Longitudinal Investigation of Open Spaces Development in Pakistan

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DEDICATION

I dedicate this work to the almighty Allah, who gave

me healthy life to meet and complete such targets in my life

This thesis is dedicated to ***my beloved parents***, ***my husband and my son Humza***.

I also dedicate this work to My Thesis Supervisor, ***Dr. Abdul Waheed***

and without whom it was impossible to achieve this milestone.

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Table of Contents

List of Tables

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List of Figures

List of Acronyms

CDA	Capital Development Authority
GIS	Geographic Information System
GT Road	Grand Trunk Road
ESI	Economic Sustanability Index
EvSI	Environmental Sustainability Index
HSI	Health Sustanibility Index
KMO	Kaiser-Meyer-Olkin
LDA	Lahore Development Authority
MHNP	Margalla Hills National Park
MDG	Millennium Development Goals
PCA	Principal Component Analysis
PDA	Peshawar Development Authority
PEPAC	Pakistan Environmental Planning & Architectural Consultants (Pvt.) Limited
PSI	Physical Sustainability Index
SDG	Sustainable Development Goals
SI	Sustainability Index
SPSS	Statistical Package for the Social Sciences
SSI	Social Sustainability Index
TMA	Tehsil Municipal Authority
UHI	Urban Heat Island

ABSTRACT

Sustainable cities are places that meet the needs of their current dwellers without compromising the community's future needs. A city's urban form comprises many components such as residential, commercial, industrial, and urban open spaces. An environment-friendly and livable city results from proper planning and detailing of these aspects. Open spaces are termed as lungs of a city, and their presence is significant for the physical and mental well-being of the residents. The present study investigates the existing open spaces in Pakistan's federal capital (Islamabad) and provincial capitals (Lahore and Peshawar). In Pakistan's haphazard and accidental urbanization, the rapid consumption of open spaces has remained a weak link or an ignored area. In the face of increasing population, unprecedented increase in the built-up area in Pakistan's urban centers, and the lack of policy, open spaces are shrinking.

The role of governments in the management and maintenance of open spaces has been recognized globally. Stable and continued local government system is a must for ensuring that the cities are planned and managed in accordance with the will of the people. Pakistan is sadly lagging as the rest of the developed world has realized the importance of open spaces. Effective legislation on open public spaces, backed by efficient policy implementation, is essential for smooth urbanization in Pakistan, the fastest urbanizing country in South Asia. The research has tried to map the scenario of open spaces through three dimensions. Starting with the temporal changes and trends that occurred in open spaces for three cities over a specific period with the help of satellite imagery and GIS software. Then obtaining public perception about socioeconomic and environmental impacts of open spaces on the public through a questionnaire survey performed with the city dwellers. This, in turn, formulated a correlation between the sustainability of open spaces in these cities. It is essential to consider environmental, social, and economic factors as a challenge and develop long-term strategic planning. Lastly, the development, implementation, and impact of policies, legislation, and regulations in Pakistan regarding open spaces apart from discussing the definition of open space used and implemented globally. In this way, proper direction for developing a strategy to cope with rapid urbanization will be formulated. The pressures mentioned earlier on cities can be released effectively and positively. As a policy area, open spaces have remained ignored. Unless a balance is

achieved in meeting the housing needs of the increasing population and planned urbanization, the future of open public spaces remains bleak. Besides this, the research helps formulate a strategy for developing a sustainable open space network in the existing metropolitan cities of Pakistan.

Keywords: Open spaces, policies, population, temporal changes, sustainability, urbanization.

CHAPTER 1: INTRODUCTION

The last three centuries have witnessed the evolution of settlement from walled cities to industrial cities to metropolis. This journey has innovation and rapid transformation, accompanied by three industrial revolutions. Carriages and pulleys have been replaced by automobiles, electric cars, and self-driving vehicles. Similarly, indigenous building materials like brick, wood, and stone have been substituted by concrete, steel, and glass. Skyscrapers now dominated the cityscape. Leisure gardens for the elites have been replaced by recreational centers and parks accessible to the public. The journey of months is now covered in hours. However, this transformation comes with consequences. Industrialization and increase in population resulted in rural to urban migration, which led to cities' rapid and haphazard expansion. The growing cities expanded into the surrounding agricultural land. With this expansion also came environmental degradation.

In 2016, more people lived in urban areas than in rural areas. Open spaces within cities, especially in developing countries, are vanishing fast due to illegal encroachment, a high population growth rate, and poor policy implementation. The ever-increasing human footprint on the earth is disturbing the ecosystem. To cope with these negative externalities, sustainable measures are incorporated now in every walk of life. From the garden city to dynapolis, the paradigm is now shifting back to compact living and sustainable development, limiting the human footprint on the earth and making communities more breathable yet compact for future generations. The rapid change in urban form is coming at the expense of open spaces, which were once the identity of cities. As Le Corbusier said, "*The towns of today can only increase in density at the expense of the open spaces which are the lungs of a city."*

A city's urban form comprises many components, including residential, commercial, industrial, and open spaces. These places are planned considering the social, cultural, economic, topographical, and geographical aspects of a specific region. Environment-friendly and livable city results from proper planning and detailing of these aspects (Oden, 2012). Among the mentioned components, urban open spaces are called the lungs of a city, and their presence is significant for its residents' physical and mental well-being. They contribute to psychological

relaxation, physical activities, and social interactions and play a vital role in protecting the community's safety and wellbeing (Braubach et al., 2017; Rakhshandehroo et al., 2017; Regional Public Health, 2010). A well-designed open space promotes social interaction and provides a place for people to meet and create opportunities for community participation. It is an integral element of neighborhood and city design.

Urban open spaces have been center for cultural, social, political, and economic activities from early human settlements. These spaces have designed from the time of the Mesopotamian and Sumerian civilizations. The Greeks built ‘Agora’ as a multi-functional public realm. Smaller parks and gardens were usually found around civic and religious buildings at the neighborhood scale. Unlike modern days there rarely were government-designated neighborhood parks (Stanley et al., 2012). However, the cities were small, and the rural areas were close to a large expanse of open land and natural settings.

Furthermore, the need for planned open spaces for healthy living was not felt, nor was it needed. However, the first Industrial Revolution changed the dynamics of living, agriculture, and industry in the West. New industry in the cities attracted the population from the countryside, and the cities started growing in density and later in the area. (Carmona et al., 2010). The cities started becoming congested with poor living conditions of labor, poor working conditions, and pollution. It gave birth to various urban planning movements like the 'garden city movement'(Chiesura, 2004; Wilkinson, 1988) and the 'beautiful city movement,' which focused on removing congestion from cities and making them more livable by increasing greenery creating more parks and open spaces for the public.

As the rapid rate of urbanization resulted in land cover change worldwide, especially in developing countries, the importance of open spaces is realized. Though only 1-6% of the land has been urbanized, the impact of this conversion is evident on local and global ecosystems, local climatic conditions, global warming, and threatening native habitat. (Shi & Woolley, 2014). Natural habitats, forests, marshes, and swamps have been destroyed in rapid urbanization and industrialization. Increased rural-urban migration in pursuit of better employment opportunities in developing countries has led to urban sprawl, leapfrog development, and satellite

cities. Cities are expanding on prime agricultural lands surrounding the old urban centers, threatening food production (Beckers et al., 2020). Not only this, but the urban centers have also declined in terms of quality as infrastructure is depleting, the land preserved for open spaces is diminishing due to the increased load on the cities (Ahmad, Aboobaider, Isa, Hashim et al., 2014; Hailemariam et al., 2016; Teferi et al., 2013; Wickramasinghe et al., 2016; Yin & Kong, 2005). Development in cities and improved quality of life came at the expense of the environment, destruction of natural areas, and depletion of natural resources. Human settlements demand a balance between the organic environment and artificial surroundings.

To combat environmental externalities resulting from an increase in population, industrialization, and urbanization, Agenda 2030 have been adopted globally for sustainable development. Goal 11of Sustainable Development Goals (SDG), make cities and human settlements inclusive, safe, resilient, and sustainable, with its sub-indicator, "ratio of land consumption rate to population growth rate," as essential parameters for analyzing sustainability of land use and land change with population growth (Shi & Woolley, 2014). Only by designing open green spaces in cities and preserving the open areas surrounding the city by controlling urban sprawl can we control the negative externalities of urbanization and make cities resilient and sustainable.

With the highest urban growth rate in South Asia, Pakistan is the sixth most populous country globally. The main factors for rapid urbanization are rural-urban migration and the high population growth rate. People are migrating to urban regions to pursue a better livelihood. The lack of basic facilities in rural areas and insecurity and instability in the war-torn rural regions, particularly Pakistani tribal regions, are pushing them towards cities for better employment and educational facilities (Kugelman, 2014). As a result of this, the pressure on urban infrastructure has increased. The cities face urban decay, economic decline, inflation, poverty, water, and energy shortages. As cities failed to accommodate all, it led to a housing backlog and an increasing number of squatter settlements (Rana & Bhatti, 2018). It is projected that by 2050, 50 percent of the population in Pakistan will be living in urban areas. The lack of structured planning for the city’s growth is causing the existing infrastructure to collapse under the growing population. The cities are

growing haphazardly, peri-urban growth, leapfrog development, and ribbons of settlement along the major highways and urban centers are the new trends.

The result is the absence of health and educational facilities and open public spaces. Major cities are developing vertically as well as horizontally. Urban sprawl is eating up agricultural land. According to one research, urbanization or urban sprawl has consumed a portion of agricultural land (Hashim et al., 2014). Capital cities like Lahore, Peshawar, Islamabad, and Karachi are losing their beauty to this uncontrolled growth. Lahore and Peshawar, once known as cities of gardens, now lack sufficient open spaces for their dwellers. Islamabad, the only planned city in Pakistan, is also growing in violation of its Master Plan, threatening its preserved surrounding areas (CDA, 2020). Few research studies have been conducted in Pakistan to evaluate different aspects of open spaces.

Moreover, the focus of thesis studies has been on studying the impacts of open spaces on society. Sustainable planning and development of urban open spaces are crucial because if they are left unattended, their character makes them prone to be converted into dangerous places (Pakistan Bureau of Statistics, 2016). Therefore, it is essential to study changes in policies and regulations, factual ground situations, and stakeholders' perceptions of public open spaces. This would develop links that break the trend of observing open spaces in isolation.

1.1 Background of the Problem

Open Spaces play a significant role in the development of a city. These spaces determine the outlook of a city. Their impact on the residents/community is also immense. Open spaces are linked with sustainable urban living. They can be defined as vacant/unconstructed land which provides environmental, social, and economic benefits to communities. Some leftover spaces can be utilized for the implementation of new ideas. Open spaces, which include parks and gardens, play areas, sports facilities, and green belts, are beneficial for improving the environment, for example, air and water purification, wind and noise filtering, and microclimate stabilization. Another vital benefit is a healthy environment that reduces stress, rejuvenates people, and promotes peacefulness in communities. Existing research studies reveal a positive correlation between the use of the park and better mental and physical health

(Yıldız et al., 2018). The social and economic impact includes encouraging outdoor spaces and increasing social integration.

Open spaces also economically serve the community through air purification by trees, reducing the sources required to overcome pollution, as landscape areas are the main tourist attraction. Finally, the presence of an open area in any form near residential or commercial property increases its value (Chiesura, 2004). The focus of SDGs 2015, which are the successor of the Millennium Development Goals, is on attaining sustainability through development in the context of 17 goals and 169 targets. Target 11.7 aims that by 2030, every human in the world should access safe, inclusive, accessible, green, and public spaces, particularly for women and children, older persons, and persons with disabilities (UN-Habitat, 2015). From the above discussion, it is safely concluded that open space development and sustainable urban living have a close relationship.

1.2 Problem Statement

In recent decades, the urbanization rate has significantly increased worldwide (Kupke, 2013). Consequently, it has become one of the key barriers to sustainable urban development, especially in metropolitan cities of developing countries. Therefore, achieving sustainability in the development pattern of rapidly urbanizing cities has emerged as a challenging issue for planners worldwide (Bekele, 2005). Besides other matters, one physical aspect of rapid urbanization is the consumption of vacant land or open spaces. These spaces are most vulnerable to consumption and affect the city's sustainability (Schultink, 2000). Pakistan is a developing country, and because most of the country's population resides in rural areas, according to the report of UNDP filed under Pakistan population Sustainable Development Goal 11 the country has few urban cities that are rapidly growing under the impact of urbanization. With deficient physical infrastructure and inadequate service delivery mechanisms, urban planners and managers face severe problems in providing essential municipal services and adequate physical infrastructure to meet the needs of the existing urban population (Anwar, 2013). Continued rapid urbanization is aggravating the problems. In the absence of weak state intervention in providing such facilities to city dwellers, people decide to cope with the situation. As a result, there

is frequent consumption of open spaces, which along with increasing the constructed portion of land, also threatens the sustainability of cities (Hailemariam et al., 2016). This phenomenon negatively affects the sustainability of cities' social, physical, economic, and environmental aspects.

1.3 Research Gap

The following are the existing gaps in research drawn from the literature review:

- Limited research on open spaces measuring temporal changes in quantity, policy level, or impact with respect to sustainability in the context of Pakistan (Burke, 2009).
- Pakistani cities are growing rapidly; however, there is a lack of knowledge about the impacts of converting existing open spaces on city fabric (UN Habitate, 2010).
- Few studies on public awareness of consumption/conversion of open spaces in Pakistan (Schmidt & Németh, 2010).
- Limited understanding of the local factors affecting the conversion of open spaces into other land uses in cities (Ahmad, Aboobaider, Isa, Hashim et al., 2014).
- There is no dedicated open space preservation policy framework to protect the conversion of open spaces (Hassan & Lee, 2015).

1.4 Research Aim

The present study aims to investigate the existing situation of open spaces in federal and two provincial capitals (Islamabad, Lahore, and Peshawar) of Pakistan to map the temporal changes and trends in open spaces over the years and to highlight the socioeconomic and environmental impacts owing these changes on the city dwellers. This research will help to develop a correlation between sustainability and open spaces. The research also aims to formulate a strategy for creating a sustainable open space network in the existing metropolitan cities of Pakistan.

1.5 Primary Research Questions

Open spaces play a significant role in the planning and development of urban fabric, and therefore, these places must be utilized in a well-planned manner. These

spaces impact humans as well as the natural and built environment. This impact is physical for the public visiting these spaces and on the environment for the surrounding, including visual and climatic effects. The condition and development pattern of open spaces, which are one of the essential features of a city, leads to answer following questions that arise while determining the significance of open spaces in the sustainability of development:

1. What is the rate of consumption of natural vegetation in major cities of Pakistan, and the intensity and trends of consumption of open spaces during the last few decades in Pakistan?
2. How does the consumption of open spaces impact urban sustainability?
3. What is a paradigm shift in policies related to developing open spaces in Pakistan?
4. What are the socioeconomic, physical, and environmental impacts of consumption of open spaces on public perception?

1.6 Objectives of the Research

The functions and role open spaces play in cities are fundamental elements and indicators of quality of life. Some urban open spaces determine the outlook and environment of the city, while others like active recreational open spaces are a requirement of residents/communities for recreation, health, and other physical activities. The specific objectives are of this research study are as follows:

1. To investigate temporal changes in vegetation and trends of consumption of open spaces in the study area.
2. To investigate the public perception of socioeconomic and environmental impacts of consumption of open spaces on city dwellers.
3. To model a relationship between the impacts of consumption of open spaces on urban sustainability.
4. To perform a longitudinal investigation about open space zoning and development policies in Pakistan.
5. To formulate a strategy for developing a sustainable open space network in existing cities of Pakistan.

1.7 Significance of the Study

As discussed in previous sections, open space plays an essential role in sustainable urban living, especially in a high-density urban environment. It is vital to develop these areas effectively to minimize wastage of land and enhance the value of urban open spaces. For this purpose, there is a need to conduct research considering different aspects of open space management and identify determining factors contributing to well-developed and user-efficient open spaces. It is also necessary to consider new approaches for conserving natural resources, environmental health, and quality of life in a city. The planned development can become more meaningful if new policies are adopted to manage the urban environment in major cities of Pakistan.

1.8 Scope and limitations

The sequence of this research starts with the literature review provided in the first and second chapters, followed by the third chapter of methodology. The research is conducted in three phases. Firstly, the GIS tool has studied the open spaces of three cities for change. The detail is provided in the fourth chapter. The second phase is about public perception, described in the fifth chapter. The longitudinal investigation has been performed by analyzing policies and their framework. The detail is provided in the sixth chapter. The last chapter is about the conclusion and recommendations.

As with any research, current research is not without limitations. Though Pakistan is witnessing rapid urbanization, there has been a lack of research on developing open spaces and maintaining and preserving them. A significant limitation is the lack of open-space data, especially policy intervention. Pakistan has five capital cities, one is Pakistan's federal capital, and the other four are provincial capitals. Therefore, Federal and provincial capitals are selected as case study areas because they are dynamic and facing rapid urbanization. The scope of this research is further reduced to the federal capital (Islamabad) and two provincial capitals (Lahore and Peshawar) due to unfavorable security conditions and considerable travel distance. The methodology adopted to collect data will be picked to use available resources efficiently.

CHAPTER 2: LITERATURE REVIEW

Urban open spaces are an integral part of a city design. These spaces contribute to the psychological, physical, and emotional well-being of the city dwellers and make cities resilient and sustainable. A well-designed, accessible urban landscape affects its dwellers' health, happiness, comfort, safety, and security. More than half of the world's population lives in cities, becoming the main driver of the economy everywhere. However, at the same time, congestion, pollution, and lack of spaces in cities are straining the environment and the city residents. Open spaces are the lungs of the cities and play a vital role in their prosperity (Braubach et al., 2017; Rakhshandehroo et al., 2017; Regional Public Health, 2010).

2.1 Concept of Open Spaces

A city is a combination of many components like open spaces, residential, commercial, and industrial zones. These components evolve from social, cultural, economic, topographical, and geographical aspects of a specific region. Proper detailing of these human and natural aspects always results in environment-friendly and livable cities (Young & Longcore, 2000). During the planning process of human settlements, open spaces are incorporated for different reasons. Including natural topography and land cover geography, reducing congestion, creating aesthetic beauty and monumental impact, and encouraging sports and community socialization.

Open spaces benefit settlers of the area socially, environmentally, and physically. Open spaces are mostly without covered areas, and natural or artificial landscape is a prominent feature of open space (State of Medway: Natural Assets and Open Space, 2008). The definition by the New York State Conservation Plan is comprehensive, it depicts a proper understanding of the concept of urban open spaces: *"Open space may be defined as an area of land or water that either remains in its natural state or is used for agriculture, free from intensive development for residential, commercial, industrial or institutional use. Open space can be publicly or privately owned. It includes agricultural and forest land, undeveloped coastal and estuarine lands, scenic lands, public parks, and preserves. It also includes water bodies such as lakes and bays. The definition of open space depends on the context.*

A vacant lot or a small marsh can be an open space in a big city, and a small park or a narrow corridor for walking or bicycling is an open space. However, developed areas may surround it,". In contrast, Wellington Regional Strategy "Open Spaces Working Group" defined open space as: "*Any area of land or body of water to which the public has physical and visual access"* (WHO, 1999).

2.2 Historical Roots of Urban Open Space

In the beginning, there was the land, and some of this land was transformed into parks (Doell & Twardzik, 1973). Urban open spaces have been a critical site of cultural, social, political, and economic life from early human settlements to date. The park's concept goes back to 2340 BC, the Mesopotamian and Sumerian civilizations (Doell & Fitzgerald, 1954). These park-like structures were designed purely for aesthetic beauty for the ruling class of the time, beautified with vineyards, trees, ponds, and trail systems epitomized in the hanging gardens of Babylon. Later, when humans started domesticating horses, hunting parks were made, and the first expansion carried out into the landscape (Jellicoe, 1987).

The concept of civic open spaces came when Greek civilization constructed Agora in several Greek cities. 'Agora' was a multi-functional public realm where various activities were generated, including athletics, shopping, politics, and education. This place was not a designed space. Instead, it emerged from the surrounded forces of the built environment. These agoras are predecessors of current-day plazas, parks, shopping centers, and markets. (Wilkinson, 1988). Other than Agora, there were gymnasiums, academies, and hippodromes that provided various sports and public gatherings opportunities in ancient Greece. Roman-like Greeks valued sports and recreation and planned spaces for such activities. These two civilizations have influenced the early modern-day city planning concepts. The villas of these times had designed gardens near the edges of the towns, a precursor of modern suburbs (Morris, 2013). During this time, the first public parks were made by converting private estates.

The dark ages (500 -1100 AD), which followed the decline of the Roman Empire, saw open space's demise. The focus of planning during this period was strong defense. Sports facilities and parks became least important amid constant

unrest and wars. The castles and towns were selected based on natural features that formed natural guard like hills, rivers, and islands. However, these defenses hindered the growth of a city (Wilkinson, 1988). During the renaissance, a new form of planning originated, grid-iron-based districts with straight streets and enclosed spaces like squares and piazzas. The piazzas were the center of socioeconomic activity and recreation (Stanley et al., 2012). A large expanse of land was used for experimental planning (Wilkinson, 1988).

Meanwhile, in the sub-continent, leisure gardens and tomb gardens were being constructed at the peripheries of cities for the ruling elites (Rehman, 2009). Throughout history, gardens, parks, and landscaped grounds surrounded the central state institutions, like palaces and temples. These are formal and institutional. Open spaces were deformed and brought under public use when the democracy took over the monarchy and the state took control of these large estates. In China, planned open spaces were designed specifically for the elite class, and these spaces were opened to the public after 2000 years when China became a colony of Europe (Stanley et al., 2012). Such examples of the opening of parks and gardens of the elite to the public are abundant. These include the imperial palace of Tokyo Marrakech in Morocco, Chapultepec Park in Mexico, the Forbidden City of China, and Shalimar Garden in Pakistan. Smaller parks and gardens at the neighborhood scale were usually found around civic and religious buildings like mosques and churches. Unlike modern days, there rarely were government-designated neighborhood parks. However, the cities were small, and the rural areas were close to a large expanse of open land and ecological settings. After the 10th century A.D., a rise in population was experienced. The population increased steadily until the industrial revolution in 1700, which changed the world and gave birth to a new era of population explosion, urbanization, and globalization.

The First Industrial revolution changed the dynamics of agriculture and industry in the West. Factory-based manufacturing replaced cottage industry, traditional agriculture, and manual labor, and human power replaced mechanical power. More labor was required to work in these factories as the technology improved and innovative ways of production were invented. New industry in the cities attracted the population from the countryside. Initially, the new industrial

towns grew in density. By 1850, more than half of the population of Great Britain lived in cities. However, after 1870, the cities started increasing due to the development of suburban railway stations (Carmona et al., 2010). The living conditions in these cities were deplorable for the labor. In New York, 80,000 tenements housed a population of 2.3 million people. Sanitary conditions were devastating. Air and water were polluted from the industrial effluent and smoke, which led to epidemics like cholera breaking out in these localities (Johnson & Hempel, 2006).

Once the adverse effects of the industrial revolution, like congestion, poor living conditions of labor, poor working conditions, and pollution, were experienced, various urban planning movements were initiated to counter these problems. The first one was the "congestion movement" by Benjamin Clark Marsh, which focused on overcrowding. As a result of this movement, a comprehensive zoning scheme was developed in the U.S." The parks movement" by Frederick Law Olmsted suggested mixed-use and dampening class conflict in the cityscape and converting old structures into parks (Johnson & Hempel, 2006). It was in the nineteenth century that open public parks proliferated. With increasing urban population and rural-urban migrations, cities worldwide started losing their natural habitat and beauty to urbanization. The need for more planned urban open spaces arose in the 20th century.

2.3 Typology of Open Spaces

Open spaces have been classified in diverse ways since urban planning became a discipline and the urban form and fabric became a subject of discourse. Kevin Lynch, in his book 'Image of the City,' divided the urban form into five elements, paths, edges, districts, nodes, and landmarks (Lynch, 1960). Later, Krier split the urban open spaces into two types: the street and the square and then cross-referred them with basic geometric shapes (Krier & Rowe, 1979). Carr distributed urban open space into 11 categories derived from their function, usage, and historical evolution. These are public parks, squares and plazas, memorials, markets, Streets, playgrounds (playground, schoolyard), community open spaces, greenways, parkways, atrium, indoor, neighborhood spaces, and waterfronts (Carr et al., 1992). Further, these spaces were divided into sub-categories based on their specific

characteristics. Gehl & Gemzoe categorize urban plazas into five types. According to their function, these are the main city square, recreational square, promenade, traffic square, and monumental square (Gehl & Gemzoe, 2000). On the other hand, Al-Hague simplified the classification by categorizing open space into 'green space' comprising vegetated land and 'grey space' as hard-surfaced (Al-Hagla, 2008). In another study by Stanley, open urban spaces have been classified into seven major types: food production areas, parks, gardens, recreational spaces, plazas, streets, transport facilities, and incidental spaces (Stanley et al., 2012). These spaces were divided into citywide, intermediate, and individual buildings. The topography of city plays crucial role in defining and categorizing open spaces, for example, which feature is present in cityscape forests, or agricultural land (Wang et al., 2012). Broadly open spaces can be divided into two types, active and passive. Active open spaces are primarily artificial; they are utilized for sports, education, and entertainment. Amusements parks, sports grounds, exhibition grounds, and open-air theatres are included in this category. Passive open spaces play a role in improving the physical environment (Holt et al., 2019). They include national parks, gardens, and green belts along roads. Agricultural land also falls in the category of open spaces (McConnell & Walls, 2005). Open spaces are mostly government-owned, but sometimes private owners also possess these areas. We will classify open spaces as active and passive open spaces for this research.

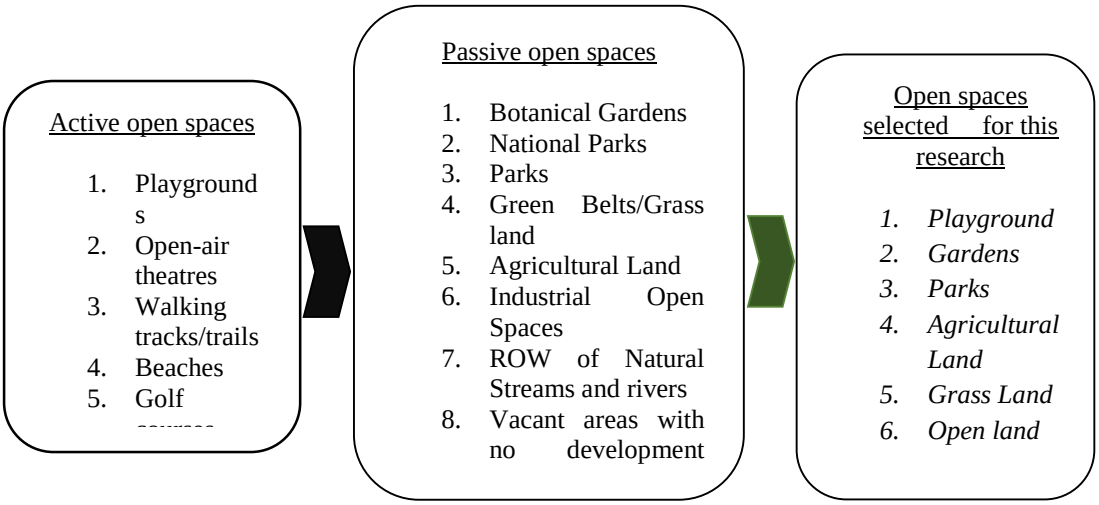

Figure 2.1 : Impacts of Open Spaces

2.4 Urbanization Impact on Sustainable Development

Natural habitats, forests, marshes, and swamps have been slurped away in rapid urbanization and industrialization. Increased rural-urban migration in pursuit of better employment opportunities in developing countries has led to new cities developed on prime agricultural lands surrounding the old urban centers, threatening food production (Beckers et al., 2020). Urban centers have also declined in terms of quality. Infrastructure is depleting, open and public spaces are diminishing due to the increased load on cities. Development and improvement in the quality of life come at the expense of the environment, destruction of natural areas, and depletion of natural resources.

Urban sprawl, leapfrog development, and satellite cities are the main contributors to the phenomenon. "Sprawl," as Bekele (2005) defines the phenomenon of development spreading out of a city into its suburbs with different areas and conditions. Previously, the term suggested that sprawl was the consumption of excessive space in an uncontrolled, haphazard manner, leading to poor distribution and eating up of open spaces and high demand for infrastructures like transportation and other amenities. This definition has not altered much over time (Simms, 2008). According to the World Urbanization Prospects Report published in 2018, the estimated urban population reached 4.22 billion, almost four times in 1950. Simms (2008) argues that since 1980, a more significant portion of the global urban population has resided in developing countries. During the second half of the twentieth century, the global urban population approximately doubled after every twenty-five years annually at a rate of more than 2.7 percent. As explained by Brundtland Commission in 1987, the term "sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their needs" (Yigitcanlar & Kamruzzaman, 2015). Agenda 21 of the Earth Summit held in Rio de Janeiro in 1992 emphasizes efforts to promote sustainable development. Sustainable development goals defined by the United Nations in 2015 realize the sustainability in city development by including it as one of its seventeen goals (UN Habitat, 2012).

Although commercial activities are an essential part of a city which leads to rapid urbanization because cities are considered engines of economic development,

failure to manage the impacts of rapid urbanization threatens the environmental quality and urban productivity (Leitmann et al., 1992). Rapid urbanization has put tremendous pressure on existing infrastructure and increased the demand for new infrastructures such as housing and shopping malls in major urban centers. Sustainability in every planning phase for a settlement is an important consideration (Simms, 2008). Achievement of sustainability is not one time task. It is a constant process and needs periodic evaluation (World Bank, 2017). Sustainability in urban planning ensures social, economic, and environmental sustainability. A sustainable city has the tiniest footprints in surrounding areas. It is a self-sufficient city that does not depend on other cities to meet its requirements. The design of the sustainable city is flexible enough to accommodate maximum population growth and provide its citizen with opportunities for their economic and personal development. Healthy communities must be the net result of sustainable settlement or city (Sen, 2013). In the past three decades, land under forestation and agricultural use has been converted for residential and commercial purposes. According to World Bank, agricultural land worldwide decreased from 39 percent in 1991 to 37.4 percent in 2016, and forest area has reduced from 31.625 percent in 1990 to 30.7 percent in 2016 worldwide. Cities are not dependent upon economic activity like industries but have expanded into a commercial culture which means mercantilism. The only suitable economic activity is real estate which attracted agricultural landowners around cities to convert their property into a development entity or sell it (Haque, N . U. & Nayyab, D. 2006).

2.5 Sustainable Development Goals and Land Use Change Dynamics

In the early 1970s, measures were taken towards "sustainable development "to combat the environmental externalities resulting from increased population, industrialization, urbanization, and vehicle dependency (Yigitcanlar & Kamruzzaman, 2015). The emergence of this new concept responded to the impacts of urbanization and development on the environment. In 2000, the UN's Millennium Development Goals (MDGs) responded to these issues and implemented sustainable practices. Later in 2015 United Nations set 17 Sustainable Development Goals (SDGs) as an urgent call of action for the developing and developed countries. These 17 goals include 232 indicators to be achieved by the year 2030. Indicator 11.3.1 of

SDGs 11 calls for “making cities and human settlements inclusive, safe, resilient and sustainable," "ratio of land consumption rate to population growth rate" are important parameters for analyzing sustainability of land use and land change with population growth (Gilani et al., 2020). Whereas, Goal 15, "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss," stresses the protection of natural green cover and sustainable land-use practices with minimal effect to the forest and natural features. The SDG indicator number 15.2.1, "progress towards sustainable forest management," calls for action by incorporating sustainable management strategies for conserving the forest cover and increasing awareness among the masses by educating them about environmental issues. It also refers to engaging a wide range of stakeholder institutions, policies, regulations, and considerations that promote sustainability and utilization of natural resources at multiple spatial scales (Gilani et al., 2020).

Congestion caused due to rapid urbanization is minimized by introducing open spaces as one of the essential infrastructure elements. Urbanization rates in developing countries during the twentieth century are disturbing due to high rates of growth in the urban areas and the rapid increase in numbers of the urban population, resulting in poverty and extreme urban primacy. To reduce these negative impacts, planners should balance individual rights and community rights in their thinking methods and approach to different knowledge fields (Naz & Ashraf, 2008). Human settlements demand a balance between the organic environment and our artificial surroundings. According to (Gideon, 1972), we become human again and let the human scale rule overall intentions. It is the core concept that is inherited in sustainable development. Importantly, sustainable development has many dimensions naturally and can be conceptualized considering the physical, economic, environmental, and social aspects of a city or community.

As discussed previously, open spaces positively affect the lives of citizens through improving urban form. These impacts are social, physical, economic, and environmental. A healthy community results from sustainable planning and development; the environment is a broader term in planning. It includes all aspects of a city and any human or natural settlements. Without managing different aspects

of the environment, it is impossible to reach sustainability (World Bank, 2017). In brief, sustainable cities meet the requirements of their present dwellers and are responsive to future communities and their requirements. There is a requirement to plan and respond to evolving needs and create places where the public wants to live permanently. Thus, it is concluded that most cities must work with all stakeholders, including the government and the private sector, to obtain a collaborative and streamlined approach to saving open spaces. By considering environmental, social, and economic issues on a long-term basis and preparing strategic plans, these issues can be resolved effectively.

2.6 Impact of Open Spaces on Urban Form

Urban form is a combination of different aspects which shape the buildup area (Williams, 2014). They have planned elements of a city. If a change occurs in urban form, it will affect the overall environment of a city and the people residing there. Urban form affects the lifestyle of the citizen. Open spaces play a significant role in shaping a city's urban form (Williams, 2014). The urban form of a city is considered healthy with an appropriate portion of open spaces. Open spaces affect a city's urban form physically and environmentally and socially. It also partially impacts the economy (Tibbetts & Fausold, 1998). The three closely integrated components that aim to achieve sustainable development are defined in figure 2.2.

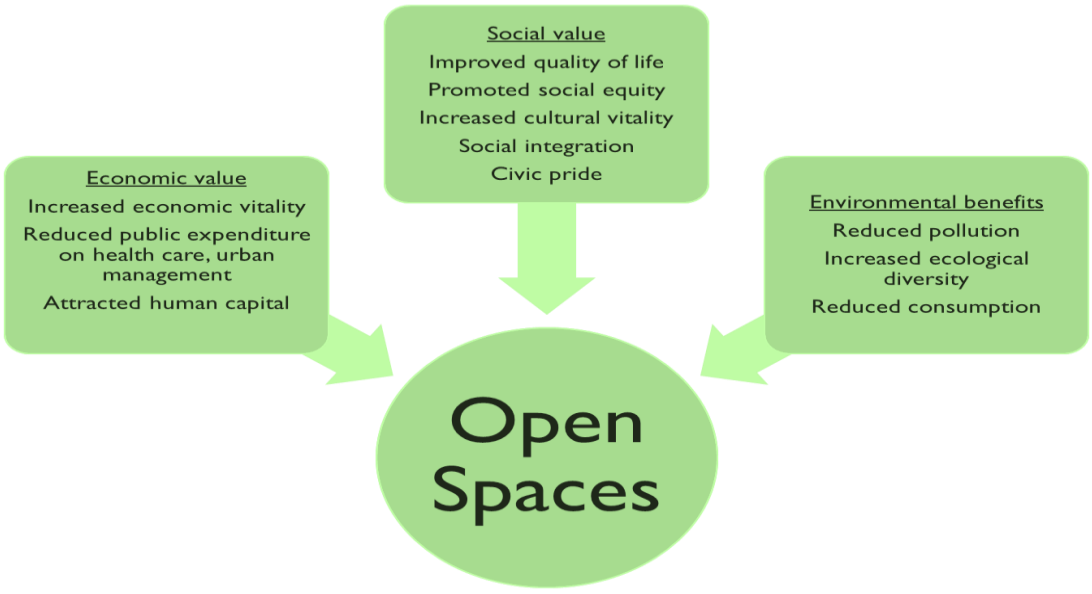

Figure 2.2: Value of Open Spaces
Source: Duygu & Fatma, 2016

2.7 Impacts of Open Spaces

Open spaces help reduce area congestion and are also used to control the density of a settlement. At the designing stage, if proper access is provided through the road network, it increases the physical impact of open spaces. They are also used as an element to decorate the city visually. Open spaces also modify sedentary lifestyles. For example, greenbelts along roads, if provided with walkways, increase the opportunity for people to reduce the use of automobiles and adopt healthy choices of walking. Similarly, playing lots within walking distance will encourage families to spend time outdoors instead of indoors (Rakhshandehroo et al., 2017). These days, cities worldwide face degradation of their environment due to rapid urbanization. The best treatment to improve a city environment is the induction of a healthy environment through utilizing small and large spaces within the city. This goal is achieved by converting these spaces into green open spaces (Regional Public Health, 2010). Therefore, if we consider the impact of open spaces on the environment, then it includes a reduction in air pollution, reducing congestion, increasing aesthetics of city, improving and preserving water channels.

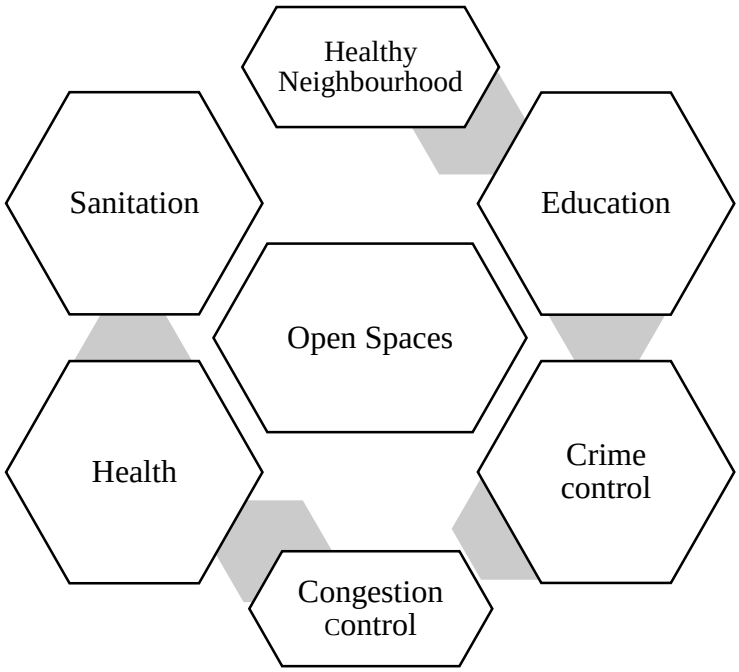

Figure 2.3: Impacts of Open Spaces
Source: Regional Public Health, 2010

As discussed previously, open spaces are active and passive and play an essential role in developing a community. People interact with each other and better understand their surrounding environment, and it has a positive impact on community health. In addition, social tolerance and maturity in citizens' behavior will be a few of many social advantages that can be observed through the presence of open space. Economic impacts of open spaces are evident in property prices, and government can generate revenue when open spaces are used for the general public's entertainment (Koohsari et al., 2015). Urban open spaces provide multi-functional social, cultural, and economic benefits, such as providing recreational activities, reducing work-related stress, etc. (Duygu & Fatma, 2016; Lynch, 1960; McConnell & Walls, 2005; Stanley et al., 2012). Protected open spaces improve physical and psychological health and build social capital (Sherer, 2006). However, due to reduced open spaces, many people are deprived of many advantages given by open spaces.

2.8 Social impacts of Open Spaces

After the industrial revolution, planners intensely observed the social impact of the lack of open spaces. As a result, recreational and open space planning became a sub-discipline of urban planning in the 19th century (Wilkinson, 1988). Open spaces promote physical cohesion. Plaza, piazza, parks, and playgrounds have been used in almost every culture. These spaces help make the urban neighborhood more livable and safer (Mumford, 2016). They give a sense of place to the community and combined ownership of a place and help control crime because residents take ownership of the surrounding area and contribute to its maintenance and development (Bramley et al., 2012). A sense of community ownership and stewardship also promotes a healthy lifestyle and social life (Dines et al., 2006). Research has shown that communities that share quiet spaces like parks have stronger social ties than communities that share complex spaces like concrete and barren land (Kafy & Ferdous, 2018). Parks and Other public spaces bring different communities together for informal contact. It also promotes participation and integration of refugees into the new society (Rishbeth & Finney, 2006).

On the other hand, a lack of open spaces has perceived loneliness and lack of social support (Braubach et al., 2017). Maximum social benefit can only be derived from open spaces when quality standards are maintained in the design of these spaces, e.g., proximity to residential and commercial areas, ease of excess, size, attractiveness, and multiple amenities for people of all ages (WHO, 1999). Open spaces in any built environment play a vital role in protecting community safety. A well-designed open space promotes social interaction and provides a place for people to meet and create opportunities for community participation. It is an essential constituent of neighborhood design, and it contributes to increasing the physical activity of its user and encourages recreation and play.

2.9 Environmental Impacts of Open Spaces

Urban spaces in developing counties are dominated by hardscape, pollution, congestion, and vehicular dependence. These factors adversely affect the health and wellbeing of its inhibitors in multiple ways. Natural scape has been replaced by asphalt pavement, concrete, and glass buildings like trees and marches. It has created the 'urban heat island effect' in the cities, like the temperature, which is much higher than in the rural areas. Urban heat island negatively affects infants, the elderly, and the poor, as they are more susceptible to thermal stress. UHI also intensifies summer heatwaves and worsens air pollution (Braubach et al., 2017). This results in more energy consumption for cooling in the summer seasons. These impacts can be decreased by increasing the green cover in the cities. Open green areas like parks and protected green lands have been found to have a lower temperature than surrounding areas. Vegetation cools the environment through evaporation, which decreases the temperature. Plants also protect from environmental hazards by providing shade in the summer, absorbing noise, pollution, and floodwater. Harmful contaminants released from industries and vehicular traffic pollute the air and are deposited in the soil. Plants effectively remove, degrade these contaminants, and purify the air and the soil (Rakhshandehroo et al., 2017). The trees, along with providing visual relief from the rugged cape, also act as a noise barrier between residential areas and busy traffic lanes when lined along the highways.

2.10 Health Impacts of Open Spaces

Apart from providing aesthetic benefit to the surrounding, Parks and other open spaces offer relief from the city's congestion. Various studies have shown that people who do not have access to parks tend to exercise less, whereas people who have access to parks exercise more. An increase of 25.6 percent in physical activity was observed with creating a park near a residential area. Moreover, if these areas are easily accessible and awareness programs are initiated in the neighborhood, people tend to get more inclined towards physical activity (Sherer, 2006). An increase in physical activity is an excellent public health strategy to combat major health issues of city dwellers. Not only does it fight obesity and obesity-related health disorders, but it also helps in decreasing depression. Exposure to nature makes people healthier and helps fight the vices of modern city life. A study conducted in America found that work productivity increases if the office windows open towards good views. A ten percent increase in nearby green space decreased a person's health complaints equivalent to a five-year reduction in that person's age (Sherer, 2006). Various studies on the relationship between open spaces and health found that people report fewer health issues when in a greener environment and rate themselves healthy, unlike living in a non-green environment. (Braubach et al., 2017). Urban life is associated with chronic stress, insufficient physical activity, and exposure to environmental hazards. Urban green spaces counter these adverse effects by providing psychological relaxation, supporting physical activities and social interactions, and creating a buffer zone in cities with fewer pollutants.

2.11 Economic Impacts of Open Spaces

Open spaces, specifically parks or green belts, give numerous direct and indirect economic benefits to the city and its residents. Fredrick Olmsted, in 1856 was the first to realize this effect when the price of the property surrounding New York City's central park that he had designed and was supervising construction rose monumentally (Schmidt & Németh, 2010). Various studies have confirmed these findings on the relationship between parks and property prices and extend this phenomenon to street trees and green spaces (Geoghegan, 2002; Hassan & Lee, 2015; Schmidt & Németh, 2010). Housing selling price is also directly related to its

proximity to open spaces. The closer the property is to a park higher its value will be. More well planned the park will be property price in its vicinity. The same relationship was also found in a study conducted by Weigher and Zerbst (1973) and the results showed that houses facing parks have higher value and that property that are far off has a lower value.

On the contrary, property near busy urban parks has also experienced a negative effect on property value (Do et al., 1994). On the other hand, houses near extensive natural areas are sought-after zones and have high property value (McConnell & Walls, 2005). McConnell & Walls(2005) analyzed 40 studies published between 1967 and 2003 which used the hedonic model and concluded that all the studies supported that property surrounded by preserved land had a higher value than potentially developable land. The paper concluded that " there is value to preserving parks, greenways, forests, and other natural areas in urban locations. However, the values vary widely with the size of the site, the proximity of the open space to residences, and the type of open space. As we stated above, busy urban parks often negatively affect property values for nearby households; this shows up in several hedonic studies.

Moreover, the hedonic studies show mixed results for different kinds of open spaces, with some natural areas and wildlife habitats increasing property values and others decreasing them. One good recent hedonic by Irwin (2002) finds very different results for urban and suburban locations. All kinds of open spaces provide more value in urban areas than suburban ones. Greenbelts, or so-called urban growth boundaries, appear to have value, but one exciting study finds that those values can change over time. Economic value is not limited to land prices only. Another aspect of financial sustainability is the ability of the city to provide its resident's fresh vegetables, poultry, and honey by using the urban land efficiently (Hassan & Lee, 2015). The middle class seeks to move near community green spaces. This trend supports the current direction of peri-urban growth, where people move away from city centers to the peri-urban areas to search for a healthier environment. Well-designed open spaces and preserved historical open spaces also attract tourism (Kafy & Ferdous, 2018). Tourism contributes to the economy and is an incentive to develop

places for the attraction of people. It also provides cultural display through the design of public spaces representing the area's culture.

2.12 Open Spaces Around the World

Open spaces are organized through planning policies and their robust implementation. Now, after Agenda 21, which is a non-binding, voluntarily implemented action plan of the United Nations about sustainable development. It is a product of the Earth Summit held in Rio de Janeiro, Brazil, in 1992. Through this, it is recognized worldwide that the importance of preservation of open spaces and their development for a sustainable environment in developed countries. Open spaces are considered precious because they protect nature and the natural environment. Open spaces around the world are preserved, planned, and conserved. Open spaces are researched by planners for their diversified nature and effective utilization, especially in urban planning. During the last few decades, planners worldwide focused on the identification, designing, and development of open spaces not only for human communities but also to benefit the overall environment of any region. Comprehensive plans for developing parks and open spaces are prepared on the city level; examples are the USA, local open space plan for New York, and Auckland council action plan for open spaces (Auckland Council, 2013). Similarly, in the U.K. Mayor of London prepared open space best practice guidance.

2.13 Treatment of Open Spaces in Pakistan

Pakistan is a developing country with most of its population living in towns and villages. However, according to World Bank, the rural growth rate is 1.4 percent, and the urban growth rate is 3.3 percent (Aaron, 2021). Pakistan's existing cities face a rapid increase in illegal occupants and land encroachment in urban areas. (Ali, 2002). Most cities of Pakistan have a history before the partition. The Government of Pakistan plans only a few. These historic cities rapidly expand, consuming agricultural and forest land (Naz & Ashraf, 2016). Because of the organic growth pattern of cities, planners mainly focused on providing basic infrastructure facilities to residents. They try to combat congestion by providing wide roads. Less consideration is given to the designing and development of open areas which can be encroached on by the land mafia and have a less financial benefit for owners (Hasan,

2010). Planning policies of different developing authorities of Pakistan also indicate that only small percentages are provided in planning parameters for open spaces (Test, 2013). No comprehensive development plan of open spaces for any Pakistani city has ever been prepared (Farkhunda et al., 2021). Very few research studies are conducted in Pakistan about open spaces. The ANGST model, which specifies guidelines for green space access provision, has been adopted by (Ali & Shafqat, 2014), who concluded that parks that are an essential component of open spaces are not provided adequately. Policies and regulations are framed on an experience basis without any authentic research. PEPAC (1983), the planners' bible, only indicates percentages of open spaces required while approving any development plan. It is silent about the detailing of the development plan for open spaces. Additionally, hardly any literature is available which evaluates the existing system of open space development and preservation in Pakistan; Therefore, the sustainability of open spaces, provided in considerable percentages in planned urban areas, is hard to obtain.

2.14 Urbanization, Open Spaces, and Major Cities of Pakistan

At the time of independence, the total population of Pakistan was approximately 31 million. At that time, sixteen percent of the population lived in urban areas, whereas eighty-six percent was rural (Ali, 2002). In 1951 the population of Pakistan was 33.8 million, of which migrants from India constituted 6.5 million which is a net increase of approximately five percent (Ali, 2002).

Table 2.1 : The Trend of Urbanization in Pakistan

Admin Unit	Population in Millions			Urban Share %		
	1991	1998	2017	1991	1998	2017
Pakistan	84.25	132.35	207.77	28.30	32.02	36.36
KPK	11.06	17.74	30.52	15.06	16.87	18.77
FATA	2.20	3.18	5.00	-	2.69	2.84
Punjab	47.39	73.82	110.01	27.60	31.37	36.71
Sindh	19.03	30.44	47.89	43.32	48.75	62.02
Baluchistan	4.33	6.67	12.34	15.62	23.69	27.65
Islamabad	0.34	0.51	2.00	60.00	65.72	50.58

Source: Pakistan Bureau of Statistics

The annual growth rate of the population of Pakistan fluctuated between approximately two percent to three percent from 1951 to 1998. According to the latest Population census of 2017, a decline is observed in the growth rate at the national level, which was two percent between 1998 and 2017, of which thirty-six percent live in urban areas (Table 2.1). It is projected that by 2050, half of the population will be living in urban areas.

As the sixth most populous country, Pakistan has the highest urban growth rate in South Asia. The main factors for rapid urbanization in Pakistan are migration from rural areas and a high population growth rate. People are migrating to urban regions to pursue a better livelihood. The lack of basic facilities in rural areas and insecurity and instability in the war-torn rural regions, particularly Pakistani tribal regions, are pushing them towards cities (Kugelman, 2014b). As a result of this, the pressure on urban infrastructure has increased. Cities face urban decay, economic decline, inflation, poverty, and water and energy shortage. At the same time, the cities are failing to accommodate all migrants, leading to a housing backlog and an increasing number of squatter settlements (Rana & Bhatti, 2018).

Lack of structured planning is causing the existing infrastructure to collapse under the growing population. Cities are growing haphazardly with peri-urban growth, leapfrog development, and ribbons of settlement along the major highways and urban centers are the new trends, resulting in the consumption of open public spaces. According to one research, a large area of agricultural land has been consumed by urbanization or urban sprawl (Ahmad, Aboobaider, Isa, Hashim et al., 2014). In Punjab, out of sixty districts, four including Lahore, Sheikhupura, Faisalabad, and Gujranwala, are home to more than one-fourth of the province's total population (Ali, 2002). The same trends can be observed in Khyber-Pakhtunkhwa's Peshawar, Nowshera, Risalpur, and Mardan districts.

2.15 Islamabad

Islamabad is the first and the only planned city in Pakistan. It was purposely built to replace Karachi as the capital of Pakistan from 1959 to 1963. Various factors such as accessibility, security, climate factor, and scenic beauty were considered before selecting the location (Zafar, 2012) and the distance from the commercial

activities and bureaucratic hold of the civil servants and business elites (Daechsel, 2013). It was designed on the principles of dynapolis and Ekistics by Doxadis to achieve traditional modernity. The city was designed for automobiles, but pedestrian connectivity was important, especially at the neighborhood level.

Islamabad is situated at the foothills of the Himalayas, surrounded by Margalla hill on the north and northeastern side, creating a scenic backdrop for the city. It was considered the "hill station city operating all year round" for the longest time (Daechsel, 2013). The city is axially planned with a major city center separated by green areas. The total area of Islamabad constitutes 906 sq kilometers, and it is divided into five zones. Two significant axes were used to define the points of access. The first was the existing Murree Highway connecting Rawalpindi to the northern hill station of Murree. The other intersects at what is known as the Zero Point and leads south to connect to the Grand Trunk (G.T.Road). This perpendicular axis is known as the Islamabad Highway. In the master plan of Islamabad, the urban area is planned in nine series from A through I. Each series is further divided into sectors, and each sector covers an. area of two square kilometers, derived from the human scale and from the traditions of ancient development where the longest distance was no more than 2000meters (Khan, 2005)

Sectors are divided into four sub-sectors, each having a central shopping mall, park, mosque, and school. Each sector is surrounded by green belts, which isolate the neighborhood from the noise and nuisance of traffic. In the words of Doxadis, "*As the town grows and traffic increases, a certain width of road section will be implemented. The rest of the right-of-way space could be rented for vegetable gardens and fruit trees. It is understood that in no case buildings of any kind, either temporary or permanent, be allowed in this area*." (Khan, 2005). Each sector relates to a gridiron system of significant transportation corridors explicitly designed for high-speed traffic, strictly separated from pedestrian traffic. At the time of conception, it was well understood that a capital city could not be confined and grow into a megacity one day. The city was designed keeping in view the historic city, which grew either marginally or explosively. The city center drifts far away from the new developments in the latter case.

On the other hand, Islamabad was designed to grow towards the south in a uniform and planned manner. According to Doxadis, "*In such a dynamic city, we do not have a conflict of man and machine; we do not run the danger of moving in the vicious circle of the old city devouring itself to grow*." The unidirectional development gives the city its dynamic nature as the central facilities will develop proportionately with the city's growth into boundless limits.

2.15.1 Urbanization Effect on Islamabad

According to Doxadis, "*it is necessary to surround the sector, the natural urban unit to which humanity is used, by a strip of open space. To a). Allow everybody to reach this open strip in the same amount of time as in the past city. b). Keep a proper balance between open landscape and urban dimensions. c). Use these strips of land for proper plantations, which will contribute to the proper ventilation of the city and the proper balance of elements leading to a better climate*" (Doxadis., 1962). The city, designed to strike a balance between the urban and open areas, does not have landscape greening policies to prevent the massive loss of natural and planned open spaces to urban sprawl.

In 1961, its population was approximately 11,669, which increased to 805,235 according to the 1998 census report. From 1981 to 1998, Islamabad's highest growth rate was 5.7 percent per annum (Ali, 2002). According to the 2017 census report, the city's population has increased to 2,006,572 with a 4.91 percent annual growth rate. In the initial decades, the city urbanized at a slow pace. During the reign of President Pervez Musharraf, the city experienced a population boom due to its economic policy, which led to the development of high-rise buildings and luxury housing in Islamabad. The Diaspora started investing back in their homeland, especially the capital, to secure a safe place back home as the situation outside the country was unstable because of the incident of 11 September (Daechsel, 2013). Later after the devastating earthquake of 2005, many poor refugees migrated to the city to make a living by working as house helpers and in other low-level salaried jobs. The unstable situation in the North-West of Pakistan also led to the movement of people to Islamabad. That was when Islamabad experienced rapid urbanization, which led to traffic congestion and urban disorder (Daechsel, 2013).

Over time, Islamabad has emerged as a thriving economy with sales and services as its primary industry, attracting people to migrate and settle here. Unfortunately, it is losing its character to urbanization, deforestation, and encroachments that quickly eat up the city's green landscape (Naeem et al., 2018). The urban portion of Islamabad was 346.17 square kilometers in 2000 and has increased to 407.18 square kilometers and 483.40 square kilometers in 2005 and 2010, respectively. The rural periphery is mainly converted into urban land. An area of 21.60 square kilometers of the rural area was converted into a developed urban area in 2005. This development is towards the south of the city. From 2005 to 2010, an area of 76.22 square kilometers has urbanized further. That means an increase of eighteen percent. The city was designed for 2.5 million people, and it is currently home to more than 1.5 million people. It is forecasted that the city will reach the total design population by 2030 if it continues to urbanize at the current rate (Manzoor et al., 2019).

Since the inception of Islamabad, seventeen significant changes have been made to the master plan. In the original master plan of Islamabad, Doxadis surrounded the city with a vast expanse of agricultural land in Zone II and V so that the city would grow its food and not depend on other cities to meet other cities' food demands. However, unfortunately, these zones were converted into residential areas in 1992, converting rural settings into urban ones. The city planned to expand southwestern, but the current trends show extending in every direction except the Margalla Hills. The land cover of Islamabad is changing very rapidly. A study conducted on the change in land use and land cover changes from 2010 to 2015 warned the urban planners, policymakers, and landscape planners about the alarming situation the capital is going to face following the current trends of urbanizations without proper land-use policies and landscape greening policies (Naeem, Cao, Waqar et al., 2018). In another study, factors like urbanization and urban sprawl have reported changes in land use and land cover (Naeem, Cao, Waqar et al., 2018).

2.16 Lahore

Lahore is the capital city of Punjab and the second-largest city of Pakistan and is situated on the left alluvial plain of River Ravi. On the west and north of

Lahore lies Sheikhupura district, on the South is Kasur district, and the eastern border is bound by the international border of Pakistan and India. The city lies 208-213 meters above sea level, and A-class agricultural lands surround the city.

2.16.1 Lahore and Open Spaces in Historical Context

Lahore is one of the few historic cities continuously undergoing urbanization. Its history date back to 982 CE, described as a town with "impressive temples, large markets, and huge orchards" (Wink, 1997). The history of Lahore is rich with three distinct historical periods that contributed majorly to shaping the city's current urban form: Mughal (1526-1747), British (1849-1947), and the post-independence period. According to Hindu traditions, Lahore city gets its name from 'Loh,' the son of the Hindu god Rama who is said to have founded the city (Baqir, 1985). During the third Mughal emperor Akbar era, the city was fortified, and many gardens were built on the periphery of the gated city along with the River Ravi. The tradition of building gardens was continued by the successors like Shah Jahan, who constructed the Shalimar Garden on the concept of 'Charbagh. Other Mughal rulers replicated the concept. Many more gardens were constructed like tomb gardens of Jahangir, Nurjahan, Asaf Khan, and Ali Mardan Khan and pleasure gardens of Gulabi Khan, Wazir Khan, and Chauburji a (Rehman, 2009). Lahore was known as the "city of gardens" during the Mughal rule. The legacy of constructing gardens was continued during British colonial rule. Lawrence garden (also known as Bagh e Jinnah), racecourses, parade grounds, tennis pitches, and cricket and polo pitches developed towards the southeast of the walled city (Rehman, 2009). Lahore Cantonment, built during the same period, was described as ' the garden city (Rana & Bhatti, 2018). After independence, many gardens and landmarks like Iqbal Park, Racecourse Park, Gulshan Iqbal Park, and model Town Park were added to the cityscape. The unused space along the roadsides was planted with trees in the 1980s under the garden movement to make the roads part of the garden (Rehman, 2009). Small and large parks and open spaces are still being developed along with roadside plantations in Lahore. Now dominated more by urban sprawl and densely populated urban zones, the city strives to protect its open spaces from illegal settlements and encroachments.

2.16.2 Urbanization and Lahore

Lahore is one of the two primate cities of Pakistan, Karachi being the other one (Arshad et al., 2019). It was a well-established trade city in the Mughal period, and during the colonial period, it served as the head link city of the British Empire. A new town was built for the British towards the south and the south-western side of the walled city, known as Civil Lines. Development of Cantonment for the imperial army five miles from the civil lines. Along the Mall Road were schools, colleges, churches, parks, and other government buildings like a high court and museums. From 1920 to 1947 growth of new indigenous communities began at Krishan Nagar, Gawal mandi, Islamia Park, and Garhi Shaho. By the time the British relinquished their rule in 1947, Lahore had become a mosaic of urban forms with at least four distinct urban physical idioms (Arshad et al., 2019):

- The walled city
- New indigenous communities
- The civil lines
- The cantonment area

As Hasan (2010) narrated at the time of independence, Lahore had the basic infrastructure and was ready to become a metropolitan city. After independence, the Muslim migrants from India settled in the urban areas of Pakistan. Lahore and Karachi were the headquarters and the two prominent localities for settling these migrants. New development schemes were started to distribute a load of the population to other areas. The new schemes included the Gulberg and the Samanabad area. These developments were in the south and the south-eastern directions, and like all the previous developments, the same trend followed in the 2021 proposal for Lahore. The government also allocated a large percentage of the national budget to develop the infrastructure of these cities to resolve migration issues. That resulted in Lahore becoming more advanced and developed than any other city in the province. Lahore was strong economically and kept attracting more industry and providing more employment opportunities. Therefore, the population kept on increasing at a very rapid rate. The Lahore population has seen a big boom in the past 70 years, as seen in figure 2.4. Lahore has turned into megacities with well-developed infrastructure and a fast road network.

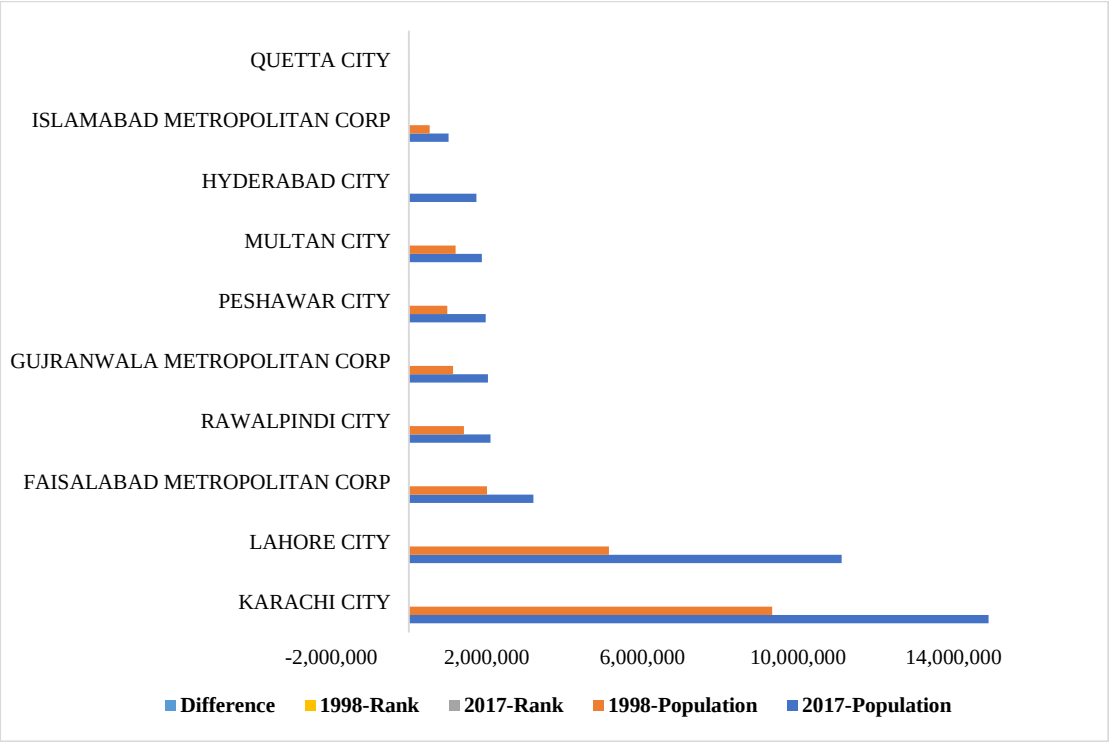

Figure 2.4: Lahore Census Comparison Bar Chart

The city of Lahore has expanded manifold in the past seven decades, as is evident from the census results, which indicate the trend of urbanization.

2.17 Peshawar

Peshawar, the oldest city in Pakistan. This city was the center of Gandara civilization, the capital of the Kushan Empire, and acted as an important trade center during the Mughal period. Moreover, after becoming part of Pakistan after independence, it served as the provincial capital of the province of Khyber Pakhtunkhwa. The name 'Peshawar' was coined by Mughal Emperor Akbar and derived from "pesh and awardan," which means "the first coming city" or "the frontier city." After crossing the Khyber Pass, Peshawar was the first city in the Indian Sub-continent. High walls surrounded the old city of Peshawar.

However, the high increase in the population led to people settling outside the bounds of the citadel. Peshawar is now a densely populated city, dominated by urban sprawl, peri-urban areas, ribbons, and satellite towns (Ali, 2002). The development of Peshawar city in three historical stages:

i. The ancient, original Walled City area.
ii. The British built a modern-style Cantonment area.
iii. The Pakistani era of modern planned suburbs and satellite townships:
    a. University campus and town area.
    b. Colonies surrounding the Walled City.
    c. Newly developed satellite suburbs like Hayatabad.

2.17.1 Peshawar and Open Spaces in Historical Context

According to the 1961 census, 29 percent of the population of the province of Khyber Pakhtunkhwa resides in Peshawar. This figure increased to 33 percent in 1998, which increased to 40 percent in 2017. The average population increase went up from 1.9 percent in 1961 to 9.2 percent in 1980. Apart from rural-urban migration, this increase in urban population witnessed the migration of Afghani refugees to Pakistan after the Soviet invasion of Afghanistan and the subsequent jihad and civil wars. During this period, 3.7 million Afghani refugees entered Pakistan. The abnormal increase in the Peshawar population was due to this influx as most of these migrants preferred to settle in Peshawar as they shared the same language and culture. This influx made Peshawar more prone to urban sprawl. From 1980 till today, this increase fluctuated between 2.5 percent to 3.6 percent. Unfortunately, the city could not cope with the increasing population, resulting in deteriorating living conditions, increased densities, and poor settlements' underserviced and haphazard development.

2.17.2 Urbanization and Peshawar

Peshawar, like Lahore, was fabled as the city of gardens. The walled city surrounded vast gardens. One of the remnants of that time is Shahi Bagh. Shahi Bagh of the Mughal era, Company Bagh from the British period, and Wazir Bagh were built-in 1802 (Hasan, 2010). However, not much work is done to increase the number of open spaces as the population increases. Currently, there are 13 major and minor parks in the city. Peshawar has terrain which possesses a network of rivers, canals, and many small streams. The valley is surrounded by hills, waterfronts, and large green regions (UNICON Consulting S, 2014).

2.18 Summary

The city components are planned to keep a specific region's social, cultural, economic, topographical, and geographical aspects. Proper detailing of these human and natural aspects always results in the formation of an environment-friendly and livable city (Longcore, 2000). During the planning process of human settlements, open spaces are incorporated for different reasons. These reasons include natural topography and geography of land cover, reducing congestion, creating aesthetic beauty, monumental impact, and encouraging sports and community socialization. Open spaces benefit settlers of the area. These benefits include social, environmental, and physical (Land Use and Urban Design, 2014). Open spaces are mostly without covered areas and natural or manmade landscape is a prominent feature of open space (Natural Assets and Open Spaces, 2008). Planners also define open spaces as the lungs of cities (Khan M., 2014). Recently open spaces have been included in Sustainable development goals which are successors of the Millennium Development Goals. According to (UN Habitate, 2015), Goal 11, target 11.7 of SDGs, defines public open spaces as: *"Public spaces are all places publicly owned or of public use, accessible and enjoyable by all for free and without profit motive. This includes streets, open spaces, and public facilities".* Open spaces relate to these needs so that their presence will enhance the visual impact and make the urbanized environment healthy for citizens, including physical and mental health. Congestion caused due to rapid urbanization is also minimized by introducing open spaces as one of the important elements of infrastructure. Sustainable cities are places that meet the needs of their current dwellers without compromising the community's future needs. It is important to consider environmental, social, and economic factors as a challenge and develop long-term strategic planning, in this way, these pressures can be released effectively and positively.

CHAPTER 3: METHODOLOGY

Mixed methods research involves collecting, analyzing, and integrating quantitative and qualitative data. This approach is used with integration because it provides a good understanding of the research problem. In this research, by combining both the researcher gains in-depth experience and knowledge while overcoming the weaknesses of using each approach. To study the sustainability of open spaces, a physical feature of a city, the researcher needed to collect and analyze quantitative and qualitative data. Therefore, this approach was selected as the most appropriate to generate results.

3.1 Case Study Area

The study areas consist of three major cities in Pakistan. Two are provincial capital, and the third is the federal capital of Pakistan. The three cities are selected for this research study because all three are capitals and highly urbanized areas, with rapid growth rates. Therefore, open spaces are frequently consumed due to real estate development and illegal encroachments. These are also cultural hubs of Pakistan. Following is a brief description of all the selected cities.

3.1.1 Islamabad

Islamabad is a planned city with a broader concept of master planning proposed by C.A Doxiadis in 1960. The Capital Development Authority has organized, managed, and developed. The fundamental idea underlying the master plan of Islamabad is the development of capital for Pakistan, which should be secure in terms of boundaries. The goals of the Islamabad master plan are based on ecological and environmental conditions. The total area of Islamabad is 906 square kilometers (Capital Development Authority, 2019), it is located between 33◦28'12"–33◦48'36" N latitude and 72◦48'36" E – 73◦24' E longitude. The elevation of the urban areas of Islamabad varies between 400–600 m, which indicates an undulating surface as its dominant character. The capital is flanked by the Margalla Hills on the northern side of the city. The total population is about 2 million with an area of 906.5 square kilometers (Naeem et al., 2018).

3.1.2 Lahore

Lahore is the capital of Punjab and the second-largest metropolitan area in Pakistan. It ranked eighteen when it comes to the population of this city in the world. The total population of Lahore is 1.12 million as per the Lahore census, 2017. This city has historical importance among South Asian cities, with the history dating back over a millennium. Lahore is the central cultural hub of the Punjab region in Pakistan. The area of the city is 1772 square kilometers which are spread between 31° 15′ and 31° 43′ N latitude and 74° 10′ and 74° 39′ E longitude (Shirazi & Kazmi, 2016). The city is of historical importance and origin linked with the Mughal and British periods. The city is also the main tourist attraction and it is a commercial hub due to its border with India in the east.

3.1.3 Peshawar

Peshawar is the capital of the Khyber Pakhtunkhwa province of Pakistan. It is the largest city of Khyber Pakhtunkhwa, and according to the 1998 census, it was the eighth-largest city and became seventh according to the 2017 census of Pakistan. Peshawar is a metropolitan city. Peshawar is situated in a large valley near the eastern end of the Khyber Pass, close to the Pak-Afghan border. The city is irrigated by various canals of the Kabul River and by its right tributary, the Bara River. Its recorded history dates to 539 BC, making it the oldest city in Pakistan and one of the oldest in South Asia. The population of this city is 1.97 million according to the census 2017. Peshawar city area is 215 square kilometers, the capital city of Khyber Pakhtunkhwa, is in the northern part of Pakistan with Latitude 34º 02' and Longitude 71º 37'.

3.2 Research Design

This research determines the role of open spaces in achieving the sustainability of a city. Exploratory and descriptive research has been used to achieve the goals of this research. Exploratory research is selected to solve the problem that lacks clarity. It also determines the best research design, data collection method, and selection of goals. It also draws results with extreme caution. Due to its fundamental nature, it helps in a perceiving problem that does not exist.

The descriptive method describes the data and characteristics of the population or phenomenon to be researched. It provides answers for who, what, where, when, why, and how. The data are always factual, accurate, and systematic.

3.2.1 Description of Data Collection

The selected research is mixed; therefore, primary and secondary data are acquired from different sources.

3.3 Type of Data and Collection Methods

Data collection is collecting and analyzing data for research using some techniques. Data collection is done to get the facts about the research conducted. This is to draw answers to research questions. Data collection must be pure and reliable. Collected data is always from the correct sources.

3.3.1 Temporal Changes and Trends in Open Space

The temporal changes and trends in open space in three selected cities of Pakistan investigate through satellite images obtained from Google with a five-year gap. The open spaces selected for these cities with a five-year difference are 2005, 2010 and 2015. They were digitized using Google Earth Pro and Arc-GIS. The data validation is done by point data comparison in which 30 random points were selected from the digitized data and compared on Google Earth Pro for its valid locations.

3.3.2 Public Perception

To obtain a public perception, a survey has been performed through a questionnaire designed to get an opinion about socioeconomic and environmental impacts on open spaces consumption. The questionnaire has been divided into three sections. The first section is about the demographic profile of participants and information related to open spaces present in the vicinity. The second section is designed to obtain an opinion about open space. This section is intended on a five-point Likert scale ranging from 1 to 5 with 1 for strongly agree, 2 agreed, 3 undecideds, 4 disagreed, and 5 strongly disagreed. Any value near 1 is considered to have a positive impact, with the participant aware of the importance of the mentioned aspect. A value near 3 is the most negligible impact as the participant has not had sufficient knowledge of the specific element of open spaces. There are five selected

indicators as shown in table 2: health, social, economic, environmental, and physical, on which the public's open spaces are studied. These five indicators help determine the sustainability of open spaces provided or presented in the vicinity of their residences. The third section consists of open-ended questions designed to take the public's perception of open spaces in their own words.

Table 3.1: Health, Environmental, Social, Economic, Physical Indicators

Impacts	Key Indicators
Health	Physical health
	Psychological
	Associated physical risk.
Environmental	Satisfaction with the density of public open spaces by typology, for example, Urban parks, green areas, green belts, botanical gardens, and playgrounds.
	Landscaping and protection of the vacant spaces.
	Both positive and negative impacts of open spaces.
	Encroachments.
Social	Educational opportunity
	Aesthetic enjoyment
	Well-being, social ties
	Recreational opportunities
Economic	Higher property value.
	Enhanced market value.
	Increase in sales or leases as compared to conventional development.
Physical	Accessibility
	Safety.
	Surrounding land uses.
	Design efficiency.
	Appropriate percentage regarding other amenities.

Notes: The table shows the indicators against which public perception is measured about environmental, social, economic, and physical impacts. Primary data from respondents has been obtained through a questionnaire based on mentioned indicators, and the data was collected through a field survey from three cities.

The sample size for the survey is obtained using Slovin's formula, which is selected because a sample is taken from a population. A formula must account for confidence levels and margins of error. When taking statistical models, sometimes a lot is known about a people, sometimes a little may be known, and sometimes

nothing is known at all, or there may be no information about how a population will behave. Therefore, Slovin's formula is used as nothing is known about people's behavior.

$$\mathbf{n = N/1+N}e^{\mathbf{2}}$$

Where

n is the sample size

N is the population size

e is the margin of error.

The total population of three cities is taken to obtain the sample size through the formula. After getting a reasonable sample size through the mentioned formula, proportionate sampling is performed to obtain the sample size for each city. The sample is increased to deal with errors that occurred during data collection.

Table 3.2: Survey Sample Size

City	Population (1998 census)	Sample (Slovin's formula)	Sample
Islamabad	529,000	200	250
Lahore	5,443,000	200	250
Peshawar	983,000	200	250
Total	695,5000	600	750

Notes: The above table narrates the total and the sample size for each city.

3.3.3 Longitudinal investigation

A longitudinal investigation of open space zoning and development in Pakistan required Secondary data. The data collection for this objective is done through developing authorities and metropolitans who manage the development of three cities. These departments' policies and regulations are standards to control and implement development patterns. All planning standards related to the management of open spaces from concerned departments have been obtained since the formulation of that department for analysis.

3.3.4. Strategy Formulation

Formulating a strategy for developing a sustainable open space network in the existing cities of Pakistan is the final objective. To achieve this objective, expert opinions have been obtained through interviews. Stakeholders listed in Table-4 have been interviewed.

Table 3.3 : Interviewees / Stakeholders List

Interviewees	Description	Interviews	Nature of information
Intellectuals	Journalist Architects and planners (Practitioners) Academicians	20	The existing condition of open spaces. Perception about change in the current scenario.
Government officials	Town planners CDA officials LDA officials TMA officials PDA officials Officials from the horticulture and park development departments	20	Opinion on existing regulations. Changes they suggested.
Consultants	Urban unit ENRON	5	Problems in existing regulation. Suggestions about their improvement.
Civil societies and NGO officials	IUCN, EPA, and MHNP Society.	10	Problems in existing regulation. Suggestions about their improvement.
Total		55	

3.4 Analysis and Processing of Data

3.4.1 Quantitative Data Analysis

Quantitative data analysis is helpful for researchers, especially in drawing meaningful results from extensive qualitative data. The most crucial benefit is separating the significant confounding factors that obscure the qualitative results.

3.4.2 Descriptive Statistics

Descriptive statistics would be used to analyze the qualitative data, i.e., collectively inferring the study findings by computing the frequencies, averages, and percentages of the responses to the questions related to the socio-political and institutional barriers. The perception of impacts categorize into three types, i.e., mild, moderate, and severe. Likewise, the characteristics of the impact would be examined and analyzed by gauging the deviations as mean, median, or standard.

3.4.3 Inferential Statistics

Inferential statistics apply to draw logical inferences against the data yet to be collected or relate the findings to the sample. To recognize commonalities in patterns, identify associations or contrast/divergences among two or more variables. Moreover, selected tests would be applied to establish whether an average value of a particular observation differs considerably/ significantly or otherwise.

3.4.4 Factor Analysis

To determine the significance and strength of interrelationships of different socio-political and institutional barriers for sustainable urban development. The importance and nature of relationships between various obstacles assess by duly considering the gravity and intensity of the impacts of said barriers upon sustainability irrespective of diversified dimensions in the urban development course of actions, patterns, procedures, and mechanisms. Factor analysis was performed for better interpretation and easy understanding of the barriers. Factor analysis categorizes many variables, which are connected or to some extent, into small categories and makes it easy for us to interpret and then explain all the variables quickly and smartly. KMO measure test was also conducted to check the suitability of factor analysis for our study.

3.4.5 Crosstab Analysis

The analysis was performed on the five dimensions selected for checking the relation of these dimensions with sustainability. A separate analysis was performed on these five dimensions, and their results were used to generate sustainability Index. The Sustainability Index was further crosstab with different demographic data

collected to obtain results about public perception. This crosstab analysis generated a correlation matrix showing correlation between the Sustainability Index and the Socio-Demographic Profile of the respondents. The values of Pearson Correlation showed the impact of the Sustainability Index on these Socio-Demographics. Pearson's value varies between +1 and -1, where +1 is a perfect positive correlation and -1 is a perfect negative correlation. 0 means there is no linear correlation at all.

3.4.6 Temporal Analysis

The temporal analysis adds time and date information to Geographic Information System (GIS). The changes observed occurred over the period at different locations. A temporal GIS process manages and analyses spatial data that changes with time. The modeling of temporal information in GIS dates back to the mid-1980s. Temporal modeling is an integration of time along with relational databases with computer science. Later, it extends into object-oriented modeling. In GIS, this trend is adopted by introducing time-stamping layers to include time stamping events and processes within the layers (Terence Young, 2000).

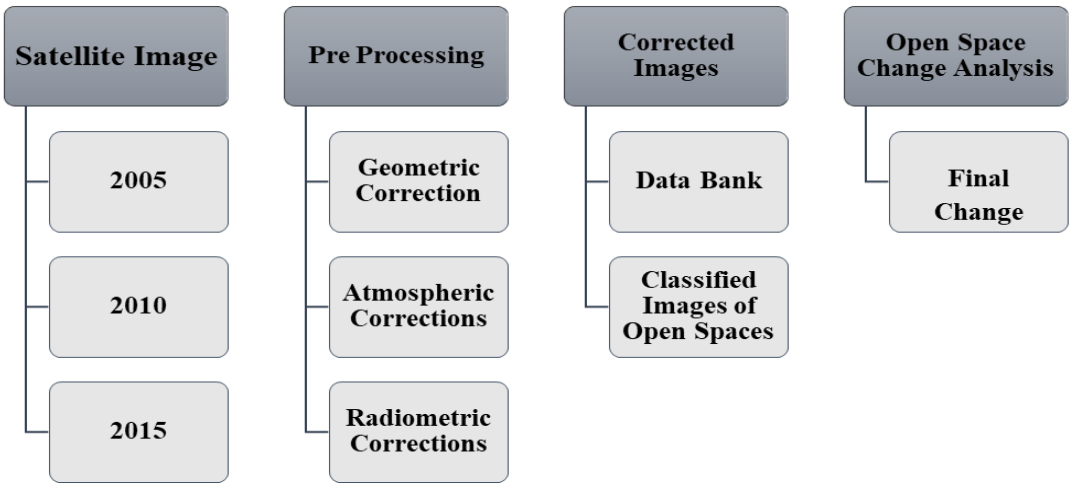

Figure 3.1: Temporal Analysis for Three Cities

3.4.7 Qualitative data analysis

Qualitative research is the process of collecting, analyzing, and interpreting non-numerical data, such as language. Qualitative research can be used to understand how an individual subjectively perceives and gives meaning to their social reality.

3.4.8 Content analysis technique

The information and relevant contents were obtained from documents, interviews would be recorded and compiled systematically, and subsequently, the same would be examined and analyzed through analysis. For the policy analysis, this research used the content analysis method, and this method is widely employed in social sciences. (Neveling, 2013). The content analysis has been adopted for this research as it provided the opportunity to review the urbanization and open spaces in Pakistan's context both in qualitative and quantitative aspects.

CHAPTER 4: DATA ANALYSIS

PART-I: SPATIO-TEMPORAL ANALYSIS

Urban green spaces provide multi-functional social, cultural, and economic benefits, such as recreational activities, enhancing cultural heritage values, reducing work-related stress (Geoghegan et al., 1997; Gobster & Westphal, 2004; Miller, 1996), Protect community, improving health, psychological relaxation (Morancho, 2003) and build social capital (Braubach et al., 2017; Verlič et al., 2015). However, due to reduced open spaces, many people are deprived of their usefulness. To find a trend of the consumption of open spaces, the spatial-temporal change in open spaces is to be evaluated and analyzed. Spatio-temporal analysis plays a vital role in helping decision-makers, policy planners, and governments in generating evidence to generate data and prepare appropriate strategies to formulate and plan land use spatially as well as to understand agents of change within time (Hailemariam et al., 2016; Tan et al., 2016). Investigating the relationship between land use open spaces and factors influencing their utilization, like urbanization, can provide primary references for site selection of green open spaces in strategic planning of urban land use (Hailemariam et al., 2016). Hence, Spatio-temporal analysis help decision-makers and policymakers ensure proper planning for sustainable development, which helps understand the changing environment's dynamics (Teferi et al., 2013). In this chapter, the study determines the pattern of consumption of open spaces, which helps identify factors affecting the development pattern of open spaces in the capital cities of Pakistan.

4.1. Spatio-Temporal Analysis

Previously various studies have been done using Spatio-temporal analysis to find open spaces occupied by urban land. Zhou et al. (2011) used integrated approaches in their paper to distinguish the spatiotemporal changes in open space in the city of China called Kunming from the year 1992 to 2009. Concentric analysis, directional landscape analyses, and landscape metrics are integrated to examine the spatial changes of patterns of green space. From 1992-2000 and 2000-2009, changing intensities were calculated for the whole area. The results demonstrated that both urban sprawls had been increasing rapidly and policies reckoned for the

change in green space. Change detection analysis measures the distinct data framework and information with a thematic change that causes more tangible insight into the underlying process that brings about land cover and land-use changes (Ahmad, 2012).

Much work has been done for urban spatiotemporal changes in open spaces due to sprawl using different methodologies and GIS tools and techniques. Li et al. (2017) analyzed to find factors associated with green spaces. They spatiotemporally distributed several visitors into selected green spaces in central Beijing to understand the external factors associated with patterns of visitors spatially distributed within these open spaces. Analysis like the Gini coefficient, kernel density estimation, and geographical detectors were used to analyze the relationship between the external factors and the pattern of spatially distributed visitors within urban green spaces. The results showed that spatially distributed visitors within green spaces in central Beijing were immense, which allowed contrasting agglomerations. Another study in which Fanhua Kong et al. (2006) analyzed temporal changes in green spaces. They presented a method, using a case study of Jinan City, China, timed 1989–2004, to quantify and capture changes in patterns of green spaces using GIS and remote sensing. Using gradient analysis, they used the "moving window" technique (FRAGSTATS) to quantify local green spaces and sampling from the urban center to the edge. Results stated that the green space pattern that was significantly altered could be assessed in each local area with landscape metrics. From the urban center, taken in eight directions, Gradient analysis reflects urbanization's effects and temporal changes.

When the entire landscape is used for quantifying metrics, more patterns and processes are linked more effectively, demonstrating ecological and socioeconomic functions as an essential basis for analyzing green spaces. Geospatial tools are necessary to find temporal changes. Molla, et al. (2018) used geospatial analysis tools to analyze southern Ethiopia's spatiotemporal changes in green spaces. In another study conducted by Wickramasinghe et al. (2016), 47 wards of Colombo city were used on the green cover mapping for 1956, 1982, 2001, and 2010. For remote sensing, IKONOS imagery and aerial images were used to make maps with the help of Geographic Information Systems. Green areas investigation and the temporal

change in each ward during the 54-year study period. The results demonstrated the decline of the green cover of Colombo city from approximately 35.67% to 22.23% from 1956 to 2010. For this research, the spatial-temporal analysis aims to find the consumption of open spaces between 2005 to 2015 at an interval of five years. That will indicate increasing or decreasing the area of open spaces in these cities. Therefore, this pattern of consumption of open spaces subsequently helps identify factors affecting the development pattern of open spaces in the capital cities of Pakistan.

4.2 Datasets

The boundary of Islamabad, Lahore, and Peshawar has been obtained from the developing authorities of each city (CDA, LDA and PDA, respectively), following which shapefiles have been developed, indicating the approved boundary of the city. Rivers and road networks of these cities. These cities were then digitized using Google Map pro for the years 2005, 2010, and 2015 to classify the open spaces of these areas.

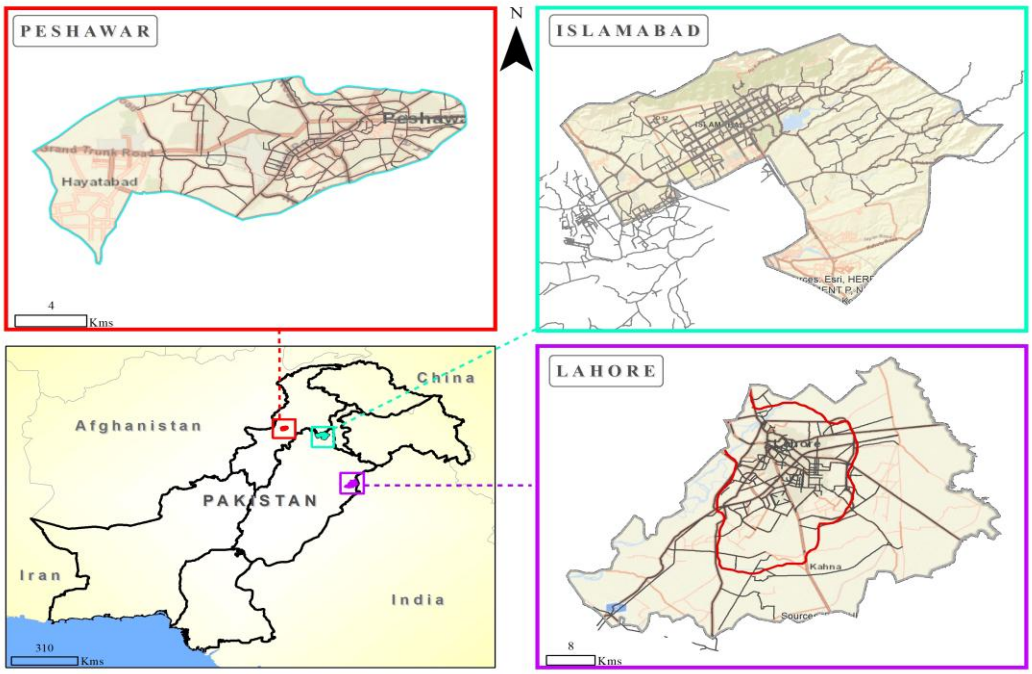

Figure 4.1: Map Indicating Three Cities

The urban spaces are classified into six groups, and each one was given a different symbology color: agricultural land, open land, garden, grassland, park, and

playground. The urban spaces were compared, and an analysis was done to calculate the areas of each attribute in the table. The comparison of different open spaces present in three cities according to their size is performed separately, with five-year intervals of 2005, 2010, and 2015 in a table. Then the calculation of percentages is done to get a statistical value of the open spaces that have been increased or decreased during those years. Using spatial vector tools in Arc-GIS, i.e., Clip and Subtract, data were extracted for each attribute of open space. The data was also validated by point data comparison in which 30 random points were selected from the digitized data and compared on Google Earth Pro for its valid locations.

4.3 Results and Discussion

Due to better health and education facilities in cities and urban areas than in villages, significant population growth and rapid urban sprawl are observed in cities, causing a decline in agricultural and open land areas with increased urbanization. One of the many reasons for reduced grassland could be climate change, extremely harsh weather conditions such as more temperature and less rainfall, natural disasters, and wildfires, which damages the green area and grassland and deteriorates the naturally balanced ecosystem of the city. The following discussion will suggest open space consumption trends in three cities separately:

4.3.1 Islamabad

Islamabad is a planned city and the youngest among the three because it was planned and developed during the 1960s. Since inception of Islamabad, seventeen significant changes have been made to the master plan. In the original master plan of Islamabad, Doxiadis surrounded the city with vast expanse of agricultural land so that the city grow its food and not depend on other cities to meet its needs. However, unfortunately, these were converted into residential areas in 1992 to prevent further haphazard development and formalize the unauthorized urban. The city planned to expand southwestern, but current trends show that it is increasing in every direction except towards Margalla Hills. The land cover of Islamabad is changing very rapidly, starting with agriculture area percentage. Data indicate that it has increased by 58.3 percent between 2005 and 2010 while it has decreased by 0.27 percent between 2010 and 2015. Garden has been reduced by 11 percent between 2005 and 2010 and 7.95

percent between 2010 and 2015. There was decrease in grassland from 18.1 percent in 2005 to 2010 and 14.3 percent from 2010- to 2015. Open land decreased by 39.5 percent from 2005 to 2010; however, it increased by 18.6 percent between 2010 to 2015. Parks have increased 1.06 percent from 2005 to 2010 and 0.42 percent from 2010 to 2015. The playground has increased 63.4 percent from 2005 to 2010 but decreased by 5.3 percent between 2010 and 2015.

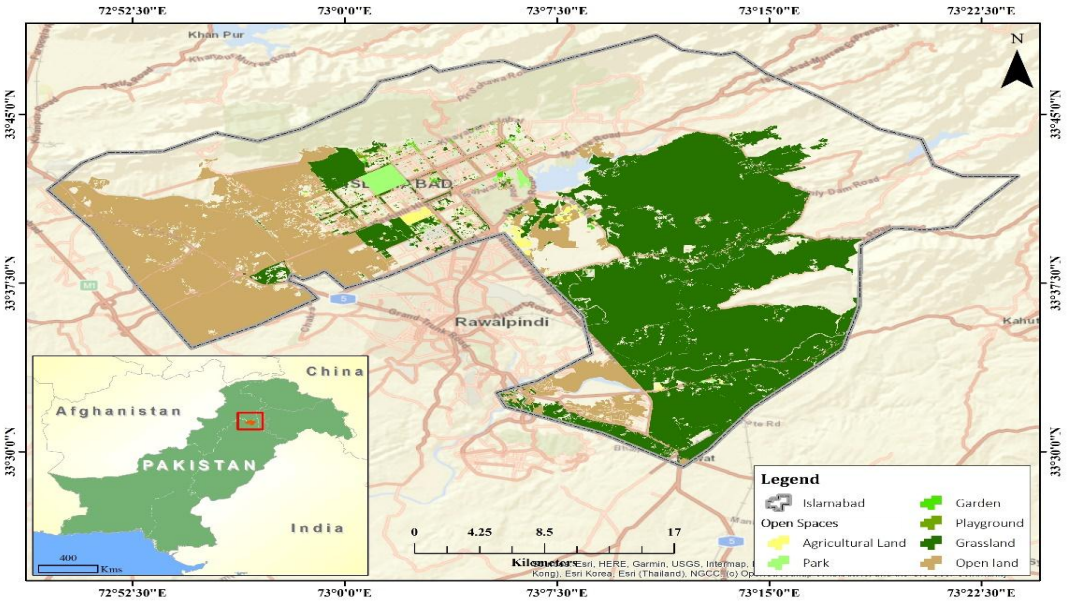

Figure 4.2.1: Open Space Distribution of Islamabad in the Year 2005

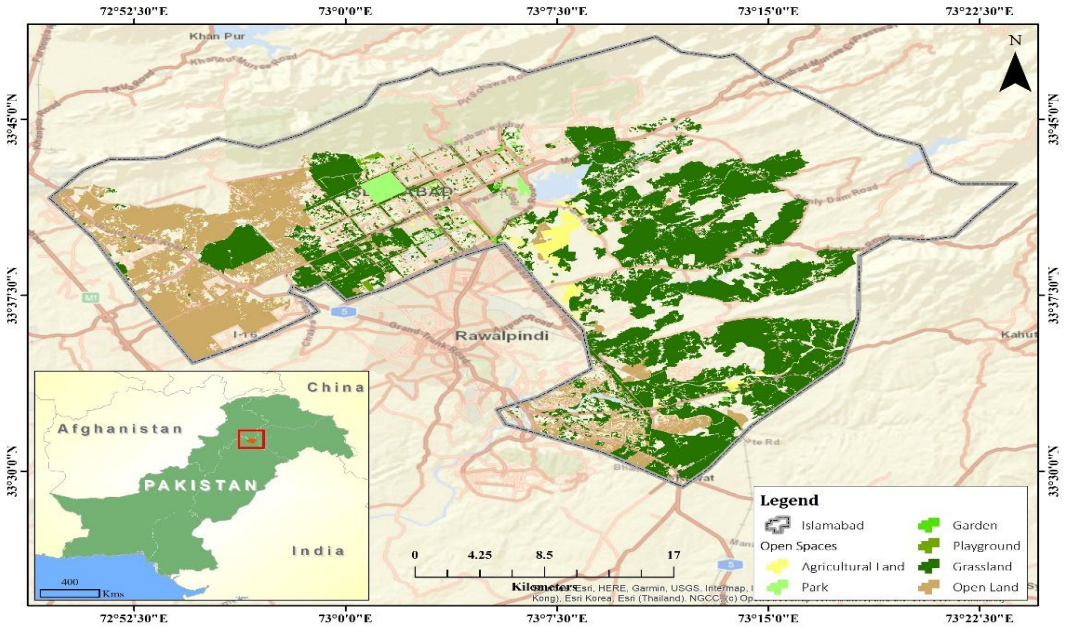

Figure 4.2.2: Open Space Distribution of Islamabad in the Year 2010

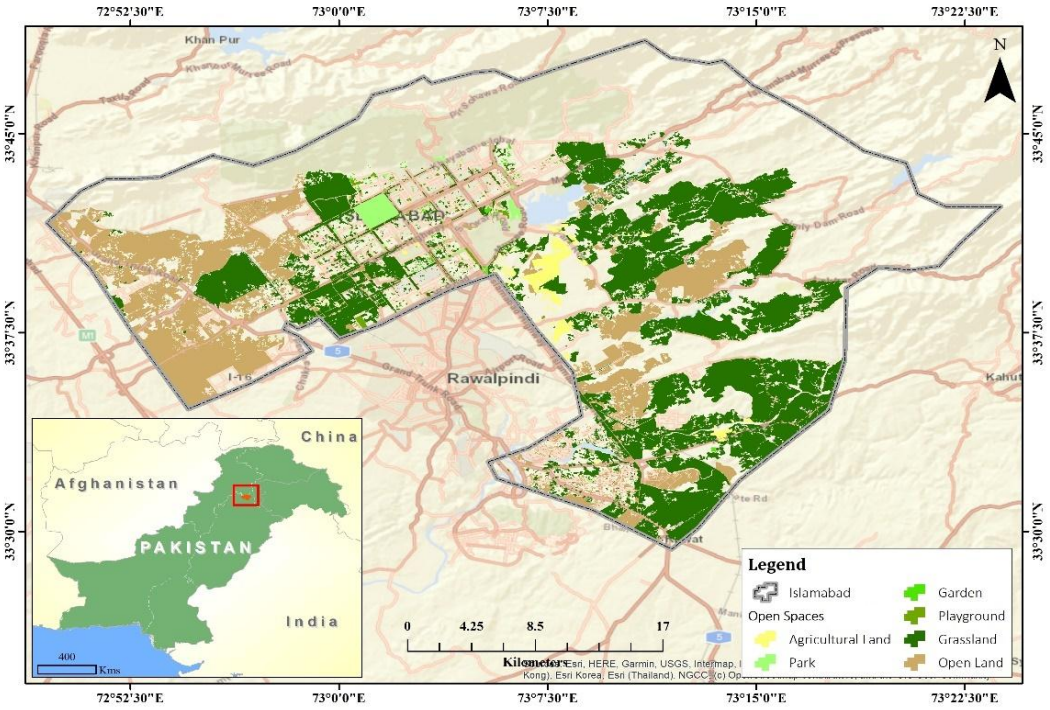

Figure 4.2.3: Open Space Distribution of Islamabad in the Year 2015

Table 4.1: Changes in Open Space Area in Islamabad During 2005-2015

Year	Agriculture	Garden	Grassland	Open land	Park	Playground
2005	5.6	2.6	298.6	171.2	5.4	1.2
2010	8.9	2.2	244.3	103.6	5.5	2.0
2015	8.9	2.0	209.4	122.8	5.5	1.9

Notes: The table will give the total area of different open spaces in Sq.km. This table is extracted from spatial data indicated in figure 4.2. The table shows a numerical distribution of open spaces for the city of Islamabad.

The data suggest a significant increase in agricultural land, and the city is losing its agricultural land at a very slow pace. However, the trend of consumption is present. Open land, parks, and playgrounds have been added more to the cityscape than their loss/consumption. That also suggests that city management has reasonable control over the city's development pattern.

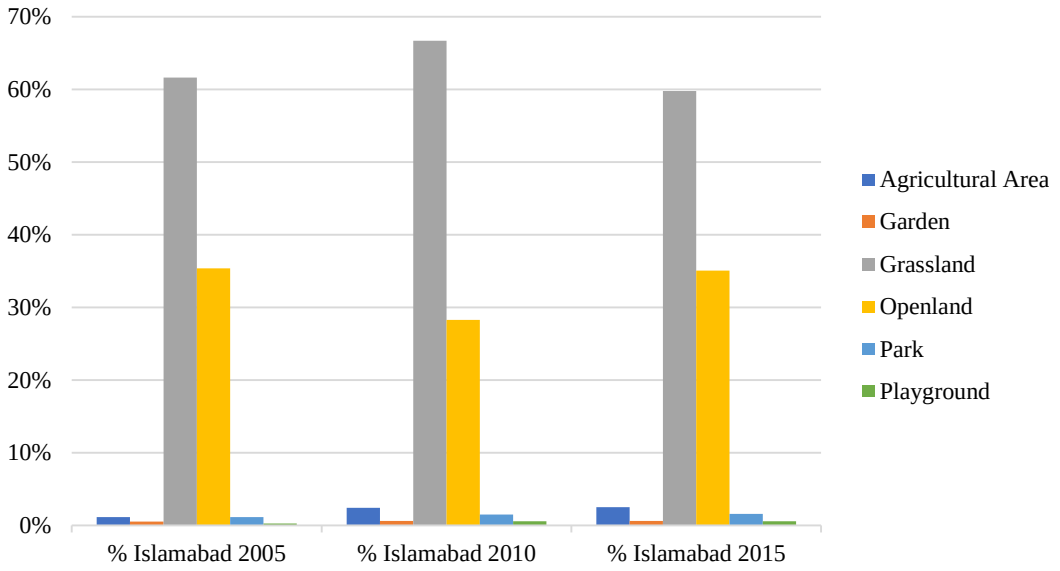

Figure 4.3: Yearly Comparison of Different Open Spaces in Islamabad

In Islamabad, there was a significant increase in Agriculture land and playgrounds in 2005-2010 while there was a decrease in the garden, grassland, and open land. The Bureau of statistics suggests that in 1998 there were 889 persons/sq. Km has increased double by 1632 persons/sq.km in 2015 (Pakistan Bureau of Statistics, 2016). Thus, it clearly shows the population increase in Islamabad and the urban sprawl, leading to a decrease in grassland, open land, and gardens. Our work coincides with Hassan et al. (2016) as well. In Islamabad, there was a major increase in Agriculture land and playgrounds in 2005-2010 while the decrease in the garden, grassland, and open land. The Bureau of statistics suggests that in 1998 there were 889 persons/sq. Km, but it has increased double by 1632 persons/sq.km in 2015 (Pakistan Bureau of Statistics, 2016). Thus, it clearly shows the population increase in Islamabad and the urban sprawl, leading to a decrease in Grassland, open land, gardens, etc. Our work coincides with Hassan, et al. (2016) as well. According to them the percentage area of each class in 1992 and 2012 showed that a major shift had been faced by barren land as it was reduced to 1.87 percent (1678 ha) in 2012. Forest Area also faced a major decline that is in 1992 was 13.49 percent (12,136 ha) of the total area and in 2012 it was reduced to 6.82 percent (6138 ha). The other three classes faced an increase in the total share. Built-up Areas faced a major increment. Its share increased from 18.09 percent (16,281 ha) in 1992 to 56.73 percent (51,039

ha) in 2012. The Agricultural Area also increased from 11.49 percent (10,336 ha) in 1992 to 32.23 percent (29,000 ha) in 2012. One of the reasons for reduced grassland and open spaces and increased urban land is the change in regulations of Zone 4. Islamabad consists of five Zone, these zones are separated due to their different design and development patterns. Zone 4 was previously declared as green area dedicated to special land uses which have least construction and congestion impact residential and commercial land uses are prohibited. But after 2010 it had changed to mixed land use and all type of land uses are allowed in this zone. This leads to the planned development of major city area which was previously facing unplanned development. Therefore, the data support this as planned open spaces are trending towards increase.

4.3.2 Lahore

Lahore is among one of the few historic cities which continuously inhabited. The city has expanded manifolds, evident from the census results, indicating the urbanization trend. Lahore is one of the most populated cities in Pakistan, with its population increasing from 1.13 million in 1951 to 1.12 million in 2017. The relatively increased density in Lahore was 149 percent from 1981 to 2010 from 128 percent between1951-72. Thus, it shows that the living condition in Lahore is stressed because of less space available per person (Zaman & Baloch, 2011). Shirazi (2012) reported that the vegetation cover reduced from 645 square kilometers (36 percent) in 1992 to 249 square kilometers (14 percent) in 2009. Our study also coincides with Riaz et al., 2017 and Omar (2013), who also observed an increase in the urban area in Lahore by 68 percent by 2009, which led to the reduction in vegetation/agricultural land due to its consequent effects. The dataset of Lahore indicates that the Agricultural area has decreased 10.4 percent from 2005- to 2010 while it has slightly increased by 0.82 percent from 2010 - 2015. Gardens have increased 0.91 percent from 2005 - 2010 and 0.09 percent from 2010 - 2015. Grassland decreased by 21.7 percent between 2005-2010 while slightly increased by 1.74 percent between 2010- 2015. Open land has been reduced to a great extent by 60 percent between 2005- 2010 and 76.72 percent from 2010-2015. Parks have also been reduced by 9.6 percent between 2005- 2010. However, they have increased 26.6

percent from 2010 -to 2015. Playgrounds have been increased slightly, i.e., 1.45 from 2005- 2010 and a further 0 86 percent between 2010- 2015.

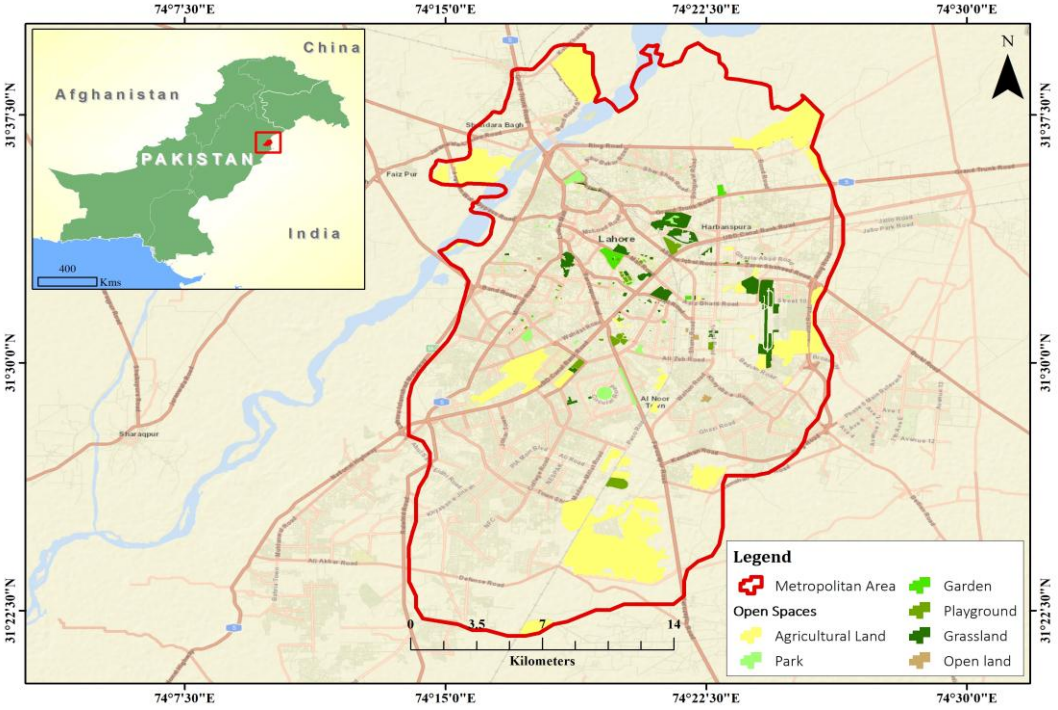

Figure 4.4.1: Open Space Distribution of Lahore in the Year 2005

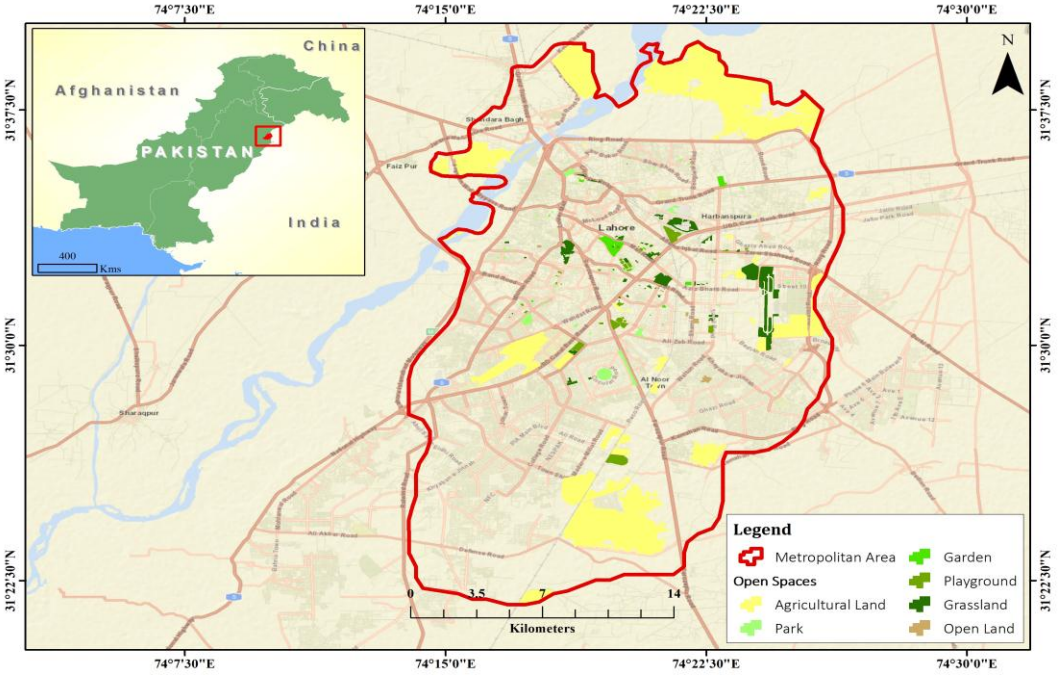

Figure 4.4.2: Open Space Distribution of Lahore in the Year 2010

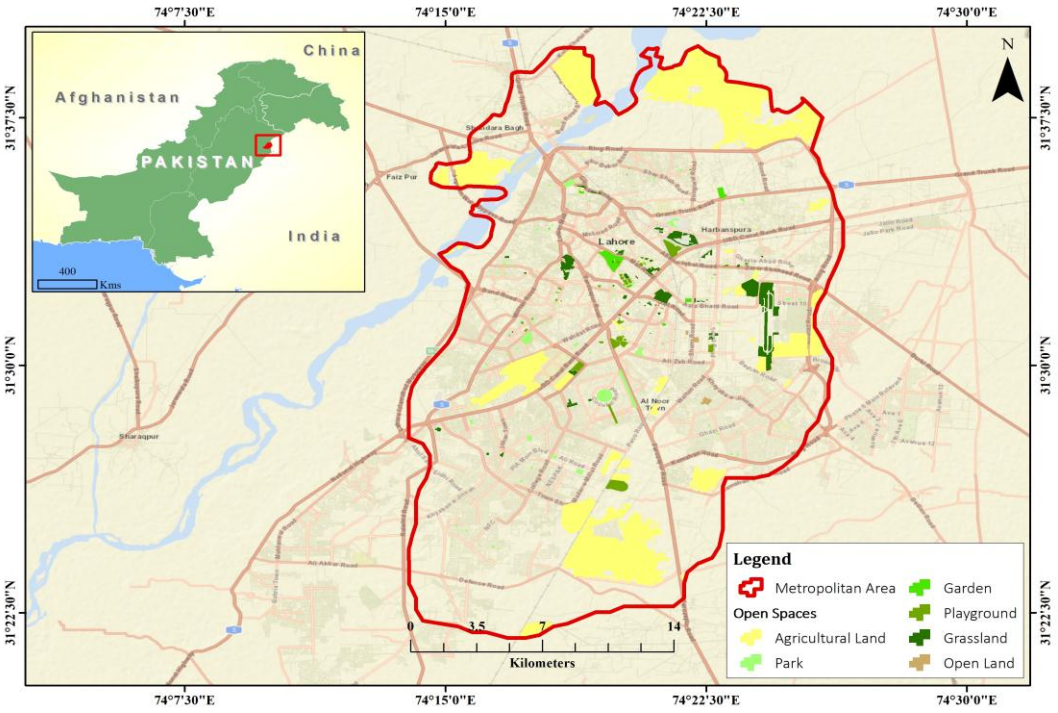

Figure 4.4.3: Open Space Distribution of Lahore in the Year 2015

Table 4.2: Changes in the Open Space Area in Lahore (2005 – 2015)

Year	Agriculture	Garden	Grassland	Open land	Park	Playground
2005	1107.2	1.1	6.8	3.1	2.4	2.1
2010	992.1	1.1	5.3	1.3	2.1	2.1
2015	1000.2	1.1	5.4	0.3	2.7	3.9

Notes: *The table will give the total area of different open spaces in Sq. Km. This table is extracted from spatial data indicated in figure-4.4. The table shows a numerical distribution of open spaces for the city of Lahore.*

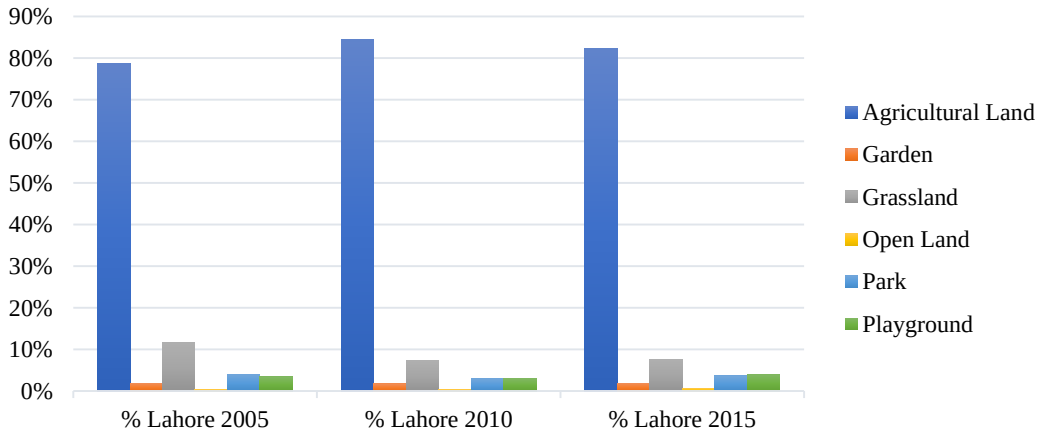

Figure 4.5: Comparison of different types of open spaces in Lahore

The analysis of data suggests an increase in Parks and playgrounds. These are most of the time developed and managed by developing authorities. This trend shows that departments managing Lahore city are constantly focusing on maintaining the green character of the city. The rapid consumption of open land, on the other hand, predicts that the rate of urbanization is on the higher side.

4.3.3 Peshawar

Peshawar is historical city. The city area of 215 square kilometers is selected for this research. The results indicate that from 2005 to 2010, agricultural land decreased by 58.7 percent, while from 2010 to 2015, it increased only 6.1percent. The trend of consumption of agricultural land is a clear indication of rapid urbanization. Garden decreased to a great extent, that is 64.8 percent from 2005 to 2010 while from 2010 to 2015 it has increased to 1.4 percent only. The data from two eras indicate that city has been losing its plantation with the slightest addition in return. There is also an abrupt decrease from 2005 to 2010 of 46.4 percent in grassland and a further 53.4 percent decrease in 2010- 2015. Open land decreased to 76.5 percent and an additional 46 percent decrease between the year 2010 – 2015.

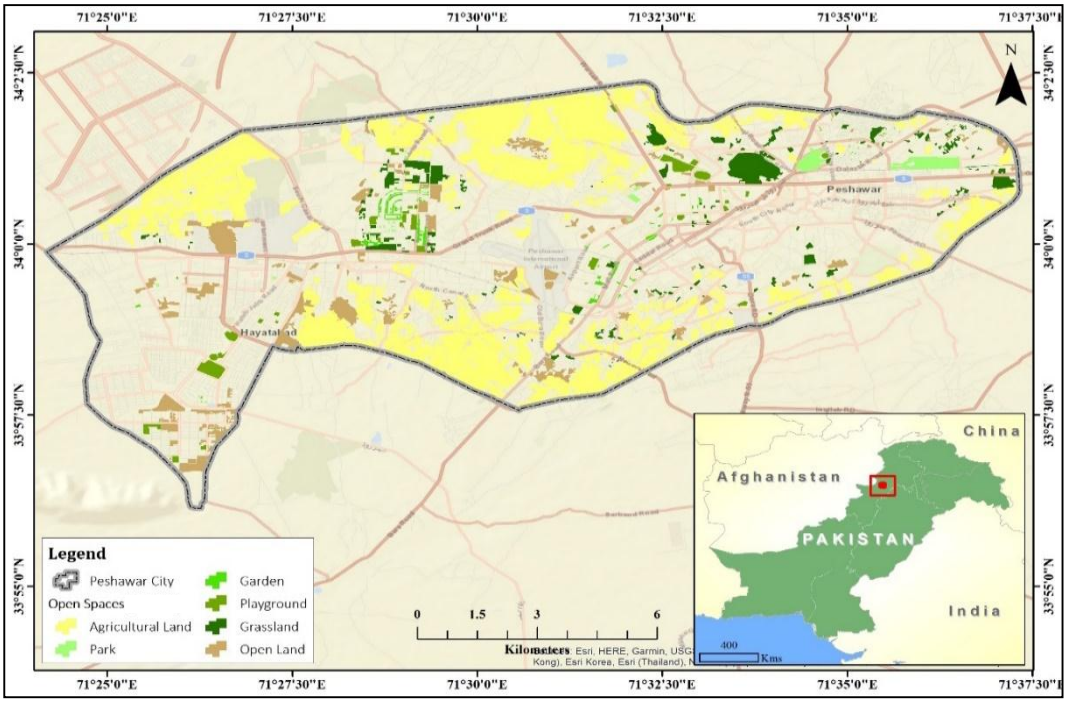

Figure 4.6.1: Open Space Distribution of Peshawar in the Year 2005

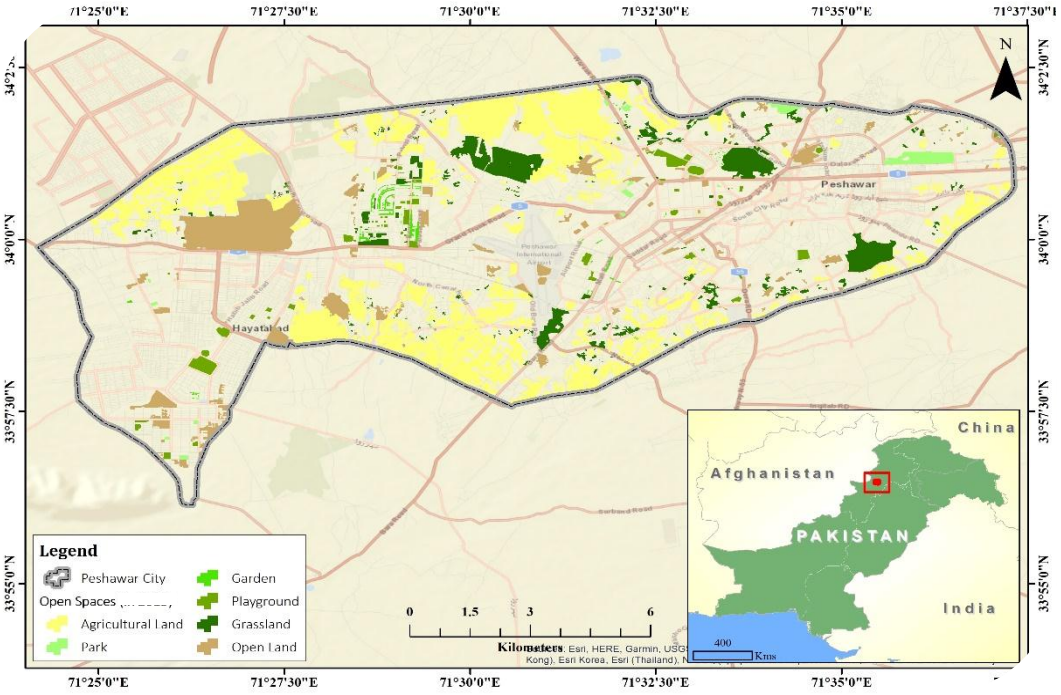

Figure 4.6.2: Open Space Distribution of Peshawar in the Year 2010

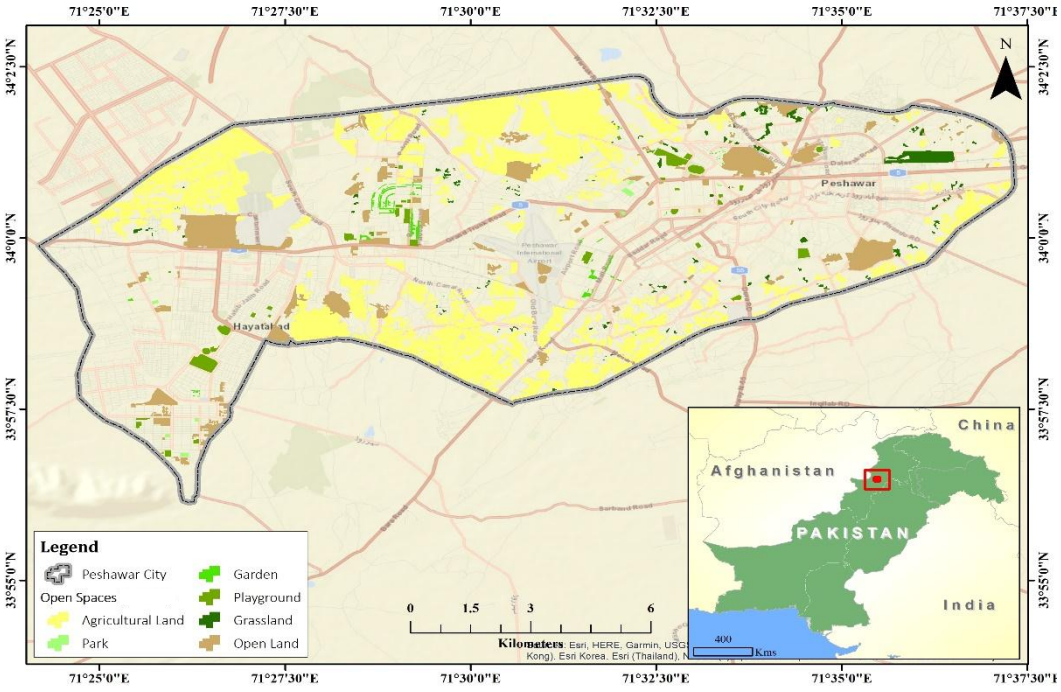

Figure 4.6.3: Open Space Distribution of Peshawar in the Year 2015

Table 4.3: Changes in Open Space Area in Peshawar During 2005 – 2015

Year	Agriculture	Garden	Grassland	Open land	Park	Playground
2005	324.8	1.7	14.10	148.3	2.4	3.4
2010	134.2	0.6	8.02	34.9	0.9	1.3
2015	142.4	0.6	3.7	50.9	0.1	1.1

Notes: *The table will give the total area of different open spaces in Sq Km. This table is extracted from spatial data indicated in figure 4.6. The table shows a numerical distribution of open spaces for the city of Peshawar.*

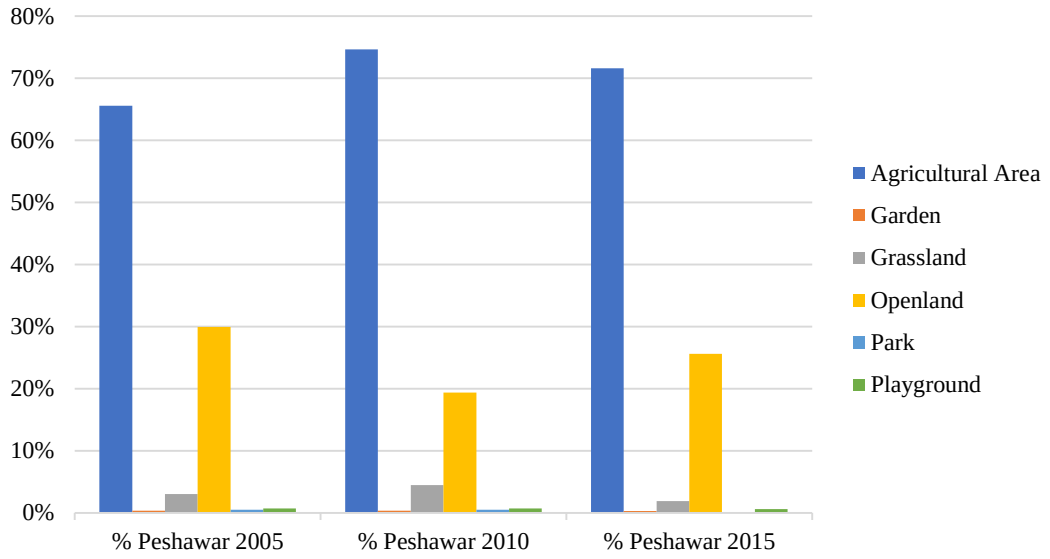

Figure 4.7: Comparison of Different Types of Open Spaces in Peshawar

The results shown above show that in Peshawar, significant changes in 2005-2010 are in agricultural areas, open land, and playground. In his paper, Abdur Raziq et al. (2016) worked on maximum likelihood classification (MLC) techniques and algorithms to identify land-use changes in Peshawar from 1999 to 2016. The study supports the finding of this research for Peshawar city because the maximum likelihood classification detected the land cover changes from 1999 to 2017 and observed a substantial increase in the built-up area resulting in the consumption of the agricultural land and barren land. This trend indicates significant urbanization during the given period for Peshawar city.

4.4 Summary

The recent trend of rural-urban migration has consumed most of the open spaces in cities leading to a higher build-up to open space ratio. That has adversely affected the ecological balance and environment. This research is about the Spatio-temporal analysis of three major cities of Pakistan to find the impacts of reduced open spaces between 2000 - 2015. The data was collected using Google Earth Pro and Arc-GIS. The extracted data was also validated by point data comparison on 30 locations through Google Earth Pro. The identified open spaces are classified into six different classes of open spaces. The results depict an interesting development as a decreasing trend in open spaces from 2005 to 2010, while an increasing trend is visible between 2010 - 2015 for two cities: Islamabad and Peshawer. However, these changes are different for separate open spaces, with mix increasing and decreasing trends. The consumption trends of open spaces indicated in this research will help decision-makers determine these changes' socioeconomic and environmental impacts on the city dwellers. That, in turn, contributes to developing a correlation between sustainability and open spaces.

CHAPTER 5: DATA ANALYSIS

PART-II: IMPACTS OF OPEN SPACES ON COMMUNITY

A well-managed and well-planned city is an outcome of economic, social, and environmental governance that rests on political, cultural, and civic rights, providing citizens with an improved quality of life (Habitat, 2020). Cities term encounters where communication and information flow as density and diversity give urban life a distinctive character (Stevens, 2007). Open public spaces in the cities are critical elements to ensure an improved quality of life and respond to citizens' social, psychological, and economic needs from diverse backgrounds (Beck, 2009). That is mainly because the quality of life directly links people's interaction with the urban environment (Das, 2008). However, cities face the challenge of unbridled expansion – from 1990 to 2015, cities in the developed world witnessed a 1.8-fold increase in urban land area as the increase in population was 1.2-fold (Habitat, 2020). Urban development leads to higher energy consumption and environmental degradation, with the cities facing internal rural to urban migration (Habitat, 2020). The decisions regarding how the land is to be used impact the people living in the cities in terms of social connectivity travel to work, homes, parks, places of worship, libraries, and shops (Kelly et al., 2012). It is also important to note that the nonuse of parks and playgrounds can lead to their misuse (Hester, 1984), and that is why the privatization of urban public space is a significant issue in the cities (Gruehn, 2008).

In recent times, open spaces in Karachi have turned into dumping yards for trash (Farkhunda et al., 2021). The concern for the decrease in the availability of open public spaces is part of SDG-11. Its indicator 11.7.1 estimates the average share of open space for public use for all by sex, age, and persons with disabilities (Habitat, 2020). That is why over the last four decades, the focus of research on urbanization has been on the context of urban open places' economic, social, and psychological benefits for the citizens (Francis, 1987). In other words, the multi-functionality of open spaces has been recognized in theory and put into practice globally (Zivkovic et al., 2019). However, the emphasis has shifted to studying open spaces in the context of overall urbanization. In 2018, the UN-Habitate called for the mainstreaming of public spaces in national urban policies. It termed public spaces a

vital ingredient of thriving cities as they help build a sense of community and culture and facilitate social, economic development, and community revitalization (Habitat, 2018). This chapter investigates the social-economic, environmental, and physical impacts of open spaces on the public by obtaining their perception of them. This helps the researcher develop a sustainable index that determines the sustainability of open spaces provided in three major cities of Pakistan through public opinion.

5.1 Social Impact of Open Spaces on Public

Sustainable spatial development is now considered incomplete or chaotic without the well-planned multifunctional open spaces in cities (Živković et al., 2019). The implications for the citizens are lifelong. Open spaces allow people to interact with each other and with nature. Human interaction with open spaces such as parks and forests strengthens their social cohesion but also helps to improve their health (Jennings & Bamkole, 2019). They help overcome the loneliness in urban living, which is disconnected from nature (Louv, 2011).

5.2 Impact of Open Spaces on Public Health

The University of Aarhus, Denmark, found that childhood exposure to green spaces such as parks, forests, and rural lands have lessened the risks associated with psychiatric disorders in adolescence and adulthood (Engemann et al., 2019). Published in the National Academy of Sciences Proceedings the study used the satellite data and the Danish Civil Registration, tracked residential green space around nearly a million people, and correlated it with their mental health outcomes (Engemann et al., 2019). Open spaces allow people to be part of their communities where they interact for events and activities or be simply in each other's company (Woolley, 2003). In 2007, the mental health charity Mind, in its report *Ecotherapy*, concluded that the people experiencing depression/mental distress used physical activity such as walking and the act of gardening to reduce their level of anxiety.

5.3 Physical Impact of Open Spaces on the Public

Apart from recreation and conservations, open spaces view as essential for the healthy functioning of the urban environment. Living in the proximity of green spaces is associated with reduced levels of depression and anxiety. That is why open

spaces are considered places that relieve the stress of living in a jungle of concrete (Farkhunda et al., 2021). This association is vital for children and people with low incomes. During both in winter and spring seasons (Song et al., 2013), the simple act of walking in an urban park helps to improve mood and at the same time decreases negativity and sense of anxiety (Song et al., 2013). The availability of easy and safe access to open spaces is critical to those sections of the humans whose mobility is restricted, such as girls in a conservative environment (Qutub & Anjum, 2015).

5.4 Economic Impact of Open Spaces on Public

Economically the open spaces may help to increase the value of the land. Along with other aspects such as the location and availability of health and education facilities nearby, the proximity to open space can significantly impact the property's price (Bolitzer & Netusil, 2000). However, more importantly, open spaces can simultaneously source revenue and social interaction. (Bolitzer & Netusil, 2000)

5.5 Environment Impact of Open Spaces on Public

Most importantly, open spaces have a role to play in mitigating the effect of climate. The Paris agreement has led to a shift in how the world perceives development, especially in cities, which are now conceived as energy-efficient and withstand climate change (Huybrechts, 2020). In this context, the role of open spaces becomes critical. Urban ecology is now part of the cities' development. It ensures that aspects such as green urban share, green corridor, planting, urban forest, and ecological footprint are considered when cities expand (Jeong, 2020). Overall, it safely claims that the importance of open public spaces in a rapidly urbanized world has been recognized. Their social, psychological, environmental, and economic role is becoming relevant to the development of cities. The world is now keenly interested in knowing how cities manage open spaces. One of the indicators for cities is the satisfactory level of green cities (Smart City Index, 2019).

5.6 Research Instrument

In an increasingly urbanized world, the importance of open spaces has been recognized as essential for citizens' social, mental, and physical well-being. As the central pillar of urbanization, these open spaces research based its questionnaire on

four aspects of life: social, economic, health, and environmental benefits. How the people living in three cities Islamabad, Lahore, and Peshawar in a fast-urbanizing country like Pakistan, are coping with the changes in open spaces. These changes are in terms of the consumption of land, natural vegetation, socioeconomic impacts, and how the provision of open space facilities or lack of them affects them physically and environmentally.

In the context of social benefits, the instrument gauges the perception and understanding regarding open spaces. The understanding and the realization that open spaces are essential for humans is the basis on which actions, collective and individual, are taken which serve the general good. The instrument also investigates the role of open spaces in mitigating the mental effects of fast-paced city life. Open spaces' role in generating economic activity was also probed. The urbanization process involves considerable and, in some cases, astronomical increases in property prices. When this happens, open spaces are the first and easy victim of the speculative Increase in land prices. This aspect is included in this research in the context of open spaces. The phenomenon of the private open spaces that the citizens can visit after paying a fee is part of the research. The most critical role of open spaces is to allow everybody to interact socially in a healthy environment, a basic human need.

5.6.1 Methodology

The objective of assessing the socio-economic, physical, and environmental impact of open spaces on the public is achieved by conducting a questionnaire survey. The questionnaire has been designed to obtain an opinion about Socioeconomic and Environmental Impacts on open spaces consumption through the demographic profile of respondents.

5.6.2 Socio-Demographic profile of data collected

The respondents belonged to three different cities in Pakistan. These cities include Islamabad, Lahore, and Peshawar. Percentage-wise distribution of respondents is, 32.2 percent of the respondents belonged to Islamabad city, whereas 32.1 percent resided in Lahore city, and the rest, 35.7 percent of respondents, belonged to Peshawar city. Gender-wise, the sample of the respondents comprised

45.5% of male participants and female respondents were 54.5%. Representing the age groups of the respondents, 61% of the total respondents are young, having ages between 18 to 29 years. Whereas the people belonging to the age group of 30 to 49 years are 31.9%. The remaining 50 years, or more, were 7.1% of the total sample. The average age of the respondents is calculated as 29.86 years. When inquired about the respondents' area, 52% of the total respondents lived in approved government schemes, whereas 32.2% resided in private housing schemes, 4.6% of the respondents were living in slums or kachi Abadi, and the rest, 11.2% people were living in other than these housing areas. The average number of respondents living in their area was calculated as 14.95 years.

Table 5.1: A detailed Socio-Demographic Profile of Respondents

Socio-Demographics		Frequency	Percentage	Mean	St. Deviation
City	Islamabad	204	32.2		
	Lahore	203	32.1		
	Peshawar	226	35.7		
Gender	Males	288	45.5		
	Females	345	54.5		
Age	18-29	386	61	29.86	11.04
	30-49	202	31.9		
	50 Plus	45	7.1		
Profession	Doctor	83	13.1		
	Engineer	26	4.1		
	Government Officer	89	14.1		
	Private Sector Employee	78	12.3		
	Teacher/Professor	42	6.6		
	Scientist/Researcher	23	3.6		
	Businessman	25	3.9		
	Laborer’s	267	42.2		
Area	Government Scheme	329	52.0		
	Private Development	204	32.2		
	Slum / Kachi Abadi	29	4.6		
	Other	71	11.2		

5.7 Data Analysis

The data analysis is performed using SPSS software. After conducting the Factor Analysis on five dimensions, five Sub-Indexes were developed using the Mean Value of each dimension mainly which are

1. Health Sub Index
2. Economic Sub Index
3. Environment Sub Index
4. Social Sub Index
5. Physical Sub Index

Finally, the Urban sustainability index was generated by combing these Sub Indexes.

5.7.1 Factor Analysis

Factor analysis was performed on the data collected on the indicator questions and statements from the public survey. This analysis is performed to understand better and interpret issues related to open spaces and their impact on people's lives. These small numbers of factors retrieved from factor analysis view all the variables within these small factors. While in SPSS, the Principal components method is applied in the factor analysis, and Principal Component Analysis (PCA) reduced the data of open spaces to more manageable groups and helped us determine the groups of variables known as factors that correlate highly with each other. The Principal Component Analysis method and varimax rotation apply to the collected data in SPSS to make new factors. For factor retention, the default option of retaining all factors having eigenvalues that are g greater than 1.0 were selected. The factor analysis converted all the statements into three factors. The Factor Loading value (the suppress small coefficient absolute value below) was taken as 0.40, which removed all coefficient values smaller than 0.60. The factors having values greater than 0.40 remained in the Rotated Component Matrix.

5.7.1.1 Factor Analysis of Health Impacts

Using IBM SPSS, factor analysis was performed on health-related statements to convert them into suitable and well-integrated categories. These values showed that our data was suitable for the Factor Analysis.

Table 5.2: KMO and Bartlett's Test (Health Impact)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.803
Bartlett's Test of Sphericity	Approx. Chi-Square	2362.475
	Df	66
	Sig.	.000

5.7.1.2 Factors Categorization of Health Impact

The factor analysis converted all the statements into factors. The Factor Loading value (the suppress small coefficient absolute value below) was taken as 0.40, which removed all coefficient values smaller than 0.60. The factors having values greater than 0.40 remained in the Rotated Component Matrix.

Table 5.3: Rotated Component Matrix for Health Impact

Sr. No	Statements	Component		
		1	2	3
1.	Can mental stress be reduced if residents regularly visit nearby open spaces like parks and green belts?	.779		
2.	Does easy access to clean and green open spaces help reduce mental tension by providing a place for rest and recreation?	.771		
3.	Can People rest and relax in open spaces that will improve their overall health in the longer term?	.741		
4.	Are Clean open spaces a source of natural beauty that gives psychological relaxation to their visitors?	.665		
5.	Do the parks provide space for individuals to have their alone time to think while being away from the city hustle and bustle?	.619		
6.	Can open areas be a source of injuries due to physical activities?		.825	
7.	Can open spaces be dangerous for visitors, especially at nighttime, because of harmful creatures like lizards and snakes?		.772	
8.	Can the wildlife parks on mountains be dangerous for people wishing to climb them?		.667	
9.	Can open green space cause pollen allergy?		.664	
10.	Do the Open spaces provide opportunities for people for physical activity that reduces risks of diseases?			.863
11.	Do the Open spaces provide opportunities for healthy activities like jogging and exercise that causes health improvement?			.862
12.	Does the clean air of green open spaces like public parks help improve their regular visitors' respiratory systems?			.670

5.7.1.3 Description of Health Impact Factors

A total of twelve statements which are selected for assessment of health aspects are subjected to factor analysis, as a result, the factors obtained through the analysis are given in Table 5.4.

Table 5.4: Health Impact Factors

Sr. No	Statement	Factor
1.	Can mental stress reduce if residents regularly visit nearby open spaces like parks and green belts?	Factor 1 Importance of provision of open spaces
2.	Does easy access to clean and green open spaces help reduce mental tension and depression by providing a place for rest and recreation?	
3.	Can people rest and relax in open spaces to improve their overall health?	
4.	Are clean open spaces a source of natural beauty that gives psychological relaxation to their visitors?	
5.	Do the parks provide space for individuals to have their alone time to think and analyze while being away from the city hustle and bustle?	
6.	Can open areas be a source of injuries to the people because of their physical activities?	Factor 2 The risk associated with open spaces
7.	Can open spaces be dangerous for visitors, especially during nighttime, because of harmful creatures like lizards, snakes, and scorpions?	
8.	Can wildlife parks existing on mountains be dangerous for people who climb them?	
9.	Can open green space cause pollen allergy in the general population?	
10.	Do the Open spaces provide opportunities for people for physical activity that reduces risks of diseases like diabetes and blood pressure?	Factor 3 Open space impact on physical health
11.	Do the Open spaces provide opportunities for healthy activities like jogging and exercise that cause improvement in human health?	
12.	Does the clean air of green open spaces like public parks help to improve the respiratory systems of their regular visitors?	

5.7.1.4 Health Sub-Index (HSI)

The indicators included in the health category described the relation of open spaces with different health benefits and drawbacks related to people's health. These

indicators were further processed in SPSS to compute a Sub-Index representing all the health factors selected for this study. The mean of the indicators residing in the respective three factors was computed separately. Furthermore, a combined mean of these three factors was computed, which formed a Sub-Index representing all the indicators' weightage in one variable. This sub-index is important in developing a correlation with the demographic profile. The objective of this correlation is to assess the impact of open spaces on the health of humans with reference to the public's perception of how the public perceives the importance of the presence of open spaces related to their health. It is known fact as derived from the literature review that open spaces, such as parks, playgrounds, and natural green spaces, can promote the mental and physical health of the public by providing psychological relaxation and stress alleviation, stimulating social cohesion, supporting physical activity, and reducing exposure to air pollutants, noise, and excessive heat. This health index determines about awareness of the public in this perspective. The factors are carefully selected to draw the required results.

5.7.1.5 Factor Analysis of Economic Impact

Factor analysis was performed on economic-related statements and the KMO value was found to be 0.858. The chi-square value in Bartlett's test was recorded to be 2461.384, which is very large and the associated significance to the lowest possible at 0.000. These values showed that our data was suitable for the factor analysis.

Table 5.5: KMO and Bartlett's Test (Economic Impact)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	2461.384
	Df	120
	Sig.	.000

5.7.1.6 Factors Categorization of Economic Impact

The factor analysis converted all statements into four factors. The Factor Loading value (the suppressed small coefficient absolute value below) was taken as

0.40, which removed all the coefficient values smaller than 0.60. The factors having values greater than 0.40 remained in the Rotated Component Matrix. The rotated component matrix for economics representing the values is provided in Table 5.6.

Table 5.6: Rotated Component Matrix for Economics Impact

Sr No	Statements	Component			
		1	2	3	4
1	Do well-maintained open spaces attract tourists that help build a softer image of the country, attracting more tourists?	.783			
2	Do Clean and green open spaces like green belts, parks, and gardens attract tourism and play a positive role in the civic economy?	.717			
3	Does tourism attraction create jobs for the local population, such as tourist guides?	.678			
4	Can open spaces help in avoiding traffic congestion?	.619			
5	Can well-maintained open spaces increase the nearby real estate prices due to a green and clean environment?	.520			
6	With new business setups in open spaces, do the employment opportunities increase?		.799		
7	Do open spaces like public parks provide opportunities for new business such as refreshments, souvenirs and sports tools?		.767		
8	Does the increased employment reduce the burden on the national exchequer for unemployment allowances?		.733		
9	Does the increase in employment rates reduce low life social evil rates such as shoplifting, drug usage and thefts?		.553		
10	Can green open spaces, causing a rise in real estate purchase prices and rentals, act as a catalyst in creating societal division by dividing living areas between rich and poor?			.725	
11	Do public places like parks and near residential areas create privacy issues for residents?			.722	
12	Does the availability of clean and green areas in the locality impact the type and quality of construction in the surrounding areas?			.628	
13	Do the People, in general, prefer to live in areas with plenty of open spaces within the vicinity?			.534	
14	Do the open spaces used for healthy activities improve overall average health, reducing government spending for the health sector?				.705
15	Do the publicly managed parks provide employment opportunities for government employees, i.e., gardeners, security guards, and cleaners?				.705
16	Do the private businesses set up in public parks pay fees/rent to the government, thus contributing to the economy?				.657

5.7.1.7 Description of Economic Factors

A total of sixteen statements were subjected to factor analysis, and it generated four factors which are described in Table 5.7. These factors are further labeled for convenience and understanding. The labeling of these factors helps in the assessment of the economic impact on the public with reference to open spaces:

Table 5.7: Economics Factors

Sr. No.	Statement	Factor
1.	Do the well-maintained open spaces attract tourists that help build a softer image of the country, attracting more tourists?	Factor 1 Impact of open spaces on the building of the image of a community
2.	Do the Clean and green open spaces like green belts, parks, and gardens attract tourism and play a positive role in the civic economy?	
3.	Does tourism attraction create jobs for the local population, such as tourist guides?	
4.	Can Open spaces help in avoiding traffic congestion?	
5.	Can well-maintained open spaces increase the nearby real estate prices due to a green and clean environment?	
6.	With new business setups in open spaces, do the employment opportunities increase?	Factor 2 Revenue generation from open spaces
7.	Do open spaces like public parks provide opportunities for setting up new business refreshments, souvenirs, and sports tools?	
8.	Does the increased employment reduce the burden on the national exchequer for unemployment allowances?	
9.	Does the Increase in employment rates reduce low life social evil rates such as shoplifting, drug usage and thefts?	
10.	Can green open spaces, causing a rise in real estate purchase prices and their rentals, act as a catalyst in creating division in society by dividing the living areas of rich and poor?	Factor 3 The indirect economic impact of open spaces on surroundings
11.	Does the presence of public places like parks and near residential areas create privacy issues for the residents?	
12.	Does the availability of clean and green areas in the locality impact the type and quality of construction in the surrounding areas?	
13.	Do the People, in general, prefer to live in areas that have plenty of open spaces within their vicinity and in their surroundings?	
14.	Do the open spaces for healthy activities improve overall average health, reducing government spending for the health sector such as hospitals, medicines, and medical staff?	Factor 4 Benefits of open spaces for governing bodies
15.	Do the publicly managed parks provide employment opportunities for government employees. Gardeners, security guards, cleaners?	
16.	Do the private businesses in public parks pay fees/rent to the government, thus contributing to national income?	

5.7.1.8 Economic Sub-Index (ESI)

The sixteen indicators in an economic category described the relation of open spaces with different economic levels and conditions, their benefits, and their drawbacks. These indicator statements were further processed in SPSS to compute a Sub-Index representing all the economic factors. The mean of the indicators residing in their respective four factors was computed separately.

5.7.1.9 Factor Analysis of Social Impact

Using IBM SPSS, factor analysis was performed on Social-related statements to convert them into well-integrated categories. These values showed that our data was suitable for the factor analysis.

Table 5.8 **:** KMO and Bartlett's Test (Social Impact)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.**886
Bartlett's Test of Sphericity	Approx. Chi-Square	2726.100
	Df	66
	Sig.	.000

5.7.1.10 Factors Categorization of Social Impact

The Factor analysis converted all the statements into three factors. The Factor Loading value was taken as 0.40, the factors having values greater than 0.40 remained in the Rotated Component Matrix.

Table 5.9: Rotated Component Matrix for Social Impact:

Sr No	Social Aspects	Component		
		1	2	3
1.	Do children get an opportunity for healthy and physical activities while avoiding excessive association with social media?	.799		
2.	Do open spaces; let the community know the importance of open spaces in their lives and their impact on the environment?	.762		
3.	Do public open spaces like public parks and open green lands allow children to gather and play?	.738		
4.	Do the open green spaces act as a change agent through alteration in the social behavior of people by making them spare their time continually for healthy activities like visiting parks and gardens?	.607		
5.	Do green spaces like walking tracks help people improve their social behavior, such as morning walks [which requires early rise]?	.585		.487
6.	Do open and green spaces allow small investors to set up small-scale recreation-related setups like merry-go-rounds and swings?		.739	
7.	Do well-maintained open space pathways provide a safe, clean, shortdistance transport system for cycling and low-speed vehicles?		.734	
8.	Do the public parks and open green spaces allow the population to interact with nature and blend with it directly?		.680	
9.	Do the open spaces allow the general population to experience nature and better understand its dynamics?		.660	
10.	Do the open spaces allow the population to understand nature's benefits to the inhabitants?		.655	
11.	Do the clean Open Spaces provide opportunities for the general population for socializing and social cohesion?			.846
12.	Does Cultural interaction increase when people gather in open spaces regularly, meet, and interact with each other?			.793

5.7.1.11 Description of Social Factors

A total of twelve statements were subjected to factor analysis, and it gave us three factors which are described and labeled in Table 5.10.

Table 5.10: Social Factors

Sr. No.	Statement	Factor
1.	Do the children get an opportunity for healthy and physical activities while avoiding excessive association with social media?	Factor 1 Open space impact on social life
2.	Do the open spaces let the community know the importance of open spaces in their lives and their impact on the environment?	
3.	Do public open spaces like public parks and open green lands provide opportunities for children to gather and play?	
4.	Do the open green spaces act as a change agent through alteration in the social behavior of people by making them spare their time continually for healthy activities like visiting parks and gardens?	
5.	Do green spaces like walking tracks help people improve their social behavior, such as morning walks [which requires early rise]?	
6.	Do open and green spaces provide opportunities for small investors to set up small-scale recreation-related setups like merry-go-rounds and swings?	Factor 2 Human interaction with nature
7.	Do well-maintained open space pathways provide a safe, clean, short-distance transport system for cycling and low-speed electric vehicles?	
8.	Do public parks and open green spaces allow the population to interact with nature and blend with it directly?	
9.	Do open spaces allow the general population to experience nature and better understand its dynamics?	
10.	Do open spaces allow the population to understand nature's benefits to the inhabitants?	
11.	Do clean Open Spaces provide opportunities for the general population for socializing and social cohesion?	Factor 3 Culture awareness
12.	Does cultural interaction increase when people gather in open spaces regularly, meet, and interact with each other?	

5.7.1.12 Social Sub-Index (SSI)

The twelve indicators included in the social category described the relation of open spaces with different social aspects and conditions, their benefits, and drawbacks impacting the life of the public. These indicator statements are further processed in SPSS to compute a Sub-Index representing all the social factors. The mean of the indicators residing in their respective three factors was computed separately. Furthermore, a combined mean of these three factors was computed, which formed a Sub-Index representing all the indicators' weightage in one variable.

5.7.1.13 Factor Analysis of Environmental Impact

Factor analysis was performed on Economic-related statements, too, to convert them into relevant factors. These values showed that our data was suitable for the Factor Analysis.

Table 5.11**:** KMO and Bartlett's Test (Environmental Impact)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.885
Bartlett's Test of Sphericity	Approx. Chi-Square	3007.510
	Df	120
	Sig.	.000

The principal component analysis method and varimax rotation were applied to the data in SPSS to make new factors. The number of factors was not specified, and a free hand was given to SPSS to make the desired categories. The default option of retaining all factors with eigenvalues greater than 1.0 was selected for factor retention. That means that the factors having eigenvalues greater than 1.0 will be included for factor extraction.

5.7.1.14 Factors Categorization of Environmental Impact

The factor analysis converted all the statements into four factors. The factor loading value (suppress small coefficient absolute value below) was taken as 0.40, which removed all the coefficient values smaller than 0.60. The factors having values greater than 0.40 remained in the Rotated Component Matrix.

Table 5.12: Rotated Component Matrix for Environmental Impact

Sr. No.	Environmental Aspect	Component			
		1	2	3	4
1.	Can ignore and neglected open spaces be a source of a compilation of waste material and city garbage?	.715			
2.	Can Dirty and non-maintained open spaces pollute the environmental air?	.697			
3.	Do Greener and cleaner environments positively affect public psychological health?	.681			
4.	Does lower-level air pollution result in lower rates of pulmonary diseases?	.571			
5.	Do green spaces increase the natural beauty of the area?	.519		.472	
6.	Do the open spaces with trees and plantations provide animals like small birds, insects, snakes and lizards?	.512		.490	
7.	Can open spaces be used as safe shelter at the time of earthquakes?	.500		.430	
8.	Should the law for new urban cities development require equitable distribution of open space in the city to ensure that all social classes have equal access to their benefits?		.768		
9.	Is there a need for highly detailed law and its strict implementation [for a given urban area] regarding setting up the proportion of open areas to be maintained with constructed/utilized space?		.765		
10.	Do you think there needs to be a specified basis for planning open space distribution in the city, e.g., population density and unit area of land?		.699		
11.	Can public unconstructed lands not available for domestic use be a source of plantation and greenery?		.480		
12.	Can open spaces like parks and green belts play an essential role in the cleansing environment and reducing air pollution?			.779	
13.	Can Green spaces reduce the environmental temperature, which is constantly affected by fuel consumption in locomotives and industries?			.663	
14.	Should landscaping and plantation of government-owned open urban spaces be handed over to the private sector against suitable funding to benefit from economies of scale and avoidance of bureaucratic red tape?				.757
15.	Should the government provide funds to the local population for encouraging them to a plantation in their local open spaces?				.666
16.	Do you think traffic flow is better due to open spaces?			.480	.626

5.7.1.15 Description of Environmental Factors

A total of sixteen statements were subjected to factor analysis and four factors were generated which are given in Table 5.13 along with their labels:

Table 5.13 : Environmental Factors

Sr. No.	Statement	Factor
1.	Can ignore and neglected open spaces be a source of a compilation of waste material and city garbage?	Factor 1 Open spaces role in the improvement of the city environment
2.	Can dirty and non-maintained open spaces pollute air?	
3.	Do greener and cleaner environments positively affect public psychological health?	
4.	Does lower-level air pollution result in lower rates of pulmonary diseases?	
5.	Do green spaces increase the natural beauty of the area?	
6.	Do open spaces with trees and plantations provide animals like small birds, insects, snakes and lizards?	
7.	Can open spaces be used as safe shelter at the time of earthquakes?	
8.	Should the law for new urban cities development require equitable distribution of open space in the city to ensure that all social classes [rich or poor] have equal access to their benefits?	Factor 2 Impact of open spaces on land use management
9.	Is there a need for highly detailed law and its strict implementation [for a given urban area] regarding setting up the proportion of open areas to be maintained concerning constructed/utilized space?	
10.	Do you think there needs to be a specified basis for planning open space distribution in a city, such as population density and unit area of land?	
11.	Can public unconstructed lands not available to the public for domestic use [like graveyards] be a source of plantation and greenery?	
12.	Can open spaces like parks and green belts play an essential role in cleansing the environment and reducing air pollution?	Factor 3 Impact of open spaces on micro and macro environment
13.	Can Green spaces reduce the environmental temperature, which is constantly affected by fuel consumption in locomotives and industries?	
14.	Should landscaping and plantation of government-owned open urban spaces be handed over to the private sector against suitable funding to benefit from economies of scale and avoidance of bureaucratic red tape?	Factor 4 Role of environmental policies on open spaces
15.	Should the government provide funds to the local population for encouraging them to a plantation in their local open spaces?	
16.	Do you think traffic flow is better due to the presence of open spaces?	

5.7.1.16 Environmental Sub-Index (EvSI)

The sixteen indicators included in an environmental category described the relation of open spaces with different environmental aspects and conditions, their benefits, and drawbacks impacting the life of the public. These indicator statements were further processed in SPSS to compute a Sub-Index representing all the environmental factors. The mean of the indicators residing in their respective four factors was computed separately. Furthermore, a combined mean of these four factors was computed, which formed a Sub-Index representing all the indicators' weightage in one variable.

5.7.1.17 Factor Analysis of Physical Impact

Factor analysis was performed on physical-related statements, too, to convert them into relevant factors. The KMO value was found to be 0.732, and the chi-square value in Bartlett's test was recorded to be 886.797, which is very large and the associated significance to the lowest possible at 0.000. These values showed that our data was suitable for the factor analysis.

Table 5.14: KMO and Bartlett's Test (Physical Impact)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.732
Bartlett's Test of Sphericity	Approx. Chi-Square	886.797
	Df	15
	Sig.	.000

5.7.1.18 Factors Categorization of Physical Impact

The factor analysis converted all the statements into two factors. The factor loading value (the suppress small coefficient absolute value below) was taken as 0.40, which removed all the coefficient values smaller than 0.60. The factors having values greater than 0.40 remained in the Rotated Component Matrix.:

Table 5.15: Rotated Component Matrix for Physical Impact

Sr. No.	Physical Aspects	Component	
		1	2
1.	Do the design of open space and its location affect the utilization of open spaces?	.830	
2.	Is accessibility an essential feature of open spaces?	.820	
3.	Do you think the presence of open spaces gives a new and differentiated identity to the locality?	.812	
4.	Do you think the presence of open spaces reduces the crime rate?		.843
5.	Do the presence of open spaces in an area a threat to children's safety?		.785
6.	Do open spaces uplift the overall image of the area?	.405	.537

5.7.1.19 Description of Physical Factors

A total of six statements were subjected to factor analysis, and it gave us the two factors as narrated in Table 5.16.

Table 5.16 : Physical Factors

Sr. No.	Physical Factors	Component
1.	Do the design of open space and its location affect the utilization of open spaces?	Factor 1 The presence of open space has a positive impact on the community
2.	Is accessibility an essential feature of open spaces?	
3.	Do you think the presence of open spaces gives a new and differentiated identity to the locality?	
4.	Do you think the presence of open spaces reduces the crime rate?	Factor 2 The positive & negative impact of open spaces on security
5.	Do the presence of open spaces in an area a threat to children's safety?	
6.	Do open spaces uplift the overall image of the area?	

5.7.1.20 Physical Sub-Index (PSI)

The remaining six indicators included in the physical category described the relation of open spaces with different physical aspects and conditions, their benefits, and drawbacks impacting the life of the public. These indicator statements were further processed in SPSS to compute a Sub-Index representing all the physical factors. The mean of the indicators residing in their respective two factors was computed separately. Furthermore, a combined mean of these two factors was

computed, which formed a Sub-Index representing all the indicators' weightage in one variable.

5.7.2 Sustainability Index

Finally, an index was formulated by combining all the sub-indices of health, economic, social, environmental, and physical categories. This index was named sustainability index. The index was computed by taking the means of all the sub-indices. The resulting variable gave us a combined value that represented all the sub-indices into one variable: Sustainability Index.

5.7.2.1 Sustainability Index with Different Demographic Profiles

For this research, sustainability index values have been compared with different socio-demographics of the respondents. These Socio-Demographics include the respondents' age, gender, location, people having open spaces within their own houses, and size of the respondents' houses. For this purpose, a Crosstab analysis was performed in SPSS. The results gave us a picture of the people's responses to open spaces and their impact on their lifestyles. That determines the impact of open spaces, an essential component of any city.

This impact provides a picture of the role of open spaces in achieving sustainability of community life in three major cities of Pakistan. Also, the framework and tool are designed to determine any community's sustainability for five central pillars (social, environmental, economic, health, and physical) of sustainability.

5.7.2.2 Sustainability Index and Age of Respondents

When comparing the Sustainability Index and the age of the respondents, the results showed that people between the age group 19 to 29 years had the lowest impact on the presence of open spaces in their own house or their surroundings. Almost 70 percent (269 out of 386 people) of the respondents belonging to this age group said that open spaces have the lowest impact on their lives or daily activities. Overall, 70 percent (a percentage of 449 people out of 633 people) of the respondents said that Open spaces have the Lowest impact on everyday life.

Table 5.17: Sustainability Index and Age

		Age of the Respondent				*p*-value
	Impact Fullness	18-29	30-49	50+	Total	
Sustainability Index	High	3	1	0	4	0.336
	Moderately	114	59	7	180	
	Low	269	142	38	449	
	Total	386	202	45	633	

5.7.2.3 Sustainability Index with Gender of Respondents

When comparing the Sustainability Index and the gender of the respondents, the results showed that both males and females have the lowest impact on the presence of Open Spaces in their own house or their surroundings.

Table 5.18: Sustainability Index and Gender

		Gender of respondents			*p*-value
	Impact Fullness	Male	Female	Total	
Sustainability Index	Highly	0	4	4	0.181
	Moderately	81	99	180	
	Lowest	207	242	449	
	Total	288	345	633	

5.7.2.4 Sustainability Index and Location

When comparing the Sustainability Index and the respondents from three cities, the results showed that three cities have the most negligible impact regarding open spaces. These results also indicate that they have insufficient knowledge about the benefits of open spaces, which ultimately significantly impact citizens' mental and physical health.

Table 5.19: Sustainability Index and Location

		City of respondent				*p*-value
	Impact Fullness	Islamabad	Lahore	Peshawar	Total	
Sustainability Index	High	1	3	0	4	0.000
	Moderate	58	83	39	180	
	Low	145	117	187	449	
	Total	204	203	226	633	

5.7.2.5 Sustainability Index and Presence of Open Space in Residences

A comparison was made between Sustainability Index and open spaces present within the residence premises. It is indicated that the open spaces present are not appropriate to impact the life of the residents. That suggests that the architecture of residential areas currently in vogue in three cities of Pakistan is not design-wise sustainable, considering that the critical aspect of open spaces is ignored..

Table 5.20: Sustainability Index and Open Space in Houses

		Open Space in House							***p*-value**
	Impact Fullness	Lawn	Veranda	Open Back yard	Roof Acssess	No OS	Other	Total	
Sustainability Index	High	1	0	0	1	2	0	4	0.017
	Moderate	79	24	11	41	24	1	180	
	Low	217	81	44	66	36	5	449	
	Total	**297**	105	55	108	62	6	633	

5.7.2.6 Comparison of Sustainability Index with Size of the Hous

The basic unit used to determine the area of any land use in Pakistan is Marla, which is equal to 272 sq. ft. This research explores the impact of open spaces on the residents residing in the smallest to largest housing units. For this purpose, four categories define between 1 to 21 and above with intervals of 5 Marlas. Each last is open-ended because the standard provided in the National Reference Manual, Pakistan, is a rulebook for designing communities in Pakistan approved by the Government of Pakistan. It refers to developing any development codes in Pakistan. This manual divides the planned housing units into 3 Marlas, 5 Marlas, 7 Marlas, 10 Marlas, 20 Marlas and 20 and above is considered a large unit with different planning parameters. The cross-tabulation of the sustainability index with the size of residential units indicates that people residing in all housing units have felt the most negligible impact of open spaces on their lives.

Table 5.21: Sustainability Index and Size of the Home Marlas

		Size of the Home in Marlas					*p*-value
	Impact Fullness	0 to 5	6 to 10	11 to 20	21 +	Total	
Sustainability Index	High	1	2	1	0	4	0.483
	Moderate	50	64	57	9	180	
	Low	115	186	111	35	447	
	Total	166	252	169	44	631	

5.7.3 Sustainability Index and Socio-Demographic Profile

Pearson's r varies between +1 and -1, where +1 is a perfect positive correlation and -1 is a perfect negative correlation. 0 means there is no linear correlation at all.

Table 5.22: Correlation Matrix of SI and Socio-Demographic Profile

	(X1)	(X2)	(X3)	(X4)	(X5)	(X6)	(X7)
Sustainability Index (X1)	1						
Location (X2)	.112**	1					
Gender (X3)	-0.0305	.301**	1				
Age (X4)	0.0629	-.338**	-.407**	1			
Occupation (X5)	.117**	.381**	.431**	-.385**	1		
Housing Unit (X6)	0.0080	.106**	0.059	-0.0003	0.0631	1	
Open Space Availability (X7)	-.112**	-.115**	-0.005	-0.0134	-0.0009	-.396**	1

Note:Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation value shows a weak positive correlation between the Location and the Sustainability Index. The impact of Location on the Sustainability Index is very small. This means that these variables tend to decrease together. The value of the Pearson correlation shows that there is a weak negative correlation between the Gender and Sustainability Index. The impact of the Gender on Sustainability Index is very small. These values show that these variables have inverse relations and tend to decrease together. The value of the Pearson correlation shows that there is a weak positive correlation between the Age and Sustainability Index. The impact of Age on the Sustainability Index is very small. These values show that the theses variables tend to decrease together. The value of the Pearson correlation shows that there is a weak positive correlation between the Occupation and Sustainability Index. The impact of Occupation on the Sustainability Index is very small. These values show that the theses variables tend to decrease together. The value of the Pearson correlation shows that there is a weak positive correlation between the Household Size and Sustainability Index. The impact of Household Size on the Sustainability Index is very small. These values show that the theses variables tend to decrease together. The value of the Pearson correlation shows that there is a

weak negative correlation between the presence of Open Space in the house and the Sustainability Index. The impact of the presence of Open Space in the house on the Sustainability Index is very small. These values show that these variables have inverse relations and tend to decrease together.

5.8 Summary

Perception is an image of an element that human-built in their minds. This image determines the actions of the people. In the context of open spaces, the public's perception helps better manage these places. Karacor, E. and Akcam, E. (2016). Research conducted by Gold (1986) concludes that habits of people have a great impact on the consumption of green areas. The open spaces are places where the public interacts with each other and the environment. The user-friendly environment of public spaces encourages the public to use these places. Fermino, Reis, Hallal & Júnior (2013). The community's perception of open spaces is important as it depicts the condition of these spaces, which shows how much the government is investing in the development of open spaces. Nasution & Zahrah (2014). This research indicates a lack of realization of the impact of open spaces for achieving sustainability in community life by the residents in three major cities of Pakistan. That shows that open spaces are neither properly placed nor designed to generate an impact on the life of residents. This result is inferred because people of different ages residing in diversified housing units have been interviewed, and the majority have reportedly given an opinion of the lowest impact.

CHAPTER 6: DATA ANALYSIS

PART-III: REVIEW OF OPEN SPACE POLICIES IN PAKISTAN

This chapter provides an overview of the development, implementation, and impact of policies, legislation, and regulations regarding open spaces in Islamabad, Lahore, and Peshawar. Apart from discussing the definition of open space used and implemented globally, this chapter reviews the policymakers and policies prevailing in Pakistan's three major cities (Islamabad, Lahore, and Peshawar) regarding open spaces.

6.1 Background and Methodology

In Pakistan, the lack of documentation is a significant barrier to policy analysis. This gap was highlighted by the Supreme Court of Pakistan when it was revealed that there was no authentic list and texts of all laws in force in the country (Scrutiny, 2017). It led to the passage of the law – the Publication of Laws of Pakistan Act – which calls for printing the texts of laws of Pakistan free of errors and making them available to citizens (Scrutiny, 2017). However, access to rules and policies remains an issue for the researchers. As the phenomenon of urbanization has only recently come on the radar of policymaking, securing relevant documents is a time-consuming task.

For the policy analysis, this research used the content analysis method. This method is widely employed in social sciences. Other methodologies used for the policy analysis include hermeneutical, critical, bibliographical, and documentary. In the hermeneutical method, the documents are interpreted in their historical context, while the required method mainly evaluates documents in the light of some standards. Librarians and documentation lists and scientists use the bibliographical method to quote other methods. The documentary method has been developed to detail the contents of the documents for easy retrieval (Neveling, 2013). The content analysis has been adopted for this research as it provided the opportunity to review the urbanization and open spaces in Pakistan's context both in qualitative and quantitative aspects. The approach to collecting the qualitative and quantitative data was divided into stages.

- The collection of relevant documents (policies/legislations/regulations) regarding open spaces
- Data regarding open spaces in Pakistan in general and in particular for Islamabad, Lahore, and Peshawar

An intense effort was made to secure all relevant documents regarding urbanization and open spaces in Pakistan in laws, policies, and regulations from the pre-partition days. The researcher personally visited the relevant offices of the Capital Development Authority (CDA), Lahore Development Authority (LDA), and Peshawar Development Authority (PDA) along with the National Library in Islamabad to access the laws, policies, and regulations regarding urbanization and open spaces in Pakistan and the three cities. In some instances, the tehsil municipal authorities were also approached. Additionally, several documents were accessed online.

After collecting the relevant documents in the form of laws, policies, regulations, and numbers, the chronological review and analysis process was carried out. Though the emphasis was on the rules, policies, and regulations from 1947 onwards, this research also briefly reviewed the process of urbanization before the partition. It is essential to highlight the challenge of accessing relevant documents in Pakistan. As mentioned above, the policy documents regarding open spaces have not been maintained. To overcome this barrier, considerable time and effort were invested in reviewing and analyzing open spaces' laws, policies, and regulations.

6.2 Policies for Regulation of Open Spaces

Today, nearly 55 percent of the global population lives in cities. The United Nations estimates that by 2050, about 68 percent of the world's population will reside in cities (Sietchiping, 2020). As a result, the world has been called a planet of cities (Kourtit, 2014). As the future of humankind is in the metropolises of the world, how they are governed and managed has become a crucial issue, particularly about the use of available space for social, economic, cultural, and political purposes. The urban landscape or environment is considered the visual and structural integration of buildings, streets, and places (Cullen, 1998).

Within this visual and structural integration, the world has begun to realize the importance of open spaces as a part of civilization’s evolution (Balogh & Takács,

2011). Announced during the Global Forum 2012, the Charter of Public Places defines public spaces as *"All places publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive. Each public space has its own spatial, historical, environmental, social and economic features."* The charter included open (streets, sidewalks, squares, gardens, and parks) and sheltered spaces (public libraries, museums), which create without the motive of profit and which are for public enjoyment (UN-Habitat, 2013). The United States Environmental Protection Agency says any undeveloped open piece of land with no buildings or other built structures is an open space accessible to the public. It divides open space into green spaces (parks, community gardens, and cemeteries), schoolyards, playgrounds, public seating areas, plazas, and vacant lots· Open spaces are considered a premium natural and cultural resource, including parks, green vegetated spaces, wetlands, squares, paved roads, challenging landscape areas, and open marketplaces (Sivam et al., 2012). For the European Commission, a public space "is anywhere accessible to gather people together on a public basis," including public squares, monuments, parks, marketplaces, public beaches, pavements, streets, and riversides. In 1975 Marilyn Myers termed public spaces as "land or water area with its surface open to the sky, consciously acquired or publicly regulated to serve conservation and urban shaping function and provide recreational opportunities" (Myers, 1975).

In Pakistan, the Capital Development Authority, the agency which manages the country's capital, defines public open spaces as any open area including parks, playgrounds, waterways, and streets meant for public use (CDA, 2019). Public open spaces have been recognized globally as essential for a vibrant social, economic, and healthy city outlook. The European Commission says the open spaces provide the benefits of play, social interaction, creativity, economic activities, and entertainment. It adds that these are the very things on which a city thrives. Open spaces are essential for a sustainable city (Rakhshandehroo et al., 2017). Sangmoo Kim, an urban specialist, working with the World Bank, thinks quality streets, squares, waterfronts, public buildings, and other well-designed public spaces may be considered luxury amenities for affluent communities. Still, they are critical for the well-being of the

poor and the development of their communities. He terms public spaces as living rooms, corridors, and gardens of urban areas (Kim, 2015).

The UN-Habitate's Global Public Space Toolkit equates to improved quality of life by providing street space, green areas, parks, recreation facilities, and other public spaces. The cities are committed to providing public space to "enhance community cohesion, civic identity, and quality of life." The toolkit terms access to public spaces "the first step toward civic empowerment and greater access to institutional and political spaces" (Habitat, 2014). The Charter of Public Places highlights individual and social wellbeing as the significant advantage of open spaces. The charter links open spaces to opportunities for recreation, physical exercise, promotion of education and culture, freedom of expression, and places of individual and collective memory (UN-Habitat, 2013).

Similarly, the UN-Habitat's Report on the State of World Cities calls upon the cities "to enhance the public realm, expand public goods and consolidate rights to the 'commons' for all to expand prosperity. That comes in response to the observed trend of enclosing or restricting these goods and commons in enclaves of prosperity or depleting them through unsustainable use." (UN Habitat, 2014).

6.3 Governance Structure of Cities in Pakistan

Pakistan has been in a constant shift to urbanization since 1947. The country has the fastest urbanization rate of 3% in South Asia (Kugelman, 2014). It is estimated that by 2050, 52.2% of Pakistan's population will live in cities (Kundu et al., 2020). According to the provisional population census, by 2017, 75.6 million or 37.6% of people were living in cities (GOP, 2017a). The proportion of the urban population living in a slum areas in Pakistan in 2018 was 38% (Habitat, 2020). While reviewing the urbanization process in Pakistan, the political context should not be ignored. The dismemberment of the country in 1971 added another layer to the phenomenon of urbanization. As Pakistan tried to implement various models of local governments, the flow of urbanization plans, policies, and rules and regulations remained top-to-bottom, with the people at the local levels almost having no say in how towns and cities were planned (Malik & Rana, 2019). From the introduction of basic democracies by the first military government to the local government laws in

the 21st century, the governance structure of cities has witnessed changes (Malik & Rana, 2019). However, a basic governance structure comprising leading bodies in a city in Pakistan is described in the table below.

Table 6.1: Basic Governance Structure of Cities in Pakistan

Agency	Function	Status
Municipality	Responsible for supply of water, road maintenance, street lighting, drainage and solid waste management, safety, and health and education. In larger cities, also responsible for local transport, managing parks and zoo.	Have elected councils but administratively part of the provincial local government department. Limited to municipal limits and unable to recruit staff, raise funds, and pass administrative orders independently..
District Administration	Responsible for maintenance of law and order, local magistracy, overseeing land management, and coordinating urban services delivery.	The hierarchy of district administration starts from the Chief Secretary of the Province to Commissioner at the Divisional level, Deputy Commissioner (DC) at the District level, and Assistant Commissioner at the tehsil or town level. The DC is the main focal point for all the development and non-development.
Development Authority	The primary function is to plan and implement land development schemes. Development Authority has different roles, including building controls and supply of services. It also prepares 10-15 years of master plans for the city.	Semi-autonomous bodies under the Provincial Department of Housing and Town Planning.
Water and Sanitation Authority	The primary function is the development of infrastructure for water supply and sewerage systems. Also responsible for water supply, maintenance of sewerage and recovery of costs.	Semi-autonomous bodies under the Development Authority.
Cantonment Board	The primary function is to provide housing and services for the armed forces. Lately, the cantonments have opened up their land and acquired additional land for Defense Housing Officers' housing schemes.	Operates under the Federal Ministry of Defense Committee set up under the Core Commanders of Army, Heads of Naval and Air Force operation and management of housing schemes in their respective cantonments.

Source: The State of Pakistani Cities. (2018). UNHabitate, The Ministry of Climate Change, the Government of Pakistan, and Australian Aid.

The other main actors in the cities' governance are the Industrial Estate, which manages industrial areas, including land development and infrastructure construction and maintenance, and operates under the development authority's supervision. Utility organizations provide services regarding electricity and gas, acquiring land, building infrastructure, and regulating and recovering utility charges (UN Habitat, 2018).

Overall, urbanization is described as promising and problematic for Pakistan. Suppose it can help boost the country economically. In that case, it also adds to the challenges of providing the facilities such as housing, healthcare, employment, education, water, and energy to the ever-increasing population in its cities (Kugelman, 2014a). However, urbanization in Pakistan has been on plots, public housing, and urban works (Qadeer, 2014). Murtaza Haider argues that Pakistan's urbanization is a story of accidental cities, shaped more by migrations such as partition or the former Soviet Union's attack on Afghanistan in 1979 than organized planning (Kugelman, 2014a).

Nadeem ul Haque argues the process of urbanization has been limited only to service delivery, with little attention or planning vis-à-vis "cities' functionality, patterns, zoning, optimum size, architecture, globalization, governance, or the developing phenomenon of urban sprawl"(Haque, 2015). Though it is amply clear that Pakistan has been an urban country since 1947, the policymakers' refusal to accept this reality and plan accordingly has led to a policy based on interventionism, limiting the need for cities' expansion (Haque, 2015). The estimates for the current population living in Pakistan's cities have been contested as the definition of an urban area has neglected the population living on the outskirts of cities. That happened after the definition of what forms an urban area was changed in the 1998 census.

It excluded the unincorporated villages and towns with populations of 5,000. Previously these unincorporated villages and towns were categorized as urban. At that time, around 31 million people were living in these villages and towns. If the definition had changed, Pakistan's urban population would have been 55 percent instead of 32.5 percent in 1998 (Haque, 2015. Internationally, according to the UN-Habitat and the United Nations Population Division, the criterion for designating a place urban is a population density of 400 persons per square kilometer or 1000

persons per square mile (Qadeer, 2014). Termed rural policies, the areas on outskirts of urban districts, if seen in population density of 400 persons per square kilometer, this definition takes Pakistan's urban population to 58 percent (Kugelman, 2014a). In each population census, the definition of urban altered. In 1951, the census described urban areas as "(a) Municipalities, cantonments and notified areas irrespective of population size; (b) any other continuous collection of houses inhabited by not less than 5,000 persons and having urban characteristics." The 1961 census explained the urban areas in more details. It said the urban areas consisted of "(a) Municipalities as well as civil lines and cantonments not included within municipal limits; (b) any other continuous collection of houses inhabited by not less than 5,000 persons and having urban characteristics which the Provincial Director of Census decided to treat as urban for census purposes." However, it also included "areas which had urban characteristics but less than 5,000 population." The census in 1981 and 1998 came up with a restricted. It maintained "all localities which are a metropolitan corporation, Municipal Corporation, municipal committee or cantonment at the time of the census were treated as urban." Finally, the census in 2017 did not change the definition of urban area adopted in the 1981 and 1998 censuses (Habitat, 2018). The increase in the urban population in 1941-51 was attributed to migration from India to Pakistan at the partition. Most refugees/migrants settled in cities (Hassan, 1965). According to the population and housing census in 2017, there has been a 74.8% increase in ten major cities since the 1998 census. The ten cities are Karachi, Lahore, Faisalabad, Rawalpindi, Gujranwala, Peshawar City, Multan, Hyderabad, Islamabad, and Quetta (GOP, 2017a).

Table 6.2: Urban Share of Population

Area	Population (million)			Urban Share (%)		
	1981	1998	2017	1981	1998	2017
Pakistan	84.3	132.4	207.8	28.3	32.5	36.4
Khyber Pakhtunkhwa	11.1	17.7	30.5	15.1	16.9	18.8
FATA	2.2	3.2	5.0	-	2.7	2.8
Punjab	47.3	73.6	110.0	27.6	31.3	36.7
Sindh	19.0	30.4	47.9	43.3	48.8	52.0
Balochistan	4.3	6.6	12.3	15.6	23.9	27.6
Islamabad	0.3	0.8	2.0	60.1	65.7	50.6

Source: Pakistan Bureau of Statistics

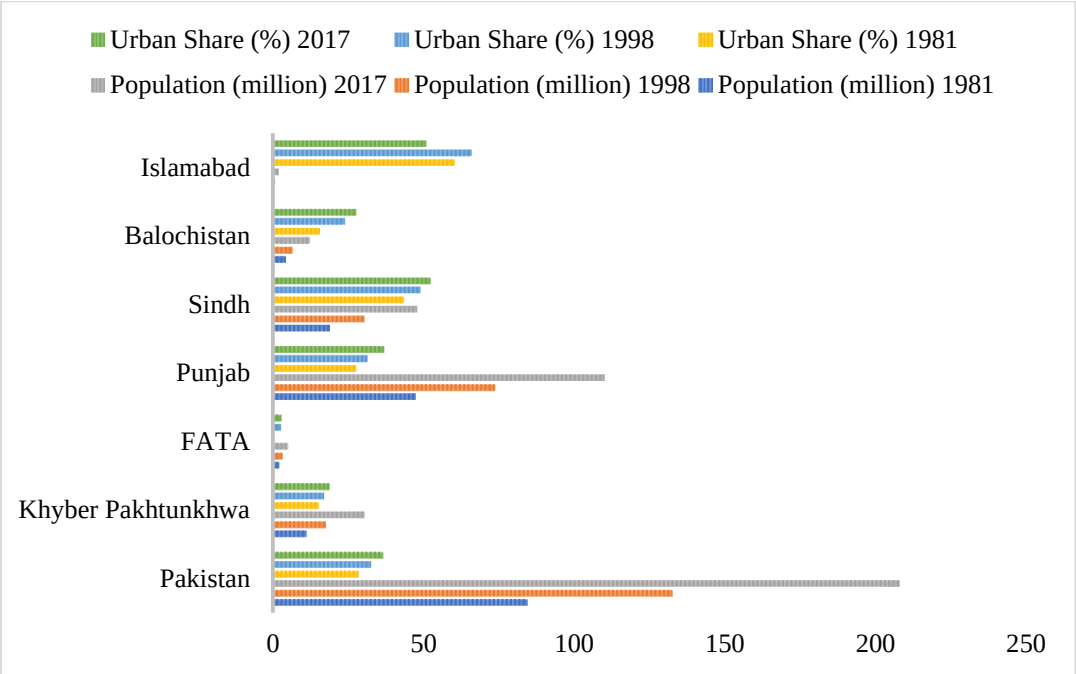

Figure 6.1: Urban Share of the Population

The share, growth, and tempo of urbanization have increased since 1950. Higher urban fertility and rural-urban migration have been the two main reasons for rapid growth in the urban population (Butt, 1996).

Table 6.3: Share, Growth, and Tempo of Urbanization (1950-2010)

Period	Urban Population (million)	Share in Total Pop (%)	Annual Average Growth Rate		The ratio of Urban/ Rural Growth	Tempo of Urban Growth
		%	Urban (%)	Rural (%)	%	%
1950	6.9	17.5	-	-	-	-
1955	8.7	19.7	4.6	1.7	2.7	23.7
1960	11.1	22.1	4.7	1.9	2.5	22.9
1965	13.5	23.6	4	2.3	1.7	13.1
1970	16.4	24.9	3.9	2.5	1.6	10.7
1975	19.7	26.4	3.8	2.2	1.7	11.7
1980	24	28.1	3.9	2.2	1.8	12.5
1985	30.8	29.8	5	3.3	1.5	11.8
1990	39.2	32	4.9	2.8	1.8	14.2
1995	49.1	34.7	4.5	2.1	2.1	16.2
2000	61.5	37.9	4.5	1.8	2.5	17.5
2005	76.1	41.4	4.3	1.3	3.3	17.7
2010	93.2	45.4	4.1	0.9	4.6	18.4

Source: UNO (1989)

The trend of urbanization is increasing during the second decade after freedom but afterward, it's on the rising side. The trend is increasing but slow-paced, contrary to the initial trend, which indicates a sharp increase.

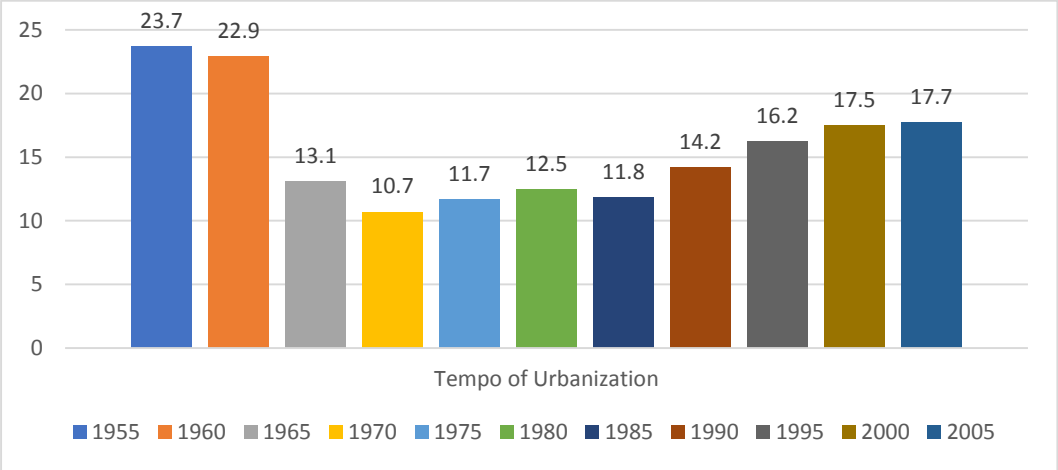

Figure 6.2: Urbanization Trend in Pakistan

After the partition in 1948, the government established a Development Board to "coordinate development plans, recommend priorities, watch the progress of development projects and make periodic reports to the Cabinet on the progress of development projects" (Waterston, 1965). Simultaneously, the Planning Advisory Board was created. The board consisted of officials and representatives from the private sector to advise the government “on planning and development, review progress in implementing plans, educate the public regarding the necessity for projects to be undertaken, and promote public cooperation of the development effort." In January 1951, the Planning Advisory Board was abolished, and the Planning Commission replaced the Development Board. Simultaneously an Economic Council was also established. The council's primary responsibility was to implement the Six-Year Development Programme, which was prepared in May 1950, while the commission was given tasks of Development Board and Planning Advisory Board (Waterston, 1965). It is also essential to keep in mind that the country witnessed the formation and abolition of various planning agencies with the same titles. The table below provides a list of planning agencies, with their duties and dates of formation and abolition. As stated above, it amply highlights a lack of continuity in policymaking (Appendix-II).

Table 6.4: Lack of Continuity in Policy Making

Sr.No	Period	Agency	Purpose
1	1948-50	Development Board	The first planning body.
2	1948-58	Ministry of Economic Affairs	Coordinated planning activities and acted as planning secretariat to various planning bodies.
3	1948-50	Planning Advisory Board	Advisory and public relations body during Pakistan's early planning period.
4	1951-57	Planning Commission	Reviewed projects before submission to higher authorities.
5	1951-56	Economic Council	An Economic Committee of the Cabinet responsible for the Six-Year Development Programmed.
6	1953-58	Planning Board	Established to prepare the first Five-Year plan
7	1956-58	Economic Committee of the Cabinet	The name was given to the Economic Council (No.5) when the National Economic Council (No.8) was established.
8	1956-58	National Economic Council	Created after adopting the Constitution of 1956 as the highest economic body in Pakistan. Approved the first Five-year plan.
9	1957-58	Development Working Party	The Central Body reviews projects and programs.
10	1958	Governors' Conference	Highest Policy making body in the country.
11	1958-59	National Planning Board	The name was given to the planning board to distinguish it from the East Pakistan Planning Board established in 1957.
12	1958	Planning Commission	Replaced the National Planning Board (No.11)
13	1959-62	Economic Committee of the Cabinet	Successor to a Development Committee previously established by the Martial Law government.
14	1959-62	Economic Council	The Martial Law government established it as the supreme economic body.
15	1959-61	Projects Division	Progressing Agency.
16	1961	Planning Division	The alternate name for the Planning Commission (No.12) after it was made part of the President's Secretariat.
17	1962	Economic Policy Coordination Committee	One of the two committees which succeeded was the 1959-62 Economic Committee of the Cabinet (no.13). Reviewed economic policies and oversaw their implementation. It was abolished soon after it was created.
18	1962	Executive Committee of the National Economic Council	The second of the two committees succeeded the 1959-62 Economic Committee of the Cabinet (no.13).
19	1962	National Economic Council	The successor of the 1959-62 Economic Committee of the Cabinet (no.14).

Source: Pakistan Bureau of Statistics

The Planning Commission prepared the Five-Year plans and oversaw their implementation. The line ministries, the provincial, and the local governments served as the executing agencies (Qadeer, 1996). In 1972, the government of Pakistan established the Environment and Urban Affairs, Division. Headed by a director-general, the focus of its responsibilities was human settlements and urban affairs. It also served as the focal point for coordinating the implementation of the National Conservation Strategy, which was formulated in 1992 (Islam & MacLean, 1993).

In the early years after the partition, urban policies focused on the physical planning house. The First-Five-year plan insisted on the government plan "to mobilize the labor, funds, and physical resources of the people who will own and use the houses and common buildings" (Qadeer, 1996). The emphasis was on the government's role in providing an institutional, infrastructural, and financial framework for the private sector to play its role in urban development effectively and equitably (Qadeer, 1996). Even by the 7th Five-Year plan (1988-93, the emphasis was on providing housing and community services for the poor.

The public sector's role was "limited to providing service and housing sites for low and lower-middle-income groups" (Qadeer, 1996). The fifth five-year plan introduced the private sector's formal role in housing investment was introduced in the 5th Five-year plan. Along with concentrating on on-site development for housing and slum improvements as part of the critical plans in the public sector, the 5th Five-Year plan called for mobilizing the private sector for investment in housing (Qadeer, 1996).

In 2011, the Planning Commission launched the Framework of Economic Growth, envisioning creative cities that would have been commercially active, focusing on "accelerated growth of housing and infrastructure" (Javed et al., 2020). The framework laid out the main factors needed for entrepreneurship, innovation, and productivity, envisioning 8% annual growth provided fundamental institutional changes. Despite being approved, the framework discards the change of government in Pakistan (Haque, 2015).

Though the implementation of Pakistan's urban policies failed to keep pace with the population growth and the tempo of urbanization, the country was a pioneer in formulating "physical planning and housing as a development function in the Third World as well as in the First World" (Qadeer, 1996).

As Pakistan's focus remained on housing and urban works, the idea of maintaining and developing open spaces in the cities remained an ignored area. In 1986, the National Reference on Planning and Infrastructure Standards discussed the need for open public spaces in detail. It perceived open spaces as planned or incidental (reserved, unutilized, or utilizable land). The manual sees planned open spaces associated with outdoor recreation. "They may be sub-categorized into stadiums and playfields, designed for active recreation (formal and information games), while parks and zoos are meant for relaxation, sigh-seeing. i.e., passive recreation." (GoP, 1986).

The manual also expressed concern over the disappearance of incidental open spaces and the non-provision of planned spaces in large urban centers (GoP, 1986). The manual provided guidelines for providing open spaces in small and medium housing schemes. While reserving 45-52% for the housing, it allocated 5-7.5% of land use for open spaces.

Table 6.5: Land Use Proportions for Small/Medium Housing Schemes

Sr	Use of land	Percentage
1	Residential	45-52%
2	Commercial	2-3%
3	Education, health, and other community facilities	7.5-10%
4	Road/Streets	25-30%
5	Open Spaces	5-7.5%
6	Others, including graveyards, equivalent reserves	2-5%

Source: National Reference Manual on Planning and Infrastructure Standards, Govt. of Pakistan 1986

While allocating open spaces, the manual discussed the population size and density, climate, and cultural habits. The manual argued that if open space is in rural areas, the increase in built-up areas in cities makes it extremely difficult to provide

open spaces (GoP, 1986). The manual also provided guidelines for land allocation to zones in designs of a new town, reserving open spaces in urban centers based on population and the type of area – residential, commercial, institutional.

It is interesting to note the discussion in the manual on the standards for open spaces. Quoting the traditional rule of allocating 10 percent space for parks and playgrounds, the manual rejects it as “not rational.” Similarly, it termed another rule – inherited from British textbooks – prohibiting 6 acres per 1000 persons as excessive (GoP, 1986). We find open public spaces in the cities’ management plans in recent times. The Lahore Development Authority Land Use (Classification, Reclassification, and Redevelopment) Rules, 2009 mention open areas, public parks, and plantations as part of the city’s development plan (GoP, 2009). A beautification plan for Peshawar in 2017 defines open spaces as "public land that has leisure, sport, landscape value, habitat conservation, environmental or visual amenity function and is zoned or reserved for public parks or conservation purposes. Open space is not only for recreation and conservation of environmental and cultural values, but it is also the foundation of urban livability” (IOM, 2014). In 2020, the Capital Development Authority defined public open spaces as any open area including parks, playgrounds, waterways, and streets, meant for public use (GoP, 2019).

6.3.1 Policy Development and Impact on Islamabad

Spread over 906.50 sq. km, Islamabad is located 14 km northeast of the garrison city of Rawalpindi. Out of the total area of the capital, 220.15 sq. km is urban, 466.20 sq. km rural, and 220.15 sq. km is Islamabad Park. In 1959, the first military government of General Ayub Khan decided to build a new city as the permanent capital of Pakistan. A Federal Capital Commission was formed to prepare a Master Plan for the capital (Hussain & Sultana, 1964). The initial master plan was designed in October 1960 as government servants and their families started shifting to Islamabad, the name given to the new capital. The master plan prepared by Doxiadis Associates was based on the principle of dynapolis, which meant a city with potential for dynamic development (Hussain & Sultana, 1964). Greek architect/town planner Doxiadis, the lead architect of Islamabad, considered Pakistan's capital as his best town planning (PIDE, 2020). It is important to note that

the capital city was conceived as a low-density administrative city (PIDE, 2020). Under the master plan, the city was divided into an urban area and a rural periphery where the urban has been planned. Still, the rural area has been managed with policy guidelines (Adeel, 2010).

In the 15 years from 2000 to 2015, Islamabad has witnessed unprecedented urbanization. The land consumption in the capital was 4.77 percent per annum from 2000 to 2015, which is higher than the land consumption rate in Karachi and Lahore. It is critical to note that between 2000 and 2015, the population growth rate of the federal capital city was 2.56 percent, the ratio of land consumption rate to the population growth rate (square meter per capita) was 1.86 percent, while the built-up area per capita increased to 83 persons from 59 persons in 2000. Therefore, from 2002 to 2015, Islamabad registered a 104.5 percent change in a total built-up area – the most significant change among major Pakistan cities (Habitat, 2018). The policy development for the city of Islamabad in chronological order is given in Appendix-II. The management of the city remained with the Capital Development Authority, which was established in 1960 through a presidential ordinance. In 2013, the local government system was introduced in the capital city to "devolve political, administrative and financial responsibility and authority to the elected representatives of the local governments" (GoP, 2013). The Capital Development Authority Ordinance, issued on 27 June 1960, introduces the aim of its establishment as "planning and development of capital (Islamabad) completing or authorizing Capital Development Authority to perform functions of a Municipal Committee and to provide for cleanliness, health, education of inhabitants, supply of goods, articles of food and mild, to promote the interest of different sections of the public" (CDA, 1960).

Under section 12 of the ordinance, the authority developed amenity plots, including public parks, playing fields, graveyards, and open spaces (CDA, 1960). However, the 1960 ordinance did not deal with open public spaces specifically. The capital was divided into five zones under the Zoning Regulation 1992 (GoP, 2013). In Zone 1, only the authority could acquire land, while in zones 2 and 5, private builders could carry out development activities. Zone 3 was declared a reserved area for mountain forests and piedmonts (Liu & Jiang, 2021). Zone 4 was for multiple

activities, including National Park, agro-farming, educational institutions, and research and development (Liu & Jiang, 2021). In other words, zones 1, 2, and 3 were reserved for planned urban development.

However, in 1992, the Modalities and Procedures Framed under ICT Zoning Regulation specifically allocated 8 percent of land for the open/green spaces/parks while allocating 55 percent for residential and 26 percent for roads/streets (CDA, 1992a). The regulation also identified nullahs or drains as open spaces which should be preserved (CDA, 1992b). While discussing permission for the private housing scheme, the undertaking under the regulation binds the private builder "transfer to the CDA, free of charge, the land reserved for open spaces/parks, graveyard, and land under right-of-way of roads, in the scheme within 45 days of the clearance of detailed layout plan of the scheme." (CDA, 1992b). In 2005, the Islamabad Land Disposal Regulation provided the classification of plots. Under section 7, the 2005 regulation registered public parks, playing fields, graveyards, and incidental open spaces as a separate identity. It said: "Plots planned, developed and maintained as public parks, playing fields, graveyards and incidental open spaces" (CDA, 2005).

Further, under section 11, the regulation explained that developing and maintaining public parks, playing fields, and graveyards rests with the CDA. However, CDA was given the power to "license/rent out some sites or the portions of public parks, playing fields or open spaces to the private sector on agreed terms and conditions for recreational purposes, sports facilities and ancillary usages" (CDA, 2005). The Islamabad Residential Sectors Zoning (Building Control) Regulations, 2005 again defined public open space as "any open area including parks, playgrounds, waterway, and streets meant for public use" (CDA, 2005).

The EPA (Environmental Protection Authority) Regulation, 2008 prohibited throwing garbage in the street, street comers, parks, or open spaces that may cause pollution directly or indirectly. The Islamabad Territory Local Government Act 2015 introduced the local government system in the federal cabinet. This act covers various aspects of managing and marinating the open spaces in the federal capital. Under the local government act, one of the tasks of the Union Council in the federal capital is to improve and maintain public ways and public open spaces (GoP, 2015a). Similarly, the 2015 act made it an offense to encroach on any property or open space

managed, maintained, or controlled by the capital's local government (GoP, 2015b). It also made establishing any open space or public park on the local government's land in Islamabad an offense (GoP, 2015d). The local government has the power to make rules about regulating the use of parks and open spaces (GoP, 2015e). Under bye-law 46, the capital's local government can provide and maintain within its local area such open spaces as may be necessary for the convenience of the public (GoP, 2015c). Islamabad was planned as a low-density city over the last two decades. It has witnessed an unprecedented increase in the built-up area. Today the share of the urban area allocated to open public places is 3.55 percent, as nearly one-third population (31.27 percent) of the capital city lives within convenient walking distance to open public spaces.

6.3.2 Policy Development and Impact on Lahore

Spread over an area of 3587 square kilometers, Lahore is the second-largest city in Pakistan, with 11.12 million (UN-Habitat, 2018). Today it has four Tehsils and 44 union councils. After the partition, the city's management was entrusted with the Lahore Development Authority (LDA, 2020). Before the partition, the city was managed by the Lahore Improvement Trust. On 19 May 1975, the Governor of Punjab notified the Lahore Metropolitan Area, which was further extended on 19 January 1988 by the orders of the LDA Director General (LDA, 2020). The city's administrative structure was altered with the promulgation of the Local Government Ordinance in 2001. It was declared as the City District Government Lahore, the city divided into six towns in 2001. In 2005, three more towns were added to the provincial capital city. The Lahore population has registered a constant increase in each census. The city's population increased to 11.12 million in 2017 (GoP, 2017a).

Table 6.6: District and Urban Population (in millions) - Lahore city

Year	1951	1961	1971	1981	1998
District Population	1.1	1.6	2.6	3.5	6.3
City Population	0.8	1.3	2.2	3.0	5.1

Source: Demographic profile of Lahore 2008. Urban Sector and Policy Management Unit

Though known as the city of gardens, the city has a high population density in the urban areas. In 2006 compared to 4,681 persons per sq. km in the district, the urban Lahore had 8,029 persons per sq. km (Mazhar & Jamal, 2009).

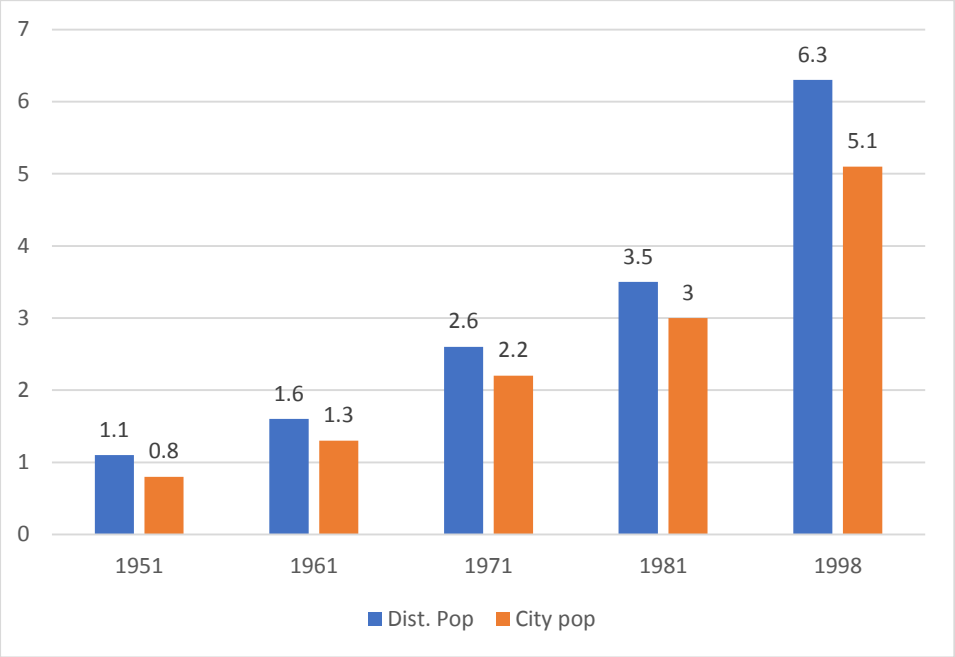

Figure 6.3: Comparison of District Population With City Population

According to the spatial indicators, Lahore is witnessing rapid urbanization. The annual land consumption rate in Lahore from 2002 to 2015 has been 3% per annum, with the population growth rate in the same period at 1.87 percent. (UN Habitat, 2020). The ratio of land consumption rate to the population growth rate between 2000 and 2015 has been 1.73% per annum (UN Habitat, 2012). The built-up area per capita (meter square per capita) was 28 in 2000, which increased to 34 in 2015. Similarly, the city has witnessed a 52.55 percent change in the total built-up area in the 15 years from 2000 to 2015 (Habitat, 2020). The urban area allocated for open space is less than 3 percent in Lahore, with 47.29 percent of the population living within convenient walking distance to open public space (Habitat, 2020).

The policy development for the city of Islamabad in chronological order is given in Appendix-III. We find a mention of the open spaces in the Town Improvement Act 1922, when the British government established the Improvement Trusts in Punjab to manage the urban centers. Under section 23 - Street schemes and

deferred street schemes – one of the tasks of the trust was to lay out thoroughfares and open spaces. Under subsection VII of section 28 - Combination of schemes and matters, which provide for, in the scheme, the act provides for the provision of open spaces in the interests of the residents "of any locality comprised in the scheme or any adjoining locality and the enlargement or alteration of existing open spaces." Further, under section 55 - Vesting in committee of streets laid out or altered, and open spaces provided by the trust under a scheme – it laid out the mechanism of the ownership of open spaces by the municipal committees. This law was last updated in 2014 (GoP, 2014c).

In 1949, the Thal Development Act provided "open spaces, playing fields, national parks, nature reserves, forests, and forest parks, camping grounds, campsites, holiday camp" under section 21, which laid out procedures for development schemes (GoP, 2003b). The subsequent legislation mentioned open space was the Punjab Development of Damaged Areas, 1952. Under its section 4 - Schemes for development of the damaged area – law allowed for the acquisition of any land…" necessary for or affected by the execution of the scheme, or adjoining any street, thoroughfare, or open space to be improved or provided under the scheme." It also provided for "open spaces in the interests of the residents of any locality comprised in the scheme or any adjoining locality and the enlargement or alteration of existing open spaces." (GoP, 2003a).

The Lahore Development Authority Act, 1975 makes a passing reference regarding the need for open spaces in the city. Under the Preparation of Schemes, section lumps the development of open spaces along with roads, parks, and graveyards. Further, it makes it an offense to establish a parking stand or any property on open space owned by the authority (GoP, 2014a). The Punjab Development of Cities Act 1976 did not define open space but made it an offense to establish parking or any property on an open space or public land (GoP, 2014b).

The Parks and Horticulture Authority Act 2012 divides open spaces into green areas, green belts, and public parks. It defines a green area as a space notified by the government "which is required to be kept green other than a public park or green belt and includes a notified playground." In contrast, the green belt is "an open space in any locality or area either pursuance of a development plan or otherwise,"

The public park is "a space reserved for use as a public park and notified by the government." The authority is responsible for "developing and maintaining public parks, green belts, and green areas" (GoP, 2017b). The need for open spaces has been mentioned in detail in the Walled City Act 2012. When it defines "buildings" in the context of the walled city, it includes open spaces in it. Encroachments under the act mean any unauthorized structure on urban open space, among other places.

Importantly, it includes open spaces as part of the heritage, and the maintenance of the open spaces is the duty of the Walled City of Lahore Authority. It perceives a public area as "any place, or urban open space to which public, subject to any restrictions deemed to be in the public interest, has a free and unfettered access." Critically it includes gardens, parks, playgrounds, walled spaces, playfields, and recreational areas as urban open spaces available to the public. Under section 7 of the act – functions of the walled city authority – one of the tasks is to "develop and maintain an urban open space." The master conservation and redevelopment plan for the Walled city under section 15 includes the "development, improvement and maintenance of public passages, urban open spaces, and public areas."

63.3 Policy Development and Impact on the City of Peshawar

Peshawar, the capital of Khyber Pakhtunkhwa province, is spread over 1,216.17 square kilometers and consists of 92 Union Councils & 346 village/neighborhoods councils. The border with Afghanistan is only 40 kilometers west of the city (Haq, 2017). Known as one of the oldest cities in South Asia, Peshawar is the eighth-largest city in Pakistan, with an annual population growth of 3 percent. Almost half of the city population (48.68% or 983000) was termed urban in the 1998 census.

In 2017, the city's population was 1.97 million, which is estimated to increase to 2.8 million in 2030 (Habitat, 2018). The city's population density increased to 4,990 persons per square kilometer in 2013 from 2,894 persons per square kilometer in 1998 (Rahim et al., 2015). Peshawar has been classified as a traditional city as it has a walled city within. Along with a cantonment, it has also been classified as a modern (Hayatabad) and informal city (UN Habitat, 2018). Like other major cities of Pakistan, Peshawar has witnessed rapid urbanization. That can be gauged from

the fact that one-third of the total urban population of the Khyber Pakhtunkhwa resides in Peshawar. Apart from the internal migration, Peshawar has been the first major destination for the Afghan people since the former Soviet Union invaded Afghanistan in 1979 (Habitat, 2018). The population growth rate in district Peshawar has consistently remained higher than in the province.

Table 6.7: Population Growth Trends in the Province and Peshawar

Inter-Censual Period	Average Annual Growth	
	Province	District
1951-61	0.02	0.03
1961-72	0.04	0.04
1972-1981	0.03	0.04
1981-1998	0.03	0.04
1998-2017	0.03	0.04

Source: Pakistan Bureau of Statistics, Govt. of Pakistan, Handbook of Population and Housing Census, 1998 Census

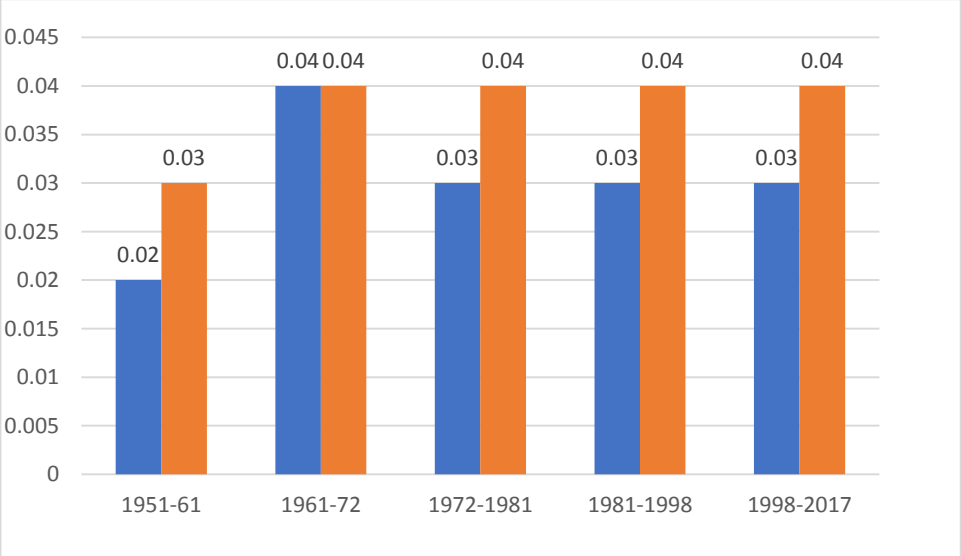

Figure 6.4: Growth Rate of Peshawar City

From 2000 to 2015, the land consumption rate in the city (1.91%) has been faster than its population growth rate – 1.78%, with the ratio of land consumption rate to population rate at 1.075%. The built-up area per capita (m2 per capita) had remained high and constant – from 96 in 2000 to 97 in 2015. That led to a 33.2% change in the built-up area in the city over the 15 years (Habitat, 2020). This rapid urbanization has put immense pressure on the resources of the city. Peshawar is one

of the six major cities with a high incidence of poverty, which stands at 31% (Habitat, 2018). Farmland area has registered a decrease from 6.656 km in 2006 to about 6.536 km in 2007 and from 6.454 km in 2008 to 6.156 in 2009 as the use of land for utilization increased.

The policy development for the city of Peshawar in chronological order is given in Appendix

-II. The Urban Policy and Planning Unit of the Khyber Pakhtunkhwa terms the "disappearance of incidental open spaces and inadequate provision of planned open spaces" a significant problem. It maintains that high land prices and high population density hinder the provision of spaces for outside recreation. Currently, the Peshawar district has nine open spaces/parks. The unit estimates that if the guidelines provided in the National Reference Manual for the provision of public open space are followed, Peshawar requires "70 hectares 114 (173 acres) for a metropolitan park, 208 hectares115 (514 acres) for metropolitan city stadiums, plus 50% of the sum of the above two, i.e., 190 hectares (469 acres) to cater for other recreational facilities mentioned above. The total area required for the future recreational complex is thus 468 hectares (1,156 acres)" (Haq, 2017). That is the estimate for a city with more than two million population. The proposed land-use plan finalized in 2017 provides parks and open spaces in major commercial areas and other facilities (Haq, 2017).

In various laws and rules in the Khyber Pakhtunkhwa, the need for providing or maintaining public open spaces has been mentioned. The Local Government (Site Development Schemes) Rules, 2005 says that while developing standards for any residential area, the National Reference Manual on Planning and Infrastructure Standards should be followed. And then it calls for reserving "Not less than 7% of total Scheme area" for open spaces and parks. While, farm housing schemes reserve 5% area for public utility purposes, including schools, dispensaries, open spaces and playgrounds, mosques, post offices, police stations, bus terminals, public toilets, and community centers. The rules mention open spaces as part of a residential scheme's location and layout plan. One of the functions of the village or neighborhood council under the Khyber Pakhtunkhwa Local Government Act, 2013 is maintaining and

improving the collective property, including public open spaces and community centers.

However, the law does not define what public space is. Under the fourth schedule, the law mentions offenses. One of them prohibits encroachment on any open space or public park managed by the local government. It also enlists Byelaws for parks and open spaces as one of the duties of the local government. However, the Peshawar Development Act, 2017 defines green areas as "any space, notified by government as a green area, which is required to be kept green including a notified playground other than public parks or green belts." It also defines a green belt as "an area other than a public park, which is kept as an open space in any locality or area either in pursuance of a development plan or otherwise." It takes a public park as an open space "reserved for use, recreation and entertainment of public duly notified by the government from time to time as a public park."

6.4 Summary

After the partition, there seems to be some realization that Pakistan would be an urbanized country at the policy level. This was made evident as the migrants mostly settled in the cities of the new country after the partition. However, there was no preparation visible to exploit urbanization's opportunities and meet the challenges it poses. That may be attributed to the political instability of the early years as Pakistan countered governance challenges. Pakistan witnessed seven prime ministers in the first ten years of its existence until martial law was imposed in 1958. In the early years, Pakistan faced a constant stream of migrants, and urbanization ensured housing facilities. As the process remained unplanned, the resulting urbanization was also haphazard. Though the emphasis remained on providing housing facilities, providing adequate housing units has never been achieved in Pakistan's history. In the context of urbanization, the open space remained an ignored policy issue. In 1986, the then Ministry of Housing and Works Environment and Urban Affairs Division described the open space parameters in its National Reference Manual on Planning and Infrastructure Standards. It discussed the open space in the context of population size and density, climate, and cultural habits. It then set standards for active recreational facilities, playfield sizes, and plot sizes. It also provided standards

for passive recreation. Though the open space standards provided by the National Reference Manual on Planning and Infrastructure Standards have been mentioned in the subsequent urbanization policies of the cities, they have not been strictly followed.

Even before the partition, the importance of open space in the cities was realized in the legislation. In several laws, policies, and regulations, the necessity for maintaining open spaces accessible to all has been mentioned. That is especially clear in the case of Punjab (Lahore) and the CDA (Islamabad). Overall, it can be argued that urbanization as a whole and open space remained ignored in terms of policymaking. That is why research studies term the cities in Pakistan unplanned and accidental. It can also be argued that the realization regarding the need for open spaces in urban life has not come from any research, but from the increasing population and the migration to cities, especially after the 1990s, resulting in rapid consumption of land and illegal development, which alarms the policymaker for the preservation of open spaces through some framework to stop urbanization.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

There is a considerable gap in the research need for open spaces and their importance in urban centers of Pakistan; this is to be addressed on an urgent basis. The need for open spaces has been mentioned in various policies, legislations, and regulations, but it has not been given the attention it deserves. Unless credible data about the population of the cities, available land, and the economy is carefully analyzed, urbanization will continue to be unplanned and haphazard in Pakistan. Spatial planning is contingent upon credible data. The lack of a stable policymaking mechanism is one of the missing links to ineffective urbanization in Pakistan.

7.1 Conclusions

7.1.1 Spatial-temporal analysis

The Spatial-temporal analysis of three major cities of Pakistan indicates the consumption of open spaces. Changes are occurring in terms of total area consumption of open spaces in three major cities of Pakistan. However, these changes are different for open spaces selected for this research, with mix increasing and decreasing trends. There is a lack of understanding of the role of open space role in planned urbanization. The concept of open spaces has been confused with the environment, or rather the idea of a plantation. The public mostly assumes that the open spaces within a house, allocated under the building bylaws, are the only areas preserved by the government.

7.1.2 Public perception of open spaces

Lack of awareness was observed during this research work about the rules and regulations regarding the open spaces in the cities. That is understandable as there seems to be no effort at the official level to frame rules for the public open spaces in the urban centers of Pakistan. A countrywide awareness campaign on the need for and importance of open public spaces was emphasized. The commercialization of land has been concluded as the main reason for the shrinking open spaces in the cities. The citizens maintained that the relevant government

departments seem oblivious to properly managing and maintaining open spaces in the cities.

Illegal constructions were also the main factor in shrinking open spaces in the cities. Illegal construction is destroying or has destroyed open spaces in the urban centers of Pakistan. Other factors responsible for the destruction of open spaces are encroachments, lack of awareness, climate change, and government inefficiency.

The citizen of Pakistan realizes the importance of open spaces for providing healthy activities, which leads to a lesser level of stress. They also agreed that open spaces contribute to an improved environment. Most public opined that regularly visiting public parks and green belts help bring down their mental stress levels. They understood and agreed that open spaces allow more significant social interaction, especially for the elderly and the young. Most recognize that playgrounds and parks are essential for the well-being of children. The public also appreciates the link between the open spaces and economic activities. They thought that open spaces could be a source of economic generation, mainly in small businesses.

7.1.3 Open Space Policies Development and Implementation

Planning policies of different developing authorities of Pakistan lack detailing and only indicate one dimension of planning for open spaces: percentages allocation of varying land uses provided in planning parameters. In the context of urbanization, the open space remained an ignored policy issue. Even before the partition, the importance of open space in the cities was realized in the legislation. In several laws, policies, and regulations, the necessity for maintaining open spaces accessible to all has been mentioned. This is especially clear in the case of Punjab (Lahore) and the CDA (Islamabad). The urbanization process involves considerable and, in some cases, astronomical increases in property prices. Open spaces are the first and easy victim of the speculative rise in land prices when this happens.

7.2 Recommendations

The consumption trends of open spaces indicated in this research will help decision-makers determine these changes' socioeconomic and environmental impacts on the city dwellers. That, in turn, contributes to developing a correlation

between sustainability and open spaces. Open spaces as a standalone policy issue have been recognized globally. In Pakistan, the maintenance and management of open spaces in urban centers should be treated as a policy issue instead of just mentioning it when urbanization is discussed. The National Reference Manual on Planning and Infrastructure Standards, formed in 1986, dedicated a chapter to open spaces in Pakistan. That needs to be updated, considering the increase in density and expansion of urban centers and the environmental factor. Experts called for including environmental experts, academic institutes, and research centers in urban planning, which would help preserve open public spaces.

The role of NGOs is vital in creating awareness about the need for open spaces like Miyawaki urban forest established in Lahore in a collaboration between the provincial Parks and Horticulture Authority and a local NGO. There was strong backing for tree plantations to solve pollution in the cities. Trees have also been seen as essential to well-maintained open spaces.

As a policy area, open public spaces have remained ignored. With no legislation and specific policies on preserving and maintaining them, Pakistan's public open spaces are shrinking. Unless a balance achieves in meeting the increasing population's housing needs and planned urbanization, the future of open public spaces remains messy and bleak. The role of government in the management and maintenance of open public spaces has been recognized globally. Stable and continued local government system, provided under article 140-A of Pakistan's constitution, is a must for ensuring that the cities are planned and managed following the people's will.

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APPENDICES

APPENDIX-I

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Survey for Assessment of Environmental and Socio-Economic Impacts of Open Spaces on community

This questionnaire is designed to gather people's perceptions about the effects of consumption of open spaces on various aspects of their daily lives. The questionnaire consists of the following three sections:

Section I: Basic information about respondents and availability of the open spaces
Section II: Opinion and perception about open spaces and their impact on the community
Section III: Factors for improvement of open spaces in the area

SECTION 1: BASIC INFORMATION ABOUT RESPONDENTS AND AVAILABILITY OF THE OPEN SPACES

1. **Location of respondent:**

   City ☐

2. **Gender of respondents**

   Male ☐ Female ☐

3. **Are you head of the family:**

   Yes ☐ No ☐

4. **What is your age _____(Years)**
5. **How many years of education you have attained_____(5 years or more)**
6. **Please state your occupation**

   Doctor ☐ Engineer ☐ Government Officer ☐ Private Sector ☐

Teacher / Professor ☐ Scientist / Researcher ☐ Businessman / Entrepreneur ☐

Other (Please Specify) _____ ☐

7. **How long have you been living in this area?_____(Years)**
8. **The area you are living in is:**

Approved Government Society Developer(s) ☐ Developed by Private ☐

Slum / Kachi Abadi ☐ Other (Please Specify)_____ ☐

9. **What is the size of the home you are living in?_____(Marlas)**
10. **Is there any open space in your house such as:**

Lawn ☐ Veranda ☐ Open Backyard ☐

Access to the roof top ☐ No Open Space ☐ Other (Please Specify)_____ ☐

11. **Is there any open space near your house?**

YES ☐ NO ☐

12. **If your answer to Question 11 is YES, then please indicate:**

Park ☐ Playground ☐ Open Area ☐

Vegetation or green areas ☐ Barren Land ☐ Other ☐

13. **Status of open space near your house:**

Public ☐ Private ☐

14. **What is the size of the open space:**

Small (Less than 1 acre-3 acres) ☐ Medium (3-5 acres) ☐

large (Above 5 acres) ☐

15. **What is the distance of open space from your house?**

Please specify in Kilometers _____

16. **Open space is newly constructed, or it existed before the period you started living in this area**

Newly Constructed ☐ Previously Constructed ☐

17. **Is the open space near your house managed by Municipal Department**

Yes ☐ No ☐

18. **If your answer to Question 17 is YES, then please state what facilities are available there:**

Security	☐	Fencing	☐	Eating Facility	☐
Lighting	☐	Playing Toolkit	☐	Sitting	☐
Walking tracks disabled	☐	Vegetation / Trees	☐	Facilities for	☐
Swings for children	☐	Drinking water for visitors	☐		

19. **Are you satisfied with the facilities provided [As per Question 17]? Please rate the facilities provided on a scale of 1 to 5, with 1 being the minimum and 5 being the maximum**

1 ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☐

20. **What type of land use dominate your surroundings**

Residential ☐ Commercial ☐ Mixed ☐ Other (Please Specify) ☐

SECTION II - OPINION AND PERCEPTIONS ABOUT OPEN SPACES AND THEIR IMPACT ON COMMUNITY

Please rate the following questions on a scale of 1 to 5.

Sr. #	Question	1 Strongly Agreed	2 Agreed	3 Undecided	4 Disagreed	5 Strongly Disagreed
1	Do the Open spaces provide opportunities for healthy activities like jogging and exercise that cause improvement in human health?					
2	Do the Open spaces provide opportunities for people for physical activity that reduces risks of diseases like diabetes and blood pressure?					
3	Does the clean air of green open spaces like public parks help improve the respiratory systems of their regular visitors?					
4	Can Unclean and filthy open spaces be hazardous for the health of visitors and people living nearby?					
5	Can open green space cause pollen allergy in the general population?					
6	Are Clean open spaces a source of natural beauty that gives psychological relaxation to their visitors?					
7	Does easy access to clean and green open spaces help reduce mental tension and depression by providing a place for rest and recreation?					
8	Can mental stress be reduced if residents regularly visit nearby open spaces like parks and green belts?					

9	Can People rest and relax in open spaces that will improve their overall health in the longer term?					
10	Do the parks provide space for individuals to have their alone time to think and analyze while being away from the city hustle and bustle?					
11	Can open areas be a source of injuries to the people due to their physical activities? [Stumbling during running for instance].					
12	Can open spaces be dangerous for visitors, especially during nighttime, because of harmful creatures like lizards, snakes, scorpions, etc.?					
13	Can the wildlife parks on mountains be dangerous for people wishing to climb them?					
14	Do Open spaces like public parks provide opportunities for setting up new businesses, refreshments, souvenirs, sports tools, etc.?					
15	With new business setups in Open spaces, do the employment opportunities increase?					
16	Does the increased employment reduce the burden on the national exchequer for unemployment allowances?					
17	Does the Increase in employment rates reduce low life social evil rates such as shoplifting, drug usage, and thefts?					
18	Do the Clean and green open spaces like green belts, parks, and gardens attract tourism and play a positive role in the civic economy?					
19	Do the well-maintained open spaces attract tourists that help build a softer image of the country, attracting more tourists?					

20	Does tourism attraction create jobs for the local population, such as tourist guides?					
21	Can unmanaged and filthy open spaces negatively affect tourism?					
22	Can the availability of well-maintained open spaces increase the nearby real estate prices due to a green and clean environment?					
23	Does the availability of clean and green areas in the locality impact the type and quality of construction in the surrounding areas?					
24	Can green open spaces, causing a rise in real estate purchase prices and their rentals, act as a catalyst in creating division in society by dividing the living areas of rich and poor?					
25	Do the People, in general, prefer to live in areas that have plenty of open spaces within their vicinity and in their surroundings?					
26	Can Open spaces help in avoiding traffic congestion?					
27	Does the presence of public places like parks and near residential areas create privacy issues for the residents?					
28	Do the public parks with entrance fees contribute to the national exchequer?					
29	Do the private businesses set up in public parks pay fees/rent to the government, thus contributing to national income?					
30	Do the publicly managed parks provide employment opportunities for government employees [gardeners, security guards, cleaners, police officers, medical specialists, etc.]?					
31	Do the open spaces being used for healthy activities result in overall better average health of the people, reducing government					

	spending for the health sector such as hospitals, medicines, and medical staff?					
32	Does the government have to bear the bear cost that increases with the increase in the number of publicly managed open spaces if the access is free of cost?					
33	Can open spaces be used as an alternate for urban agriculture?					
34	Can private house lawns and gardens support their owners in growing fruits and vegetables sufficient for their own needs?					
35	Do the clean Open Spaces provide opportunities for the general population for socializing and social cohesion?					
36	Does Cultural interaction increase when people gather in open spaces regularly, meet, and interact with each other?					
37	Do green spaces like walking tracks help people improve their social behaviors, such as morning walks [which requires people early rise & early to bed]?					
38	Do public open spaces like public parks and open green lands provide opportunities for children to gather and play?					
39	Do the children get the opportunity for healthy and physical activities while avoiding excessive association with social media?					
40	Do the open spaces let the community know the importance of open spaces in their lives and their impact on the environment?					
41	Do the open green spaces act as a change agent through alteration in social behaviors of people by making them spare their time continually for healthy activities like visiting parks and gardens?					

42	Do the open spaces bring positive change in the behavior and thinking style of the people?					
43	Do well-maintained open space pathways provide a safe, clean but short-distance transport system such as cycling low-speed electric vehicles?					
44	Do open and green spaces provide opportunities for small investors to set up small-scale recreation-related setups like merry-go-rounds and swings?					
45	Do the public parks and open green spaces allow the population to interact with nature and blend with it directly?					
46	Do the open spaces allow the general population to experience nature and better understand its dynamics?					
47	Do the open spaces allow the population to understand nature's benefits to the inhabitants?					
48	Can the open spaces be used for activities like drug sales, prostitution, or other criminal activities if not kept clean, well maintained, and adequately guarded?					
49	Can open urban spaces play a role in Social sustainability by providing an opportunity for the population to visit a commonplace and interact with each other?					
50	Does the absence of open spaces in a city threaten its sustainability?					
51	Do you think the presence of open spaces reduces the crime rate?					
52	Do the Open spaces uplift the overall image of the area?					
53	Do the presence of open spaces in the area threaten children's safety?					

54	Do you think traffic flow is better due to the presence of open spaces?					
55	Can Open spaces like parks and green belts play an important role in cleansing the environment and reducing pollution, especially air pollution?					
56	Can Green spaces reduce the environmental temperature, which is constantly affected by fuel consumption in locomotives and industries?					
57	Can Trees and plantations provide fresh oxygen to the environment and population and reduce carbon levels in the air?					
58	Can Dirty and non-maintained open spaces pollute the environmental air?					
59	Can be ignored and neglected open spaces be a source of a compilation of waste material and city garbage?					
60	Does lower-level air pollution result in lower rates of pulmonary diseases?					
61	Do Greener and cleaner environments positively affect general public psychological health?					
62	Can Open spaces provide passage for the floodwaters at times of flooding, thus avoiding damage to property and avoiding associated costs?					
63	Can open spaces be used as safe shelter at the time of earthquakes?					
64	Do the open spaces with trees and plantation provides habitat for animals like small birds, insects, snakes, lizards, etc.?					

65	Do green spaces increase the natural beauty of the area?					
66	Can private open lands such as private house lawns well gardened with flowers refresh the air and participate towards the area's average cleanliness and natural look?					
67	Can public unconstructed lands not available to the public for domestic use [like graveyards] be a source of plantation and greenery?					
68	Is there a need for highly detailed law and its strict implementation [for a given urban area] regarding setting up the proportion of open areas to be maintained about constructed/utilized space?					
69	Should the law for new urban cities development require equitable distribution of open space in the city to ensure that all social classes [rich or poor] have equal access to their benefits?					
70	Do you think there needs to be a specified basis upon which open space distribution in a city is planned such as population density, unit area of land etc.?					
71	Should the government provide funds to the local population for encouraging them to a plantation in their local open spaces?					
72	Should the landscaping and plantation of government-owned open urban spaces be handed over to the private sector against suitable funding to benefit from economies of scale and avoidance of bureaucratic red tape?					
73	Can open spaces with greenery and plantation act as a recycling tool for the city, thus making the city livable and self-sustainable for a longer period?					

74	Do the open green spaces act as an agent of sustainability of living space by constantly cleaning breathable air, cooling down the temperature that results in rainfalls that help maintain irrigation, underwater table, and drinkable water storage?					
75	Do the open spaces provide space for naturally growing grass and greenery?					
76	Do the green spaces provide shade to the living beings, especially under high temperatures?					
77	Can the higher number of open and green areas regulate the temperature for a longer period?					
78	Do you think the presence of open spaces gives a new and differentiated identity to the locality?					
79	Do the design of open space and its location affect the utilization of open spaces?					
80	Is accessibility an important feature of open spaces?					

SECTION III
FACTORS FOR IMPROVEMENT OF OPEN SPACES IN THE AREA

1. Please provide your opinion regarding the management of open spaces

_____
_____
_____

2. How can more effective open spaces be included in your community? Please Comment

_____
_____
_____

3. Are you willing to move to another place if you find better open spaces in another community? Please comment

_____
_____
_____

4. What measures do you think the government should take to improve the situation of open spaces in the communities? Please comment

_____
_____
_____

Thank you for your time

Appendix-II

Table Indicating Policy in Different Eras of Islamabad City

City	Year	Policy/Legislation	Clause	Department
Islamabad	1964	Master Plan		Federal Capital Commission
Islamabad	1960	CDA	Section 12	Capital Development Authority - CDA
Islamabad	1969	The Islamabad Capital Territory Municipal Bye-Laws, 1969	105	CDA
Islamabad	1979	The Islamabad Wildlife (PPC&M) Ordinance, 1979	Section 20	CDA
Islamabad	1985	The Capital Development Authority Conduct of Business Regulation, 1985	1	Estate Management Directorate
Islamabad	1985	The Capital Development Authority Conduct of Business Regulation, 1985	V. Subsection 1	Regional Planning Directorate (including rural development)
Islamabad	1985	The Capital Development Authority Conduct of Business Regulation, 1985	4. Subsection A	CDA
Islamabad	1992	Zoning Regulation 1992	5. Planning Standards (Subsection II)	CDA
Islamabad	1992	Zoning Regulation 1992	5. Planning Standards (Subsection X)	CDA
Islamabad	1992	Modalities and Procedures Framed Under ICT, (Zoning) Regulation, 1992	7. Clearance of detailed layout plan of the scheme	Capital Development Authority
Islamabad	1992	Modalities and Procedures Framed Under l. CT (Zoning) Regulation, 1992	Sub-section D Undertaking Annexure A Sub-section D	Capital Development Authority
Islamabad	1993	Islamabad Land Disposal Regulation, 1993	Regulation 3	Capital Development Authority
Islamabad	2002	The ICT. Agricultural Produce Markets Ordinance, 2002	33. Encroachments Subsection 1.	Capital Development Authority
Islamabad	2005	The Islamabad Land Disposal Regulation, 2005	7. Public Parks, Playing Fields, Graveyards, and incidental Open Spaces	Capital Development Authority
Islamabad	2005	The Islamabad Land Disposal Regulation, 2005	11. Public Parks Sub Section 2	Capital Development Authority
Islamabad	2005	The Islamabad Residential Sectors Zoning (B, C.) Regulations, 2005	1.2.50	Capital Development Authority
Islamabad	2005	The Islamabad Residential Sectors Zoning (B. C.) Regulations, 2005	1.2.115	Capital Development Authority
Islamabad	2008	The CDA (Environmental Protection) Regulation, 2008	5. Prohibitions Subsection XII	Capital Development Authority

Table Indicating Policy in Different Eras of Islamabad City

City	Year	Policy/Legislation	Clause	Department
Islamabad	2008	The CDA (Environmental Protection) Regulation, 2008	5. Prohibitions XXIX	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Section 71. Functions of Union Council. Subsection a	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Section 73. Functions of Metropolitan Corporation. Subsection VII	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Part II. Offense. Subsection 15	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Part II. Offense. Subsection 19	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Part II Bye-Laws Subsection 17	Capital Development Authority
Islamabad	2015	The Islamabad Capital Territory Local Government Act, 2015	Licensing: General Provisions Subsection 46. Open Spaces	Capital Development Authority
Islamabad	2020	Revised Modalities & Procedures framed Under ICT (Zoning) Regulation, 1992 (Amended)	5 – Planning Standards for Zones 2 and 5	Regional Planning Directorate

Appendix-III

Table Indicating Policies in Different Eras for Lahore City

City	Year	Policy / Legislation	Clause	Department
Lahore	1922	Town Improvement Act 1922	Section 23	Improvement Trust, Punjab
Lahore	1922	Town Improvement Act 1922	Section 28	Improvement Trust, Punjab
Lahore	1922	Town Improvement Act 1922	Section 55	Improvement Trust, Punjab
Lahore	1949	Thal Development Act 1949	Section 21	Punjab government
Lahore	1952	The Punjab Development of Damaged Areas 1952	Section 4	Punjab government
Lahore	1975	The Lahore Development Authority Act, 1975	13. Preparation of Schemes. Subsection 6	Punjab Assembly
Lahore	1976	The Punjab Development of Cities Act 1976	Schedule-Part B. Subsection 7	Punjab Assembly
Lahore	2012	The Parks and Horticulture Authority Act 2012	Section 2. Definitions	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XI	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XVI	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XXII	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XXIX	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XXX	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XXXII	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XXXIX	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Section 2. Definitions. Subsection XL	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter III Powers and Functions of the Authority Subsection VIII	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter III Powers and Functions of the Authority Subsection X	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter IV Conservation, Planning, Development, Management, and Regulation of the Walled City Section 15-Master conservation and	Punjab Assembly

Table Indicating Policies in Different Eras for Lahore City

City	Year	Policy / Legislation	Clause	Department
			redevelopment plan for Walled City Subsection VII	
Lahore	2012	The Walled City Act 2012	Chapter IV Conservation, Planning, Development, Management, and Regulation of the Walled City Section 3, Subject to Subsection 2 (IV)	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter V Heritage Properties and Zones of Special Value Section 23- Declaration of Heritage Property Subsection 1	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter V Heritage Properties and Zones of Special Value Section 23- Declaration of Heritage Property Subsection 2	Punjab Assembly
Lahore	2012	The Walled City Act 2012	Chapter V Heritage Properties and Zones of Special Value Section 24- Zones of Special Value Subsection 2	Punjab Assembly

Appendix-IV

Table about Policies in Different Eras for Peshawar City

City	Year	Policy/Legislation	Clause	Department
Peshawar	2005	The Local Government (Site Development Schemes) Rules, 2005	Chapter II Scrutiny of Scheme subsection IV	Local Government, Election and Rural Development Department, Khyber Pakhtunkhwa
Peshawar	2005	The Local Government (Site Development Schemes) Rules, 2005	Section 8. Planning Standards Subsection a	Local Government, Election and Rural Development Department, Khyber Pakhtunkhwa
Peshawar	2005	The Local Government (Site Development Schemes) Rules, 2005	Section 9. Sanction and its communication Subsection ii	Local Government, Election and Rural Development Department, Khyber Pakhtunkhwa
Peshawar	2005	The Local Government (Site Development Schemes) Rules, 2005	Section 11. Farm Housing Scheme. Subsection c	Local Government, Election and Rural Development Department, Khyber Pakhtunkhwa
Peshawar	2013	The Khyber Pakhtunkhwa Local Government Act, 2013	Section 29	Khyber Pakhtunkhwa Assembly
Peshawar	2013	The Khyber Pakhtunkhwa Local Government Act, 2013	Fourth Schedule – List of Offences with Enforcement Jurisdiction Requiring Court Trial Subsection – 16	Khyber Pakhtunkhwa Assembly
Peshawar	2013	The Khyber Pakhtunkhwa Local Government Act, 2013	Fourth Schedule – List of Offences with Enforcement Jurisdiction Requiring Court Trial Subsection – 20	Khyber Pakhtunkhwa Assembly
Peshawar	2013	The Khyber Pakhtunkhwa Local Government Act, 2013	Part-II Bye-Laws Subsection – 22	Khyber Pakhtunkhwa Assembly
Peshawar	2017	The Peshawar Development Authority Act, 2017	2. Definitions Subsection h	Khyber Pakhtunkhwa Assembly
Peshawar	2017	The Peshawar Development Authority Act, 2017	2. Definitions Subsection m	Khyber Pakhtunkhwa Assembly