population. Similarly, there may be the presence of interviewer bias in which the responses from interviewees may not be entirely truthful to please the researcher because most of the subjects are selected based on personal connections. Thus, their responses may correlate with past literature to ensure the authenticity and reliability of the study. Besides, variable selection has limitations as it mainly depends on the author's understanding of the research and the depth of the review. Moreover, time and resource constraints are another limitation of this research. Because of limited time, resources, and the COVID-19 situation, the scale of the study area and sample size (8% error margin) for this research remains small.

3.5 Ethical Considerations

This research is conducted in an ethical manner, ensuring all ethical guidelines are followed. Participants are informed about the research objectives and how their responses will be used. They provide consent through an informed consent document, which outlines their rights, including the right to withdraw at any time and to refuse to answer any question. Participation is voluntary. Additionally, the researcher ensures that interviews are conducted with a focus on the participants' security, safety, and comfort. Confidentiality is maintained, as none of the responses are linked to individual participants, and all data is kept anonymous. This has protected the participants from speaking out freely and instilled a sense of security and freedom. Also, the researcher has not shared participants' data with any third party, including their names, designations, personal contact information, and organization names. This is done to ensure the privacy of the participants. The responses recorded during the interviews are expected to be destroyed after six months of submission of the research work.

Chapter Four: Dynamics of Land Use/Land Cover Change and Urban Expansion of Shaqra City

4.1 Introduction

Urban expansion and changes in land use and land cover (LULC) patterns are central to the modern urbanization narrative. This chapter delves into the intricate dynamics of urban growth, examining Shaqra City's transforming condition and reshaped environment. Beginning with exploring the changes in LULC patterns, this chapter analyzes the shifts in natural, agricultural, and built-up areas resulting from urban expansion. Understanding the nature of urban expansion is essential for discerning urban growth's diverse forms and characteristics, from sprawling developments to compact urban forms. Moreover, investigating the direction of urban expansion provides insights into the spatial orientation of growth, encompassing issues such as urban sprawl and inner-city regeneration. Finally, this chapter scrutinizes the dynamics of urban expansion, considering the multifaceted interactions between physical factors and environmental considerations that shape the trajectory of urban growth. Through this comprehensive examination, this study aims to unravel the complexities of urbanization, offering perspectives on sustainable land use management, environmental conservation, and equitable urban development in the face of rapid urban expansion.

4.2 Changes in LULC Patterns

Table 4.1 and **Figure 4.1** provide information on the land use/land cover changes in Shaqra City, Saudi Arabia, from 1992 to 2022. The area covered by built-up land has increased steadily from 5.07 sq. km (5% of the total area) in 1992 to 19.26 sq. km (18.99% of the total area) in 2022. This indicates rapid urbanization and expansion of the city due to population growth, increasing economic activities, and infrastructure development. The expansion of built-up areas may have resulted in the conversion of other land uses, such as bare soil. However, the area covered by vegetation increased slightly over time, accounting for a negligible percentage of the total area. This suggests the city has limited natural vegetation due to the typical geographical condition.

The area covered by water bodies increased slightly from 1.35 sq. km (1.33% of the total area) in 1992 to 5.72 sq. km (5.64% of the total area) in 2022. This increase may be due to developing water storage and management systems such as reservoirs and irrigation systems. The increase in waterbodies can positively affect the environment and human activities such as agriculture, fishing, and recreation. Besides, the area covered by bare soil decreased over time, indicating the conversion of bare soil to other land uses. Bare soil cover decreased from 94.94 sq. km (93.63% of the total area) in 1992 to 76.19 sq. km (75.13%) in 2022. This is due to the conversion of bare soil area mainly into built-up area.

Overall, Shaqra City has undergone significant land use/land cover changes in the last three decades, with urbanization and infrastructure development being the major driving forces of change. Understanding these land-use changes can help policymakers develop sustainable land-use plans and management strategies to minimize negative impacts on the environment and promote sustainable development in Shaqra.

Table 4.1: Land use/ land cover in square kilometers and percentage during 1992, 2002, 2012, and 2022.

LULC	1992		2002		2012		2022	
	Area (sq. km)	%	Area (sq. km)	%	Area (sq. km)	%	Area (sq. km)	%
Built-up	5.07	5.00	6.90	6.80	13.47	13.29	19.26	18.99
Vegetation	0.03	0.03	0.03	0.03	0.07	0.04	0.22	0.22
Waterbody	1.35	1.33	1.96	1.93	2.99	2.95	5.72	5.64
Bare soil	94.94	93.63	92.5	91.24	84.86	83.72	76.19	75.13
Total	101.39	100	101.39	100	101.39	100	101.39	100

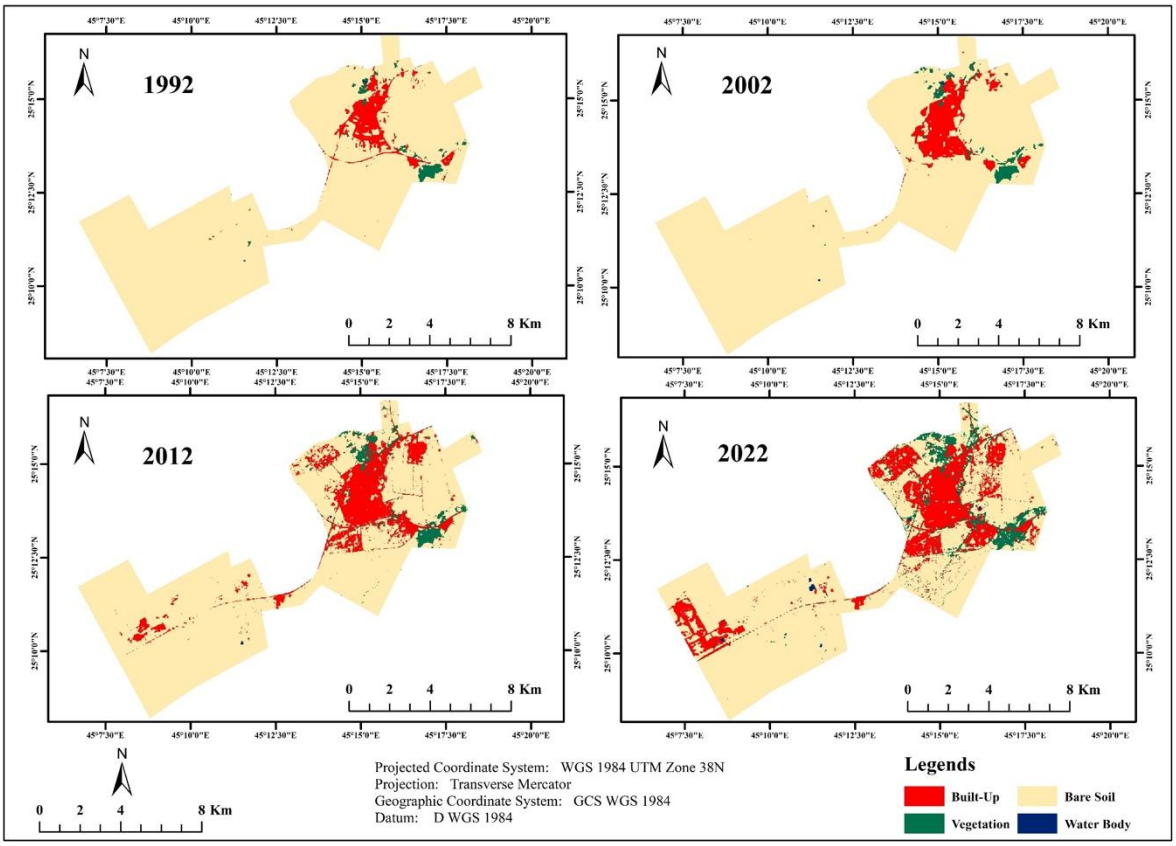

Figure 4-1: The classified images of the study area for 1992, 2002, 2012, and 2022. (Source: Own representation)

4.3 Nature of Urban Expansion

Table 4.2 provides information on the nature of urban expansion in Shaqra City, Saudi Arabia, from 1992 to 2022. The table shows that the city has experienced significant urban expansion over the past three decades, with the annual rate of urban expansion increasing over time.

From 1992 to 2002, the city experienced an urban expansion of 1.83 sq. km, with an annual urban expansion rate of 0.183 sq. km/year. This suggests that the city was experiencing moderate urbanization during this period, with limited infrastructure development and population growth.

From 2002 to 2012, the city experienced a significant increase in urban expansion, with a total urban expansion of 6.57 sq. km and an annual urban expansion rate of 0.657 sq. km/year. This period corresponds with rapid economic growth and development in Saudi Arabia, which likely led to an influx of people into urban areas like Shaqra City. Additionally, government policies

promoting urbanization and infrastructure development, such as the National Transformation Plan, have contributed to the rapid urban expansion during this period.

From 2012 to 2022, the city experienced a decrease in urban expansion compared to the previous period, with a total urban expansion of 5.79 sq. km and an annual urban expansion rate of 0.579 sq. km/year. This is due to various factors, including the limited availability of land for development and a shift in government policies towards more sustainable and controlled urban development. Understanding the nature of urban expansion in Shaqra City can help policymakers develop sustainable urban development strategies that balance economic growth with environmental and social considerations.

Table 4.2: Nature of urban expansion in the Shaqra City.

Years	Total Urban Expansion (sq. km)	Annual Urban Expansion Rate (sq. km/year)
1992-2002	1.83	0.183
2002-2012	6.57	0.657
2012-2022	5.79	0.579

4.4 Direction of Urban Expansion

Figure 4.2 depicts the urban expansion and development in Shaqra City over three periods, from 1992 to 2002, 2002 to 2012, and 2012 to 2022. The direction of urban expansion is shown in each picture. The first picture shows that during the first period, urban expansion occurred in all directions around the city's center. This indicates that the city was expanding in all directions to meet the demands of its growing population. This is due to increased population and a shift in urban planning policies that encouraged development in all city areas.

The second picture shows that during the second period, urban expansion occurred in the same direction as the first period, around the city's center, but it also expanded towards the west. This suggests that the city was continuing to grow and that the western region was becoming more attractive for development. This is due to factors such as the availability of land and the newly developed Shaqra University.

The third picture shows that urban expansion intensified in all directions during the third period, including towards the west. This indicates that the city was growing rapidly, and the region continued to be a focus for development. The reasons for this expansion are similar to those in the second period but also due to the changes in government policies and economic conditions that favored development in all city areas.

Overall, the figures suggest Shaqra City experienced rapid urban expansion and development over the last three decades. This expansion occurred in all directions around the city, but particularly towards the west in the later periods. This expansion is due to various factors, such

as population growth, economic development, changes in government policies, and social and cultural factors. However, the impact of this urban expansion on the environment, social structures, and the city's economy is still uncertain and requires further investigation.

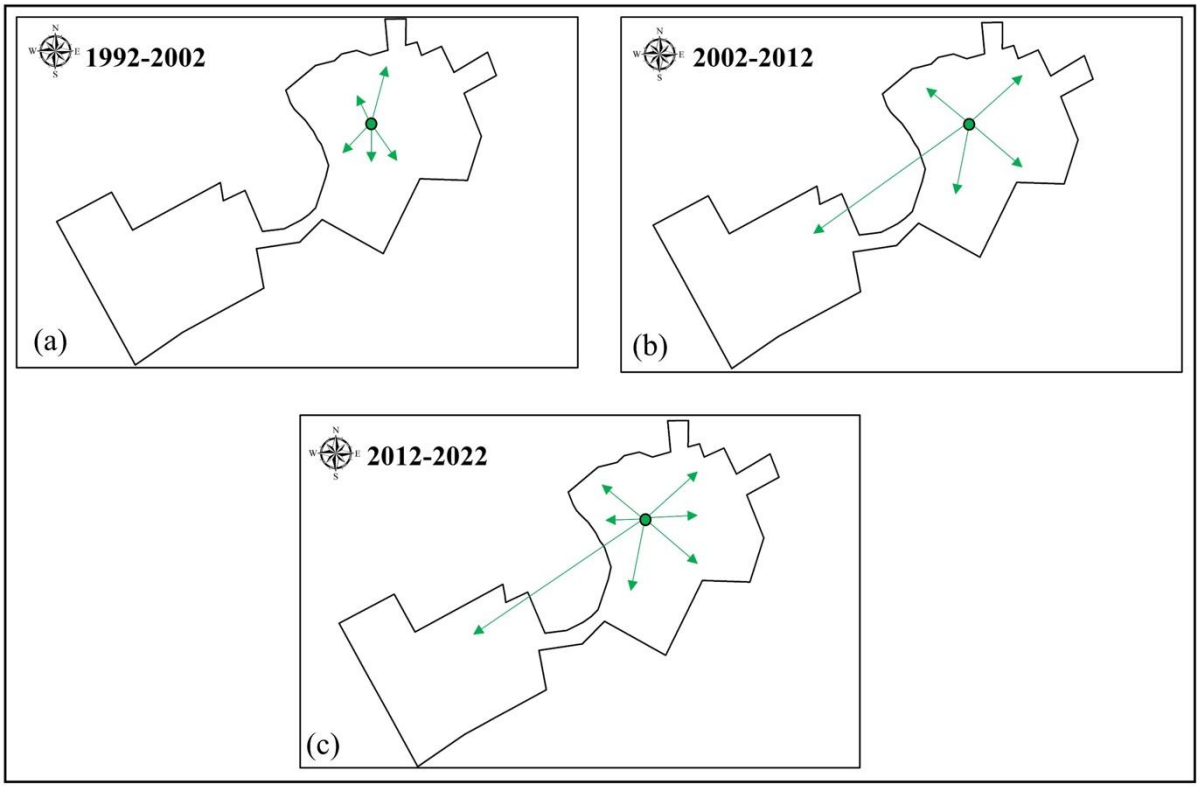

Figure 4-2: Direction of urban expansion/development in Shaqra City between years (a) 1992-2002, (b) 2002-2012, and (c) 2012-2022. (Source: Own representation)

4.5 Dynamics of Urban Expansion

Table 4.3 and Figure 4.3 provide information on the Land Surface Temperature (LST) of Shaqra city, Saudi Arabia, over three decades, from 1992 to 2022. The table shows that there has been a consistent increase in the mean, maximum, and minimum LST in the city over the past three decades.

In 1992, the mean LST of Shaqra city was 40.69 °C, with a maximum LST of 44.08 °C and a minimum LST of 35.65 °C. Over the next decade, there was an increase in the mean, maximum, and minimum LST of the city. By 2002, the mean LST had increased to 41.53 °C, with a maximum LST of 45.19 °C and a minimum LST of 36.83 °C.

The trend of increasing LST continued over the next decade, with the mean LST of the city reaching 43.27 °C in 2012, with a maximum LST of 47.21 °C and a minimum LST of 37.17

°C. By 2022, the mean LST had increased to 45.89 °C, with a maximum LST of 49.39 °C and a minimum LST of 36.79 °C.

There could be several reasons for the increase in LST in Shaqra city. One of the primary reasons could be urbanization and the changes in land use in the city. As seen in **Table 4.3**, the city's built-up area has increased significantly over the past three decades, likely leading to increased absorption and retention of solar radiation, resulting in higher LST. Another factor could be the increase in population, which has led to increased vehicular traffic, industrial activities, and energy consumption, resulting in increased urban heat island effect.

Changes in climate patterns and global warming could also be contributing factors. The increase in LST in Shaqra city could reflect the overall increase in temperature observed globally. The rise in temperature could also be due to Shaqra being located in a desert region, which is naturally prone to higher temperatures.

In conclusion, the table shows that there has been a consistent increase in the mean, maximum, and minimum LST in Shaqra city over the past three decades. The probable reasons for temperature increase in the city include urbanization, population growth, industrial activities, and changes in climate patterns. Understanding the factors contributing to the rise in temperature can help policymakers develop strategies to mitigate the effects of urban heat islands and promote sustainable urban development.

The table 4.4 presents the mean Land Surface Temperature (LST) of Shaqra City for different land use/land cover (LULC) types over four decades (1992, 2002, 2012, and 2022). The data reveals a consistent increase in LST across all categories, indicating a warming trend. Built-up areas experienced a significant rise from 39.86°C in 1992 to 45.16°C in 2022. Water bodies also showed a temperature increase from 40.91°C to 44.95°C. Vegetation, which typically helps regulate temperature, saw a rise from 39.85°C to 44.73°C. Bare soil exhibited the highest LST in 2022 at 46.01°C, increasing from 40.75°C in 1992. These trends suggest the impact of urbanization, reduced vegetation, and climate change, contributing to the urban heat island effect in Shaqra City.

Table 4.3: Land Surface Temperature (LST) of Shaqra City in the years 1992, 2002, 2012, and 2022.

Year	Mean LST (°C)	Maximum LST (°C)	Minimum LST (°C)
1992	40.69	44.08	35.65
2002	41.53	45.19	36.83
2012	43.27	47.21	37.17
2022	45.89	49.39	36.79

Table 4.4: Land use/land cover specific mean LST of Shaqra City in 1992, 2002, 2012, and 2022.

LULC	Mean Land Surface Temperature (°C)			
	1992	2002	2012	2022
Built-Up	39.86	40.44	42.23	45.16
Water Body	40.91	41.38	41.65	44.95
Vegetation	39.85	41.74	42.14	44.73
Bare Soil	40.75	41.60	43.44	46.01

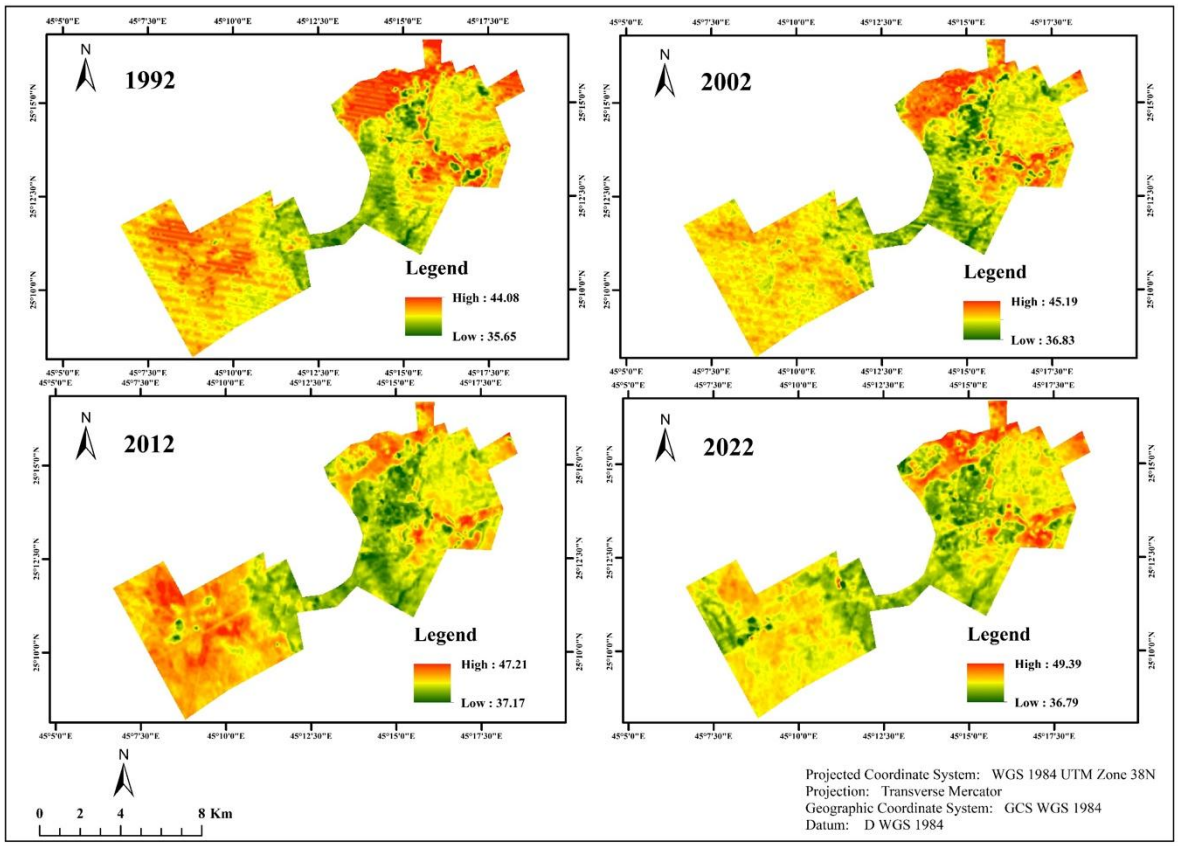

Figure 4-3: Maps of Land Surface Temperature (LST) of Shaqra City in 1992, 2002, 2012, and 2022. (Source: Own representation)

Chapter Five: Sustainable Urbanism: A Closer Look at Shaqra City's Progress

5.1 Introduction

In an era of rapid urbanization and environmental consciousness, cities are at the forefront of global sustainability efforts. This chapter explores Shaqra City's sustainable development, focusing on social, economic, and environmental sustainability. Section 4.2 gives an in-depth analysis of the Sustainable City Index. Section 4.3 synthesizes these dimensions into a composite index, providing a holistic perspective on Shaqra's sustainability.

5.2 Sustainable City Index: In-depth Assessment

This section takes center stage as a crucial analytical project within the context of this chapter. Peeling back the layers of Shaqra City's sustainability initiatives and practices, this part is devoted to a thorough and systematic analysis of its level of sustainability. The evaluation takes the form of a multifaceted investigation that carefully examines the city's advancements in social, economic, and environmental sustainability.

5.2.1 Social Sustainability

Social sustainability aims to create equitable, inclusive communities prioritizing well-being and rights. Key indicators include gender equity, trust in leaders, quality education, healthcare, safety, and good governance. It involves public spaces, utilities, transportation, sanitation, and social insurance. Active participation in community decisions and elections empowers residents. In summary, it seeks to establish cohesive, safe, and prosperous communities where every individual's needs and rights are met, fostering equity, inclusivity, and overall welfare.

5.2.1.1 Descriptive Insights of Social Sustainability Indicators

Table 5.1 presents descriptive statistics of social sustainability indicators measured on a Likert scale within Shaqra City. The table encompasses various facets of social sustainability, including gender equity, trust in local leaders, trust in public officials, quality of educational and healthcare facilities, safety and security levels, the quality of governance, and the availability of parks and playgrounds. The data reveals a diverse range of perceptions among respondents. Notably, "Moderate" is a common perception for gender equity, trust in local leaders, trust in public officials, educational facilities, and healthcare facilities. Safety, security, and good governance are perceived more positively, with higher mean scores. The availability of parks and playgrounds is also seen as "Moderate." These insights provide a comprehensive view of how residents perceive various aspects of social sustainability in Shaqra City.

Table 5.1: Descriptive statistics of social sustainability indicators (Likert scale).

Indicators	Category	Frequency (n=174)	Percentage (n=174)	Mean (±SD)
Level of gender equity	*Very low*	23	13.2	3.17 (±1.19)
	Low	16	9.2	
	Moderate	69	39.7	
	High	41	23.6	
	Very high	25	14.4	
Trust on local leaders	*Very low*	32	18.4	2.87 (±1.21)
	Low	26	14.9	
	Moderate	66	37.9	
	High	33	19.0	
	Very high	17	9.8	
Trust on public officials	*Very low*	37	21.3	2.76 (±1.26)
	Low	36	20.7	
	Moderate	50	28.7	
	High	34	19.5	
	Very high	17	9.8	
Quality of educational facilities	*Very low*	18	10.3	3.16 (±1.07)
	Low	17	9.8	
	Moderate	74	42.5	
	High	49	28.2	
	Very high	16	9.2	
Quality of healthcare facilities	*Very low*	34	19.5	2.62 (±1.11)
	Low	42	24.1	
	Moderate	62	35.6	
	High	28	16.1	
	Very high	8	4.6	
Level of safety and security	*Very low*	9	5.2	3.72 (±1.04)
	Low	5	2.9	
	Moderate	54	31.0	
	High	63	36.2	
	Very high	43	24.7	
Level of good governance	*Very low*	4	2.3	3.85 (±0.99)
	Low	12	6.9	
	Moderate	41	23.6	
	High	66	37.9	
	Very high	51	29.3	

Availability of parks and playgrounds	*Very low*	15	8.6	3.25 (±1.12)
	Low	23	13.2	
	Moderate	64	36.8	
	High	48	27.6	
	Very high	24	13.8	

Table 5.2 focuses on binary responses regarding specific social sustainability indicators. It provides insights into the presence or absence of critical services and amenities within the community. Almost all respondents have access to electricity, while approximately half have internet access. However, mass transit utilization is relatively low, with only 11.5% reporting its use. Most respondents have sewage connections, but social insurance coverage is less common, as reported by around 13.2% of respondents. Additionally, community engagement appears to vary, with approximately 27.6% participating in community meetings and 25.9% participating in municipal elections. These binary indicators offer a snapshot of the availability and utilization of essential services and community engagement within Shaqra City.

Table 5.2: Descriptive statistics of social sustainability indicators (yes/no).

Indicators	**Category**	**Frequency (n=174)**	**Percentage (n=174)**
Having electricity connection	*Yes*	172	98.9
	No	2	1.1
Having internet connection	*Yes*	83	47.7
	No	91	52.3
Using mass transit	*Yes*	20	11.5
	No	154	88.5
Having sewage connection	*Yes*	112	64.4
	No	62	35.6
Having social insurance coverage	*Yes*	23	13.2
	No	151	86.8
Participating in community meetings	*Yes*	48	27.6
	No	126	72.4
Participating in municipal elections	*Yes*	45	25.9
	No	129	74.1

5.2.1.2 Measuring Social Sustainability

Table 5.3 is a comprehensive assessment of social sustainability in Shaqra City, offering a detailed breakdown of various indicators that collectively measure the city's social well-being and the availability of essential services. Each indicator is assigned a numerical value, reflecting different aspects of social sustainability within the community. These values are

derived from data collected on aspects such as perceptions of gender equity, trust in local leaders and public officials, quality of educational and healthcare facilities, safety and security levels, governance quality, access to parks and playgrounds, and the presence of critical services like electricity, internet, sewage connections, and more. The "Minimum Value" and "Maximum Value" columns provide context by indicating the lowest and highest possible values for each indicator, setting the range within which the data falls. The "Normalized Value" column standardizes these values, making it easier to compare diverse indicators that may have different measurement scales.

The table also calculates a "Social Sustainability Index" by aggregating the normalized values of all indicators. This index offers a comprehensive numerical representation of the city's overall social sustainability performance. Interpreting this index, the table classifies Shaqra City's level of social sustainability as "Moderate." The accompanying note further explains the interpretation of index values, ranging from "very low social sustainability" to "very high social sustainability." Table 3 is a valuable tool for assessing and monitoring Shaqra City's progress in promoting social well-being and access to essential services. It provides a comprehensive and standardized overview of the city's social sustainability, aiding policymakers and stakeholders in making informed decisions and targeting areas for improvement in pursuit of a more sustainable and livable urban environment.

Figure 5.1 offers valuable insights into the state of social sustainability within Shaqra City. Overall, the city is classified as having "Moderate" social sustainability, suggesting that it has made reasonable progress regarding social well-being and access to essential services. However, a closer look reveals areas that may benefit from attention and improvement. Notably, trust in public officials and the quality of healthcare facilities have room for enhancement, with relatively lower normalized values. On the positive side, good governance and safety and security indicators exhibit relatively high performance. Most residents have access to fundamental services like electricity and sewage connections, but internet access and mass transit utilization are relatively lower, indicating potential areas for infrastructure development. Additionally, community engagement levels, as reflected in participation in community meetings and municipal elections, are relatively modest, suggesting an opportunity to encourage greater resident involvement in local decision-making processes. In summary, Shaqra City is making strides in social sustainability. However, targeted efforts to bolster public trust, healthcare quality, infrastructure, and community engagement could enhance its overall social well-being and sustainability.

Table 5.3: Level of social sustainability in Shaqra City.

Indicators	Value	Minimum Value	Maximum Value	Normalized Value
Level of gender equity	3.17	*1*	*5*	0.543
Trust on local leaders	2.87	*1*	*5*	0.468

Trust on public officials	2.76	*1*	*5*	0.44
Quality of educational facilities	3.16	*1*	*5*	0.54
Quality of healthcare facilities	2.62	*1*	*5*	0.405
Level of safety and security	3.72	*1*	*5*	0.68
Level of good governance	3.85	*1*	*5*	0.713
Availability of parks and playgrounds	3.25	*1*	*5*	0.563
Having electricity connection	98.9	*0*	*100*	0.989
Having internet connection	47.7	*0*	*100*	0.477
Using mass transit	11.5	*0*	*100*	0.115
Having sewage connection	64.4	*0*	*100*	0.644
Having social insurance coverage	13.2	*0*	*100*	0.132
Participating in community meetings	27.6	*0*	*100*	0.276
Participating in municipal elections	25.9	*0*	*100*	0.259
			Social Sustainability Index	0.483
			Level of Social Sustainability	Moderate

Note: Meaning of index value: 0-0.20 = very low social sustainability; 0.21-0.40 = low social sustainability; 0.41-0.60 = moderate social sustainability; 0.61-0.80 = high social sustainability; and 0.81-1 = very high social sustainability.

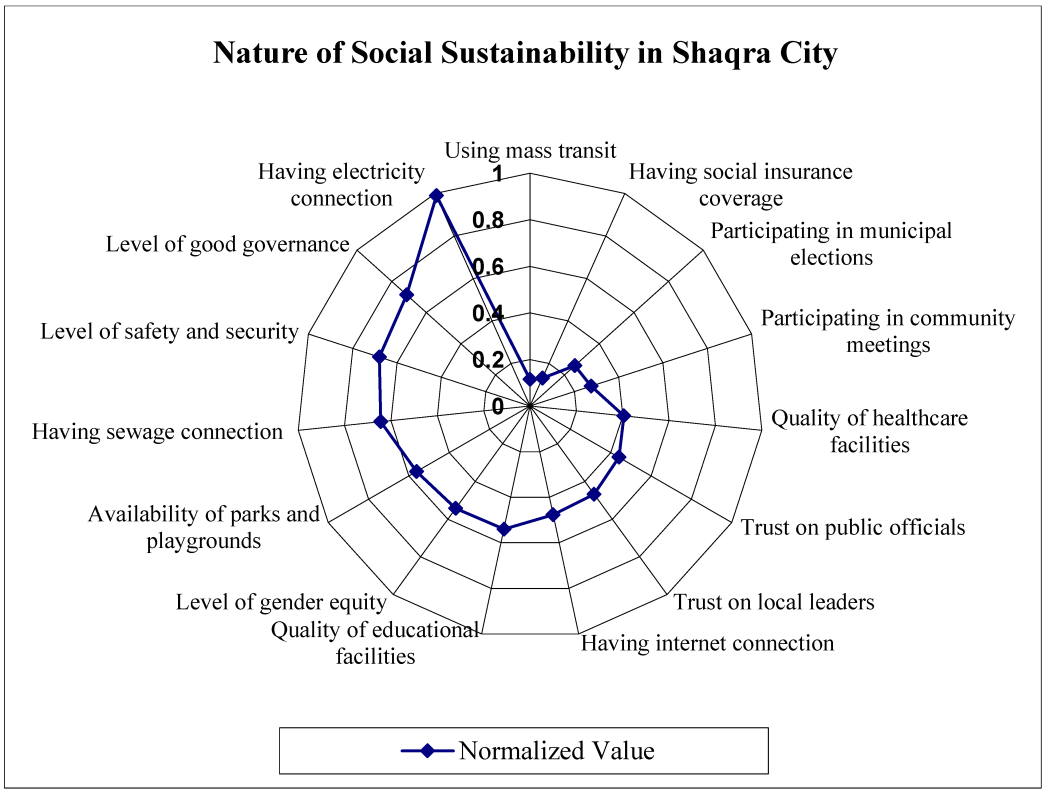

Figure 5-1: Nature of social sustainability in Shaqra City (Source: Own representation)

5.2.1.3 Major Limitations of Social Sustainability in Shaqra City

Shaqra City faces several significant limitations in its journey toward social sustainability, as indicated by normalized index values below 0.5 across various key indicators. The challenges include low utilization of mass transit, limited social insurance coverage, and low participation in municipal elections and community meetings. Additionally, the quality of healthcare facilities, trust in public officials, trust in local leaders, and internet connectivity fall below the desired threshold. A multifaceted approach is needed to overcome these limitations and enhance social sustainability. The city could invest in improving its public transportation system, making it more accessible, efficient, and environmentally friendly to encourage greater use. Expanding social insurance coverage and launching awareness campaigns can ensure more residents have access to essential safety nets. To boost civic engagement, efforts should enhance transparency and trust in local leadership, promoting participation in municipal elections and community meetings. Furthermore, improving the quality and availability of healthcare facilities is essential to address residents' healthcare needs. Lastly, increasing internet accessibility and affordability can bridge the digital divide, promoting education and economic opportunities. By addressing these limitations comprehensively, Shaqra City can work towards a more sustainable and inclusive future for its residents.

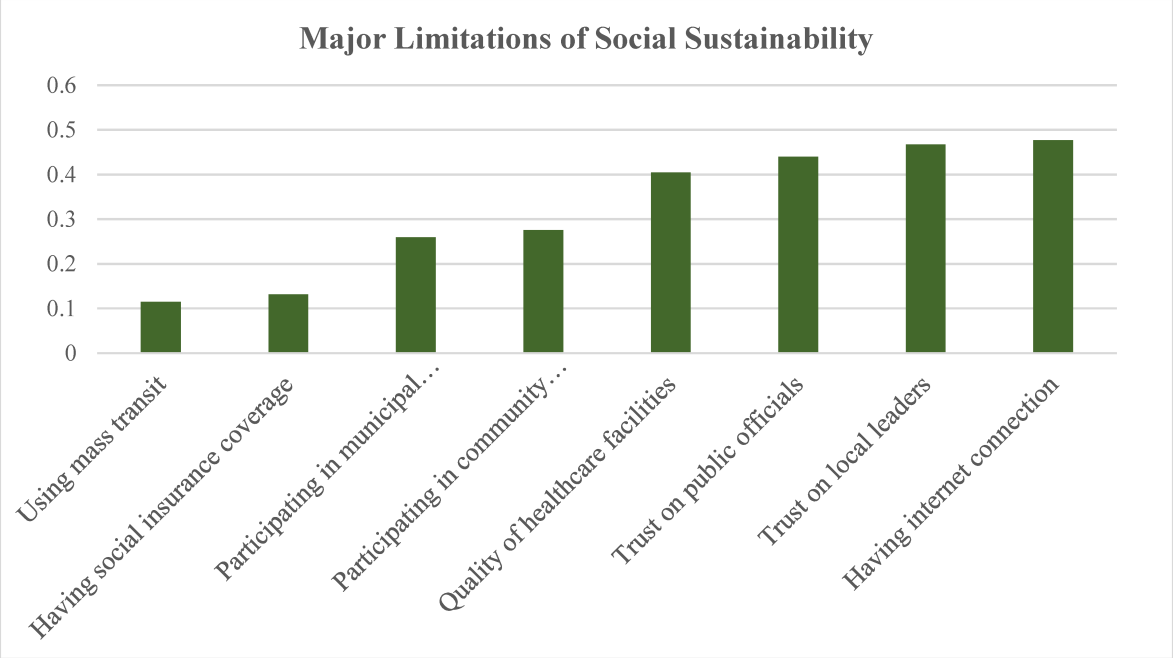

Figure 5-2: Major limitations of social sustainability in Shaqra City(Source: Own representation)

5.2.2 Economic Sustainability

Economic sustainability encompasses the long-term viability and well-being of a community's economic systems, shaped by various indicators. It involves ensuring affordable housing and transportation, equitable income distribution, and access to essential services without imposing financial burdens on households. Moreover, fostering entrepreneurship, maintaining low levels of corruption, and creating favorable business conditions are vital components. Residents' satisfaction with job opportunities, addressing unemployment, promoting savings, homeownership, and self-employment are integral to economic sustainability. Access to health insurance and financial services further bolsters economic resilience. Economic sustainability strives for a balanced, inclusive, and resilient economy that provides opportunities for income growth, financial security, and a high quality of life while minimizing income inequality and promoting responsible resource management.

5.2.2.1 Descriptive Insights of Economic Sustainability Indicators

Table 5.4 provides a detailed and comprehensive assessment of economic sustainability indicators in Shaqra City, measured on a Likert scale. These indicators encompass various facets of the city's economic well-being, offering insights into residents' perceptions. Notably, the data reveals a moderate perception of housing affordability and transportation means accessibility, with a diverse income distribution leaning towards higher levels. However, there's room for improvement regarding government support for entrepreneurship and job

opportunities satisfaction. On a positive note, the level of corruption appears to be relatively low, indicating a favorable economic environment.

Table 5.4: Descriptive statistics of economic sustainability indicators (Likert scale).

Indicators	Category	Frequency (n=174)	Percentage (n=174)	Mean (±SD)
Affordability of housing unit	*Very low*	16	9.2	3.06 (±1.03)
	Low	27	15.5	
	Moderate	74	42.5	
	High	45	25.9	
	Very high	12	6.9	
Affordability of transportation means	*Very low*	4	2.3	3.63 (±0.95)
	Low	9	5.2	
	Moderate	72	41.4	
	High	52	29.9	
	Very high	37	21.3	
Level of income	*Very low*	20	11.5	3.76 (±1.43)
	Low	22	12.6	
	Moderate	16	9.2	
	High	37	21.3	
	Very high	79	45.4	
Affordability of services and facilities	*Very low*	4	2.3	3.71 (±0.95)
	Low	8	4.6	
	Moderate	64	36.8	
	High	57	32.8	
	Very high	41	23.6	
Government support for entrepreneurship development	*Very low*	24	13.8	2.84 (±1.08)
	Low	33	19.0	
	Moderate	75	43.1	
	High	30	17.2	
	Very high	12	6.9	
Level of corruption	*Very low*	41	23.6	2.34 (±1.1)
	Low	66	37.9	
	Moderate	43	24.7	
	High	14	8.0	
	Very high	10	5.7	
	Very low	27	15.5	2.68 (±1.01)
	Low	35	20.1	
	Moderate	88	50.6	

Level of favorable business condition	*High*	15	8.6	
	Very high	9	5.2	
Satisfaction regarding job opportunities	*Very low*	55	31.6	2.25 (±1.14)
	Low	55	31.6	
	Moderate	37	21.3	
	High	20	11.5	
	Very high	7	4.0	

Table 5.5, in contrast, focuses on binary responses (yes/no) for key economic sustainability indicators. These include the prevalence of unemployed family members, savings, housing ownership, self-employed family members, health insurance coverage, and access to loan or credit facilities. This binary data complements the Likert scale data in Table 4 by providing concrete insights into the presence or absence of crucial economic resources and opportunities within the community. Collectively, these tables offer a comprehensive understanding of Shaqra City's economic sustainability landscape, aiding policymakers in targeted efforts to enhance economic well-being and prosperity for its residents.

Table 5.5: Descriptive statistics of economic sustainability indicators (yes/no).

Indicators	**Category**	**Frequency (n=174)**	**Percentage (n=174)**
Having unemployed family members	*Yes*	127	73.0
	No	47	27.0
Having savings	*Yes*	70	40.2
	No	104	59.8
Housing ownership	*Yes*	88	50.6
	No	86	49.4
Having self-employed family members	*Yes*	34	19.5
	No	140	80.5
Having health insurance	*Yes*	35	20.1
	No	139	79.9
Having access to loan or credit facilities	*Yes*	70	40.2
	No	104	59.8

5.2.2.2 Measuring Economic Sustainability

Table 5.6 presents a comprehensive assessment of economic sustainability in Shaqra City, offering detailed insights into various economic indicators and their associated values. These indicators encompass affordability, income levels, government support, and financial security. The "Value" column provides numerical data on different dimensions of the city's economic landscape, with indicators like housing affordability, income levels, and corruption levels reflecting specific aspects of economic well-being.

The "Minimum Value" and "Maximum Value" columns are crucial to understanding these indicators, which set benchmarks for each indicator's possible range. For instance, the "Affordability of housing unit" indicator can range from very low to very high affordability, with a minimum value of 1 and a maximum value of 5. However, the most critical aspect is the "Normalized Value" column, which standardizes these diverse economic indicators, enabling a fair comparison. These normalized values are based on actual values and the respective minimum and maximum values. The "Economic Sustainability Index" is the culmination of these normalized values, offering a single numerical representation of the city's overall economic sustainability. In this case, the index value of 0.455 categorizes the city's economic sustainability as "Moderate." The note at the table's bottom interprets the index values, clarifying that a value between 0.41 and 0.60 signifies "moderate economic sustainability." This table, alongside the note, is a valuable resource for policymakers and stakeholders, guiding future economic development strategies and policies within Shaqra City.

Moreover, **Figure 5.3** provides a multifaceted insight into Shaqra City's economic sustainability. The Economic Sustainability Index categorizes the city's overall economic sustainability as "Moderate," indicating that it is making reasonable progress in fostering economic well-being and financial stability for its residents. Notable strengths include moderate affordability in housing and transportation, a diverse income distribution, and relatively low levels of corruption. However, areas for improvement are evident, such as enhancing government support for entrepreneurship job satisfaction and addressing the high percentage of unemployed family members. Nevertheless, savings and access to credit facilities offer financial security. These insights provide a balanced view of the city's economic landscape, guiding policymakers and stakeholders in shaping strategies further to bolster economic prosperity and financial resilience within the community.

Table 5.6: Level of economic sustainability in Shaqra city.

Indicators	Value	Minimum Value	Maximum Value	Normalized Value
Affordability of housing unit	3.06	*1*	*5*	0.515
Affordability of transportation means	*3.63*	*1*	*5*	0.658
Level of income	*3.76*	*1*	*5*	0.69
Affordability of services and facilities	*3.71*	*1*	*5*	0.678
Government support for entrepreneurship development	*2.84*	*1*	*5*	0.46
Level of corruption	*2.34*	*1*	*5*	0.665
Level of favorable business condition	*2.68*	*1*	*5*	0.42
Satisfaction regarding job opportunities	*2.25*	*1*	*5*	0.313

Having unemployed family members	*73.0*	*0*	*100*	0.27
Having savings	*40.2*	*0*	*100*	0.402
Housing ownership	*50.6*	*0*	*100*	0.506
Having self-employed family members	*19.5*	*0*	*100*	0.195
Having health insurance	*20.1*	*0*	*100*	0.201
Having access to loan or credit facilities	*40.2*	*0*	*100*	0.402
			Economic Sustainability Index	*0.455*
			Level of Economic Sustainability	*Moderate*

Note: Meaning of index value: 0-0.20 = very low economic sustainability; 0.21-0.40 = low economic sustainability; 0.41-0.60 = moderate economic sustainability; 0.61-0.80 = high economic sustainability; and 0.81-1 = very high economic sustainability.

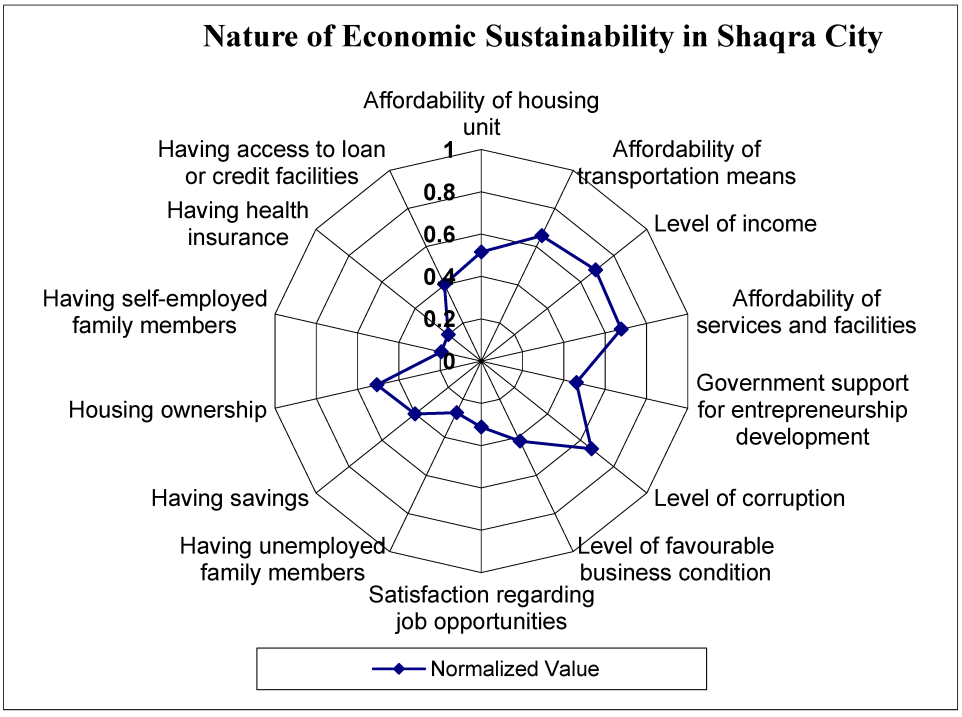

Figure 5-3: Nature of economic sustainability in Shaqra City (Source: Own representation)

5.2.2.3 Major Limitations of Economic Sustainability in Shaqra City

Shaqra City faces significant limitations in several key economic indicators, as indicated by their normalized index values falling below 0.5. These limitations serve as critical focal points for improving economic sustainability within the community. Challenges are evident in self-employment opportunities, health insurance coverage, unemployment rates, job satisfaction,

savings habits, access to financial resources, business conditions, and government support for entrepreneurship. Addressing these limitations will require concerted efforts from local authorities, businesses, and community stakeholders. Strategies aimed at job creation, workforce development, and the promotion of entrepreneurship are vital for improving the city's residents' economic well-being and financial security. Moreover, fostering a favorable business environment, expanding access to financial resources, and enhancing health insurance coverage are essential steps toward building a more economically sustainable future for Shaqra City.

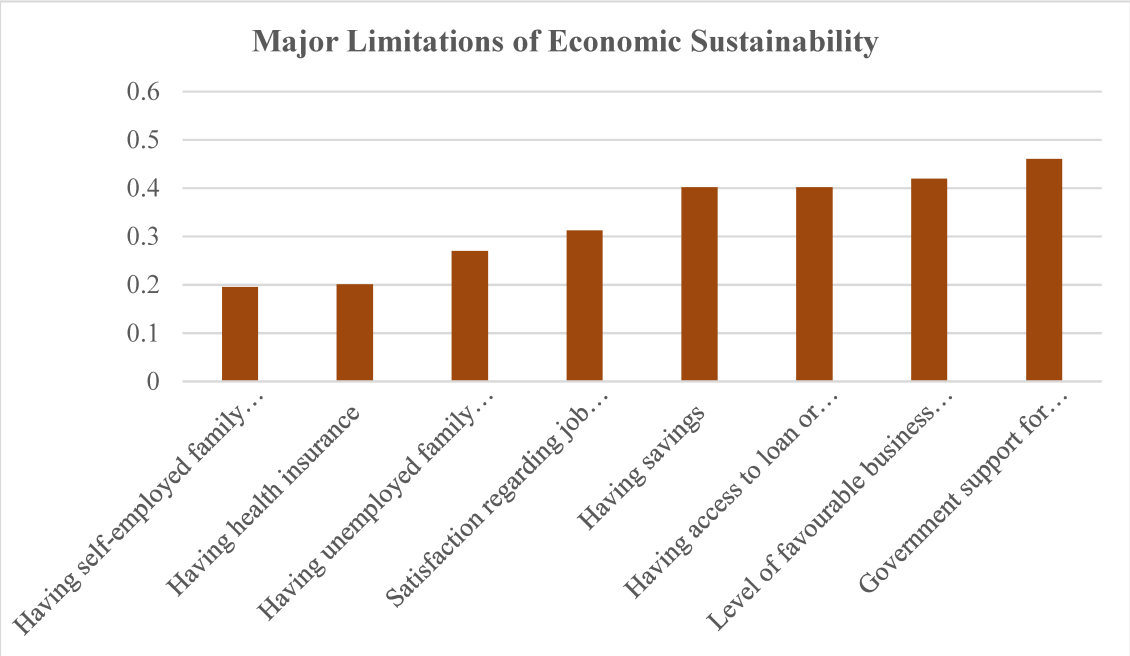

Figure 5-4: Major limitations of economic sustainability in Shaqra City (Source: Own representation)

5.2.3 Environmental Sustainability

Environmental sustainability refers to the community's commitment to preserving and improving its natural environment for the well-being of current and future generations. It signifies the ability to maintain a harmonious and balanced relationship with nature. In this context, environmental sustainability involves various aspects: managing noise levels to create a peaceful living environment, ensuring the quality of water resources is free from pollutants, demonstrating enthusiasm for tree plantation to enhance greenery and biodiversity, recognizing the significance of combatting ecological degradation, embracing gardening as a means to promote plant life and urban green spaces, adopting waste reuse practices to reduce environmental impact and minimize landfill waste, and fostering awareness about the critical issue of climate change. Environmental sustainability is not merely a goal but a holistic approach encompassing a responsibility toward the environment. It involves individual and

collective efforts to reduce pollution, conserve natural resources, and safeguard ecosystems to create a healthier and more sustainable future for the community and the planet.

5.2.3.1 Descriptive Insights of Environmental Sustainability Indicators

Tables 5.7 and **5.8** provide a comprehensive overview of environmental sustainability indicators in the context of Shaqra City. **Table 5.7**, which comprises Likert scale-based indicators, offers insights into residents' perceptions regarding various aspects of environmental sustainability. Notably, it assesses noise levels, water quality, interest in tree plantation, and awareness of ecological degradation. The mean values and standard deviations provide a quantitative understanding of these aspects. For example, the noise level is perceived as relatively low (mean of 2.22), while water quality receives a moderately positive rating (mean of 3.41). Interest in tree plantation and awareness about ecological degradation exhibit moderate levels, with means of 3.07 and 2.86, respectively.

Table 5.7: Descriptive statistics of environmental sustainability indicators (Likert scale).

Indicators	**Category**	**Frequency (n=174)**	**Percentage (n=174)**	**Mean (±SD)**
Noise level	*Very low*	41	23.6	2.22 (±0.96)
	Low	73	42.0	
	Moderate	46	26.4	
	High	9	5.2	
	Very high	5	2.9	
Quality of water	*Very low*	8	4.6	3.41 (±0.98)
	Low	17	9.8	
	Moderate	66	37.9	
	High	62	35.6	
	Very high	21	12.1	
Interest for tree plantation	*Very low*	30	17.2	3.07 (±1.33)
	Low	27	15.5	
	Moderate	48	27.6	
	High	38	21.8	
	Very high	31	17.8	
Awareness about ecological degradation	*Very low*	34	19.5	2.86 (±1.24)
	Low	28	16.1	
	Moderate	59	33.9	
	High	35	20.1	
	Very high	18	10.3	

Table 5.8 focuses on binary indicators related to environmental sustainability. It explores residents' interest in gardening, their willingness to reuse generated waste, and their awareness of climate change. These indicators are presented as frequencies and percentages, shedding light on the prevalence of environmentally friendly behaviors and awareness. Notably, most residents express interest in gardening (55.2%) and reusing generated waste (53.4%), indicating a propensity for sustainable practices. However, awareness about climate change is relatively low, with only 16.1% of respondents indicating awareness. Together, these tables provide a comprehensive picture of environmental sustainability within Shaqra City, highlighting areas where the community excels and others where efforts toward sustainability can be further encouraged and nurtured.

Table 5.8: Descriptive statistics of environmental sustainability indicators (yes/no).

Indicators	Category	Frequency (n=174)	Percentage (n=174)
Interested for gardening	*Yes*	96	55.2
	No	78	44.8
Reuse of generated waste	*Yes*	93	53.4
	No	81	46.6
Awareness about climate change	*Yes*	28	16.1
	No	146	83.9

5.2.3.2 Measuring Environmental Sustainability

Table 5.9 offers a comprehensive and nuanced evaluation of environmental sustainability within Shaqra City. It examines a spectrum of vital environmental indicators, encompassing residents' perceptions and behaviors related to the city's environmental well-being. The table first presents the indicators, including noise level, water quality, interest in tree plantation, awareness of ecological degradation, interest in gardening, reuse of generated waste, and awareness of climate change. These indicators serve as key proxies for understanding various dimensions of environmental sustainability.

What makes this table particularly informative is the inclusion of normalized values for each indicator. These normalized values are calculated based on the actual indicator scores and the respective minimum and maximum values. They provide a standardized basis for comparing and assessing the different indicators. For instance, the normalized value of 0.161 for climate awareness suggests that resident’s environmental awareness is relatively low. In contrast, the normalized value of 0.603 for water quality implies a favorable perception of the city's water quality.

The table's pinnacle is the "Environmental Sustainability Index," a single numerical representation of the city's overall environmental sustainability. With a value of 0.504, the

index categorizes Shaqra City's environmental sustainability as "Moderate." This index condenses a wealth of information from multiple indicators into a concise and meaningful assessment of the city's environmental health. The accompanying note below the table adds further context by explaining the meaning of the index value ranges. It clarifies that an index value falling from 0.41 to 0.60 corresponds to "moderate environmental sustainability." This categorization helps policymakers and stakeholders understand where Shaqra City stands regarding its environmental sustainability efforts.

Figure 5.5 suggests that Shaqra City is making reasonable strides in maintaining a harmonious relationship with its natural surroundings. Residents perceive noise pollution as relatively high, with a normalized value of 0.695 for noise levels, and they hold a favorable perception of water quality, evidenced by a normalized value of 0.603. Moreover, residents are positively inclined toward environmental initiatives, including interest in tree plantation (normalized value of 0.518) and gardening (55.2% participation). However, the data also highlight a notable gap in awareness, particularly regarding climate change, with just 16.1% of respondents indicating awareness. This underscores the importance of educational and awareness-raising efforts in addressing this vital aspect of modern environmental sustainability. These insights provide valuable guidance for policymakers and stakeholders, offering a foundation for further enhancing Shaqra City's environmental sustainability endeavors.

Table 5.9: Level of environmental sustainability in Shaqra city.

Indicators	Value	Minimum Value	Maximum Value	Normalized Value
Noise level	2.22	*1*	*5*	0.695
Quality of water	3.41	*1*	*5*	0.603
Interest for tree plantation	3.07	*1*	*5*	0.518
Awareness about ecological degradation	2.86	*1*	*5*	0.465
Interested for gardening	55.2	*0*	*100*	0.552
Reuse of generated waste	53.4	*0*	*100*	0.534
Awareness about climate change	16.1	*0*	*100*	0.161
Environmental Sustainability Index				0.504
Level of Environmental Sustainability				*Moderate*

Note: Meaning of index value: 0-0.20 = very low environmental sustainability; 0.21-0.40 = low environmental sustainability; 0.41-0.60 = moderate environmental sustainability; 0.61-0.80 = high environmental sustainability; and 0.81-1 = very high environmental sustainability.

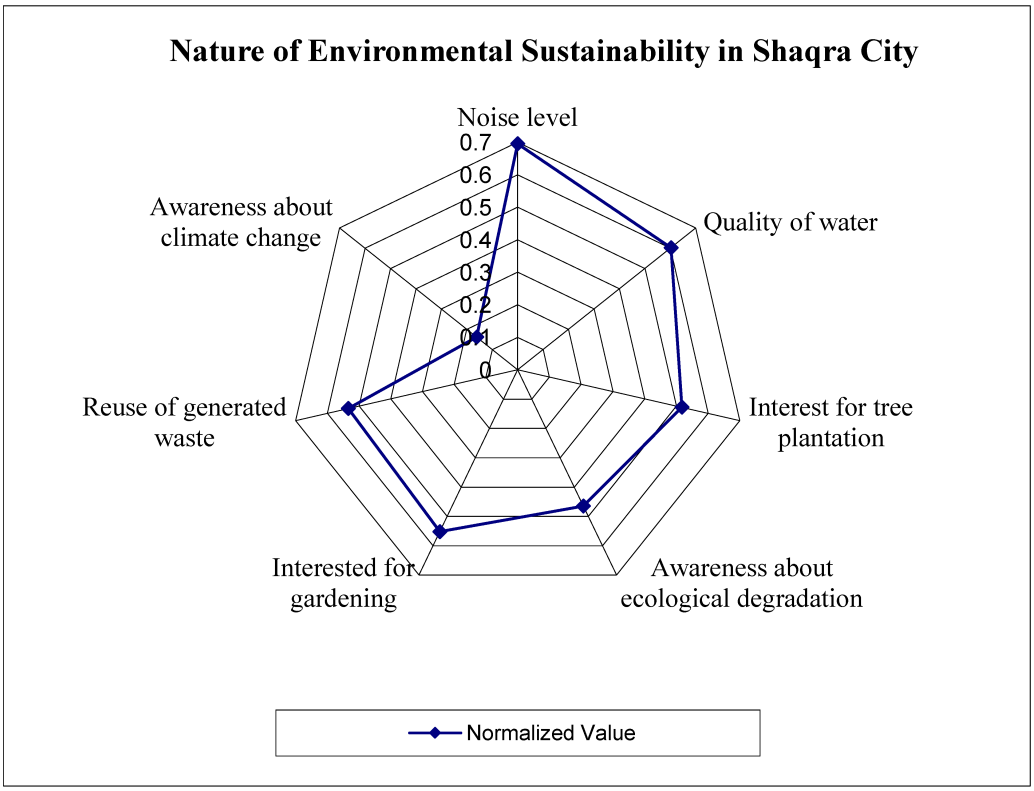

Figure 5-5: Nature of environmental sustainability in Shaqra City (Source: Own representation)

5.2.3.3 Major Limitations of Environmental Sustainability in Shaqra City

In Shaqra City, two major limitations revolve around awareness, identified by considering a normalized index value of less than 0.5 as a significant constraint. Firstly, a substantial lack of awareness about climate change exists, as indicated by a normalized index value below 0.5. This limitation impedes the city's ability to actively participate in climate change mitigation and adaptation efforts. To address this, comprehensive educational campaigns and community engagement initiatives must be launched to raise awareness about the pressing issue of climate change and foster a sense of responsibility among residents.

Secondly, a similar challenge is evident in awareness about ecological degradation, with the normalized index value falling below 0.5. This signifies a significant gap in residents' understanding of preserving natural ecosystems and habitats. Shaqra City should prioritize educational programs and awareness-raising campaigns emphasizing ecological conservation and sustainable environmental practices to overcome this limitation. In doing so, the city can empower its residents to take proactive measures toward environmental sustainability, thereby contributing to a healthier and more balanced coexistence with its natural surroundings.

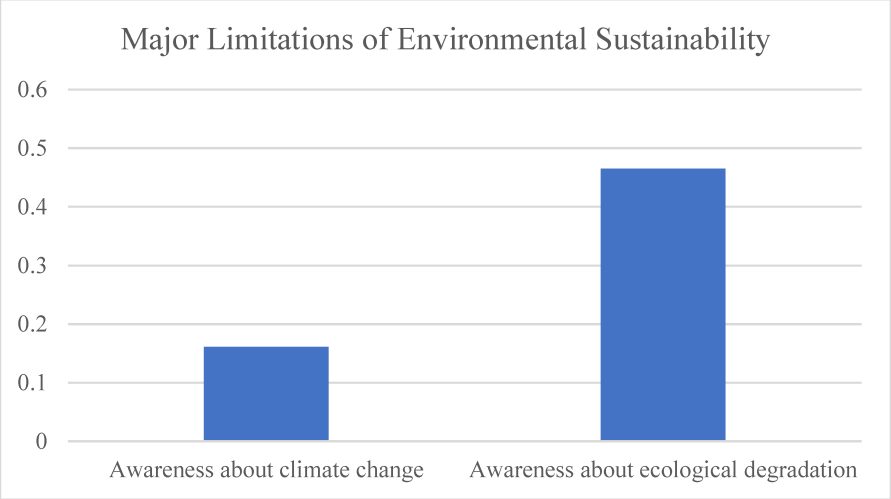

Figure 5-6: Major limitations of environmental sustainability in Shaqra City (Source: Own representation).

5.3 Composite Sustainable City Index for Shaqra City

A Composite Sustainable City Index has been formulated to assess Shaqra City's progress comprehensively. This index synthesizes various indicators, ranging from social and economic factors to environmental considerations. By amalgamating these facets of sustainability, the index offers a holistic perspective on the city's current state of sustainability and serves as a roadmap for future enhancements.

Table 5.10 provides an overview of the Composite Sustainable City Index for Shaqra City, offering a comprehensive evaluation of the city's sustainability across major indices. In terms of social sustainability, Shaqra City scores 0.483, indicating substantial progress in fostering social well-being and equity among its residents. The city's commitment to economic sustainability is reflected in its Economic Sustainability Index, which stands at 0.455, showcasing efforts to promote economic stability and prosperity. In environmental sustainability, with an index value of 0.504, the city demonstrates dedication to preserving its natural environment and mitigating ecological impacts. These indices collectively contribute to the Sustainable City Index, rated at 0.481, categorizing Shaqra City's overall sustainability as "Moderate" based on the provided scale. This assessment offers valuable insights for city policymakers and stakeholders, highlighting both areas of strength and opportunities for improvement as the city continues its journey toward becoming a more sustainable and livable urban environment for its residents.

Table 5.10: Composite sustainable city index for Shaqra city.

Major Indices	Value
Social Sustainability Index	0.483
Economic Sustainability Index	0.455
Environmental Sustainability Index	0.504
Sustainable City Index	*0.481*
Level of Sustainability	*Moderate*

Note: Meaning of index value: 0-0.20 = very low environmental sustainability; 0.21-0.40 = low environmental sustainability; 0.41-0.60 = moderate environmental sustainability; 0.61-0.80 = high environmental sustainability; and 0.81-1 = very high environmental sustainability.

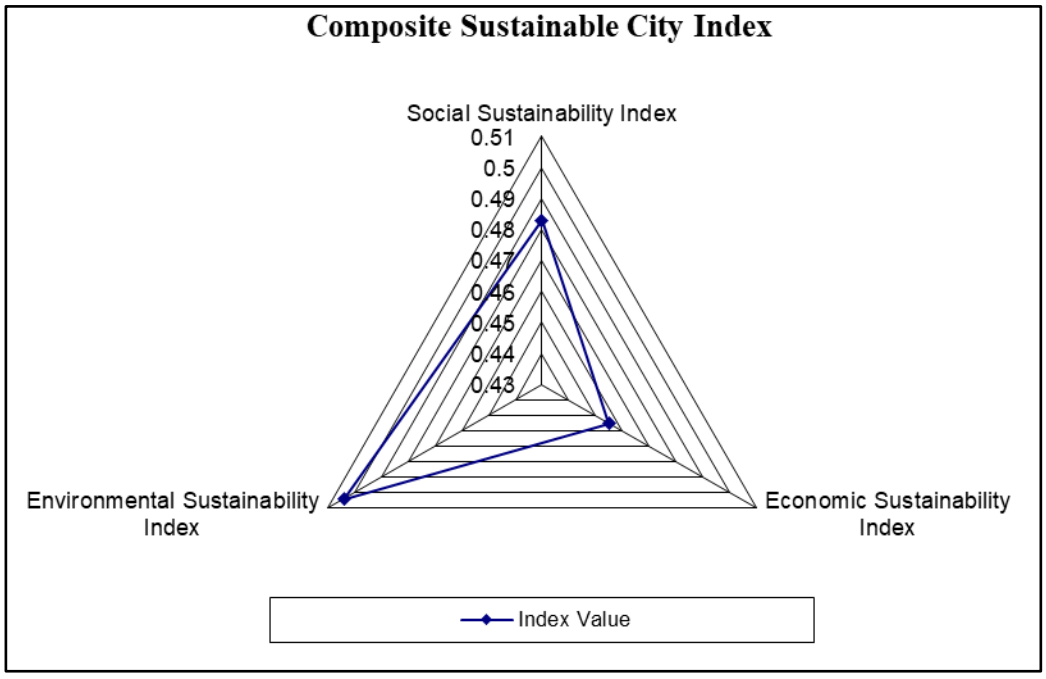

Figure 5-7: Major indices value that composites sustainable city index for Shaqra city(Source: Own representation)

The major insights from **Table 5.10**, which presents the Composite Sustainable City Index for Shaqra City, reveal a balanced approach to sustainability within the city. Shaqra City demonstrates moderate levels of sustainability across its major indices: social, economic, and environmental. This balanced performance suggests that the city has made noteworthy strides in addressing various dimensions of sustainability without significant disparities among them. While this "Moderate" rating is commendable, it also indicates ample room for further improvement in all aspects of sustainability. Shaqra City's commitment to social sustainability underscores its dedication to promoting social well-being and equity among its residents. Simultaneously, the city prioritizes economic sustainability, striving for economic stability and

prosperity for its population. Environmental conservation and mitigation of ecological impacts are priorities, as reflected in the Environmental Sustainability Index. These insights emphasize Shaqra City's potential to progress on its sustainability journey. By focusing on targeted strategies and initiatives, the city can ascend to higher levels of sustainability, ultimately providing its residents with a more sustainable and livable urban environment while safeguarding its natural resources.

5.4 Summary of the chapter

Shaqra City is making notable strides in sustainability, but there is room for improvement across all dimensions. By addressing identified limitations and focusing on targeted strategies, the city can enhance its overall sustainability and quality of life for its residents.

Social Sustainability:

- Social sustainability aims for equitable, inclusive communities prioritizing well-being and rights.
- Key indicators include gender equity, trust in leaders, quality education, healthcare, safety, and governance.
- Descriptive statistics reveal diverse perceptions, with moderate ratings in gender equity, trust in leaders, and quality of education and healthcare.
- Binary indicators show almost all residents have electricity, but only half have internet access, and mass transit use is low.
- The Social Sustainability Index categorizes Shaqra City's social sustainability as "Moderate," highlighting areas for improvement like healthcare quality and public trust.
- Major limitations include low mass transit utilization, limited social insurance, and low civic engagement, suggesting areas for targeted improvement.

Economic Sustainability:

- Economic sustainability involves long-term viability, affordable housing, transportation, equitable income, and access to essential services.
- Descriptive statistics show moderate housing affordability and transportation perceptions, with low job satisfaction and government support for entrepreneurship.
- Binary indicators reveal significant unemployment, limited savings, and health insurance coverage.
- The Economic Sustainability Index categorizes Shaqra City's economic sustainability as "Moderate," with strengths in housing affordability and low corruption but weaknesses in job satisfaction and unemployment.

- Major limitations include high unemployment, low self-employment, insufficient health insurance, and limited financial resources, necessitating comprehensive economic development strategies.

Environmental Sustainability:

- Environmental sustainability emphasizes preserving and improving the natural environment for current and future generations.
- Descriptive statistics indicate moderate perceptions of noise levels, water quality, and awareness of ecological degradation.
- Binary indicators show moderate interest in gardening and waste reuse but low awareness of climate change.
- The Environmental Sustainability Index categorizes Shaqra City's environmental sustainability as "Moderate," with strengths in water quality and noise levels but weaknesses in climate change and ecological degradation awareness.
- Major limitations include low awareness of climate change and ecological degradation, highlighting the need for educational campaigns.

Composite Sustainable City Index for Shaqra City:

- The Composite Sustainable City Index aggregates social, economic, and environmental indices, giving Shaqra City an overall sustainability rating of "Moderate."
- The city's balanced approach to sustainability shows progress in social well-being, economic stability, and environmental conservation but also indicates areas for improvement.
- Policymakers and stakeholders can use these insights to target specific areas for further enhancement, aiming for a more sustainable and livable urban environment.

5.5 Conclusion

In conclusion, the detailed assessment of Shaqra City's sustainable development journey underscores its commendable progress and areas ripe for improvement. With a focus on social, economic, and environmental sustainability, the city exhibits a balanced approach to enhancing the quality of life for its residents while safeguarding natural resources. While achieving a "Moderate" rating across key sustainability indices, there is room for growth, particularly in areas such as awareness of climate change and ecological degradation, trust in public officials, and infrastructure development. Shaqra City can further elevate its sustainability efforts by prioritizing targeted strategies and fostering community engagement, ensuring a more inclusive, resilient, and environmentally conscious urban environment for current and future generations. However, the next chapter presents a detailed qualitative assessment of sustainable urban development in Shaqra city to better understand the quantitative analysis.

Chapter Six: Qualitative Appraisal of Sustainable Development in Shaqra City

6. Introduction

The interpretive analysis adopted in this study enables the researcher to investigate the research questions through the eyes of city inhabitants. Their perceptions, emotions, and lived experiences thoroughly understand the context, leaving out researcher biases.

Six main themes have been identified in line with the three research questions, each with sub-themes. The chapter begins with an analysis of the perceptions of the physical geographical components of the city (Theme: 1) as pivotal foundations for progress. These components intricately shape the city's potential for growth and prosperity, encompassing its landforms, natural resources, and geographical features. The quotes are presented under each theme. Theme (2): Education and Health services; Theme (3): sustainable development as seem from social, economic, and environmental perspectives; Theme (4): services and facilities available for the citizens to enhance the quality of life. Theme (5): lessons learned and a way forward to achieve sustainability, and Theme (6): the challenges and opportunities inherent in this pursuit within the unique context of Shaqra City.

6.1 Theme 1: Physical and Geographical Components of Development in Shaqra City

Geography plays a critical role in the development of urban spaces. It determines peoples' livelihoods, access to economic activities, and educational opportunities. In the past, population hubs emerged in close proximity to water resources such as rivers, which provided water for cultivation. In the present era, most cities are developed close to trade centers that provide diverse growth opportunities. Population dynamics, land use planning, and city infrastructure significantly impact geography.

Shaqra City's urban landscape has a long history of growth and adaptation. The city's unique geographic location further complements this urban evolution. Its proximity to Riyadh, the capital of Saudi Arabia, and its historical significance on the Hijaz route have made it an attractive destination for many.

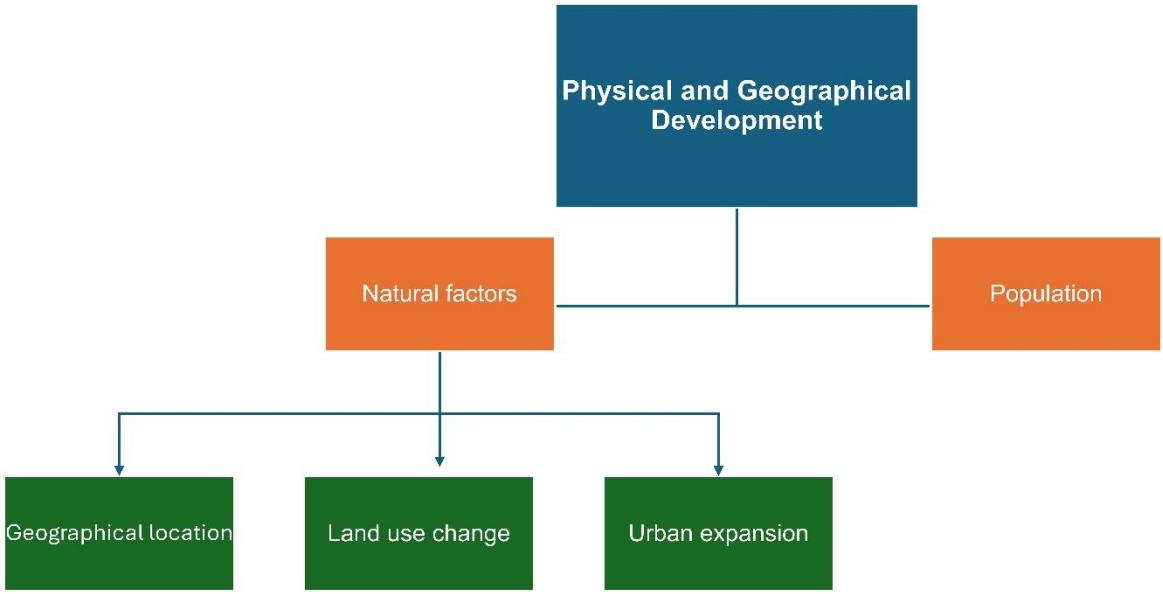

Figure 6-1 Physical and Geographical Components of Development

6.1.1 Sub-Theme 1: Natural factors

Geographic location and features

The geographical characteristics of the area are described regarding the diversity of its landscape, including mountains and peaks, as well as fertile soil that supports agricultural productivity. Participants view the local soil as ideal for growing key crops such as dates, wheat, and red pepper, as well as greenhouse vegetables like cucumbers and tomatoes, highlighting the area's agricultural potential.

"The soil is suitable for cultivating the best products in the city, which are dates, wheat, and red pepper, as well as greenhouses such as cucumbers and tomatoes" " ***Participant 2****.*

"The topography of the city is diverse, with two peaks and mountains", ***Participant 17****.*

Shaqra city today is home to diverse nationalities who moved to the city due to the university and the housing project. This is an obvious factor for city dwellers as they mention that they see many people originally from other areas. As the participants mention,

*"People began to live in Shaqra from all regions of the Kingdom of Saudi Arabia from the south, north, west, and east because of the Alaskan project and the university" (P****articipant 18****)*

Most of the participants provided evidence that Shaqra has attracted many people from the peripheries, contributing to changes in the population composition of the city. When it comes

to being close to Riyadh, people have mixed feelings. The interviewees had various opinions about the advantages and disadvantages of being close to the country's capital. They agree that being close to Riyadh facilitates their commute to the capital city for their necessary activities. However, the city dwellers are concerned that being close to the capital restricts the development of Shaqra as an independent city. This can be considered a common scenario because small cities in close proximity to a mega city tend to become overly dependent on the larger city for economic and social needs, thus avoiding or postponing the development of these services in smaller cities. Yet, Shaqra can benefit from the trickle-down effects of being close to the capital city. They consist of increased job opportunities, better infrastructure, and improved access roads and tourism. Only one participant stated that many families had left Shaqra and moved to Riyadh. This is one of the negative impacts of being in close proximity to the capital city. People living in the peripheral cities tend to move to the capital city for better opportunities and living conditions.

"The city's proximity to Riyadh has a positive and negative double impact. It positively affects people as they get their things in Riyadh and return to Shaqra. It is negatively affected because it does not economically serve Shaqra city" ***Participant 13****.*

"The city's proximity to Riyadh enables the residents of Riyadh to meet their needs from the Shaqra city and return on the same day", ***Participant 8****.*

"Proximity to the city of Riyadh is an advantage on the one hand, and on the other hand, a weakness", ***Participant 3****.*

Climate is another factor that determines urbanization, as it influences peoples' decisions to settle in a particular city. Many participants observed that there were no major climatic changes in the area. They mainly refer to the temperature, which has not shown any significant change recently. Although it gets colder and warmer some years, there is no environmental change in general. Many participants share the belief that there has been no significant change in temperature or environmental conditions over time, suggesting a perceived stability in climate patterns. They tend to attribute any perceived extremes in weather, whether colder or hotter, to normal changes rather than long-term shifts. For some, this reinforces the idea that while certain years may stand out, the overall climate has remained relatively consistent.

"From my point of view, the temperature has not changed. We always say that if a severe cold comes, we have never had a cold like this before, and if it is hot, we say that we have never had such heat before" " ***Participant 13****.*

"The temperature did not change, and the sandstorms did not increase," ***Participant 14****.*

"Sometimes it gets a little colder in some years, and sometimes it gets hotter in some years; in general, there is no environmental change ", ***Participant 6****.*

Land use change

Land use patterns of a city indicate how the spatial area in the town is used for different purposes such as residential, commercial, industrial, or recreational activities or even urban agriculture. It signifies the development path of the city, too. Observing changes in land use patterns with urban expansion or city development is common. This is mainly characterized by allocating more space for dwellings to provide housing for the increasing population. However, the participants of this study mainly pointed out the increased commercial areas in the city. Key streets, which were once primarily residential, are now filled with cafes, restaurants, and shops. For example, roads such as the 'King Abdullah Saud Road' and the Arbaeen Street now contain many shops and cafes on their sides. These predominantly residential areas are gradually being converted into commercial areas.

"There is a change in land use, as an example of 'King Abdullah Saud Road', which now contains many cafes and restaurants", ***Participant 13****.*

"There are some streets, such as Arbaeen Street, which was transformed from residential to commercial, and now 'Abdullah Street' is transformed from residential to commercial", ***Participant 14****.*

"There has been a change in your streets, as you have moved from residential to commercial, such as Al-Arbaeen Street, which is considered the main artery of the city", ***Participant 6****.*

However, while there has been significant investment and transformation, some participants feel that the level of development remains insufficient compared to neighboring cities. They express a desire for further improvement despite acknowledging the progress made over the past decade, including adding new hotels and furnished apartments. They point out that the investments made in the development of Shaqra City are below the required level compared to the neighboring cities.

"Investment has been made in the city during the previous years, but it is below the required level compared to neighboring cities. We always want greater development. During the previous six years, a transformation took place in the streets; previously, most of them were houses, but now we find restaurants and shops", ***Participant 12****.*

"Significant growth has occurred during the past ten years. The city now contains three hotels. In the years 1423-1424, they suffered a lot in securing housing when we hosted the Kingdom Table Tennis Championship. Now, there are many furnished apartments in addition to hotels" ***Participant 5****.*

Urban expansion

When considering urban expansion, it refers to the process of cities growing both in physical size and population. Although this can occur through various mechanisms, such as establishing industrial areas within the city, new housing projects, and infrastructure, most participants perceive it as an extension of the city's landscape. The city's expansion has been primarily towards the north and west while restricted by the university's presence in the west. The natural barriers, such as mountains and farms, have restricted growth towards the south and east. Comparatively, the pace of urban expansion in Shaqra is slower than in other cities, such as the Unaizah City in Qassim. They pointed out that Shaqra city cannot be expanded from the south due to sandy land and the east due to geographical barriers imposed by the mountains. Expansion is available in the west from the university side, which has already occurred due to the university. Some believe the city can be extended towards the Al-Andalus neighborhood in the north.

*Urban expansion in the city in the west from the university side, which is considered available, it is not possible to expand in the south because it is sandy; in the east, there are mountains and another city, and in the north, there are valleys and another city", **Participant 12**.*

*"Urban expansion in the direction of the west and north towards the rehabilitation of Al-Andalus neighborhood", **Participant 4**.*

*"In Shaqra, its urban expansion is entirely in the west because the university's headquarters is in the west of the governorate, and the geographical nature is beyond its severity, as it only expanded from the west," **Participant 8**.*

6.1.2 Sub-Theme 2: Population

Shaqra City has approximately 45,000 inhabitants (2023) of diverse cultures. The establishment of Shaqra University in 2009 further diversified the population due to students and academics from other areas of the country moving to Shaqra. At the same time, the noted migration trend, where families from Shaqra relocating to Riyadh, presents a unique challenge. On the one hand, the city is experiencing growth due to incoming populations, but on the other, it's also witnessing a drain of its native populace. This migration can lead to vacated spaces, underutilized facilities, and a potential strain on the city's economic growth. However, they highlighted the main attractions of Shaqra University, established in 2009, and the Alaskan project.

*"There are many families who left Shaqra and migrated to Riyadh. As a result, we notice a change in the families who live in Shaqra city", **Participant 2**.*

*"After the housing project, people began to live in Shaqra from all regions of the Kingdom of Saudi Arabia from the south, north, west, and east because of the Alaskan project and the university", **Participant 18**.*

*"A high percentage of Shaqra's residents are from outside the city", **Participant 11**.*

*"People come from outside the Shaqra city and live there because of the university", **Participant 15**.*

*"When we enter the supermarket, we notice the presence of residents of origins outside the city clearly, and the main reason for the increase in the population is the university", **Participant 12**.*

6.2 Theme 2: Health and Education Services

Urban infrastructure refers to basic physical structures such as schools, hospitals, and roads, as well as services such as water and electricity supply and waste management. These are considered public goods and services the government or municipality supplies for city inhabitants. High-quality urban infrastructure contributes to the economic development of the city while facilitating high-quality living for people in a sustainable environment.

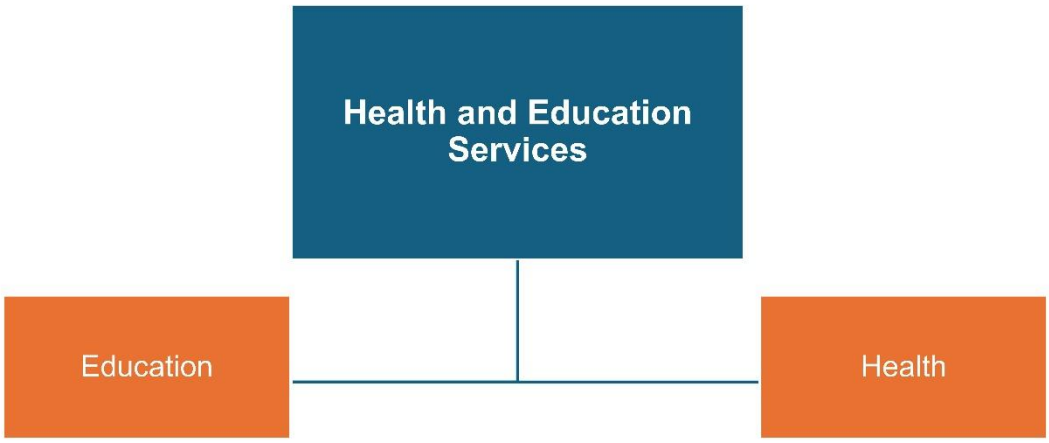

Figure 6-2 Health and Education Services

6.2.1 Sub-theme 1: Education

The respondents consistently emphasize the pivotal role of the university in the development of Shaqra. They attribute much of the city's growth and transformation to the university's presence, highlighting its influence in attracting new residents, opening businesses, and creating job opportunities. The influx of students, faculty, and professionals has spurred

economic activity, leading to the emergence of shops, brands, and services that were previously unavailable in the city.

Most interviewees mentioned that the university is the main reason for the city's residential, cultural, and commercial development. Before the construction of Shaqra University, the potential young generation studied at Riyadh University. With the adoption of the digital admission system, students from other cities started registering at Shaqra University. The city is cheaper than Riyadh city, and this encourages the registration of students from different cities at Shaqra University. With the university, the number of students, doctors, and employees living in the city has increased, and more shops and amenities have been opened that did not exist before the university. Shaqra University is the largest university in the Kingdom of Saudi Arabia in terms of the urban area, with more than five thousand students. Of course, this figure is increasing, with more and more students enrolling from the city or other cities. This leads to a state of constant development of the university through adding new colleges.

While some acknowledge that development existed before the university, they agree that the pace and scale of growth significantly accelerated after the university was established. Educational opportunities provided by the university are seen as a critical factor not only in attracting people to live in Shaqra but also in driving the overall progress of the city.

“To my mind, I find that the university to be the key element in the city’s development", ***Participant 11.***

"The presence of the university led to the opening of shops and brands that did not exist before the university", ***Participant 1.***

"The university is considered one of the reasons that led to the city’s development. Studying is important in obtaining jobs, so people live in the city in order to study at the university", ***Participant 13****.*

"The main reason is the university", ***Participant 15.***

"The presence of the university led to an increase in the number of students and doctors in the city", ***Participant 16.***

"Before the university, the city developed, but the development was not as it happened after the existence of the university", ***Participant 10****.*

"Availability of educational opportunities for the city, such as the university, as the university is one of the most important reasons that led to the development of the city", ***Participant 8.***

The respondents offer differing views on the impact of integration within Shaqra’s educational facilities. Some believe that educational services remain excellent, noting that while integration

did not significantly increase class sizes, it resulted in a broader range of grade levels being offered. However, others feel that the quality of education has declined due to larger class sizes, which they attribute to reduced enthusiasm and effectiveness from teachers. This mixed feedback highlights both the benefits and challenges of educational integration in the city.

"The educational services are excellent; the integration did not lead to an increase in the number of students in the class, but it led to an increase in the grades", ***Participants 2 and 15.***

" The integration led to a decrease in the quality of education due to the teacher's lack of enthusiasm as a result of the increase in the class", ***Participant 14.***

Almost all the interview participants identify the university's presence as a catalyst for city development. Although the city has shown some development earlier, the rate of growth and development increased after the establishment of the university. The availability of educational and employment opportunities are key factors attracting people to cities, ultimately leading to their development. In Shaqra, it has led to an increase in commercial establishments and population. It is an increase in population and a change in population structure because a university attracts many students with diverse backgrounds. Yet, both of them are associated with the growth or the development of the city.

The respondents recognize the role of the Scientific Institute in Shaqra's development but emphasize that its influence is now much smaller compared to the university. In the past, the institute played a part in the city's growth, especially due to the presence of renowned scholars. However, its current impact is limited due to its smaller size and capacity. In contrast, Shaqra University, which is geographically the largest in the Kingdom, has a much broader reach and a far greater number of students, making it the primary driver of the city's recent development.

"The scientific institute has a simple role, unlike the universities. The number of students accepted reached thirteen thousand students in one year, while the number of those admitted to the Scientific Institute is limited by virtue of its size and by virtue of its capabilities because Shaqra University is the largest geographical university in the Kingdom of Saudi Arabia in terms of area", ***Participant 12****.*

"In the past, the Scientific Institute had a reason for the development of the city, as famous scholars had previously taught there", ***Participant 9****.*

The respondents reveal varied access to health insurance in Shaqra. Some individuals, such as those associated with specific organizations or associations, have health insurance. Others either lack insurance altogether or must pay for it personally. Government employees, in particular, do not seem to receive health insurance as part of their employment benefits. This suggests that health insurance coverage is not widespread or uniformly provided, with many relying on personal arrangements or going without coverage altogether.

6.2.2 Sub-theme 2: Health

The respondents see the hospital as an important facility for providing healthcare services to Shaqra and neighboring cities. However, they do not view it as a driver of population growth. While the hospital serves many people from different areas, patients typically come for treatment and then return to their own cities rather than choosing to relocate to Shaqra. Thus, the hospital supports the local community and surrounding regions but does not contribute to a long-term increase in the city's population.

“The hospital served the city, but it was not the reason to increase the city's population", ***Participant 18****.*

"The hospital provided care for residents of several cities in addition to Shaqra", ***Participant 20****.*

"Patients are treated in the hospital and return to their cities. They do not need to live in the city", ***Participant 1****.*

The respondents highlight a key issue with health facilities in Shaqra: while the infrastructure of hospitals and health centers is generally good, there is a significant shortage of medical staff and specialists. The growing population, driven by the university and housing projects, has put additional pressure on healthcare services, leading to long delays in hospital appointments. Previously, patients could get appointments within a week or two, but now it can take up to six months due to the increased demand.

Additionally, certain medical specialties, such as neurology, are not available locally, causing gaps in healthcare services. In response to the perceived lack of resources, some community members have begun donating equipment or funding visiting doctors to address these shortages. Overall, while the facilities are present, the lack of personnel and specialized care limits the effectiveness of healthcare in the city.

"Good infrastructure is available for hospitals and health centers, but they lack medical staff, " ***Participant 12.***

"Hospital appointments are currently delayed due to the population increase resulting from the university and the housing project. Before, appointments were within a week or two weeks, but today it takes six months. In addition, medical personnel are not available for Participant 19. "There are specialties so far that are not available in the hospital that are related to the brain and nerves, which means that there are things that are lacking in", ***Participant 3.***

"As a result of the people’s feeling of a lack of equipment and staff, hospitals have started to make donations of complete equipment or to bring visiting doctors at their own expense", ***Participant 8.***

Discourses related to Theme (2)

Scrutinizing the transcripts of the interviews, the growth discourse emerged through the participants' opinions on how the university contributes to urban development. It has two aspects: i) population increase; "*The university is considered one of the reasons that led to the city's development. Studying is important in obtaining jobs, so people live in the city to study at the university*" (**Participant 13)**, and economic development through trade and commerce; *"The presence of the university led to the opening of shops and brands that did not exist before the university" (**Participant 1).***

All the participants shared their opinions on the university's huge contribution to urban development (growth) while recognizing that the scientific institute has a limited contribution. Although the hospital fulfills the health needs of inhabitants, it does not contribute to the city's growth, thus remaining neutral in the growth discourse. All three utilities identified under urban infrastructure do not contradict each other under the growth discourse. Still, they have their capacities and limits in contributing to the city's growth.

6.3 Theme 3: Level of sustainable development in Shaqra City

In par with the second research question, how effectively the city meets the diverse needs of its populace, it attempted to analyze the existing level of sustainable development in Shaqra City. Sustainability was assessed by examining specific codes, including Agriculture, Garbage Sorting, Cleanliness, Noise, Corruption, Confidence, Equality, and Social Initiatives.

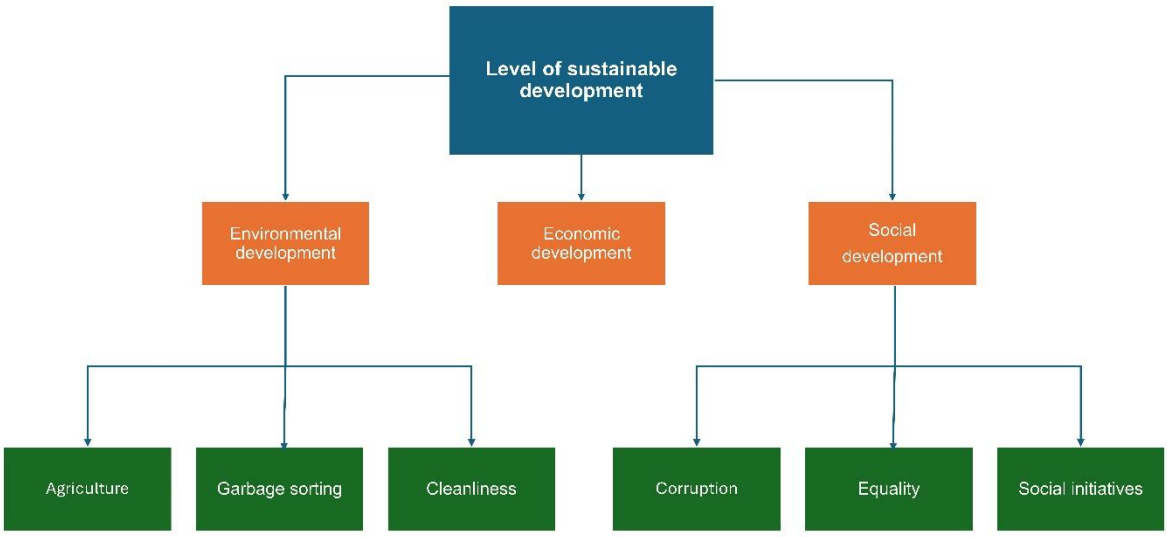

Figure 6-3 Level of sustainable development

6.3.1 Sub-theme 1: Environmental development

With most of the world's population living in urban areas, cities tend to become more environmentally stressed in their efforts to fulfill the needs of inhabitants. Urban agriculture, green infrastructure, and waste management are some of the important aspects to be considered in the environment to achieve sustainable development.

Agriculture

Urban agriculture can bring many benefits to cities. They provide livelihood and food security for citizens while contributing to green cities with clean air. These can have many forms: community, rooftop, backyard, etc. Most interviewees stated they had no interest in agriculture, whether in a farm, garden, or roof-top operation. Only a few confirmed they had farms where they could cultivate and were interested in agriculture.

" I like to work in agriculture; I have a farm, I grow on it ", ***Participant 19.***

Garbage sorting

Waste management is one of the most important aspects of creating environmentally friendly cities for healthy living. The circular economy demands garbage sorting as an essential component in waste management. According to the interviewee, no bins are set aside for spoiled food, cardboard, or plastic debris that may be recycled instead of being thrown away or burnt, harming the environment. They attributed the lack of community awareness and the municipality's negligence. Some mentioned containers belonging to philanthropic organizations that distributed food and clothing.

The respondents view the city's cleanliness positively, noting that cleaning services are consistently provided, with street and container cleaning happening regularly, except on Fridays. They observe that cleaners are visible throughout the day, maintaining the streets and sidewalks. However, there are also concerns about waste management practices. While there are designated areas for waste disposal, sorting of waste is not practiced, and this is attributed to the municipality's negligence and a lack of public awareness.

Just because the waste collection places are available does not necessarily mean they contribute to sustainable development. If these wastes are not sorted, they may end up in incinerators or landfills. Both are harmful to the environment. While pointing out the negligence of the municipality, participant 11 associates this with a lack of community awareness.

"In general, there is a place for waste, but you do not find it sorted", ***Participant 1.***

" This negligence by the municipality in addition to the awareness of the community", ***Participant 11***

" There are food containers everywhere; for example, in the association, there are containers to put bread", ***Participant 13***

Cleanliness

A clean city free of litter and pollution makes it an attractive and safe place to live. The respondent's express satisfaction with the cleanliness of the city, noting that cleaning services are consistently provided throughout the day. Cleaners are seen working from early in the morning, and waste containers are emptied daily, except for Fridays. While overall hygiene standards are considered excellent, the performance of cleaning companies varies, with some delivering higher quality services than others. Despite these differences, the city is generally perceived as well-maintained and clean.

In general, cleanliness is excellent in the city. I expect that cleaning companies contract annually with the municipality, so we find some companies whose performance is very high and some of them are considered lower quality" Participant 8. "There is good hygiene, and we notice cleaners doing cleaning continuously. This is clear", ***Participant 2.***

"There is continuous cleaning of the streets and the evacuation of containers on a daily basis except for Friday", ***Participant 5.***

"We find cleaners from six in the morning, and cleaners change during the day, cleaning the sidewalks and streets", ***Participant 1.***

Noise: The increasing urban population and factors such as the rising number of vehicles and urban industries lead to noise pollution. Less noise pollution brings many health benefits to city inhabitants: reducing stress, promoting a sense of calm and relaxation, etc. The interviewees emphasized that the city is quiet and has no noise pollution.

The respondents describe Shaqra as a quiet and peaceful city, even with the presence of the university. Despite the influx of students and residents, the city has maintained a calm atmosphere. They highlight the absence of noise typically associated with larger cities, emphasizing that smaller provinces like Shaqra continue to offer a more peaceful environment.

"The city is considered quiet compared to others, despite the university's presence in it", ***Participant 11****.*

"There is no noise in the small provinces such as the city of Shaqra", ***Participant 13.***

6.3.2 Sub-theme 2: Economic development

Sustainable economic activities contribute to economic growth while creating an environmentally friendly city. The interviewees believe the city is experiencing economic development, though the level of investments is low. However, they were unable to relate the economic activities to the sustainable development of the city.

The respondents express mixed views on the economic development in Shaqra. On the one hand, there have been positive developments, such as the launch of convenient services like Absher and the emergence of small-scale enterprises, including productive families selling homemade goods. Seasonal events like the Red Pepper Festival also contribute to local economic activity.

However, there are significant challenges. Many note that the city's economic growth is weak compared to neighboring regions, with limited commercial activity and insufficient purchasing power among residents. While setting up businesses is seen as relatively easy in terms of procedures, the lack of demand and high operational costs, including commercial fees, make it difficult for businesses to thrive. The local markets provide essential goods, but the variety and quality of stores are limited, and there are gaps in key sectors, such as the availability of car parts.

Participants identify some economic development prospects, especially at a small scale. This cottage industry or small-scale commercial activity can contribute significantly to income generation and community/social development. However, they are of the opinion that the level of economic development is not at the required level when compared to the neighboring cities, especially the capital city, Riyadh. While attributing the weak economic growth to limited purchasing power, many issues are highlighted here.

"There is economic development in terms of launching the new Absher service; your card arrives at home until the birth certificate", ***Participant 13.***

"There are so-called productive families, that is, domestic workers, where, for example, a girl makes sweets and sells them", ***Participant 2.***

"There is difficulty in investing in the city in terms of commercial fees and work costs", ***Participant 12.***

"It is easy to establish a work in Shaqra city in terms of procedures, but there is no purchasing power for any customers", ***Participant 20.***

" It has an economic movement, but compared to other neighboring governorates, it is weak. There are three markets in the city with the main needs, with a few supermarkets that last 24 hours", ***Participant 1.***

*" Economic development is not at the required level. For example, commercially, compared to Riyadh, it is weak. There are commercial stores in the city, but they are weak in terms of quantity and quality. For example, there are no spare parts for cars in the city of Shaqra. And selling from the sentence to the stores is difficult; for example, the owners of farms find it difficult to sell their vegetables" " P****articipant 3.***

*"There is weak economic growth; there is no significant purchasing power", **Participant 2.***

*"There is economic development through economic activities held in certain seasons such as the Red Pepper Festival, which is used from the blonde mountains in the red brick industry, and blonde has become the main product of al –Habhr", **Participant 4.***

6.3.3 Sub-theme 3: Social development

Cities are for people. Therefore, social development is what makes people live in cities.

Corruption

Corruption in city governance prevents equity in benefits sharing, service provision, and resource distribution among city inhabitants. The interviewees indicated a low level of corruption in the projects of Shaqra City due to the presence of monitoring in recent years.

*"I expect that there is corruption, but the level of monitoring has become higher in recent years", **Participant 12.***

*"At the present time, corruption has decreased with periodic follow-up, but it is less than in past years", **Participant 10.***

Most interviewees stated that they do not know the workers and do not trust them. The respondents express concerns about trust and effectiveness regarding municipal employees. Some feel uncertain or distrustful due to a lack of personal familiarity with the staff. There is also a perception that the quality of municipal services depends on the leadership and initiative of individual managers, with energetic and motivated leaders able to drive progress, while others may fall short. This highlights a general sense of caution in interactions with local government, tempered by hope for strong leadership to foster improvements.

*You must have confidence in the person you meet, but you must be careful at the same time", **Participant 20.***

*"I do not know the municipality's employees and therefore do not trust them", **Participant 11.***

*"There is a shortcoming on the part of the municipal employees. Depending on the personal activity, an energetic and enthusiastic manager may come who makes successive achievements", **Participant 6.***

Equality

Sustainable urban development necessitates equal distribution of benefits and access to resources among diverse social groups, including those belonging to different genders and marginalized communities. Most interviewees emphasized the equality of men and women in terms of employment possibilities, educational opportunities, and wages.

"I find equality between men and women in terms of salary, a right of women, but in terms of job opportunities, I prefer that men have more job opportunities than women because he bears the burdens of the family in our society", ***Participant 12***

" There is equality between the sexes in the city; for example, training opportunities are available for men and women, and the work salary is the same for men and women", ***Participant 18.***

"There is no difference between women and men. Women drive cars and buy and review government departments. And have the right to work", ***Participant 5.***

Social initiatives: Community engagement in identifying social issues and working together to overcome them is an important aspect of the sustainable development of cities. There are social initiatives through charities to support low-income families, widows, divorcees, and orphans, such as the Al-Bir Association and the Development Association.

The respondents highlighted the role of local initiatives in community development and education. The Development Association, which evolved from the Parents' Council, plays a significant part in organizing events festivals, and providing ongoing support for individuals with special needs. It is financially sustainable due to ownership of key assets, such as the traditional Heliwa market, which is a major livestock market, and a heritage restaurant, both of which fall under the association's management.

Additionally, educational efforts in the community are emphasized, including campaigns aimed at raising awareness about important issues such as financial fraud. These campaigns are supported by institutions like Islamic banks and central banks, indicating a proactive approach to community education and protection.

"We have the Development Association, which is an extension of the Parents' Council. It holds parties and festivals, receives support, and provides for special needs. And the support for it is sustainable, as we own the assets. We have a market which is the center of the traditional Heliwa market. This is one of the largest markets in livestock. This is completely affiliated with the Development Association, and you also have the heritage restaurant in Deira", ***Participant 17.***

" I speak in my capacity as a trainer in the Department of Education. A week ago, we set up a campaign under the slogan "Be Careful", supervised by Islamic banks and central banks, which is the subject of educating the community about financial fraud", ***Participant 1.***

Sub-theme (3): Social development

Social equality is important in social development as it reduces poverty and creates peaceful, healthy communities. Equality has many aspects, and diverse groups are considered in terms of gender, ethnicity, religion, social status (rich or poor), people with disabilities, etc. It embedded many aspects, such as equal access to education, healthcare, and other public services and resources. Although there are several aspects to equality concerning different social groups, the participants referred only to gender equality, and all seem satisfied with the level of gender equality. According to them, training opportunities are equally available for men and women, and both groups receive equal salaries. One participant (Participant 12) believes there should be more job opportunities for men than women because he bears the burdens of the family.

Local-level social initiatives can also contribute to the social development of the city. The participants presented two examples of social initiatives, Development Association and 'Be Careful,' that provide for people in need and create awareness of financial fraud. However, there may be many other opportunities for social initiatives to support Shaqra city inhabitants. For example, the local market mentioned by Participant 17 can be considered a good initiative that can be developed more to give opportunities for cottage-level entrepreneurs to sell their products.

Lack of corruption is an essential component of the governance system that leads to a just society. The participants of this study believe that the level of corruption in city governance is decreasing and at a lower level. This is attributed to the good monitoring system. Some lack confidence in the municipality officials, yet they do not generalize it. They believe the level of confidence one can place on municipality officials is individualized. As the participants imply, most of the time, the way the work is done depends on the efficiency and capabilities of the manager.

Discourses related to Theme (3)

The analysis of respondents' data shows that Shaqra City's sustainable urban development is multifaceted, encompassing environmental, economic, and social dimensions. On the environmental front, while the city boasts commendable cleanliness and tranquility, there's a noticeable gap in areas like agricultural interest and waste management practices. In particular, the lack of garbage sorting underscores the need for greater community awareness and municipal intervention. Economically, Shaqra City is showing signs of growth, with events

like the Red Pepper Festival highlighting its potential. However, the sentiments of the residents suggest that there's room for more robust economic development, especially when benchmarked against neighboring regions. Socially, the city is making strides in promoting equality and launching initiatives to support its vulnerable populations. The presence of organizations like the Al-Bir Association and the Development Association is a testament to the city's commitment to social welfare. However, challenges like low confidence in municipal workers and limited cultural activities indicate areas that need further attention.

Two major discourses are derived from the above analysis: **'Governance discourse'** and **'Room for development discourse.'** These two discourses are closely related because the room for development cannot be tapped without the support of good governance.

The governance discourse is illustrated under all three sub-themes: environment, economic and social development. For example, the cleanliness of the city is mainly due to the municipality's efforts, though different companies undertake the task. Yet, the participants blame the city governance for not sorting the garbage; *"This is negligence by the municipality in addition to the awareness of the community"* ***(Participant 11).***

Although the level of economic development is low, the participants appreciate the governance; *"It is easy to establish a work in the Shaqra city in terms of procedures"* ***(Participant 20).*** Good governance also contributes to low levels of corruption, where participant 12 and participant 10 attribute it to the continuous monitoring system.

Likewise, the room for development discourse can be detected under all three sub-themes. There is potential to develop urban agriculture in Shaqra; what is needed is to raise the interest of the community, maybe with the mediation of the municipality. Garbage sorting definitely needs to be improved, and the involvement of the municipality is necessary here. More economic development needs more attention from municipal authorities and maybe the central government. What is needed here is problem identification and taking necessary initiatives to improve the situation. Social initiatives can contribute immensely to this aspect.

While the city prides itself on its cleanliness and tranquility, there's a discernible gap in areas like waste management and agricultural pursuits. This illustrates the room for development in these areas where the city could enhance its environmental stewardship, thereby ensuring a healthier living environment for its residents.

Inhabitants of the city have clear opinions about the level of sustainable development. Their views and opinions indicate the need for more involvement of the municipality in sustainable urban development, i.e., better governance to tap the room for development.

6.4 Theme 4: Availability of Services and Facilities to Fulfill the Needs of Residents

Framed within the overarching theme of "Available Services and Facilities," the investigation is structured around four vital sub-themes: Housing, Public Utilities, Job Opportunities, and Safety and Peace. These sub-themes collectively evaluate the city's commitment to providing for its residents.

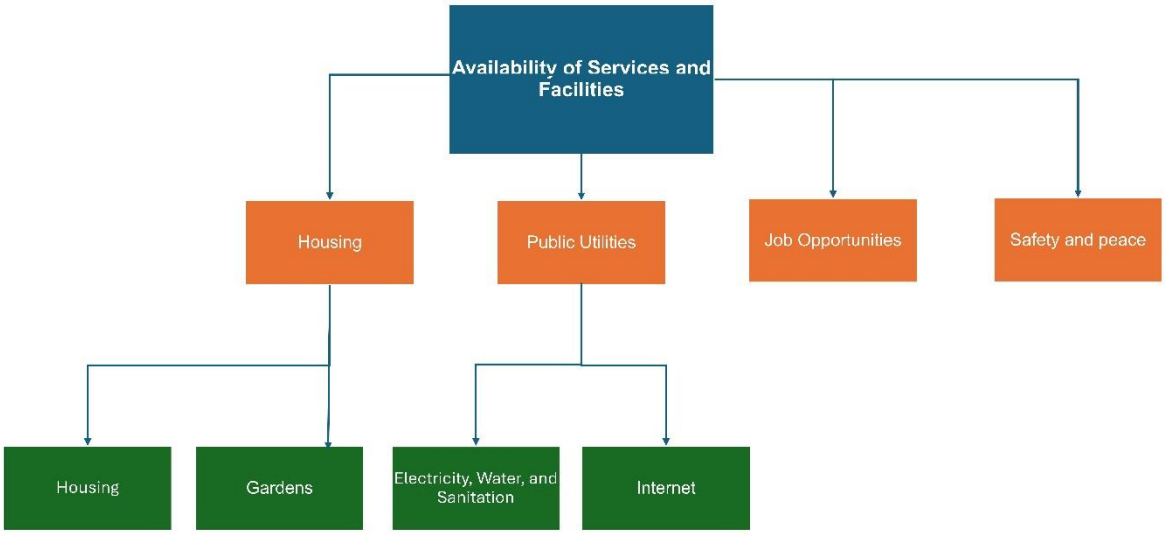

Figure 6-4 Availability of Services and Facilities

6.4.1 Sub-theme 1: Housing

Cities in the present era are expected to offer diverse facilities and services for their inhabitants. Affordable housing prices are a major factor that makes people live in the city. Access to healthcare and recreational facilities such as city parks and gardens contributes to health, well-being, and quality of life. Access to health facilities is a fundamental requirement for anyone living in a city or rural area. Most participants stated that Shaqra City's hospital has adequate infrastructure. But they are not satisfied with the service provided. They identify two main issues: longer waiting periods and a lack of qualified staff. One participant (Participant 3) specifically mentioned the lack of specialists in the areas of the brain and nerve system. The waiting time for appointments, which used to be one or two weeks, has now become approximately six months. This indicates that the hospital has many issues that need the attention of the responsible administrative authorities. Meanwhile, most of the participants stated that they do not have any health insurance, even those who are working for the government; "*For me, I am a government*

*employee; there is no health insurance" (**Participant 8).*** This quote may indicate many things; either they are not aware of the benefits of having health insurance, or they cannot afford to buy health insurance, or they even trust the health care system and do not think it is necessary to have health insurance.

The availability of educational facilities provides opportunities for the younger generation to obtain the knowledge and skills required for employment and a high-quality life. In general, the participants seem to be satisfied with the available education facilities. However, they identify an issue with integration. What they imply here is that the number of students in a class has increased, maybe students from diverse backgrounds enrolled, which has led to a decrease in the enthusiasm of teachers (Participant 14).

The primary driving force behind the development of any city is people moving to live in that particular city. Inhabiting a city is mainly determined by the availability and prices of dwellings. Most responders affirmed that house prices and rents in Shaqra are commensurate with salaries. They even compared the housing prices with those in the nearby capital city and stated that the housing prices in Shaqra were lower than those in Riyadh. This is not a surprising fact; in any country, the housing prices in the capital city tend to be the highest due to the availability of many opportunities in the capital. At the same time, Participant 15 has observed an increase in rents in Shaqra in recent years. This is not a surprising fact; with increasing population and demand for houses, the prices normally increase.

Housing:

The respondents generally find house prices in Shaqra to be more affordable compared to larger cities like Riyadh. They note that salaries are sufficient to purchase or rent homes in Shaqra, whereas the same salary would not allow for such purchases in Riyadh due to the higher cost of living. However, some mention that rent prices in Shaqra have risen in recent years, reflecting an upward trend, though housing is still considered more affordable than in larger urban areas. The housing market in Shaqra is seen as manageable and more aligned with local incomes.

> *"House prices are commensurate with the salary. For example, in Shaqra, you can buy a house that you cannot buy in Riyadh with the same salary", **Participant 8**.*
>
> *" The salary is suitable for renting and buying housing.", **Participant 5.***
>
> *"The salary is commensurate with the rent in the city. The same salary can be purchased in the city of Shaqra, but it cannot be purchased in Riyadh," **Participant 14.***
>
> *"Rents have increased in recent years", **Participant 15.***

Gardens

The respondents express dissatisfaction with the availability and quality of gardens and recreational spaces in Shaqra. While there are a few gardens, they are seen as insufficient for the population, and the play areas for children are limited and of poor quality. The lack of well-maintained and adequate spaces for families and children is a common concern, as the existing facilities do not meet the community's needs or expectations.

"Gardens and a place for children's games are few. Moreover, gardens are not of the required quality", ***Participant 14.***

"Gardens are available in Shaqra, but few have two or three. It has games but is not commensurate with the population,", ***Participant 16.***

"The games are of low quality", ***Participant 9.***

6.4.2 Sub-theme 2: Public utilities

Adequate infrastructure, such as undisrupted water, electricity, and internet facilities, has become essential in modern life. They have become prerequisites for the development of cities. These include utilities such as water, electricity, internet, and sewage systems. Many concerns were raised with regard to the functioning of sewage schemes, particularly in newer neighborhoods, and the high cost of connecting sewage, water, and electricity to their homes.

Generally, the participants are satisfied with the water quality and use it as drinking water. Only one participant stated that he had installed a water filter. Some interviewees stated that the water network is unavailable in all Shaqra neighborhoods, especially in new ones. Therefore, they depend on water tanks to fill their tanks. Additionally, they are concerned about the cost of connecting water lines to homes.

The interviewees stated that the electricity and water bills are at acceptable rates. Although there are recent increases in electricity bills, they do not complain. It seems that they understand that the water and electricity bills are their own responsibility; the more they use electricity, the more they have to pay. This is what Participant 5 implies; *"I see that the bills are according to personal use; for example, when the air conditioners are turned on for twenty-four hours, the result is an increase in the electricity bill"***.**

Sewage management is an essential service in a city, and it has become an issue in Shaqra. As pointed out by the participants, some areas, such as Ghasla and Al-Qarayen, do not have sewage systems. They also pointed to the high costs of connecting sewage networks to homes. The Collection of sewage from households, transporting it to a separate area, treating it, and

discharging it in an environmentally friendly manner is a necessary condition for the sustainable development of a city. Therefore, this issue needs the immediate attention of city authorities.

In addition to these necessary services, interviewees indicated they have access to high-quality mobile internet services, but there is still an opportunity to improve; *"The mobile internet is excellent, but the fiber is not available" (**Participant 19).***

Electricity, Water, and Sanitation:

The respondents highlight several issues with sewage and water infrastructure in Shaqra. Sewage services are incomplete, and many neighborhoods still lack proper sewage systems. Some areas, particularly newer neighborhoods and places like Mount Ghasla, have not been connected to the sewage system. Additionally, the cost of connecting sewage, water, and electricity to homes is high, further complicating access in under-served areas.

*"Shaqra's water, sewage and SDL schemes have not been implemented; even sewage is still lacking", participant 14. "There is no sewage in Shaqra to a great extent", **Participant 12.***

*"Most of Shaqra city has sewage, but there are neighborhoods where sewage is unavailable", **Participant 9.***

*" The cost of connecting sewage, water and electricity into the house is high, and there are some new neighborhoods in the city of Shaqra that water and sewage did not reach", **Participant 8.***

*" I live in Mount Ghasla, and we do not have sewage", **Participant 5.***

Regarding water quality, there is general satisfaction, especially in areas like the Aseila Center, where the salinity levels are acceptable, making the water drinkable. However, the cost of connecting water to new homes can be high in areas without existing infrastructure. Some residents take extra precautions, such as installing water filters, to ensure the quality of their drinking water. Water quality is seen as good, but access to both sewage and water services remains inconsistent across the city.

*"The waters of the Aseila Center are described, the salinity level is very acceptable, so it is drunk normally", **Participant 8.***

*" The cost of connecting water to the new homes is high if the water connections are not available in the neighborhood, but if they are available, they are inexpensive. Excellent water quality so it can be drunk," **Participant 19**.*

*" I installed a water filter", **Participant 20***

The respondents generally view electricity and water bills in Shaqra as fair and tied to personal consumption. They acknowledge that higher usage, such as running air conditioners continuously, naturally leads to increased costs. While one participant mentions a rise in electricity prices, they consider the increase to be reasonable. The perception is that the bills are manageable and aligned with individual usage.

"I see that the bills are according to personal use; for example, when the air conditioners are turned on for twenty-four hours, the result is an increase in the electricity bill", ***Participant 5***

"I see that electricity and water bills are not expensive, according to consumption", ***Participant 11.***

"Electricity has risen from the above, but a reasonable rise", ***Participant 13***

Internet*:*

The respondents share mixed feedback on internet services in Shaqra. While DSL is available in certain areas, such as along King Abdullah Road, and is reported to be fast, fiber-optic internet is not yet accessible. Mobile internet, however, is seen as excellent, providing good connectivity in the absence of fiber. This suggests that while internet access is generally reliable, there are limitations in terms of infrastructure development, particularly with the availability of fiber-optic services.

"The DSL is available on the side of King Abdullah, and it is fast", ***Participant 14.***

" The mobile internet is excellent, but the fibre is not available", ***Participant 19.***

6.4.3 Sub-theme 3: Job Opportunities

Job opportunities in a city contribute to increasing productivity and enhancing the economic development of the city while promoting social sustainability. Shaqra city seems to have rather limited job opportunities, especially for graduates. The situation is worsened by the low salaries connected to available jobs, making many seek employment opportunities in nearby Riyadh.

Job opportunities are one of the main factors that attract people to cities, and access to a diverse range of jobs is one of the biggest benefits of living in a city. Almost all the participants emphasized the high unemployment rate and the difficulties in finding a job, even for graduates. This has led to 'underemployment'; "*University graduates are now working in restaurants due to the lack of job opportunities that suit their certificates" (****Participant 3).***

The respondents emphasize the scarcity of job opportunities in Shaqra, particularly for university graduates, who often struggle to find employment that matches their qualifications. Many are

forced to leave the city, typically moving to Riyadh, in search of better prospects. Some graduates take jobs in sectors unrelated to their studies, such as working in restaurants or low-paying roles, due to the limited availability of positions in both the public and private sectors.

Another issue pointed out by the participants is the low salaries attached to the limited jobs in Shaqra city. This has led many people to seek jobs in the nearby capital city, Riyadh. They seem to consider Shaqra University one of the major employers. This is evident in the explanation presented by Participant 8, who states that the last university recruitment competition was held three years ago and included only 36 jobs. The participants believe that finding a job in the government sector is difficult, mainly because it is not available except through competition. The number of private sector companies in Shaqra is few, maybe due to being close to the capital city, and the salaries in the private sector are considered to be lower than those in the government sector. Further, they pointed out that the salary paid in Riyadh is higher than that in Shaqra for the same job. Furthermore, due to the weak purchasing power, the private sector has no incentives to open shops in Shaqra. One of the respondents suggested that raising the quality of life as a solution; *"Raising the quality of life in the city leads to an increase in job opportunities. For example, opening clubs, offices, caffeine, and shops lead to an increase in the need for employees." (**Participant 4).***

A key issue highlighted is the lack of private companies and competitive salaries in Shaqra compared to Riyadh. Even when private sector jobs are available, they often offer lower pay due to the city's weaker purchasing power. Government jobs are also difficult to obtain, as they are scarce and highly competitive.

Respondents suggest that improving the quality of life in Shaqra, such as through the opening of new businesses and services, could help create more job opportunities. However, the private sector has little incentive to invest in the city due to limited consumer demand and a culture of saving. To foster growth, businesses need to be more professionally managed to appeal to the local population and stimulate economic activity.

> *"The job opportunities are few, and it is difficult for graduates to obtain it, so they have to get out of the city and search for a job opportunity", **Participant 1.***
>
> *"University graduates are now working in restaurants due to the lack of job opportunities that suit their certificates", **Participant 3.***
>
> *"University graduates find it difficult to obtain job opportunities in the private and public sector and may have to travel or wait years. If he wants to work without the university degree he obtained as an accountant in stores, the salary is small. The reason for this is the increase in population, the lack of opportunities, and the company's orientation to open new branches in Riyadh. In addition, the integration and closure of scientific institutions have led to a lack*

of need for teachers. For example, the last university recruitment competition was three years ago, which included 36 jobs", ***Participant 8.***

"Many citizens go to the city of Riyadh because job opportunities in Shaqra are not available due to the lack of private companies. Finding a job in the government sector is difficult, as it is not available except through competition. In the event that jobs are available in the private sector, it is weak salaries compared to Riyadh; for example, those who work as a cashier in a Riyadh store have a higher salary than the one who works as a cashiers in the city of Shaqra, and this may be due to the purchasing power available in the city of Riyadh compared to the Shaqra city", ***Participant 5.***

" Raising the quality of life in the city leads to an increase in job opportunities. For example, opening clubs, offices, caffeine, and shops leads to an increase in the need for employees. The private sector does not have the incentive to invest in Shaqra City because of the pressures of purchasing power in it, and this is due to consumer behavior and a savings culture in addition to the fact that the stores should be opened professionally so that they satisfy the tastes of consumers", ***Participant 4.***

6.4.4 Sub-theme 4: Safety and Peace

Peace and safety make the city a place where its inhabitants thrive and live happily, contributing to the quality of life. Participants of this study consistently highlighted the city's exceptional safety and peace, with affirmations of a low crime rate, creating a positive living environment.

Shaqra City stands out positively in terms of security for lives and properties. The interviewees consistently highlighted the prevailing sense of security and tranquility that envelops the city, stating that *"the most important characteristic in the city of Shaqra is security and safety"* ***(Participant 5).***

This makes Shaqra a desirable place for both residents and potential newcomers. The absence of thefts or significant security-related issues is a testament to the city's effective law enforcement. It reflects the cohesive community fabric where residents look out for one another. This sense of safety has broader implications for the city's development. A secure environment encourages investments, fosters community interactions, and promotes a higher quality of life. Residents can go about their daily activities, whether leisurely evening walks, children playing in gardens, or late-night shopping, without the constant fear of security breaches. Such an environment is also conducive to hosting events, festivals, and community gatherings, further enriching the city's cultural and social tapestry. Moreover, the peace and security in Shaqra City can be seen as a reflection of its governance and administrative efficiency. Effective policing, community engagement initiatives, and proactive measures to address potential threats have collectively contributed to this positive security landscape.

"Peace and safety are excellent; there are no thefts", ***Participant 20.***

Discourses related to Theme (4)

Two major discourses derived from the analysis under this theme: 1) **Utility discourse** and ii) **Health and well-being discourse.** These two discourses are supplementary to each other. Therefore, they will be discussed together.

Urban utilities such as clean water, electricity, internet, and sewage systems significantly affect people's health and well-being. All the participants shared the opinion that the water quality is high in Shaqra City, and they do not present any major issues with regard to them. Yet, there is a big issue in sewage management, where many participants highlighted the absence of sewage systems in some parts of the city.

"Most of Shaqra city has sewage, but there are neighborhoods where sewage is unavailable" ***(Participant 9).***

"I live in Mount Ghasla, and we do not have sewage" ***(Participant 5)***

These are just two examples from the transcripts, but almost all the participants share this complaint. Lack of sanitation facilities, such as sewage systems, leads to infectious diseases. Proper sewage management is an essential requirement for a healthy environment and determines the quality of life. Adding to this, participants have a shared and strong opinion about the health facilities, mainly the service provided by the hospital. They tend to build a cause-and-effect relationship in their discourses by attributing the lack of staff to the low level of services they receive.

"For hospitals and health centers, good infrastructure is available, but they lack medical staff" ***(Participant 12)***

Another dissatisfactory factor is recreational facilities, i.e., Gardens in the City. Green spaces such as parks and gardens in cities provide physical activities and relaxation space. These aspects are major determinants of health and well-being as they influence physical and mental health, ultimately contributing to a high quality of life. Here, too, almost all the participants have a shared view; the number of gardens is inadequate, and the quality of what is available is low. Participant 14 combines these factors in his discursive statement; "*Gardens and a place for children's games are few. Moreover, gardens are not of the required quality"* ***(Participant 14).***

On a positive note, all the participants agree that housing prices are affordable. Access to affordable housing determines the well-being of people and quality of life. Having stated all these factors, one of the prominent factors contributing to the well-being of people in Shaqra city can be considered safety and peace. All the participants strongly believe the city is safe and peaceful. This is well illustrated by the statement made by Participant 5; "*The most important characteristic in the city of Shaqra is security and safety"* ***(Participant 5).*** The words 'the most important characteristic' signify the value

given to safety and peace and their trust that the city is a safe place to live. Safety can be considered as a cornerstone for wellbeing and high-quality living, because without it no one can thrive where they live.

6.5 Theme 5: Lesson Learned and Way Forward to Achieve Sustainability

The three main components of sustainable development, environment, economic, and social, which were discussed under theme three earlier, are discussed here to identify the way forward in making Shaqra a sustainable city.

➢ **Promote Agriculture**

- **Insights:** As presented under theme 1, Shaqra has a rich soil where many crops can be cultivated. Yet there seems to be no interest among residents in it, at least in having rooftop gardens. As illustrated in the above quotes given in Table 6.5, only one participant (19) stated that he is involved in agriculture. This indicates the lack of interest and the need for community involvement in agricultural practices to harness the potential for agriculture development, which will contribute to a green city.
- **Recommendations:** The city should initiate community-based agricultural programs. Workshops and incentives can be provided to residents to cultivate rooftop gardens or community farms. As Participant 7 mentioned, the joy of cultivating a rooftop garden can be a transformative experience for urban dwellers.

➢ **Waste Management**

- **Insights:** Participants acknowledged the existence of waste disposal locations but emphasized the absence of systematic garbage sorting, which was attributed to the lack of community awareness and municipal initiatives. City inhabitants are also responsible for separating their household waste when they put it for collection. As Participant (11) points out, “It is the negligence by the municipality in addition to the awareness of the community”. The Absence of sewage systems in certain parts of the city, which was discussed earlier, should also be considered here. Municipal negligence and the community's awareness levels are contributing factors, highlighting the need for targeted waste management strategies.
- **Recommendations:** The municipality should launch awareness campaigns emphasizing the environmental and economic benefits of waste segregation. As some participants noted, philanthropic organizations are already making strides in this area; collaboration can amplify their efforts.

➢ **Maintain Cleanliness**

- **Insights:** Participants appreciate the commendable cleanliness levels in the city. The acknowledgment of high-performing cleaning companies and continuous efforts in maintaining the city's hygiene signifies a commitment to environmental well-being.

- **Recommendations:** To ensure continuous maintenance of cleanliness, the municipality should consider expanding the workforce and incorporating innovative waste management solutions.

➢ **Noise Management**

- **Insights:** The respondents unanimously appreciated the tranquility of Shaqra City. The city's reputation for being relatively quiet, even with the presence of a university, suggests a positive environmental quality. This quiet ambiance contributes to a more sustainable and livable urban environment.
- **Recommendations:** Urban planning should prioritize noise management, ensuring that zones are designated to maintain this peace as the city expands.

➢ **Diversify Economic Activities**

- **Insights:** Almost all the participants are not satisfied with the level of economic development in Shaqra. As Participant 2 states, "*There is weak economic growth; there is no significant purchasing power". Limited purchasing power may be one reason behind it. This illustrates the need for diversifying economic activities within the city.* The mention of seasonal economic activities, such as the Red Pepper Festival, demonstrates an understanding of the potential for specialized events to contribute to economic development. These activities indicate a forward-thinking approach to fostering economic sustainability.
- **Recommendations:** The city should explore hosting more such events, perhaps focusing on its history, culture, or other local produce, to boost tourism and local businesses. As seen within Theme (1), many shops are beginning to appear along the streets, which can be further promoted and facilitated with the mediation of the municipality.

➢ **Promote Local Produce**

- **Insights:** The agricultural potential of the region, though underutilized, was acknowledged by a few respondents. The emergence of productive families engaged in domestic businesses signifies positive strides in economic development. These initiatives and the diversity of economic activities showcase the city's potential for sustainable growth. Concerns about limited purchasing power and weaker economic growth compared to neighboring regions illuminate areas requiring targeted interventions for economic sustainability.
- **Recommendations:** Establishing farmer's markets, promoting organic farming and rooftop gardens, and incentivizing local produce can enhance the city's economic and environmental sustainability.

Sub-theme 3: Social Development

➢ **Transparency and confidence in institutions**

- **Insights:** While there is an acknowledgment of corruption in the past, participants noted a decrease in corruption in recent years. This reduction is attributed to heightened monitoring and periodic follow-ups, suggesting an evolving understanding of the importance of transparency for social sustainability. Although governance seemed transparent, respondents noted a lack of trust in workers: *"I do not know the municipality's employees and therefore do not trust them" (**Participant 11).*** Confidence in institutions seems individually biased; *"There is a shortcoming on the part of the municipal employees. Depending on the personal activity, an energetic and enthusiastic manager may come who makes successive achievements", (**Participant 6).***
- **Recommendations:** The performance of institutions, especially highly important institutions such as the municipality, should not depend on the employees' performance. There should be properly laid systems for governance that all employees must follow. This nuanced perspective emphasizes the importance of robust institutional frameworks for building public confidence. Community engagement programs, open town hall meetings, and transparent communication can bridge this trust gap.

➢ **Equality considerations**

- **Insights:** Although there are many aspects related to equality, the participants of this study referred only to gender equality, where the respondents appreciated the city's commitment to gender equality in employment and education. However, some participants express preferences for certain gender roles based on societal expectations; *"I find equality between men and women in terms of salary, a right of women, but in terms of job opportunities, I prefer that men have more job opportunities than women because he bears the burdens of the family in our society" (**Participant 12).***
- **Recommendations:** These insights shed light on the need for targeted efforts to address gender-related disparities for comprehensive social sustainability. Further initiatives, like women entrepreneurship programs or skill development workshops, can solidify this commitment.

➢ **Promote Social Initiatives**

- **Insights:** The city showcases various social initiatives, including a Development Association orchestrating events, livestock markets, and educational campaigns. These initiatives reflect a collaborative effort toward community well-being and highlight the importance of community engagement for social sustainability. Respondents highlighted charities such as the Al-Bir Association and the Development Association for their commendable work.
- **Recommendations:** The city should collaborate with such organizations, providing resources and platforms to expand their reach and diversify their activities. These can include more activities catering to cultural and human development, such as establishing cultural centers and activities, libraries and reading circles, and community spaces for city

inhabitants to gather and exchange ideas. Social initiatives such as these will foster a sense of community and cultural pride.

Discourses related to Theme (5)

The insights from the respondents regarding this research question, as captured in the data, indicate potential sustainable developmental patterns. While Shaqra City has made commendable developments in areas like environmental cleanliness and gender equality, areas like agriculture and cultural and social development require improvement. The role of the university cannot be ignored here. As highlighted by the interviewees, the university has not only been an academic benefit but has also improved the socio-economic needs of the city's residents. The influx of students and educators has prompted commercial activities, thereby meeting the economic needs of its residents.

Two main discourses can be identified here: i) **Governance discourse** and ii) **Community involvement discourse.** These two discourses are mutually inclusive in sustainable urban development, but Governance is more dominant. For example, the municipality is responsible for building and maintaining sewage and waste management utilities. As the participants indicated above, some parts of the city do not have sewage systems, which can be built only by the municipality. Waste management, particularly garbage sorting, needs the commitment of citizens, too. Therefore, community involvement is necessary for proper waste management in the city. Likewise, promoting urban agriculture needs initiatives from the municipality and community involvement.

While the city authorities and the community both can take credit for a safe and peaceful city, they both need to be involved in building trust and confidence in the governance system. Transparent procedures will ensure proper resource usage and build trust in the governance system. Community involvement through strategies such as citizens' participation in the decision-making process can be adopted as a measure of this aspect. At the same time, the municipality needs to take initiatives towards developing urban green spaces such as parks and cultural centers that promote social cohesiveness,

Sustainable urban development is a holistic and inclusive process that involves many stakeholders and addresses multiple goals such as economic, environmental, and economic development. The nuanced patterns identified in the lessons learned and the way forward for sustainable urban development in Shaqra City provide a robust foundation for strategic decision-making. These patterns offer actionable insights for city planners and policymakers, guiding efforts to enhance environmental, economic, and social sustainability in Shaqra City. This study, therefore, recommends the implementation of the suggestions proposed by the interviewees in this study as basic requirements for improvement. Shaqra City will achieve sustainable urban development and set a benchmark for other cities to emulate.

6.6 Theme 6: Challenges and Opportunities

This research addresses the fundamental question: What are the current constraints and opportunities shaping the trajectory of sustainable urban development in the city? By systematically dissecting the hurdles and potential pathways for progress, this research aims to provide valuable insights for stakeholders, policymakers, and urban planners vested in steering the city toward a future characterized by sustainable and resilient urban development.

6.6.1 Sub-theme 1: Challenges of sustainable urban development

All cities experience challenges in their efforts in sustainable development. The common challenges include maintaining air quality and cleanliness, supplying utilities such as clean drinking water and electricity, providing affordable housing facilities, and providing education and job opportunities. The pursuit of sustainable urban development in Shaqra City is not without its challenges, as articulated by the insights of participants. One of the major and unique challenges is its geographic location. Proximity to the bustling city of Riyadh emerges as a hurdle, with residents expressing a preference for the superior quality and style of shops and cafes in Riyadh, contributing to a reliance on the neighboring city for certain needs. Some other challenges may not appear in this study, such as environmental concerns, with air pollution not being measured as rigorously as in Riyadh due to the absence of factories.

A significant challenge highlighted in the study is the lack of initiatives from community members in creating a sustainable city. Therefore, creating community awareness and obtaining their participation in the efforts toward sustainable urban development should be considered a challenge that needs immediate attention. This highlights the necessity for fostering a sense of ownership and active participation within the community to drive sustainable practices.

Waste management poses another challenge with regard to environmental concerns and community participation. The lack of waste sorting practices indicates a cultural gap within the community regarding the environmental impact of waste, emphasizing the need for increased awareness and education. While there are commendable efforts by the Green Shaqra Committee and the Shaqra Development Association, challenges persist, such as creating green spaces.

> *"One of the obstacles to sustainable urban development in Shaqra is its proximity to the city of Riyadh. You can meet your needs in Riyadh. For example, I prefer shops and cafes in Riyadh to Shaqra, where quality and style in Riyadh are better than Shaqra.",* ***Participant 2.***

> *"The delay in sustainable urban development is due to the lack of initiative from the community members",* ***Participant 3****.*

> *"Air pollution is not measured as in Riyadh due to the lack of factories in the city. In addition, garbage is not sorted due to the lack of culture in the community regarding the damage*

resulting from the waste. The reason is also due to the lack of culture and motivation of the municipality.", ***Participant 1.***

"There is interest in the city from the environmental aspect by the Green Shaqra Committee," ***Participant 18.***

6.6.2 Sub-theme 2: Opportunities of Sustainable Urban Development in Shaqra City

Cities bring many opportunities for people, such as access to education, employment, and other income-earning avenues, as well as high-quality living with modern infrastructure and services. However, each city has opportunities to explore its way toward sustainable development.

In Shaqra City, innovative initiatives that harness environmental consciousness and community engagement shape a promising landscape for sustainable urban development. One notable opportunity is the "Establishment of Reserves by Shaqra Al-Khadraa Association," where crop trees are planted and nurtured through treated water. This initiative promotes green spaces within the city and underscores the significance of sustainable water management. Furthermore, the city is on the verge of embracing an impactful proposal from the university, contemplating collaborating with a company to institute recycling and garbage sorting practices. This indicates that the opportunity has already been identified. This initiative, once implemented, has the potential to significantly enhance waste management and contribute to a more environmentally responsible urban ecosystem.

Additionally, the Pepper Festival is a testament to the city's commitment to fostering community engagement and sustainable practices. The festival's continuous development, shaped by the active involvement of organizers who value visitor opinions, exemplifies an opportunity for the city to establish and expand sustainable events that celebrate local culture and promote environmental awareness and social cohesion. These initiatives collectively signal a positive trajectory for Shaqra City, embodying opportunities that can propel its sustainable urban development forward.

As illustrated in the above discussion, the challenges and opportunities can be summarized below

- **Challenges**

Proximity to Riyadh: The participants express a significant challenge in the proximity of Shaqra to Riyadh. The allure of the capital city leads residents to prefer its shops and cafes, posing a hurdle to the development of local businesses in Shaqra.

Community Initiative: A notable challenge identified is the delay in sustainable urban development, which is attributed to the lack of initiative from community members. This

highlights the importance of fostering a sense of responsibility and active participation within the community for holistic development.

Environmental Awareness: Air pollution and the lack of garbage sorting are identified challenges, primarily attributed to a deficiency in environmental awareness and cultural understanding within the community. There is a recognized need for increased education and motivation, particularly at the municipal level.

- **Opportunities**

Environmental Initiatives: The Green Shaqra Committee and the Shaqra Development Association are identified as key actors showing interest in initiating environmental and urban development projects. Despite challenges, these initiatives, such as tree reserves and the Pepper Festival, showcase sustainable practices and community engagement opportunities.

University Proposal: The potential collaboration between the university and a recycling company presents an opportunity for waste management and environmental sustainability. Waiting for a response suggests a proactive approach to addressing urban challenges.

Treated Water for Agriculture: The establishment of reserves by Shaqra Al-Khadraa Association, utilizing treated water for irrigation, represents an opportunity for sustainable agricultural practices. This initiative aligns with water conservation and responsible resource use.

While challenges like proximity to Riyadh and a lack of community initiative pose hurdles, initiatives by environmental committees, proposals from the university, and community-led projects showcase a promising landscape for positive change. The intricate balance between these challenges and opportunities highlights the need for targeted interventions, community engagement, and strategic planning to foster sustainable urban development in Shaqra City.

> *"Establishment of reserves by Shaqra Al-Khadraa Association, where the trees of the crops are planted and irrigated by relying on treated water",* ***Participant 8.***

> *"There is a proposal by the university to agree with a company for the purpose of recycling and sorting garbage, and we are waiting for a response",* ***Participant 10.***

" There are beautiful initiatives such as the Pepper Festival, there is a great follow-up by the supervisors, and its form differed in the first years in which it was held from its current situation, as it is in a state of continuous development due to the interest of operators and their consideration of the opinions of visitors", ***Participant 1.***

Through an in-depth exploration of various insights from participant perspectives and recommendations for action, a holistic understanding of Shaqra City's urban landscape emerges, paving the way for informed strategies toward sustainability. Challenges loom on the horizon, stemming from intrinsic and extrinsic factors to the city's fabric. The gravitational pull of neighboring Riyadh poses a challenge as residents flock to the capital for certain amenities, highlighting the need to fortify Shaqra's local economy and commercial offerings. Environmental concerns, including air pollution and waste management, underscore the imperative for heightened awareness and concerted action to bridge cultural gaps and instill eco-conscious behaviors within the populace. Yet, amid these challenges lie fertile grounds for growth and transformation. Opportunities abound, driven by innovative initiatives and collaborative endeavors. The establishment of green reserves by the Shaqra Al-Khadraa Association heralds a paradigm shift towards sustainable water management and urban greening. Proposals for recycling and waste sorting initiatives and the vibrancy of events like the Pepper Festival signify a burgeoning momentum towards environmental stewardship and community empowerment. These initiatives foster local pride and cultural celebration and serve as catalysts for social cohesion and environmental responsibility. As Shaqra City navigates the complexities of urban development, the path toward sustainability beckons with promise and possibility. It is imperative for stakeholders, from governmental bodies to grassroots organizations and individual residents, to collaborate synergistically, leveraging the city's strengths and addressing its vulnerabilities. Shaqra City can go toward a future characterized by resilience, inclusivity, and harmony with its natural surroundings through targeted interventions in areas such as economic diversification, environmental education, and community empowerment.

Finally, the city planners and relevant authorities must consider the following discourses identified in this study.

(1) Growth: Shaqra has the potential for growth, both spatially and in population
(2) Migration: The population of the city is increasing due to inward migration, mainly due to the university
(3) Governance: Good governance is required in certain aspects.
(4) Room for development: There is room for development in all three pillars of sustainability
(5) Utilities: Utilities such as waste management needs improvement
(6) Health and well-being: There is a need to improve health services and recreational facilities that contribute to physical and mental well-being
(7) Community involvement: Involvement of the community in creating a sustainable city seems to be a minimum
(8) Challenges: There are many challenges, such as the city’s proximity to Riyadh and the lack of community interest in green cities and other social initiatives
(9) Opportunities: Shaqra provides many opportunities for economic, environmental, and social development that have to be properly utilized in its way towards sustainable development of the city.

7. Chapter Seven: Conclusion and Recommendations

7.1 Introduction

Shaqra City, nestled in the heart of Saudi Arabia, is characterized by its strategic location, diverse demographics, and landscape. The city's sustainable urban growth is marked by an interplay of infrastructure provision, community dynamics, and governance frameworks, which shape its socio-economic fabric. Shaqra's urban development dynamics are shaped by environmental, economic, and social factors, each presenting challenges and opportunities. The city has made commitments to cleanliness and waste management, yet issues remain with garbage sorting and disposal. Economically, growth is slowed by high commercial fees and limited job opportunities, highlighting the need for targeted efforts to attract investment and strengthen economic resilience. On the social side, Shaqra faces issues such as perceptions of corruption, gender inequality, and challenges to community cohesion, pointing to a need for inclusive policies and community-driven initiatives that address social disparities and promote a more cohesive and sustainable society.

7.2 Spatiotemporal growth of Shaqra City

The dynamic changes in land use/land cover (LULC) patterns and urban expansion in Shaqra City, Saudi Arabia, from 1992 to 2022, reveal rapid urbanization and development. The area covered by built-up land has expanded significantly, with an increase from 5.07 sq. km (5% of the total area) in 1992 to 19.26 sq. km (18.99% of the total area) in 2022. Urban growth aligns with the city's increasing population, economic activities, and infrastructure development. The urban expansion depicts growth around the city center, followed by an expansion in the West. The westward expansion observed in recent years may be influenced by factors such as the availability of land and the establishment of Shaqra University, indicating the importance of incorporating educational and environmental considerations into development strategies. However, an expansion in all directions during the most recent decade.

The nature of this urban expansion provides crucial insights into the city's evolution. From 1992 to 2002, the city experienced moderate urbanization, reflecting limited infrastructure development and population growth. Subsequently, from 2002 to 2012, a substantial increase in urban expansion occurred, correlating with rapid economic growth and government policies promoting urbanization. However, from 2012 to 2022, the urban expansion rate decreased, indicating a shift in government policies towards more sustainable and controlled development.

The increase in built up area has also resulted in an increased land surface temperature (LST) of Shaqra City. Over the three decades, there has been a consistent increase in mean, maximum, and minimum LST. In 1992, the mean LST was 40.69 °C, rising to 45.89 °C in 2022. The rise in LST can be attributed to various factors, including urbanization, population growth, industrial activities, and changes in climate patterns. The impact of these changes on the

environment, social structures, and the economy remains uncertain and requires further investigation. Built-up areas consistently exhibit the highest LST. Water bodies and vegetation, on the other hand, consistently display lower LST due to their cooling effects. Bare soil, with moderate LST, acts as a mediator between the extremes, absorbing more solar radiation than water bodies and vegetation but less than built-up areas.

The observed decrease in the urban expansion rate from 2012 to 2022 suggests a responsive shift in government policies towards sustainable development. To promote a balance between economic growth and environmental considerations, policymakers should focus on mitigating the urban heat island effect. Integrating green spaces, enhancing water body conservation, and promoting sustainable infrastructure can alleviate the adverse effects of rapid urbanization on LST. This research provides key insights into Shaqra's rising land surface temperatures due to urban expansion. The UHI effect, defined by Oke (1973), suggests that increased built-up areas lead to localized temperature rises, creating distinct thermal zones in cities. Urban resilience theory, which originated from studies on disaster response, has evolved to encompass a city's ability to adapt to environmental stressors, such as climate change and urban heat. By integrating green infrastructure and promoting compact urban planning, this study directly links with theories on reducing urban sprawl through urban greening and compact development.

7.2.1 Recommendation for sustainable urban growth

The dynamic urbanization and environmental changes witnessed in Shaqra City over the past three decades underscore the urgent need for sustainable urban development strategies. As the city continues to expand and evolve, it is imperative to address the challenges posed by rapid urbanization. The following recommendations are proposed to ensure the sustainable development of Shaqra city, considering the interplay between urban expansion, land use/land cover changes, and land surface temperature trends.

1. Mixed and Compact Urban Development: Mixed-use development should be encouraged within the city center, where residential, commercial, and recreational spaces are close to each other. Urban planners should promote a vibrant and walkable community in Shaqra city. This can help reduce urban sprawl. Shaqra City can maximize land use efficiency by promoting higher-density and infill development and decreasing the load on peripheral lands.

2. Sustainable Zoning and Land use Planning: Shaqra City should adopt sustainable zoning and land use policies in its urban development plan. Zoning policies (ranging from incentive zoning and density zoning) can help maintain residential, commercial, industrial, and recreational spaces in a compatible manner. Agricultural protection zones can support the city in food security and preserve the rural areas. Zoning can help Shaqra city to promote economic development, manage traffic, and create quality of life for residents.

4. Thermal Comfort Zonation (TCZ) for Better Planning: The TCZ map of Shaqra City (see **Appendix A**) will aid urban planners in optimizing infrastructure and public spaces for thermal comfort. It's crucial for mitigating heat-associated health risks and optimizing energy use. By delineating comfort zones, planners can enhance living conditions while minimizing environmental impact. Regulating population density within Thermal Comfort Zones (TCZ) is crucial for maintaining livable urban environments. By managing population density in accordance with TCZ, cities can ensure that residents have access to comfortable living and working conditions, reducing the risk of heat-related illnesses (see **Appendix B**).

3. Environment Protection and Resource Management: Protecting Shaqra City's natural and cultural resources is important for preserving the city. Planners can establish green belts around the city to provide recreational spaces, promote ecological balance, and limit urban sprawl. In this way, the city can be more environmentally friendly and sustainable. Various strategies and techniques are available to developers that can make it more sustainable, e.g., nature-based solutions, green infrastructure, etc. Establishing eco-parks is a vital strategy for achieving sustainable urban development. These parks serve as green lungs within cities, providing recreational spaces while enhancing biodiversity and mitigating environmental impacts. The optimized location for the establishment of eco-parks in Shaqra City is presented in **Appendix C**.

4. Urban Expansion and Growth: Future Land Use and Land Cover (LULC) prediction and planning are essential for sustainable development. This predictive approach enables proactive decision-making in urban and regional planning, ensuring that land resources are allocated efficiently and in accordance with long-term sustainability goals. The predicted LULC of Shaqra City for 2032 is presented in **Appendix D**. Future urban development/master plans must accommodate the expansion of the city to stop urban sprawl. LULC mapping is important to predict how and where the growth will happen. Master planning can help develop the city in an organized manner.

5. Introducing 15 Minutes (Walking) and 5 Minutes (Car) City Concept: The 15 Minutes City concept revolutionizes urban living by prioritizing accessibility and sustainability. In this model, every essential amenity and service, such as groceries, schools, and parks, is reachable within a 15-minute walk from home. By reducing reliance on cars and shortening travel times, 15 Minutes City promotes healthier lifestyles, reduces carbon emissions and fosters vibrant, connected communities. The 15-minute city concept is visualized for Shaqra City in **Appendix E**. The 5 Minutes Car City Concept is a hypothesized concept aiming to reach all essential destinations within a 5-minute car ride. This approach reduces congestion, promotes efficient travel, and enhances accessibility for residents. The 5-minute car city concept is visualized for Shaqra city in **Appendix F**.

7. Integrated Sustainable Infrastructure Development: Increasing the coverage of services and facilities is essential for enhancing quality of life and promoting equitable access to essential

resources. Encouraging the use of renewable energy, such as solar panels on residential and commercial buildings, would help the city reduce its carbon footprint and energy costs. By expanding the reach of amenities such as healthcare, education, parks, and public services, communities can ensure that all residents meet their needs regardless of location or socioeconomic status. This proactive approach fosters inclusivity, fosters economic development, and contributes to the overall well-being and resilience of society. The coverage of commercial, educational, and recreational facilities in Shaqra City is presented in **Appendix G**. Planning sustainable water and waste management systems is also essential for meeting the needs of a growing population without overburdening the city's resources.

8. Promote Green Infrastructure: Implement policies incorporating green spaces and parks into urban planning initiatives. These green areas can help mitigate the urban heat island effect, improve air quality, and provide recreational spaces for residents. Some green infrastructure establishment manuals are provided in **Appendix H & I**.

7.3 Dimensions of Urban Sustainability in Shaqra City

The findings intricately link with the concept of sustainable urban development, emphasizing the interconnectedness of social, economic, and environmental dimensions. .

7.3.1 Social Sustainability

Examining social sustainability in Shaqra City reveals a complex picture, with most indicators rated as "Moderate." While safety and governance are viewed positively, challenges remain in areas like gender equity, trust, and community involvement. Differences in internet access and use of public transit suggest possible gaps in infrastructure, raising questions about how accessible and inclusive the city truly is for all residents. Building trust within the community is crucial, as is addressing lower perceptions of gender equity and limited community involvement in decision-making. These findings highlight the need for initiatives that promote transparency, inclusivity, and active participation. This approach underscores that social sustainability is not just a collection of separate issues but a set of interconnected elements that shape the overall urban experience.

Theories of social sustainability, such as those proposed by Dempsey et al. (2011), highlight the role of social cohesion, trust, and active community participation in sustainable urban development. The study also agrees with the model that urban areas can benefit from policies that enhance public trust, inclusivity, and local engagement.

7.3.2 Economic Sustainability

The analysis of economic sustainability in Shaqra City provides insights into the financial well-being of its residents. The "moderate" classification suggests a balanced economic landscape, yet critical reflections reveal areas demanding attention. Disparities in government support for

entrepreneurship and access to credit and self-employment opportunities underscore potential impediments to economic inclusivity. The critical lens also highlights the need for strategies that go beyond quantitative economic indicators. While housing affordability and transportation accessibility are moderately satisfactory, the city must navigate economic development to ensure inclusivity, job satisfaction, and financial security for all residents. This critical perspective prompts policymakers to consider not just economic growth but the equitable distribution of economic benefits, aligning with the principles of sustainable urban development.

The role of educational institutions as transformative agents in urban sustainability can be supported by theories on knowledge-based urban development (KBUD). Universities and research centers serve as catalysts for urban transformation by fostering innovation and promoting sustainable practices. Shaqra University's influence aligns with KBUD theory, as it supports social and economic development within the community, positioning educational institutions as critical assets in sustainable city planning.

7.3.3 Environmental Sustainability

Environmental sustainability in Shaqra City reflects a positive inclination toward eco-friendly practices, yet critical reflections reveal substantial gaps in awareness. The "Moderate" Environmental Sustainability Index indicates commendable efforts, but the low awareness of climate change signals a critical limitation. This gap raises questions about the effectiveness of environmental education and the degree of community engagement in sustainability initiatives. The critical perspective underscores the need for a holistic approach to environmental sustainability, extending beyond individual behaviors to community-wide understanding and commitment. While positive gardening and waste reuse trends showcase a willingness to adopt sustainable practices, a more comprehensive awareness strategy is vital. This critical reflection emphasizes that fostering a harmonious relationship with the environment demands individual actions, community-wide consciousness, and informed decision-making.

The Composite Sustainable City Index synthesizes social, economic, and environmental indices, providing a holistic perspective on Shaqra City's sustainability. The "Moderate" classification indicates commendable progress, but critical reflections underscore urban development's dynamic and continuous nature. The city is on a continuous journey toward higher levels of sustainability, prompting the need for adaptive strategies. This critical perspective challenges policymakers to consider the interconnectedness of social, economic, and environmental dimensions. While individual indices provide specific insights, the holistic view emphasizes that a sustainable and livable urban environment requires integrated and cohesive policies. Critical reflection prompts a nuanced understanding of sustainability, urging the city to adapt its strategies to meet evolving challenges and capitalize on opportunities.

7.3.4 Recommendations for Social Sustainability

Affordable Housing and Options: Shaqra city needs to ensure access to affordable housing. It should adopt policies that promote a mix of housing types, i.e., apartments and units to family homes. A certain percentage of new developments must be affordable, which can help Shaqra balance housing supply and demand. In addition, promoting mixed-income communities can help promote the diversity of income groups in the city for social sustainability.

Inclusive and Accessible Public Services and Amenities: Shaqra has good university and hospital facilities. Such essential services, including healthcare, education, public transport, and recreational facilities, can enhance social sustainability. The institutions should focus on developing equitable amenities and services. Investing in education and affordable healthcare facilities for all can reduce disparities and improve the quality of life of Shaqra citizens.

Community Engagement and Public Participation: Shaqra city has a diverse population from various socio-economic and cultural backgrounds. Including feedback from local and international citizens can help create resilient and socially sustainable communities. Institutions should include public forums, and feedback to allow concerns of residents in the development of their neighborhoods. Participatory planning can be used to strengthen the relationship between the community and the government. Social support and capital can be enhanced to build strong communities. Shaqra city can encourage the development of community organizations, support groups, and local nonprofits to aid vulnerable populations. Initiatives like neighborhood and community groups can strengthen social ties, create a sense of safety, and help social sustainability. Social sustainability also needs an aware population engaged with sustainability goals. Education and awareness programs on topics like environmental leadership and community engagement can empower residents to make sustainable choices. It can further promote cultural programs and events to increase mutual respect and understanding between diverse populations of Shaqra city.

Safety and Security: Safety is an important aspect of social sustainability. Safety can affect the quality of life and the willingness of the communities. The concerns of citizens must be addressed to enhance social sustainability. This can be achieved by increasing the trust between local governments, law enforcement, and the community. More tangible solutions like well-lit streets, safe walkways, and clear signage can also help promote a sense of security.

7.3.5 Recommendations for Economic Sustainability

Economic Diversification and Job Opportunities: Shaqra city should focus on creating a more inclusive economy that provides opportunities for everyone. Urban development should support small businesses and other economic sectors. Partnerships with educational institutions

can help residents access employment opportunities. By promoting economic inclusivity, cities can reduce inequality and create a more sustainable urban society. Economic sustainability can be strengthened when cities avoid dependence on a single industry. Various sectors, such as technology, manufacturing, retail, tourism, and industries, can be diversified. Shaqra City can attract people by creating policies that encourage economic sustainability by investing locally. This increases job accessibility and reduces commuting times. Planners need to create compact urban spaces for generating local economic activities. A skilled workforce is also essential to economic sustainability, as it attracts businesses, increases productivity, and reduces unemployment.

Sustainable Infrastructure: Using sustainable infrastructure — such as energy-efficient buildings and renewable energy sources, can support long-term economic growth. Long-term costs will be reduced by saving on bills and an indoor built environment. Investing in green infrastructure (e.g., green roofs and nature-based solutions) can reduce urban heat, lower energy costs, and improve the health of Shaqra residents. Sustainable infrastructure also attracts businesses that are committed to environmental responsibility and enhance overall economic sustainability.

Public-Private Partnerships (PPPs) and Entrepreneurship: Shaqra city is uniquely positioned to build strong networks between local businesses, universities, and research institutions. Innovation drives economic sustainability by creating new jobs and fostering economic growth. Shaqra city can create an ecosystem where innovation can attract new businesses. Public-private partnerships can facilitate economic sustainability to achieve shared goals. Large infrastructure projects, such as transportation networks and renewable energy facilities, reduce financial burdens on the city. They can drive economic development projects and create jobs.

Resilient Economic Development Planning: Shaqra city should create a resilient economic development plan. The plan should consider economic shocks like disasters, economic downturns, or pandemics. The plan can help recover from disruptions while protecting jobs. The plan can also promote green practices that can enhance the circular economy and reduce waste. The plan must be regularly assessed and updated to ensure that the city can respond to changing conditions to meet the economic sustainability of the city.

7.3.7 Recommendations for Environmental Sustainability

Development of Open and Green Spaces: Shaqra City needs green spaces such as parks, community gardens, and reserves to offer environmental benefits. Green spaces can improve air quality, reduce urban heat, and provide habitats for wildlife. Planners should ensure green spaces and their accessibility through zoning and land use planning. Medium- and long-term projects can be added to Shaqra's urban development plan, which can be used to create green

belts and protect biodiversity, while smaller-scale projects, like rooftop gardens, can bring nature closer to home. This will create environmental sustainability in Shaqra city.

Building Standards and Resilient Development: In Shaqra, housing can be a major energy consumer in terms of greenhouse gas emissions. Adopting standards can significantly reduce energy use, lower emissions, and improve indoor air quality. Renewable energy is essential for reducing urban carbon emissions and mitigating climate change. Shaqra City can support this by investing in renewable energy infrastructure.

Waste Management, Recycling, and Water Conservation Strategies: Shaqra City has a problem with waste management and water usage. Effective waste management reduces landfill sizes, lowers greenhouse gas emissions, and keeps people healthy. Shaqra City should prioritize waste reduction and recycling through proper waste collection and disposal in recycling facilities. Institutions can support a circular economy, where products are designed for reuse, repair, or recycling, further decreasing waste and promoting efficiency. Water management is critical for Middle east cities, especially in areas prone to windstorms, heat, and droughts. The city needs to implement rainwater harvesting programs, greywater recycling, and green infrastructure (e.g., green roofs, etc.) to lessen the demand for municipal water supplies.

Air Quality Monitoring and Improvement: Shaqra City can have poor air quality in cities, impacting both health and environmental sustainability. Institutions should monitor air quality levels, identify pollution hotspots, and implement measures to reduce emissions to combat this. Planting trees, reducing vehicle emissions, and controlling industrial emissions can all contribute to improved air quality.

Heat Resilience and Thermal Comfort: Climate change poses significant risks to Shaqra City, including rising temperatures, extreme weather events, etc. Shaqra City should increase resilience to these impacts by developing climate adaptation strategies, such as heat-resistant building materials, and planning for thermal comfort areas. Tree planting and shaded walkways can help reduce the urban heat island effect. Lastly, integrating climate resilience into urban planning master plans can help cities from the effects of climate change and ensure long-term environmental sustainability.

7.4 Further Research Directions

This research used a mixed-method research strategy to assess the sustainability of urban development in Shaqra, Saudi Arabia. Future researchers in the field of Shaqra City's sustainable urban development are encouraged to explore several key avenues. First and foremost, an in-depth investigation into the transformative impact of educational institutions, particularly the university, would provide valuable insights. Researchers are encouraged to

examine the mechanisms through which the university influences these aspects. A comprehensive study on waste management practices, including garbage sorting, disposal methods, and overall cleanliness initiatives, is needed. Exploring economic policies and interventions to stimulate local businesses and job opportunities is required. Social issues, including corruption, gender inequality, and community resilience, present areas for investigation. Researchers can investigate the root causes and formulate inclusive policies to address these challenges. Furthermore, exploring the environmental sustainability initiatives and geographical advantages would provide a comprehensive understanding of Shaqra City and inform future strategies for sustainable urban development. Future researchers can adopt an interdisciplinary approach, getting insights from urban planning, economics, environmental science, and social studies to contribute to the sustainable growth of Shaqra City.

References

Abdelkarim, A. (2019). Integration of Location-Allocation and Accessibility Models in GIS to Improve Urban Planning for Health Services in Al-Madinah Al-Munawwarah, Saudi Arabia. *Journal of Geographic Information System, 11*(06), 633.

Abou-Korin, A. A., & Al-Shihri, F. S. (2015). Rapid urbanization and sustainability in Saudi Arabia: The case of Dammam metropolitan area. *Journal of Sustainable Development, 8*(9), 52.

Abubakar, I. R., & Dano, U. L. (2019). Sustainable urban planning strategies for mitigating climate change in Saudi Arabia. *Environment, Development and Sustainability*, 1-24.

Abuiyada, R. (2018). Traditional Development Theories have failed to Address the Needs of the majority of People at Grassroots Levels with Reference to GAD. *International Journal of Business and Social Science, 9*(9), 115-119.

Adams, D. (2012). *Urban planning and the development process*. Routledge.

Ahmadi, F., & Toghyani, S. (2011). The role of urban planning in achieving sustainable urban development. *OIDA International Journal of Sustainable Development, 2*(11), 23-26.

Aina, Y. A., Parvez, I. M., Balogun, A.-L., & Adam, E. (2021). Urban Heat Island Effects and Mitigation Strategies in Saudi Arabian Cities. In N. Enteria, M. Santamouris, & U. Eicker (Eds.), *Urban Heat Island (UHI) Mitigation: Hot and Humid Regions* (pp. 235–248). Springer. https://doi.org/10.1007/978-981-33-4050-3_11

Al-Gilani, A., & Filor, S. (1997). POLICY AND PRACTICE Environmental Policies in Saudi Arabia. *Journal of Environmental Planning and Management, 40*(6), 775-788.

Al-Gilani, A., & Filor, S. (1999). Reforming the national framework for environmental policies in Saudi Arabia. *Journal of Environmental Planning and Management, 42*(2), 253-269.

Al-Hathloul, S. (2017). Riyadh development plans in the past fifty years (1967-2016). *Current Urban Studies, 5*(01), 97.

Alahmadi, M., & Atkinson, P. M. (2019). Three-Fold Urban Expansion in Saudi Arabia from 1992 to 2013 Observed Using Calibrated DMSP-OLS Night-Time Lights Imagery. *Remote Sensing, 11*(19), 2266.

Allinson, J. (2006). Over-educated, over-exuberant and over here? The impact of students on cities. *Planning Practice & Research*, *21*(1), 79–94. https://doi.org/10.1080/02697450600901541

Allmendinger, P. (2017). *Planning theory*: Macmillan International Higher Education.

Alqurashi, A. F., Kumar, L., & Sinha, P. (2016). Urban Land Cover Change Modelling Using Time-Series Satellite Images: A Case Study of Urban Growth in Five Cities of Saudi Arabia. *Remote Sensing*, *8*(10), Article 10. https://doi.org/10.3390/rs8100838

Andah, B. W. (1982). *African Development in Cultural Perspective, with Special Reference to Nigeria*: Department of Archaeology and Anthropology, University of Ibadan.

Anderson, J. R., Hardy, E. E., Roach, J. T., & Witmer, R. E. (1976). A land use and land cover classification system for use with remote sensor data. In *A land use and land cover*

classification system for use with remote sensor data (USGS Numbered Series 964; Professional Paper, Vol. 964). https://doi.org/10.3133/pp964

Armitage, A. (2012). A Methodology of the Imagination. *Journal of Business Administration Research, 1*(1). doi:https://doi.org/10.5430/jbar.v1n1p1

Arnfield, A. J. (2003). Two decades of urban climate research: A review of turbulence, exchanges of energy and water, and the urban heat island. *International Journal of Climatology*, *23*(1), 1–26. https://doi.org/10.1002/joc.859

Ash, C., Jasny, B. R., Roberts, L., Stone, R., & Sugden, A. M. (2008). Reimagining cities. *Science*, *319*(5864). https://doi.org/10.1126/science.319.5864.739

Bagstad, K. J., Semmens, D. J., Waage, S., & Winthrop, R. (2013). A comparative assessment of decision-support tools for ecosystem services quantification and valuation. *Ecosystem Services*, *5*, 27–39. https://doi.org/10.1016/j.ecoser.2013.07.004

Barton, H., & Grant, M. (2013). Urban planning for healthy cities. A review of the progress of the European Healthy Cities Programme. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *90 Suppl 1*, 129–141. https://doi.org/10.1007/s11524-011-9649-3

Basiago, A. D. (1998). Economic, social, and environmental sustainability in development theory and urban planning practice. *Environmentalist, 19*(2), 145-161.

Berger, M. T. (2019). *The battle for Asia: from decolonization to globalization*: Routledge.

Berlin, A., Doherty, F., Garmise, S., Ghosh, S., Moorman, N., Sowders, J., & Texter, M. (2010). International Economic Development Council (IEDC). *Unlocking entrepreneurship: a primer for economic developers*.

Bevilacqua, C., Calabrò, F., & Della Spina, L. (2020). *New Metropolitan Perspectives: Knowledge Dynamics, Innovation-driven Policies Towards the Territories' Attractiveness Volume 1*: Springer Nature.

Biermann, F., Kanie, N., & Kim, R. E. (2017). Global governance by goal-setting: The novel approach of the UN Sustainable Development Goals. *Current Opinion in Environmental Sustainability*, *26–27*, 26–31. https://doi.org/10.1016/j.cosust.2017.01.010

Birkhofer, K., Diehl, E., Andersson, J., Ekroos, J., Früh-Müller, A., Machnikowski, F., Mader, V. L., Nilsson, L., Sasaki, K., Rundlöf, M., Wolters, V., & Smith, H. G. (2015). Ecosystem services—Current challenges and opportunities for ecological research. *Frontiers in Ecology and Evolution*, *2*, 87. https://doi.org/10.3389/fevo.2014.00087

Bodenheimer, S. (1970). Dependency and imperialism: The roots of Latin American underdevelopment. *Nacla Newsletter, 4*(3), 18-27.

Boulton, C., Dedekorkut-Howes, A., & Byrne, J. (2018). Factors shaping urban greenspace provision: A systematic review of the literature. *Landscape and urban planning, 178*, 82-101.

Brooks, A. (2017). What Is Urban Development? Bizfluent. In.

Brownlie, S., King, N., & Treweek, J. (2013). Biodiversity tradeoffs and offsets in impact assessment and decision making: Can we stop the loss? *Impact Assessment and Project Appraisal*, *31*(1), 24–33. https://doi.org/10.1080/14615517.2012.736763

Brundtland, G. H. (1987). Our common future—Call for action. *Environmental Conservation, 14*(4), 291-294. Retrieved from https://www.jstor.org/stable/44518052

Burgass, M. J., Halpern, B. S., Nicholson, E., & Milner-Gulland, E. (2017). Navigating uncertainty in environmental composite indicators. *Ecological Indicators, 75*, 268-278.

Burkey, S. (1993). *People first: A guide to self-reliant participatory rural development*: Zed Books Ltd.

Burkhard, B., Müller, A., Müller, F., Grescho, V., Anh, Q., Arida, G., Bustamante, J. V. (Jappan), Van Chien, H., Heong, K. L., Escalada, M., Marquez, L., Thanh Truong, D., Villareal, S. (Bong), & Settele, J. (2015). Land cover-based ecosystem service assessment of irrigated rice cropping systems in southeast Asia—An explorative study. *Ecosystem Services*, *14*, 76–87. https://doi.org/10.1016/j.ecoser.2015.05.005

Burton, E. (2000). The Compact City: Just or Just Compact? A Preliminary Analysis. *Urban Studies*, *37*(11), 1969–2006. https://doi.org/10.1080/00420980050162184

Busch, M., La Notte, A., Laporte, V., & Erhard, M. (2012). Potentials of quantitative and qualitative approaches to assessing ecosystem services. *Ecological Indicators*, *21*, 89–103. https://doi.org/10.1016/j.ecolind.2011.11.010

Buttel, F. H. (2000). Ecological modernization as social theory. *Geoforum*, *31*(1), 57–65. https://doi.org/10.1016/S0016-7185(99)00044-5

Caiaffa, W., Friche, A., Dias, M., Meireles, A., Ignacio, C., Prasad, A., & Kano, M. (2014). Developing a conceptual framework of urban health observatories toward integrating research and evidence into urban policy for health and health equity. *Journal of Urban Health, 91*(1), 1-16.

Caldatto, F. C., Bortoluzzi, S. C., Pinheiro de Lima, E., & Gouvea da Costa, S. E. (2021). Urban Sustainability Performance Measurement of a Small Brazilian City. *Sustainability*, *13*(17), 9858. https://doi.org/10.3390/su13179858

Campbell, J. B. (2011). *Introduction to Remote Sensing, Fifth Edition: James B. Campbell, Randolph H. Wynne: 9781609181765: Amazon.com: Books*. https://www.amazon.com/Introduction-Remote-Sensing-Fifth-Campbell/dp/160918176X

Caprotti, F., Cowley, R., Datta, A., Broto, V. C., Gao, E., Georgeson, L., ... & Joss, S. (2017). The New Urban Agenda: key opportunities and challenges for policy and practice. *Urban research & practice*, *10*(3), 367-378.

Carpenter, S. R., Mooney, H. A., Agard, J., Capistrano, D., DeFries, R. S., Díaz, S., Dietz, T., Duraiappah, A. K., Oteng-Yeboah, A., Pereira, H. M., Perrings, C., Reid, W. V., Sarukhan, J., Scholes, R. J., & Whyte, A. (2009). Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *Proceedings of the National Academy of Sciences*, *106*(5), 1305–1312. https://doi.org/10.1073/pnas.0808772106

Chase-Dunn, C. (2000). *The effect of international economic dependence on development and inequality: A cross-national study (1975).* Paper presented at the From modernization to globalization: perspectives on development and social change.

Chee, Y. E. (2004). An ecological perspective on the valuation of ecosystem services. *Biological Conservation*, *120*(4), 549–565. https://doi.org/10.1016/j.biocon.2004.03.028

Choon, S.-W., Siwar, C., Pereira, J. J., Jemain, A. A., Hashim, H. S., & Hadi, A. S. (2011). A sustainable city index for Malaysia. *International Journal of Sustainable Development & World Ecology*, *18*(1), 28–35. https://doi.org/10.1080/13504509.2011.543012

Chirot, D. (2013). *Social change in a peripheral society: The creation of a Balkan colony*: Elsevier.

Christoff, P. (1996). Ecological modernisation, ecological modernities. *Environmental Politics*, *5*(3), 476–500. https://doi.org/10.1080/09644019608414283

Cimon-Morin, J., Darveau, M., & Poulin, M. (2013). Fostering synergies between ecosystem services and biodiversity in conservation planning: A review. *Biological Conservation*, *166*, 144–154. https://doi.org/10.1016/j.biocon.2013.06.023

Constantine, S. (2005). *The making of British colonial development policy 1914-1940*: Routledge.

Construction Climate Challenge. (2019). Singapore is Leading the Way in Green Urban infrastructure. Retrieved from https:// constructionclimatechallenge.com/2019/02/20/singapore-is-leading-theway-in-green-urban-infrastructure/

Crossan, F. (2003). Research philosophy: towards an understanding. *Nurse Researcher (through 2013)*, *11*(1), 46.

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., & van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. *Nature*, *387*(6630), 253–260. https://doi.org/10.1038/387253a0

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*: Sage publications.

Daily, G.C. (1997). *Nature's Services: Societal Dependence on Natural Ecosystems*. Island Press: Washington, DC, USA.

Daily, G. C., Polasky, S., Goldstein, J., Kareiva, P. M., Mooney, H. A., Pejchar, L., Ricketts, T. H., Salzman, J., & Shallenberger, R. (2009). Ecosystem services in decision making: Time to deliver. *Frontiers in Ecology and the Environment*, *7*(1), 21–28. https://doi.org/10.1890/080025

Davison, S. C. (2015). Economic Development. In C. L. Cooper, M. Vodosek, D. N. D. Hartog, & J. M. McNett (Eds.), *Wiley Encyclopedia of Management* (pp. 1-3).

De Beer, F. (1997). Participation and community capacity building. *Participatory Development Management and the RDP. Cape Town: Juta*.

De Groot, R. S., Alkemade, R., Braat, L., Hein, L., & Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecological Complexity*, *7*(3), 260–272. https://doi.org/10.1016/j.ecocom.2009.10.006

De Groot, R., Wilson, M., & Boumans, R. (2002). *A typology for the classification, description and valuation of ecosystem functions, goods and services*. https://doi.org/10.1016/S0921-8009(02)00089-7

Dodd, C. (1972). Political Development and Political Modernisation. In *Political Development* (pp. 9-15): Springer.

Du Pisani, J. A. (2006). Sustainable development–historical roots of the concept. *Environmental Sciences, 3*(2), 83-96.

Dunford, R., Harrison, P., Smith, A., Dick, J., Barton, D. N., Martin-Lopez, B., Kelemen, E., Jacobs, S., Saarikoski, H., Turkelboom, F., Verheyden, W., Hauck, J., Antunes, P., Aszalós, R., Badea, O., Baró, F., Berry, P., Carvalho, L., Conte, G., … Yli-Pelkonen, V. (2018). Integrating methods for ecosystem service assessment: Experiences from real world situations. *Ecosystem Services*, *29*, 499–514. https://doi.org/10.1016/j.ecoser.2017.10.014

Easterly-Smith, M., R. T., & Lowe, A. (2002). Management Research: An Introduction. In: London: Sage.

Edelstein, L. (1967). *Ancient medicine; selected papers of Ludwig Edelstein*: Baltimore: Johns Hopkins Press.

Edwards, M. (1993). How relevant is development studies. *Beyond the impasse: New directions in development theory*, 77-92.

Elmqvist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P. J., McDonald, R. I., . . . Seto, K. C. (2013). *Urbanization, biodiversity and ecosystem services: challenges and opportunities: a global assessment*: Springer Nature.

Fallanca, C. (2020). *The City of Well-Being. The Social Responsibility of Urban Planning.* Paper presented at the INTERNATIONAL SYMPOSIUM: New Metropolitan Perspectives.

Fedulova, I., Voronkova, O. Y., Zhuravlev, P., Gerasimova, E., Glyzina, M., & Alekhina, N. A. (2019). Labor productivity and its role in the sustainable development of economy: on the example of a region. *Entrepreneurship and Sustainability Issues, 7*(2), 1059.

Ferreira, A. C., Silva, L. T., & Ramos, R. A. (2012). Urban observatories, tools for monitoring cities.

Filgueri, C. H., and Filgueri, F. . (2001). *Development: Social International Encyclopedia of the Social and Behavioural Sciences*.

Fitzgerald, B. G., O'Doherty, T., Moles, R., & O'Regan, B. (2012). A quantitative method for the evaluation of policies to enhance urban sustainability. *Ecological Indicators, 18*, 371-378.

Foster-Carter, A. (1973). Neo-Marxist approaches to development and underdevelopment. *Journal of Contemporary Asia, 3*(1), 7-33.

Frank, B., Delano, D., & Caniglia, B. S. (2017). Urban systems: A socio–ecological system perspective. *Sociology International Journal*, *Volume 1*(Issue 1). https://doi.org/10.15406/sij.2017.01.00001

Freire, M. (2006). *Urban planning: Challenges in developing countries.* Paper presented at the International congress on human development, Madrid.

Friedmann, J. (1998). Planning theory revisited. *European Planning Studies, 6*(3), 245-253.

Friedrichs, R. W. (1970). *A sociology of sociology* (Vol. 91088): Free Press.

Früh-Müller, A., Wegmann, M., & Koellner, T. (2015). Erratum to: Flood exposure and settlement expansion since pre-industrial times in 1850 until 2011 in north Bavaria, Germany. *Regional Environmental Change*, *15*(1), 195–195. https://doi.org/10.1007/s10113-014-0657-1

Fukuyama, F. (1995). *Trust: The social virtues and the creation of prosperity* (Vol. 99): Free press New York.

Garibaldi, L. A., Steffan-Dewenter, I., Winfree, R., Aizen, M. A., Bommarco, R., Cunningham, S. A., Kremen, C., Carvalheiro, L. G., Harder, L. D., Afik, O., Bartomeus, I., Benjamin, F., Boreux, V., Cariveau, D., Chacoff, N. P., Dudenhöffer, J. H., Freitas, B. M., Ghazoul, J., Greenleaf, S., … Klein, A. M. (2013). Wild pollinators enhance fruit set of crops regardless of honey bee abundance. *Science (New York, N.Y.)*, *339*(6127), 1608–1611. https://doi.org/10.1126/science.1230200

Garman, E. T., Leech, I. E., & Grable, J. E. (1996). The negative impact of employee poor personal financial behaviors on employers. *Financial counseling and planning, 7*(1), 157-168.

Gerschenkron, A. (1962). Economic Backwardness in Historical Perspective (1962). *The Political Economy Reader: Markets as Institutions*, 211-228.

Goudie, A. S. (2018). *Human impact on the natural environment*: John Wiley & Sons.

Gould, P. (2016). *The geographer at work*: Routledge.

Gran, G. (1983). Development by People; citizen construction of a just world.

Grêt-Regamey, A., Celio, E., Klein, T. M., & Wissen Hayek, U. (2013). Understanding ecosystem services trade-offs with interactive procedural modeling for sustainable urban planning. *Landscape and Urban Planning*, *109*(1), 107–116. https://doi.org/10.1016/j.landurbplan.2012.10.011

Grunewald, K., Bastian, O., & Syrbe, R. U. (2013). Raum-ZeitAspekte von ÖSD. In: Grunewald, K.; Bastian O. (eds.) (2013): Ökosystemdienstleistungen. Konzept, Methoden und Fallbeispiele. Berlin, 56-69.

Guilhot, N. (2005). *The democracy makers: Human rights and international order*: Columbia University Press.

Glynn, P. J., Cadman, T., & Tek, N. M. (2017). Ecological Modernization: Theory and the Policy Process.

Ha-Mim, N. M., Hossain, M. Z., & Moniruzzaman, S. M. (2019). Asset Based Profile Approach for Understanding Differentiated Vulnerability and Resilience of Coastal Households in the Context of Climate Change. In *International Conference of Disaster Risk Management* (pp. 363-368).

Ha-Mim, N. M., Hossain, M., Rahaman, K. R., & Mallick, B. (2020). Exploring Vulnerability–Resilience–Livelihood Nexus in the Face of Climate Change: A Multi-Criteria Analysis for Mongla, Bangladesh. *Sustainability*, *12*(17), 7054.

Hall, P. (2014). *Cities of tomorrow: An intellectual history of urban planning and design since 1880*. John Wiley & Sons.

Haque, M. S. (1999). *Restructuring development theories and policies: A critical study*: SUNY Press.

Hattam, C., Böhnke-Henrichs, A., Börger, T., Burdon, D., Hadjimichael, M., Delaney, A., Atkins, J. P., Garrard, S., & Austen, M. C. (2015). Integrating methods for ecosystem service assessment and valuation: Mixed methods or mixed messages? *Ecological Economics*, *120*, 126–138. https://doi.org/10.1016/j.ecolecon.2015.10.011

Haughton, G. (1997). Developing sustainable urban development models. *Cities, 14*(4), 189-195.

Haughton, G. (1999). Environmental Justice and the Sustainable City. *Journal of Planning Education and Research*, *18*(3), 233–243. https://doi.org/10.1177/0739456X9901800305

HDB. (2018). Homes at One with Nature. Retrieved from https://www.hdb.gov.sg/cs/infoweb/about-us/news-and-publications/press-releases/homes-at-onewith-nature1

Healey, P., & Williams, R. (1993). European urban planning systems: Diversity and convergence. *Urban studies, 30*(4-5), 701-720.

Hodder, R. (2005). *Development geography*: Routledge.

Hoerbinger, S., Immitzer, M., Obriejetan, M., & Rauch, H. P. (2018). GIS-based assessment of ecosystem service demand concerning green infrastructure line-side vegetation. *Ecological Engineering*, *121*, 114–123. https://doi.org/10.1016/j.ecoleng.2017.06.030

Holden, M. T., & Lynch, P. (2004). Choosing the appropriate methodology: Understanding research philosophy. *The marketing review*, *4*(4), 397-409.

Holstein, J. A., & Gubrium, J. F. (1995). *The Active Interview*. doi:10.4135/9781412986120

Howes, D. (2010). *Sensual Relations: Engaging the Senses in Culture and Social Theory*. University of Michigan Press.

Huang, L., Wu, J., & Yan, L. (2015). Defining and measuring urban sustainability: A review of indicators. *Landscape Ecology*, *30*(7), 1175–1193. https://doi.org/10.1007/s10980-015-0208-2

Jax, K., Barton, D. N., Chan, K. M. A., de Groot, R., Doyle, U., Eser, U., Görg, C., Gómez-Baggethun, E., Griewald, Y., Haber, W., Haines-Young, R., Heink, U., Jahn, T., Joosten, H., Kerschbaumer, L., Korn, H., Luck, G. W., Matzdorf, B., Muraca, B., … Wichmann, S. (2013). Ecosystem services and ethics. *Ecological Economics*, *93*, 260–268. https://doi.org/10.1016/j.ecolecon.2013.06.008

Jedliński, M. (2014). The Position of Green Logistics in Sustainable Development of a Smart Green City. *Procedia - Social and Behavioral Sciences*, *151*, 102–111. https://doi.org/10.1016/j.sbspro.2014.10.011

Jones, E. C. (2004). Wealth-based trust and the development of collective action. *World Development, 32*(4), 691-711.

Kaplan, B. (1993). Social change in the capitalist world. *Beverly Hills*.

Kilijoniene, A., & Simanaviciene, Z. (2009). Evaluation model of regional policy's influence on social and economical development of the region. *Economics and management*(14), 825-831.

Kitchin, R., Lauriault, T. P., & McArdle, G. (2015). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science, 2*(1), 6-28.

Klopp, J. M., & Petretta, D. L. (2017). The urban sustainable development goal: Indicators, complexity and the politics of measuring cities. *Cities, 63*, 92-97.

Koponen, J. (2020). *Development: History and Power of the Concept.* Paper presented at the Forum for Development Studies.

Korten, D. C. (1990). *Getting to the 21st century: Voluntary action and the global agenda*: Kumarian Press West Hartford, CT.

Kroeger, T., & Casey, F. (2007). An assessment of market-based approaches to providing ecosystem services on agricultural lands. *Ecological Economics*, *64*(2), 321–332. https://doi.org/10.1016/j.ecolecon.2007.07.021

Kühne, O., & Duttmann, R. (2020). Recent Challenges of the Ecosystems Services Approach from an Interdisciplinary Point of View. *Raumforschung Und Raumordnung | Spatial Research and Planning*, *78*(2), 171–184. https://doi.org/10.2478/rara-2019-0055

Lavorel, S., Bayer, A., Bondeau, A., Lautenbach, S., Ruiz-Frau, A., Schulp, N., Seppelt, R., Verburg, P., Teeffelen, A. van, Vannier, C., Arneth, A., Cramer, W., & Marba, N. (2017). Pathways to bridge the biophysical realism gap in ecosystem services mapping approaches. *Ecological Indicators*, *74*, 241–260. https://doi.org/10.1016/j.ecolind.2016.11.015

Ledford, J. R., & Gast, D. L. (2014). *Single case research methodology: Applications in special education and behavioral sciences*: Routledge.

Levy, J. M. (2016). *Contemporary urban planning*: Taylor & Francis.

Li, B., Chen, Dongxiang, Wu., Shaohua, Zhou., Shenglu, Wang, T., & Chen, H. (2016). Spatio-temporal assessment of urbanization impacts on ecosystem services: Case study of Nanjing City, China. *Ecological Indicators*, *71*, 416–427. https://doi.org/10.1016/j.ecolind.2016.07.017

Lichfield, N., Kettle, P., & Whitbread, M. (2016). *Evaluation in the Planning Process: The Urban and Regional Planning Series, Volume 10* (Vol. 10): Elsevier.

Liu, H., Zhou, G., Wennersten, R., & Frostell, B. (2014). Analysis of sustainable urban development approaches in China. *Habitat international*, *41*, 24-32.

Loc, H. H., Irvine, K. N., Suwanarit, A., Vallikul, P., Likitswat, F., Sahavacharin, A., Sovann, C., & Song Ha, L. (2020). Mainstreaming Ecosystem Services as Public Policy in South East Asia, from Theory to Practice. In V. Mauerhofer, D. Rupo, & L. Tarquinio (Eds.), *Sustainability and Law: General and Specific Aspects* (pp. 631–665). Springer International Publishing. https://doi.org/10.1007/978-3-030-42630-9_31

Loewe, M. (2012). *Post 2015: How to reconcile the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs)?* (Research Report No. 18/2012). Briefing Paper. https://www.econstor.eu/handle/10419/199699

Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research*, *25*(2), 137–149. https://doi.org/10.1080/13511610.2012.660325

Lu, Y., Geng, Y., Liu, Z., Cote, R., & Yu, X. (2017). Measuring sustainability at the community level: An overview of China's indicator system on National Demonstration Sustainable Communities. *Journal of Cleaner Production*, *143*, 326–335. https://doi.org/10.1016/j.jclepro.2016.12.105

Lundin, O., Smith, H. G., Rundlöf, M., & Bommarco, R. (2013). When ecosystem services interact: Crop pollination benefits depend on the level of pest control. *Proceedings of the Royal Society B: Biological Sciences*, *280*(1753), 20122243. https://doi.org/10.1098/rspb.2012.2243

Lynch, A. J., Andreason, S., Eisenman, T., Robinson, J., Steif, K., & Birch, E. L. (2011). *Sustainable urban development indicators*. Retrieved from

Lynch, E. A., Mudge, A., Knowles, S., Kitson, A. L., Hunter, S. C., & Harvey, G. (2018). "There is nothing so practical as a good theory": A pragmatic guide for selecting theoretical approaches for implementation projects. *BMC Health Services Research*, *18*, 857. https://doi.org/10.1186/s12913-018-3671-z

Lyu, R., Zhang, J., Xu, M., & Li, J. (2018). Impacts of urbanization on ecosystem services and their temporal relations: A case study in Northern Ningxia, China. *Land Use Policy*, *77*, 163–173. https://doi.org/10.1016/j.landusepol.2018.05.022

MA, (2005). *Millennium ecosystem assessment: Synthesis*. Island Press, Washington, D.C., USA.

M A Gadou, H., & MA Quazi, A. (2009). Role of Planning and Management in Promoting Urban Development: Case Study of Jeddah, Saudi Arabia. *JES. Journal of Engineering Sciences, 37*(1), 193-215.

Madanipour, A. (2006). Urban planning and development in Tehran. *Cities, 23*(6), 433-438.

Madugundu, R., Al-Gaadi, K. A., Patil, V. C., & Tola, E. (2014). Detection of Land Use and Land Cover changes in Dirab region of Saudi Arabia using remotely sensed imageries. *American Journal of Environmental Sciences*, *10*(1). https://www.cabdirect.org/cabdirect/abstract/20143124974

Mallick, J., Singh, V. P., Almesfer, M. K., Talukdar, S., Alsubhi, M., Ahmed, Mohd., & Khan, R. A. (2022). Spatio-temporal analysis and simulation of land cover changes and their impacts on land surface temperature in urban agglomeration of Bisha Watershed, Saudi

Arabia. *Geocarto International*, *37*(25), 7591–7617. https://doi.org/10.1080/10106049.2021.1980616

Martín-López, B., Gómez-Baggethun, E., García-Llorente, M., & Montes, C. (2014). Trade-offs across value-domains in ecosystem services assessment. *Ecological Indicators*, *37*, 220–228. https://doi.org/10.1016/j.ecolind.2013.03.003

Meadows, D.H. (1972). *Limits to Growth*. New American Library: New York, NY, USA.

Meraj, G., Singh, S. K., Kanga, S., & Islam, Md. N. (2021). Modeling on comparison of ecosystem services concepts, tools, methods and their ecological-economic implications: A review. *Modeling Earth Systems and Environment*. https://doi.org/10.1007/s40808-021-01131-6

Meyer, J. W. (2007). Globalization: Theory and trends. *International Journal of Comparative Sociology, 48*(4), 261-273.

Midgley, J. (1995). *Social development: The developmental perspective in social welfare*: Sage.

Mikovits, C., Rauch, W., & Kleidorfer, M. (2018). Importance of scenario analysis in urban development for urban water infrastructure planning and management. *Computers, Environment and Urban Systems, 68*, 9-16.

Miky, Y. H. (2019). Remote sensing analysis for surface urban heat island detection over Jeddah, Saudi Arabia. *Applied Geomatics*, *11*(3), 243–258. https://doi.org/10.1007/s12518-019-00256-9

Mirakhor, A., & Askari, H. (2010). *Islam and the path to human and economic development*: Springer.

Mitcham, C. (1995). The concept of sustainable development: its origins and ambivalence. *Technology in society, 17*(3), 311-326.

Mol, A. P. J., & Sonnenfeld, D. A. (2000). Ecological modernisation around the world: An introduction. *Environmental Politics*, *9*(1), 1–14. https://doi.org/10.1080/09644010008414510

Moles, R., Foley, W., Morrissey, J., & O'Regan, B. (2008). Practical appraisal of sustainable development—Methodologies for sustainability measurement at settlement level. *Environmental Impact Assessment Review, 28*(2-3), 144-165.

Moore, M. (1993). Globalization and social change. *New York: Elseiver*.

Mori, K., & Christodoulou, A. (2012). Review of sustainability indices and indicators: Towards a new City Sustainability Index (CSI). *Environmental Impact Assessment Review*, *32*(1), 94–106. https://doi.org/10.1016/j.eiar.2011.06.001

Morrissey, J., Iyer-Raniga, U., McLaughlin, P., & Mills, A. (2012). A strategic project appraisal framework for ecologically sustainable urban infrastructure. *Environmental Impact Assessment Review, 33*(1), 55-65.

Mudasser, M., Hossain, M., Rahaman, K. R., & Ha-Mim, N. M. (2020). Investigating the Climate-Induced Livelihood Vulnerability Index in Coastal Areas of Bangladesh. *World*, *1*(2), 149-170.

Munda, G. (2005). “Measuring Sustainability”: A Multi-Criterion Framework. *Environment, Development and Sustainability*, *7*(1), 117–134. https://doi.org/10.1007/s10668-003-4713-0

Myint, S. W., Gober, P., Brazel, A., Grossman-Clarke, S., & Weng, Q. (2011). Per-pixel vs. Object-based classification of urban land cover extraction using high spatial resolution imagery. *Remote Sensing of Environment*, *115*(5), 1145–1161. https://doi.org/10.1016/j.rse.2010.12.017

Naeem. (2013). Ecosystem Services: Is a Planet Servicing One Species Likely to Function?. Springer.

Naess, P. (2001). Urban planning and sustainable development. *European Planning Studies, 9*(4), 503-524.

Naess, P., & Vogel, N. (2012). Sustainable urban development and the multi-level transition perspective. *Environmental Innovation and Societal Transitions, 4*, 36-50.

Nanaki, E. A., & Koroneos, C. J. (2016). Climate change mitigation and deployment of electric vehicles in urban areas. *Renewable energy, 99*, 1153-1160.

Nations, U. (2015). *World Urbanization Prospects: The 2014 Revision*. Retrieved from New York: https://population.un.org/wup/Publications/Files/WUP2014-Report.pdf

Nelson, E. J., & Daily, G. C. (2010). Modelling ecosystem services in terrestrial systems. *F1000Prime Rep*, *2*(53). https://facultyopinions.com/prime/reports/b/2/53/

Nesshöver, C., Assmuth, T., Irvine, K. N., Rusch, G. M., Waylen, K. A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Külvik, M., Rey, F., van Dijk, J., Vistad, O. I., Wilkinson, M. E., & Wittmer, H. (2017). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. *Science of The Total Environment*, *579*, 1215–1227. https://doi.org/10.1016/j.scitotenv.2016.11.106

Niemelä, J. (1999). Ecology and urban planning. *Biodiversity & Conservation, 8*(1), 119-131.

Nisbet, R. A. (1980). *History of the Idea of Progress*: Transaction publishers.

Nussbaum, M. C. (2000). *Women and Human Development: The Capabilities Approach*. Cambridge University Press. https://doi.org/10.1017/CBO9780511841286

Oberle, W. H., Stowers, K. R., & Darby, J. P. (1974). A definition of development. *Journal of the Community Development Society, 5*(1), 61-71.

Omar, S. (1979). *The marketing imagination*. New York: Free Press.

Parnell, S. (2016). Defining a global urban development agenda. *World Development, 78*, 529-540.

Parr, J. B. (1999). Growth-pole strategies in regional economic planning: a retrospective view. Part 1. Origins and advocacy. *Urban Stud, 36*(7), 1195-1215. doi:10.1080/0042098993187

Patel, U., Rakshit, S., Ram, S. A., & Irfan, Z. B. (2019). Urban Sustainability Index: Measuring Performance of 15 Metropolitan Cities of India. *South Asian Journal of Social Studies and Economics*, 1–11. https://doi.org/10.9734/sajsse/2019/v3i430111

Pauleit, S., & Duhme, F. (2000). Assessing the environmental performance of land cover types for urban planning. *Landscape and urban planning, 52*(1), 1-20.

Peet, R. (1999). Theories of Development (with Elaine Hartwick). *Guilford Press, New York. Portes, A.(1998),"Social Capital: Its Origins and Applications in Modern Sociology", Annual Review of Sociology, 24*, 1-24.

Pérez, F. (2018). Riyadh: The Metamorphosis of a City From Centerless to Polycentric. *CTBUH Journal*(4).

Peter, S. (2020). Integrating Key Insights of Sociological Risk Theory into the Ecosystem Services Framework. *Sustainability*, *12*(16), 6437. https://doi.org/10.3390/su12166437

Pettey, G., Bracken, C. C., & Pask, E. B. (2017). *Communication research methodology: A strategic approach to applied research*: Taylor & Francis.

Phuong, D. M., & Gopalakrishnan, C. (2003). An application of the contingent valuation method to estimate the loss of value of water resources due to pesticide contamination: The case of the Mekong Delta, Vietnam. *International Journal of Water Resources Development*, *19*(4), 617–633. https://doi.org/10.1080/0790062032000161409

Pollex, J., & Lenschow, A. (2018). Surrendering to growth? The European Union's goals for research and technology in the Horizon 2020 framework. *Journal of Cleaner Production*, *197*, 1863–1871. https://doi.org/10.1016/j.jclepro.2016.10.195

Porter, M. E. (1990). The Competitive Advantage of Nations The Free Press, a division of Macmillan. *Inc. New York*.

Prastyo, H., & Herdiwijaya, D. (2019). *Spatial Analysis of Light Pollution Dynamics Around Bosscha Observatory and Timau National Observatory Based on VIIRS-DNB Satellite Images.* Paper presented at the Journal of Physics: Conference Series.

Prebisch, R. (1962). The economic development of Latin America and its principal problems. *Economic Bulletin for Latin America*.

Pupphachai, U., & Zuidema, C. (2017). Sustainability indicators: A tool to generate learning and adaptation in sustainable urban development. *Ecological Indicators, 72*, 784-793.

Pye, L. W. (1965). The concept of political development. *The Annals of the American Academy of Political and Social Science, 358*(1), 1-13.

Rabie, M. (2016). *A theory of sustainable sociocultural and economic development*: Springer.

Rahman, M. T., Aldosary, A. S., & Mortoja, M. G. (2017). Modeling Future Land Cover Changes and Their Effects on the Land Surface Temperatures in the Saudi Arabian Eastern Coastal City of Dammam. *Land*, *6*(2), Article 2. https://doi.org/10.3390/land6020036

Randolph, B., Kam, M., & Graham, P. (2012). Who Can Afford Sustainable Housing? *Steering Sustainability in an Urbanising World: Policy, Practice and Performance*, 203.

Rapley, J. (1997). *Understanding development: Theory and practice in the third world*: Psychology Press.

Rawls, J. (1999). *A Theory of Justice* (2nd edition). Belknap Press: An Imprint of Harvard University Press.

Redfield, R. (1965). Peasants and Peasant Societies and Culture. In: Chicago, University of Chicago Press.

Reyes, G. E. (2001). Four main theories of development: modernization, dependency, word-system, and globalization. *Nómadas. Revista Crítica de Ciencias Sociales y Jurídicas, 4*(2), 109-124.

Rifat, S. A. A., & Liu, W. (2019). Quantifying Spatiotemporal Patterns and Major Explanatory Factors of Urban Expansion in Miami Metropolitan Area During 1992–2016. *Remote Sensing*, *11*(21), Article 21. https://doi.org/10.3390/rs11212493

Rodrigues, M., & Franco, M. (2020). Measuring the urban sustainable development in cities through a Composite Index: The case of Portugal. *Sustainable Development*, *28*(4), 507–520. https://doi.org/10.1002/sd.2005

Rojas-Caldelas, R. I., & Corona Zambrano, E. A. (2008). Urban observatories opportunities for environmental monitoring: solid wastes. *Waste Manag, 28 Suppl 1*, S40-44. doi:10.1016/j.wasman.2008.04.008

Roser, M. (2014). Human development index (HDI). *Our World in Data*.

Rostow, W. W. (1960). *The process of economic growth*. Retrieved from

Rozbicki, M. (1998). *The complete colonial gentleman: cultural legitimacy in Plantation America*: University Press of Virginia.

Sairinen, R. (2004a). Assessing social impacts of urban land-use plans: From theory to practice. *Boreal environment research, 9*(6), 509-517.

Sairinen, R. (2004b). Social impact assessment in urban planning. *WIT Transactions on Ecology and the Environment, 72*.

Santos, T. D. (1970). The structure of dependence. *The american economic review, 60*(2), 231-236.

Sardar, Z. (1996). Beyond Development: An Islamic Perspective. *The European Journal of Development Research, 8*(2), 36-55. doi:10.1080/09578819608426664

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*: Pearson education.

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students (6th ended.) Harlow*.

Schindler, M., Dionisio, R., & Kingham, S. (2018). A multi-level perspective on a spatial data ecosystem: needs and challenges among urban planning stakeholders in New Zealand. *International Journal of Spatial Data Infrastructures Research, 13*, 223-252.

Sen, A. (2000). *Development as Freedom* (Reprint edition). Anchor.

Seto, K. C., Fragkias, M., Güneralp, B., & Reilly, M. K. (2011). A Meta-Analysis of Global Urban Land Expansion. *PLOS ONE*, *6*(8), e23777. https://doi.org/10.1371/journal.pone.0023777

Shalaby, M. S., & Shalaby, A. S. (2018). The Urban Planning and Design of Eco-Industrial Parks Case of Asfan, Saudi Arabia. *Journal Impact Factor, 3*, 31.

Shareia, B. F. (2015). Theories of development. *International journal of language and linguistics, 2*(1), 78-90.

Shi, Y., Bilal, M., Ho, H. C., & Omar, A. (2020). Urbanization and regional air pollution across South Asian developing countries—A nationwide land use regression for ambient

PM2.5 assessment in Pakistan. *Environmental Pollution (Barking, Essex: 1987)*, *266*(Pt 2), 115145. https://doi.org/10.1016/j.envpol.2020.115145

Silver, C. (2018). The origins of planning education: overview. *Urban Planning Education*, 11-25.

Silverman, D. (2020). *Qualitative research*: Sage Publications Limited.

Singh, M. (2017). Post-monolingual research methodology: Multilingual researchers democratizing theorizing and doctoral education. *Education Sciences, 7*(1), 28.

Smith, P. E. (2009). Social development needs better politics. In L. R. Elling (Ed.), *Social development*. New York: Nova Science Publishers.

Sonnenfeld, D. A. (2000). Developing countries. *Environmental Politics*, *9*(1), 235–256. https://doi.org/10.1080/09644010008414518

Sowell, T. (1994). *Race and culture: A world view*: Basic Books.

Spaargaren, G., & Koppen, C. S. A. K. (2009). Provider Strategies and the Greening of Consumption Practices: Exploring the Role of Companies in Sustainable Consumption. In L. Meier & H. Lange (Eds.), *The New Middle Classes: Globalizing Lifestyles, Consumerism and Environmental Concern* (pp. 81–100). Springer Netherlands. https://doi.org/10.1007/978-1-4020-9938-0_5

Stern, D. I. (2004). The environmental Kuznets curve. *Modelling in Ecological Economics. Edward Elgar, Cheltenham*, 173-202.

Stiglitz, J. E. (2002). *Globalization and its Discontents* (Vol. 500): New York Norton.

Stossel, Z., Kissinger, M., & Meir, A. (2015). Measuring the biophysical dimension of urban sustainability. *Ecological economics, 120*, 153-163.

Sun, Y., Zhao, S., & Qu, W. (2015). Quantifying spatiotemporal patterns of urban expansion in three capital cities in Northeast China over the past three decades using satellite data sets. *Environmental Earth Sciences*, *73*(11), 7221–7235. https://doi.org/10.1007/s12665-014-3901-6

Sustainable Development Goals Cities. (2015). *Cities – United Nations Sustainable Development.* Retrieved from https://www.un.org/sustainabledevelopment/cities

Swanepoel, H., & De Beer, F. (2006). *Community Development: Breaking the Cycle of Poverty*: Juta and Company Ltd.

Szymanski, A. (1982). The socialist world-system. *Socialist states in the world-system*, 57-84.

Tang, H.-T., & Lee, Y.-M. (2016). The Making of Sustainable Urban Development: A Synthesis Framework. *Sustainability*, *8*(5), 492. https://doi.org/10.3390/su8050492

Tanguay, G. A., Rajaonson, J., Lefebvre, J.-F., & Lanoie, P. (2010). Measuring the sustainability of cities: An analysis of the use of local indicators. *Ecological Indicators*, *10*(2), 407–418. https://doi.org/10.1016/j.ecolind.2009.07.013

Taherdoost, H. (2017). Determining sample size; how to calculate survey sample size. *International Journal of Economics and Management Systems, 2*.

TEEB – The Economics of Ecosystems and Biodiversity. (2010): The Economics of Ecosystems and Biodiversity. Ecological and Economic Foundations. London.

Thakuriah, P. V., Tilahun, N. Y., & Zellner, M. (2017). Big data and urban informatics: innovations and challenges to urban planning and knowledge discovery. In *Seeing cities through big data* (pp. 11-45): Springer.

Thomas, W. (2009). Do environmental regulations impede economic growth? A case study of the metal finishing industry in the South Coast Basin of Southern California. *Economic Development Quarterly, 23*(4), 329-341.

Ting, F.-N. (1989). *Wittgenstein's descriptive method*: Pontificia Universitas Gregoriana.

Todaro, M. P. (2000). *Economic Development* (7th ed.): Addison Wesley Longman.

Todaro, M. P., & Smith, S. C. (2006). *Economic Development* (9th Edition ed.). Harlow: Pearson Education Ltd.

United Nations. (2018). 68% of the World Population Projected to Live in Urban Areas by 2050, Says UN. News. Retrieved fromhttps://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html.

United Nations Economic and Social Council. (2016). Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators. http://ggim.un.org/knowledgebase/Attachment1333.aspx?AttachmentType1.

Urbanization and Urban Development. (1966). *International Social Work, 9*(4), 7-11. doi:10.1177/002087286600900402

Vaggione, P. (2012). *Urban Planning for City Leaders: UN-Habitat* (V. Quinlan Ed. 2nd Edition ed.). Nairobi: UN-HABITAT.

Vaggione, P. (2013). *URBAN PLANNING FOR CITY LEADERS* (V. Quinlan Ed. 2nd Edition ed.). Nairobi GPO KENYA: United Nations Human Settlements Programme (UN-Habitat).

Van Nieuwenhuijze, C. (1979). Social Development: Concept and Policy. *Humanity & Society, 3*(2), 107-121.

Vanclay, F. (2003). International principles for social impact assessment. *Impact assessment and project appraisal, 21*(1), 5-12.

Varpio, L., Paradis, E., Uijtdehaage, S., & Young, M. (2020). The Distinctions Between Theory, Theoretical Framework, and Conceptual Framework. *Academic Medicine*, *95*(7), 989–994. https://doi.org/10.1097/ACM.0000000000003075

Villa, F., Ceroni, M., Bagstad, K., Johnson, G., & Krivov, S. (2009). ARIES (Artifcial Intelligence for Ecosystem Services): a new tool for ecosystem services assessment, planning, and valuation. In: Proceedings of the 11th annual BIOECON conference on economic instruments to enhance the conservation and sustainable use of biodiversity, Venice, Italy.

Wallerstein, I. (1987). *The construction of peoplehood: racism, nationalism, ethnicity.* Paper presented at the Sociological forum.

Walliman, N. (2017). *Research methods: The basics*: Routledge.

Ward, B., & Dubos, R. (1972). *Only one earth. The care and maintenance of a small planet*: Harmondsworth: Penguin Books Ltd.

Wang, B., Zhang, Q., & Cui, F. (2021). Scientific research on ecosystem services and human well-being: A bibliometric analysis. *Ecological Indicators*, *125*, 107449. https://doi.org/10.1016/j.ecolind.2021.107449

Wang Penglong, G. F. (2018). Progresson Sustainable City Assessment Index System for SDGs. *Remote Sensing Technology and Application*, *33*(5), 784–792. https://doi.org/10.11873/j.issn.1004-0323.2018.5.0784

Warna, P., Halfani, M., & Rodriguez, A. (2009). Towards an understanding of governance. In R. Stren (Ed.), *Urban research in the developing world*. Toronto: University of Toronto Press.

Waugh, D. (2009). *The new wider world* (Third Edition ed.). Cheltenham, UK: Nelson Thornes.

Welty, C., Miller, A. J., Belt, K. T., Smith, J. A., Band, L. E., Groffman, P. M., . . . Shedlock, R. J. (2007). Design of an environmental field observatory for quantifying the urban water budget. *In: Novotny, Vladimir; Brown, Paul, eds. Cities of the future: Towards integrated sustainable water and landscape management. London: International Water Association: 72-88.*

Wong, C. (2006). *Indicators for urban and regional planning: the interplay of policy and methods*: Routledge.

Worster, D. (1993). *The wealth of nature: environmental history and the ecological imagination*: Oxford University Press on Demand.

Wright, S., O'Brien, B. C., Nimmon, L., Law, M., & Mylopoulos, M. (2016). Research Design Considerations. *J Grad Med Educ, 8*(1), 97-98. doi:10.4300/JGME-D-15-00566.1

Yamane, T. (1967). *Statistics: An Introductory Analysis*. New York: Harper and Row.

YANG, R., OUYANG, W., & TIAN, L. (2018). Origin, Development and Evolution of Urban Planning and Public Health. *Shanghai Urban Planning Review, 3*, 79-85.

Yang, L., & Li, Y. (2013). Low-carbon City in China. *Sustainable Cities and Society*, *9*, 62–66. https://doi.org/10.1016/j.scs.2013.03.001

Yigitcanlar, T., & Teriman, S. (2015). Rethinking sustainable urban development: towards an integrated planning and development process. *International Journal of Environmental Science and Technology, 12*(1), 341-352.

Zahid, Z. H. (1996). *Urban planning in Saudi Arabia, with special reference to the Nitag Omrani Programme.* Durham University,

Zhang, X., & Li, H. (2018). Urban resilience and urban sustainability: What we know and what do not know? *Cities, 72*, 141-148.

Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2021). AR6 Climate Change 2021: The Physical Science Basis.

Zhu, Z., & Stackpoole, S. (2010). *Assessing carbon stocks, carbon sequestration, and greenhouse-gas fuxes in ecosystems of the United States under present conditions and future scenarios*. US Department of the Interior, US Geological Survey.

Appendices

Appendix A

Thermal Comfort Zonation (TCZ) For Shaqra City

This research has prepared a Thermal Comfort Zonation (TCZ) map for Shaqra city for detailed recommendations. The Thermal Comfort Zonation (TCZ) map for Shaqra city and its associated statistics are vital for understanding and addressing thermal comfort levels across different areas of the city. The TCZ map provides essential insights for urban planners and developers to plan infrastructure, housing, and public spaces more effectively. By considering thermal comfort zones, they can design areas that are more conducive to comfortable living and working conditions.

Thermal comfort directly impacts the health and well-being of the city's residents. Areas with higher temperatures can increase the risk of heat-related illnesses. By identifying these zones, appropriate measures can be taken to protect public health. Understanding thermal comfort zones allows for more efficient energy management. For instance, areas with higher temperatures may require more energy for cooling purposes. By tailoring energy usage based on specific zones, overall energy consumption can be optimized, leading to cost savings and reduced environmental impact.

Table A1 provides a detailed breakdown of Shaqra city's Thermal Comfort Zones (TCZs), offering insights into the area coverage and average temperatures associated with each zone. Each TCZ, ranging from "Very high comfort" to "Very low comfort," is allocated a distinct portion of the city's landscape, with corresponding measurements of area coverage presented in square kilometers. The recorded average temperatures within each zone, expressed in degrees Celsius, highlight the varying climatic conditions experienced across Shaqra city.

Table A1. Area coverage and average temperature of Thermal Comfort Zones.

Thermal Comfort Zones (TCZs)	Area Coverage (Square Kilometer)	Average Temperature (Degree Celsius)
Very high comfort	9.62	44.49
High comfort	32.61	45.33
Moderate comfort	41.74	46.14
Low comfort	4.06	46.70
Very low comfort	13.34	47.26

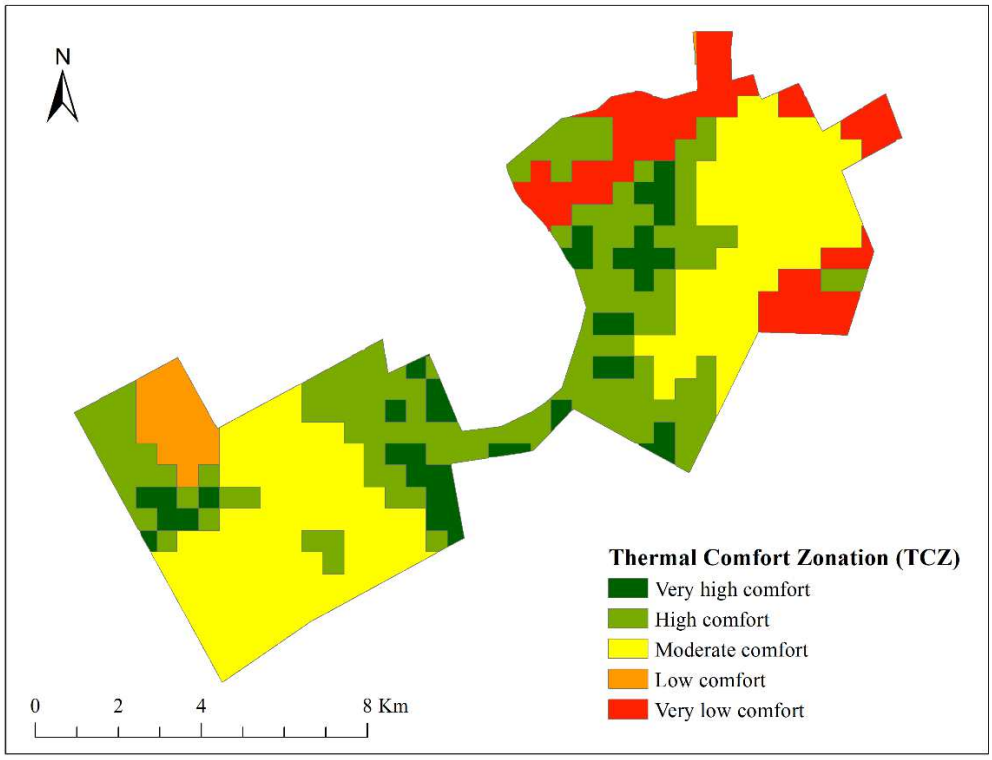

Figure A1. Map of Thermal Comfort Zones (TCZs). (Source: Own representation)

Appendix B

Population Density in Thermal Comfort Zones (TCZs)

The current distribution of population density, with higher concentrations in the "High comfort" zone and lower densities in the "Low comfort" zone (see **Figure A2** and **A3**), presents ample opportunities for Shaqra city. This arrangement benefits residents by reducing the risk of heat-related illnesses in areas with more favorable thermal conditions. However, for future planning, it's imperative to prioritize different adaptation strategies while planning for the low comfort zones. Climate adaptation measures should be integrated, including heat-resilient building designs and urban greenery enhancements, to address the increasing threat of heatwaves due to climate change. Embracing mixed-use development and engaging communities in the planning process will be critical to fostering inclusive and sustainable growth while enhancing resilience to extreme heat events. By leveraging the existing scenario's advantages and incorporating proactive planning strategies, Shaqra city can create a more resilient and livable urban environment for all residents.

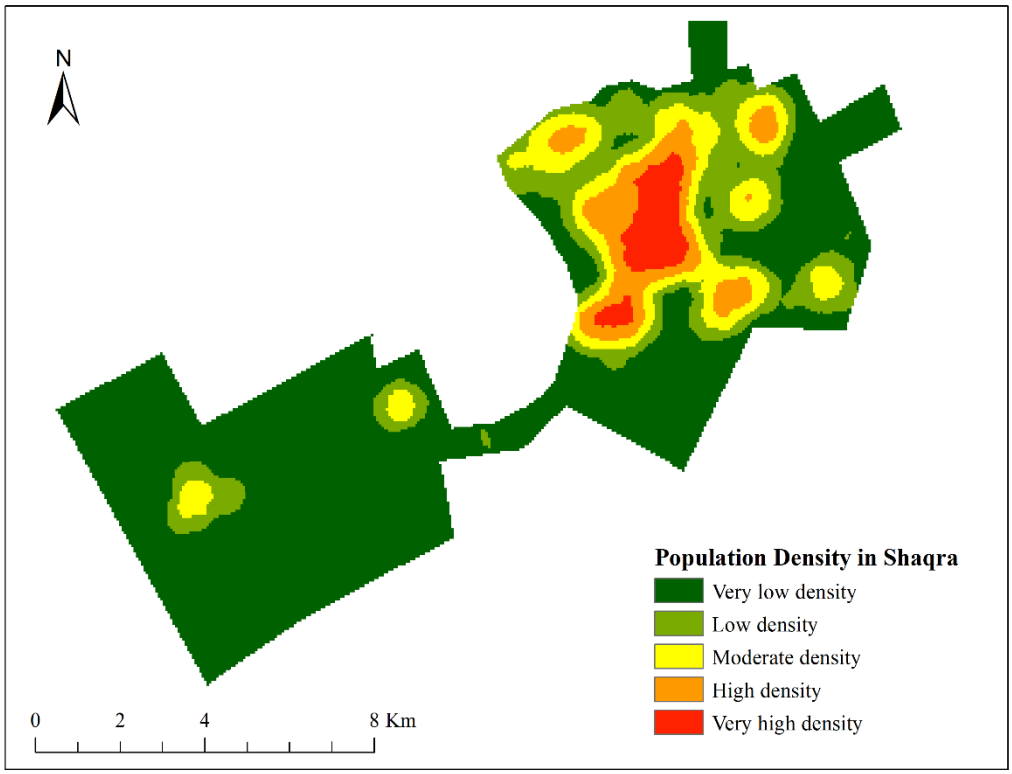

Figure A2. Population density in Shaqra City. (Source: Own representation)

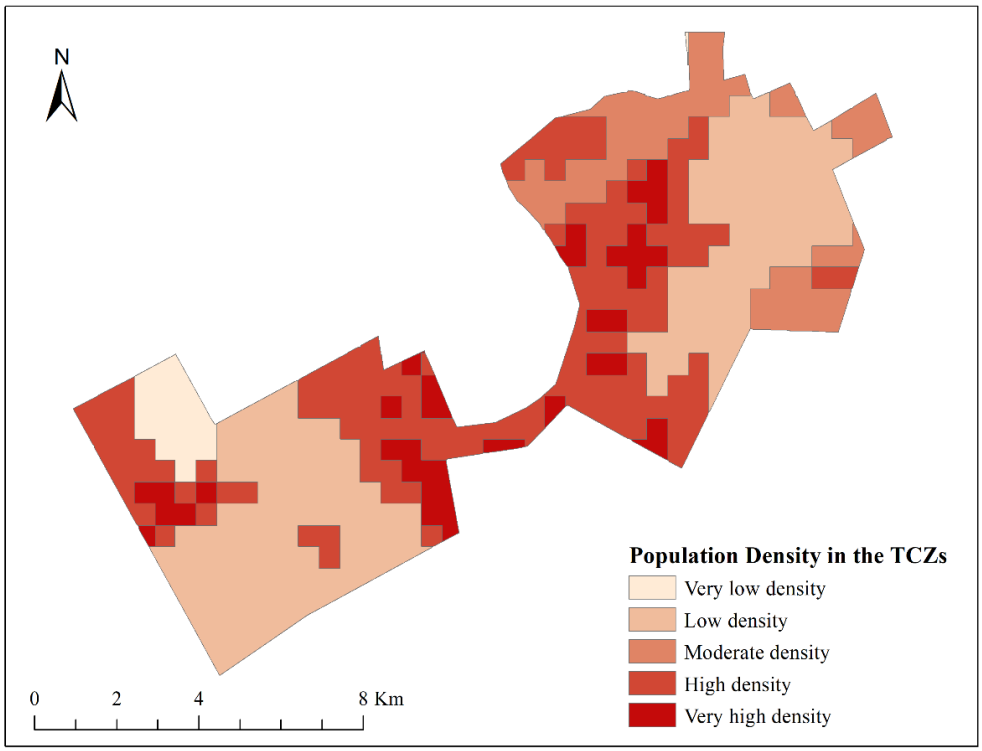

Figure A3. Population density in Thermal Comfort Zones (TCZs). (Source: Own representation)

Appendix C

Optimized Location for Eco-parks

In pursuit of promoting sustainable development within Shaqra city, four optimized locations for eco-parks have been proposed. Each eco-park is strategically positioned to serve a designated area extending six kilometers from its location. The selection of these sites aims to maximize accessibility and coverage across the city, ensuring equitable distribution of eco-friendly recreational spaces. By strategically distributing the eco-parks, the intention is to foster environmental stewardship, enhance public well-being, and promote biodiversity within urban landscapes. This initiative aligns with principles of sustainable urban development, seeking to balance economic growth with ecological preservation and social equity. Through the collective presence of these eco-parks, Shaqra city will endeavor to create a more livable, resilient, and environmentally conscious urban environment for its residents.

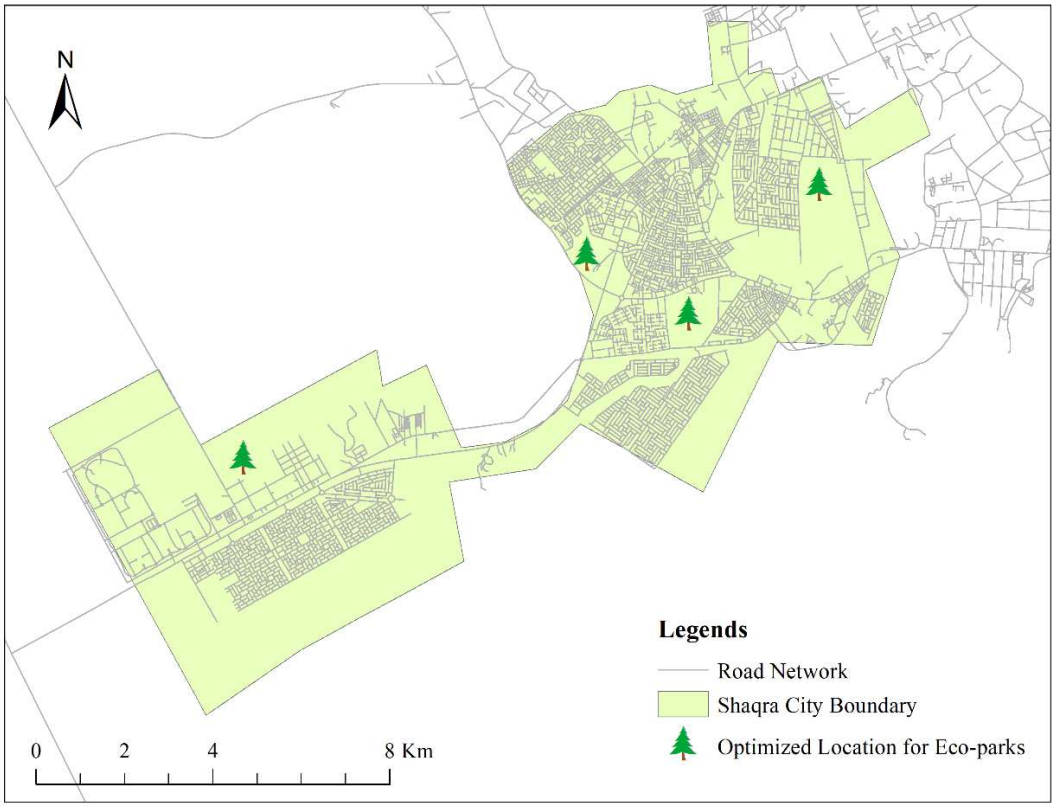

Figure A4. Optimized location for eco-parks. (Source: Own representation)

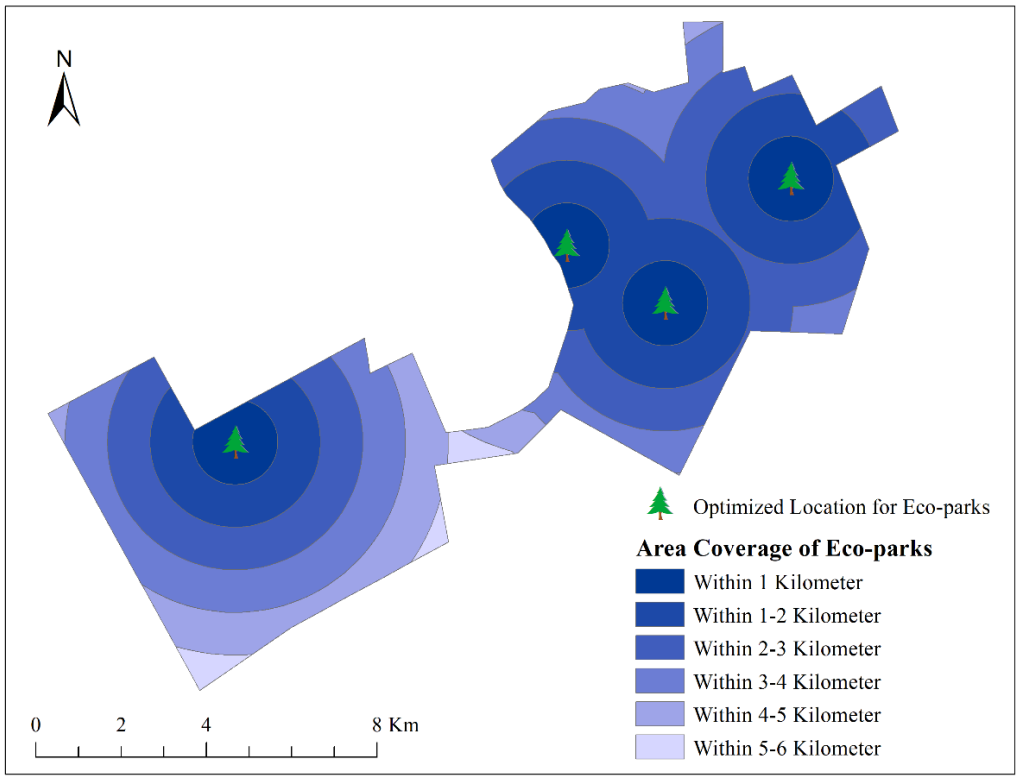

Figure A5. Area coverage of the proposed eco-parks (Source: Own representation)

Appendix D

LULC Prediction of Shaqra City for 2030

The predicted land use land cover (LULC) map for Shaqra city in the year 2030, generated through the utilization of the MOLUSCE plugin in QGIS, offers a comprehensive depiction of the anticipated spatial distribution and composition of land use categories within the urban landscape.

The predicted LULC map holds significant implications for urban planning, environmental management, infrastructure development, and community resilience. Firstly, it provides valuable insights into the spatial distribution of population growth and urban sprawl, enabling authorities to anticipate infrastructure demands, allocate resources efficiently, and mitigate the adverse impacts of unplanned urbanization such as traffic congestion, pollution, and loss of green spaces. Moreover, the identification of areas prone to environmental degradation or vulnerability to natural hazards allows for proactive measures to safeguard critical ecosystems, enhance disaster preparedness, and promote climate resilience.

Furthermore, the predicted LULC map informs land use policies, zoning regulations, and development strategies to promote sustainable land use practices, compact urban forms, and mixed land use patterns. By encouraging infill development, transit-oriented design, and green infrastructure integration, the city can optimize land utilization, reduce environmental footprints, and foster vibrant, livable neighborhoods that cater to diverse socioeconomic needs and aspirations.

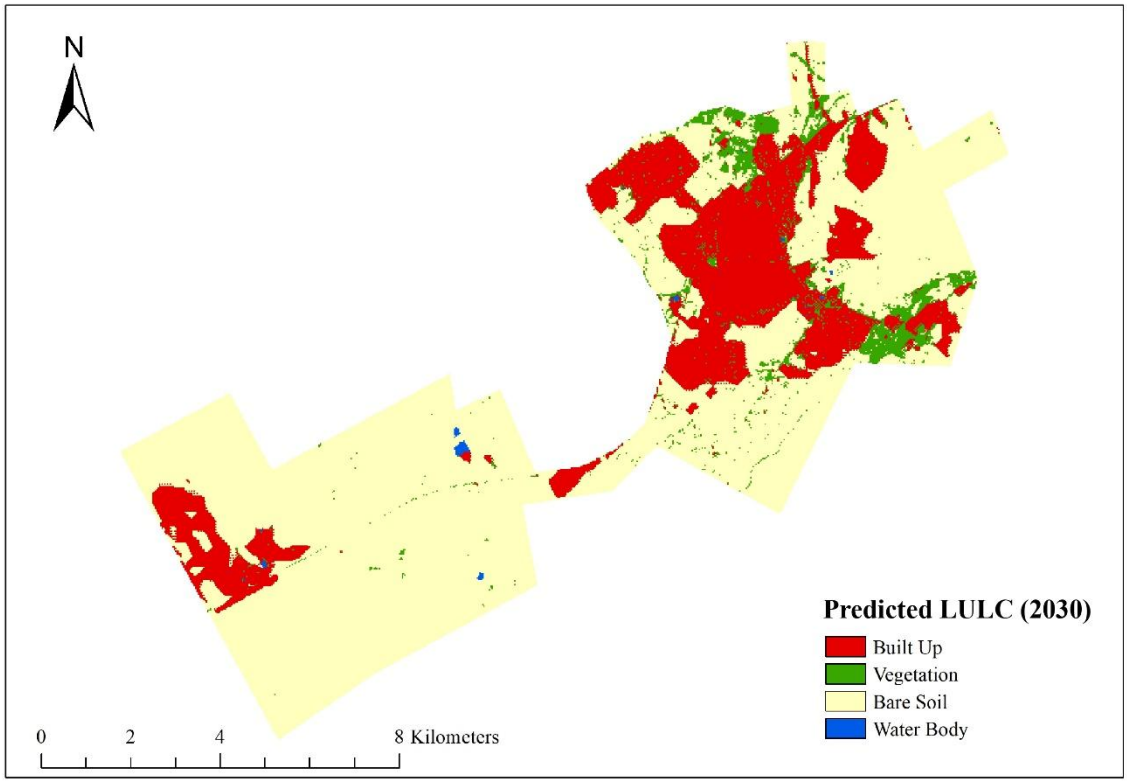

Figure A6. Predicted land use/ land cover for 2032 in Shaqra City. (Source: Own representation)

Appendix E

15 Minutes (Walking) City Concept for Shaqra

The 15-minute city concept has emerged as a novel approach to urban planning aimed at fostering sustainable development by ensuring that essential amenities and services are within

a short walking or cycling distance from residential areas. This research presents a case study of Shaqra City, Saudi Arabia, where the 15-minute city concept could be implemented as a strategy to achieve sustainable urban development. Through a detailed examination of the concept, its implementation in Shaqra City, and its implications for urban sustainability, this study offers insights into the potential of the 15-minute city model to transform urban landscapes and improve quality of life.

The 15-minute city concept proposes that residents should have access to key services and amenities, including schools, healthcare facilities, parks, shops, and public transportation, within a 15-minute walk or cycle from their homes. By reducing the need for car travel and promoting active modes of transportation, such as walking and cycling, the concept aims to minimize environmental impact, enhance social cohesion, and improve overall urban livability. In Shaqra City, this concept could be adopted to suit the local context, with a focus on making each district self-sustaining by ensuring that all necessary facilities are accessible within a 15-minute walking distance from the centroid of each district. To achieve this goal, detailed maps have been developed for each district of Shaqra City, showing the areas within 5, 10, and 15 minutes walking distance from the district centroids. The necessary amenities and services, such as schools, healthcare facilities, markets, parks, and public transportation hubs etc. could be provided withing these areas to ensure sustainability.

The implementation of the 15-minute city concept in Shaqra City will hold significant implications for sustainable urban development. By promoting compact, mixed-use neighborhoods with a diverse range of amenities and services, the concept encourages more sustainable land use patterns, reduces urban sprawl, and minimizes reliance on private automobiles. This, in turn, can lead to a reduction in greenhouse gas emissions, air pollution, and traffic congestion, contributing to improved environmental quality and public health outcomes. Additionally, by fostering walkable and bikeable communities, the concept promotes physical activity, social interaction, and community engagement, enhancing overall quality of life and well-being for residents.

Furthermore, the 15-minute city concept aligns with broader goals of sustainable development by addressing social equity and inclusion. By ensuring that essential services are accessible to all residents within a short distance from their homes, regardless of socioeconomic status or location within the city, the concept promotes equal access to opportunities and resources, reducing disparities and fostering social cohesion. Moreover, by decentralizing amenities and services and promoting local businesses, the concept supports economic development at the neighborhood level, creating opportunities for entrepreneurship and job creation.

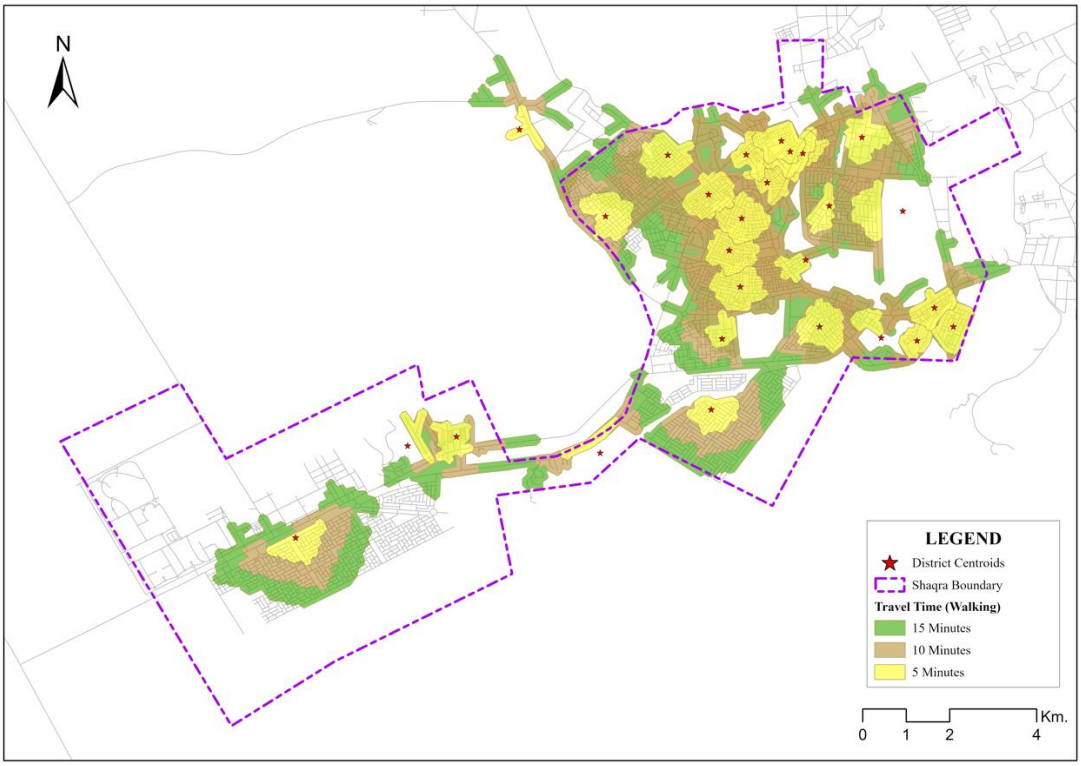

Figure A7. 15 minutes (walking) city concept for Shaqra City. (Source: Own representation)

Appendix F

5 Minutes (Car) City Concept for Shaqra

The 5-minute car city concept proposes that residents should have access to key services and amenities within a 5-minute drive from their homes, thereby minimizing the need for long commutes and reducing reliance on private automobiles. This paper explores the application of this concept in Shaqra City, Saudi Arabia, aiming to foster sustainable urban development. Through detailed mapping and strategic infrastructure planning, Shaqra City can endeavor to ensure that all districts are self-sustaining, with residents having easy access to necessary facilities within a short driving distance. By prioritizing proximity and minimizing travel times, this approach holds significant promise for reducing traffic congestion, air pollution, and greenhouse gas emissions. Additionally, it promotes compact, mixed-use neighborhoods, fostering economic vitality and social inclusion. The implementation of the 5-minute car city concept in Shaqra City could represent a significant step towards creating a more resilient, livable, and environmentally sustainable urban environment.

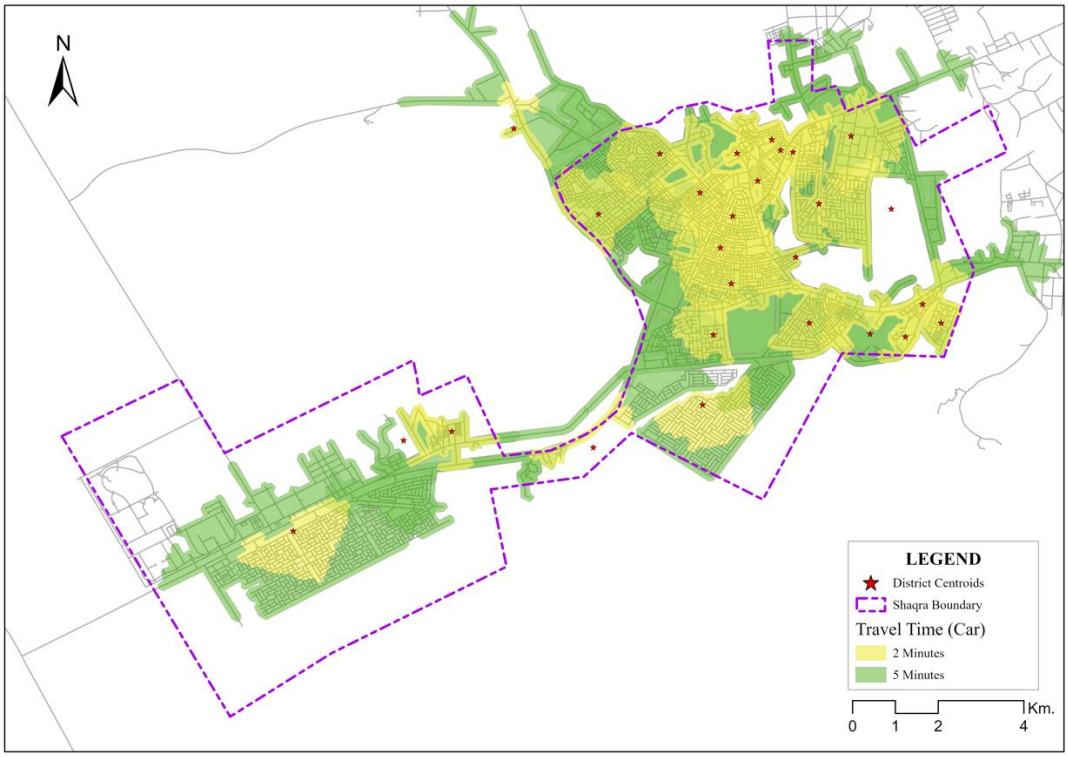

Figure A8. 15 minutes (car) city concept for Shaqra City. (Source: Own representation)

Appendix G

Coverage of Services and Facilities in Shaqra City

The service and facilities coverage map for commercial, educational, and park amenities within varying walking distances of 5, 10, 15, and 30 minutes in Shaqra City represents a comprehensive urban planning initiative aimed at enhancing accessibility and promoting sustainable development. By strategically mapping the distribution of these vital facilities, the city seeks to ensure equitable access for all residents while minimizing the need for vehicular travel, thus reducing traffic congestion, carbon emissions, and reliance on non-renewable energy sources. Once the coverage map is created, urban planners and policymakers can prioritize infrastructure development and investment to fill any gaps in service provision. This may involve establishing new commercial zones or educational facilities in underserved areas and enhancing existing parks to meet the recreational needs of residents. Furthermore, the implementation of pedestrian-friendly infrastructure, such as sidewalks, crosswalks, and pedestrian bridges, is essential to ensure safe and convenient access to these amenities. Additionally, public transportation networks should be integrated to complement walking distances, providing further accessibility options for residents. Moreover, community engagement and participatory planning processes are crucial for ensuring the success of this

initiative. Input from residents can help identify specific needs and preferences, guiding decision-making and resource allocation to align with the priorities of the community.

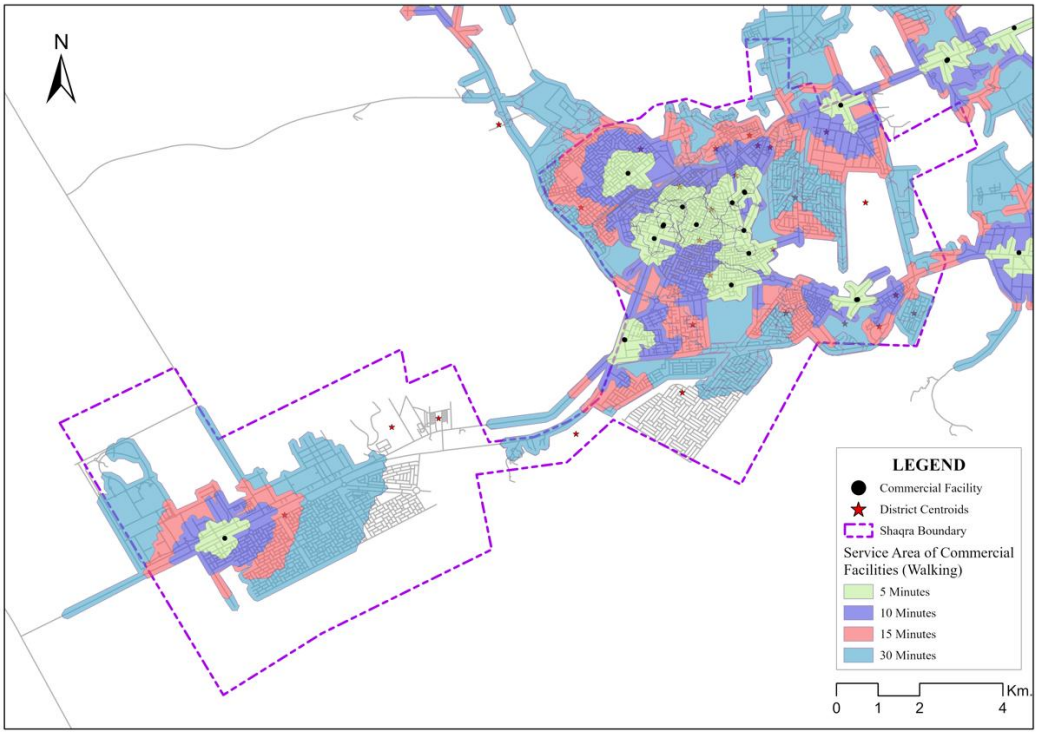

Figure A9. Service area of existing commercial facilities in Shaqra City. (Source: Own representation)

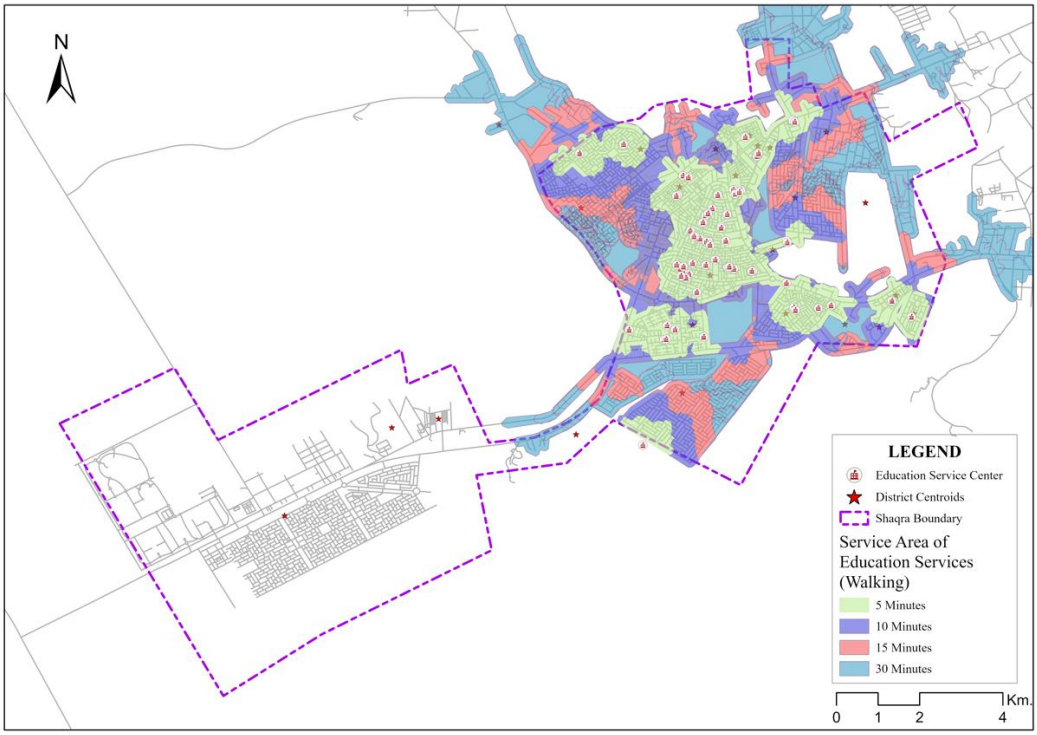

Figure A10. Service area of existing educational facilities in Shaqra City. (Source: Own representation)

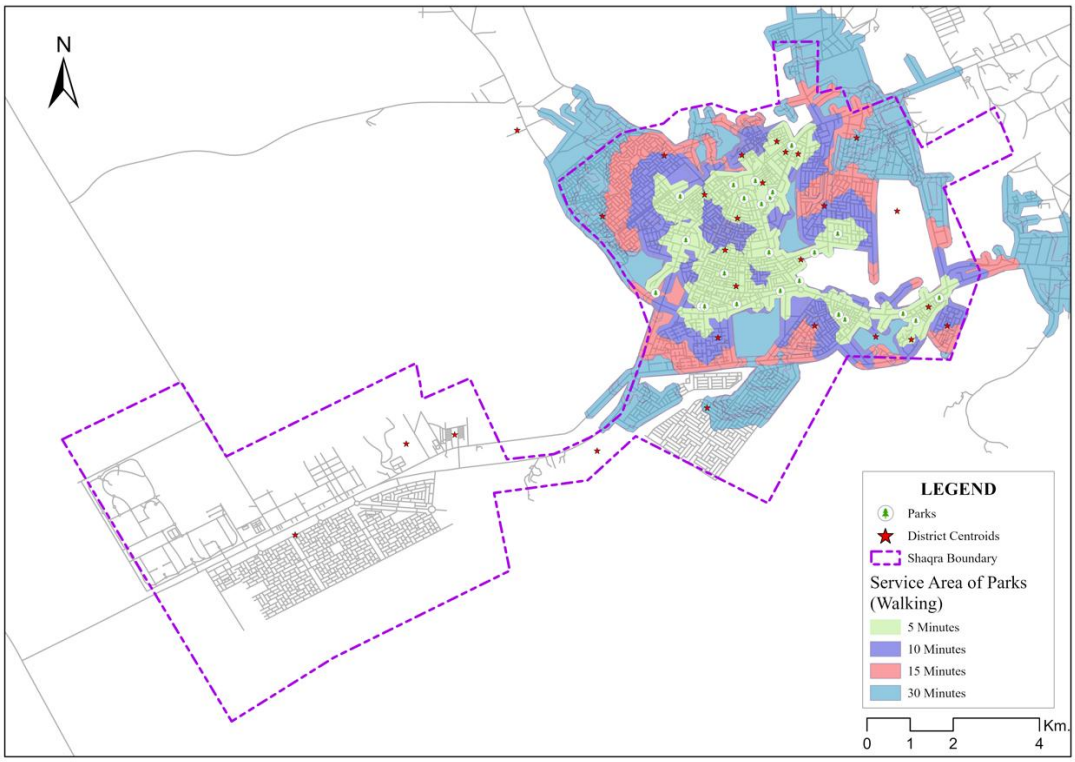

Figure A11. Service area of existing park facilities in Shaqra City. (Source: Own representation)

Appendix H

Figure A12. Types of green infrastructure that can be adopted to ensure sustainable urban development[1].

[1] A Green Infrastructure Guide for Small Cities, Towns and Rural Communities by Green Belt Foundation. https://www.greenbelt.ca/report_green_infrastructure

Appendix I

Planning Zones

Urban planning is typically structured around defining different zones in a community. Different types and scales of green infrastructure are appropriate for different zones and provide varying benefits depending upon their location. The zones may include:

- Private Residential
- Transportation Right-of-ways
- Public Lands and Parks
- Downtowns
- Institutional and Commercial
- Future Developments
- Agricultural Lands

This zoning approach to green infrastructure can guide the development of a green infrastructure strategy. The zoning map below is an illustration of how this approach could be applied.

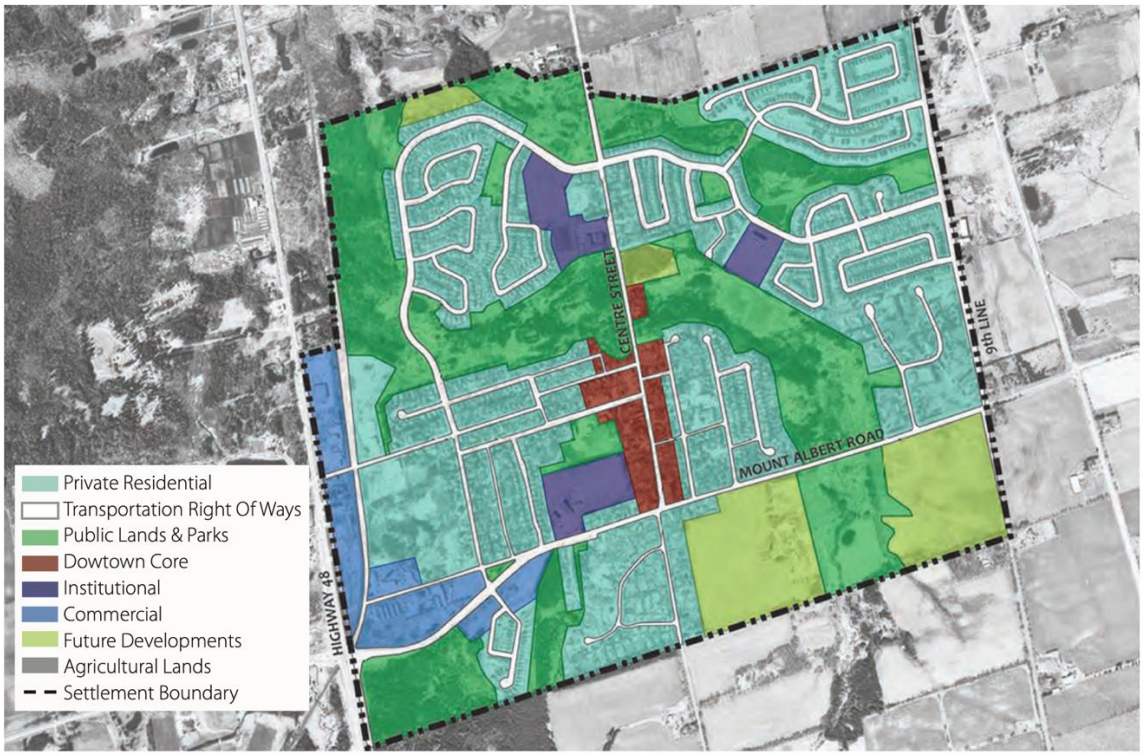

Figure A13. Illustrative zoning approach to green infrastructure[2].

[2] A Green Infrastructure Guide for Small Cities, Towns and Rural Communities by Green Belt Foundation. https://www.greenbelt.ca/report_green_infrastructure