



**INTEGRATING LAND USE AND TRANSPORTATION PLANNING FOR
SUSTAINABLE DEVELOPMENT: A CASE STUDY IN KABUL CITY**

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**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE
IN CITY AND REGIONAL PLANNING DEPARTMENT**

**GAZİ UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

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(M. Sc. Thesis)

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ABSTRACT

This thesis investigates the integration of land use and transportation planning to achieve sustainable development in Kabul, Afghanistan. The rapid urbanization and population growth of the city have led to serious problems, such as traffic congestion, air pollution, and inefficient land use, posing significant challenges for sustainable urban development. Through a comprehensive field study methodology, this research evaluated planning processes and interviewed stakeholders to identify existing problems and recommend strategic interventions. Key findings reveal that uncoordinated planning and lack of sustainable infrastructure are major obstacles to effective urban development. The study proposed a set of integrated planning strategies aimed at improving connectivity, reducing environmental impacts, and enhancing the overall quality of urban life. The recommendations include developing multimodal transportation systems, encouraging mixed-use development, and implementing policies that support green infrastructure and equitable resource distribution. In conclusion, the research highlighted the critical need for coordinated land use and transportation planning to address Kabul's urban challenges.

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SÜRDÜRÜLEBİLİR KALKINMA İÇİN ARAZİ KULLANIMI VE ULAŞIM
PLANLAMASININ ENTEGRE EDİLMESİ: KABUL ŞEHİRİ ÖRNEĞİ

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ÖZET

Bu tez, Afganistan'ın Kabil kentinde sürdürülebilir kalkınmayı sağlamak için arazi kullanımı ve ulaşım planlamasının bütünleştirilmesini araştırmaktadır. Şehrin hızlı kentleşmesi ve nüfus artışı, trafik sıkışıklığı, hava kirliliği ve verimsiz arazi kullanımı gibi ciddi sorunlara yol açmış ve sürdürülebilir kentsel kalkınma için önemli zorluklar ortaya çıkarmıştır. Kapsamlı bir saha çalışması metodolojisi aracılığıyla, bu araştırma planlama süreçlerini değerlendirmiş ve mevcut sorunları belirlemek ve stratejik müdahaleler önermek için paydaşlarla görüşmüştür. Temel bulgular, koordine olmayan planlamanın ve sürdürülebilir altyapı eksikliğinin etkili kentsel kalkınmanın önündeki en büyük engeller olduğunu ortaya koymaktadır. Çalışma, bağlantıyı iyileştirmeyi, çevresel etkileri azaltmayı ve kentsel yaşamın genel kalitesini iyileştirmeyi amaçlayan bir dizi entegre planlama stratejisi önermiştir. Öneriler arasında çok modlu ulaşım sistemleri geliştirmek, karma kullanımlı kalkınmayı teşvik etmek ve yeşil altyapıyı ve eşit kaynak dağıtımını destekleyen politikaları uygulamak yer almaktadır. Sonuç olarak, araştırma Kabil'in kentsel zorluklarını ele almak için koordineli arazi kullanımı ve ulaşım planlamasına olan kritik ihtiyacı vurgulamıştır.

Bilim Kodu : 123685
Anahtar Kelimeler : Kentsel ulaşım planlaması, kentleşme, kalkınma, sürdürülebilirlik
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Danışman : Prof. Ebru Vesile ÖCALIR

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I dedicate this thesis to my mother, who has consistently supported me, provided insightful guidance, demonstrated my life path, and motivated me to pursue my lifelong learning goals. I also dedicate this thesis to my dad, who taught me the art of overcoming adversity and persevering through challenging times. I would like to express my eternal thanks to Prof. Ebru Vesile ÖCALIR, my family, and my friends for the support they showed me during my entire academic journey.



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SYMBOLS AND ABBREVIATIONS

Below are the symbols and abbreviations used in this study along with their explanations.

Icons	Descriptions
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km²	square kilometer
hz	Hektar
m²	Square meter

Abbreviations	Descriptions
----------------------	---------------------

BOT	Build Operate Transfer
BRT	Bus Rapid Transit
CBD	Central Business District
CSO	Central Statistical Office
CAV	Connected and Autonomous Vehicles
DEM	Digital Elevation Model
GIS	Geographic Information System
IAPT	International Association of Public Transport
JICA	Japan International Cooperation Agency
KUDF	Kabul Urban Design Framework
KUPD	Kabul Urban Planning Department
KM	Kabul Municipality
KMDA	Kabul Metropolitan Development Authority
MAAS	Mobility as A Service
MUDL	Ministry of Urban Development and Land
NRC	National Research Council
SUM	Shared Used Mobility
SUMP	Sustainable Urban Mobility Plans
TOD	Transit Oriented Development
TMC	Turning Movement Count
UPT	Urban Public Transit

1. INTRODUCTION

Kabul city has experienced rapid urbanization and population growth over the past few decades, resulting in significant challenges in managing land use and transportation effectively. Comprehensive land use planning is lacking in the city, leading to the informal development of a significant portion of the land. Many neighborhoods have grown haphazardly, leading to a lack of basic infrastructure, inadequate public services, and informal settlements (Noori, 2010). The city's 1970s-era master plan is out of date and ill-equipped to handle the problems of today. There is a need for updated land use plans that consider the current population, economic, and social dynamics of the city (Mohamad, 2005).

Kabul's transportation system faces numerous challenges, including traffic congestion, inadequate road infrastructure, and limited public transport options. The city has experienced a rapid increase in the number of vehicles, resulting in high traffic volumes and long travel times. Furthermore, the road network is insufficient to accommodate the increasing number of vehicles, and many roads are in poor condition. There are limited and poorly integrated public transportation options. Kabul has a few bus routes operated by private companies, but these services are inconsistent and unreliable (Mahmoud et. al., 2016). There is no formal public transit authority responsible for coordinating and planning public transportation services.

The absence of coordinated land use and transportation planning in Kabul City has given rise to several issues. The unanticipated expansion of residential, commercial, and industrial sectors has resulted in disorganized development patterns and deficiencies in transportation infrastructure. Consequently, the urban area is contending with significant traffic congestion, insufficient public transportation infrastructure, and heightened levels of air pollution. However, Kabul City has the potential to reduce the reliance on private vehicles, curtail carbon emissions, and alleviate the environmental consequences of transportation.

A multitude of obstacles confront Kabul City, the principal urban center and administrative hub of Afghanistan, in its ongoing process of growth and advancement. The primary concerns that necessitate attention in achieving sustainable development include rapid

urbanization, population growth, and insufficient infrastructure (Mahmoud, et. al, 2016). An imperative area that necessitates prompt consideration is the integration of land use and transportation planning. The integration of land use and transportation planning is a fundamental requirement for developing a cohesive and optimized urban environment.

The process entails the synchronization of land use patterns and transportation systems to foster sustainability, enhance accessibility, and mitigate congestion. Through the strategic placement of land uses and transportation networks, the city has the potential to optimize connectivity, decrease trip durations, and mitigate adverse environmental effects.

In conclusion, the task at hand entails the formulation of an all-encompassing strategic blueprint that considers the spatial arrangement of various land uses, the prevailing need for transportation services, and the optimal usage of pre-existing infrastructure. Promoting mixed-use developments, designing compact and walkable neighborhoods, and enhancing public transit systems can facilitate the attainment of a more sustainable urban environment.

Through the intentional integration of land use planning and transportation infrastructure, metropolitan areas have the potential to establish a highly efficient, interconnected, and environmentally friendly urban environment. Implementation of this measure would have the potential to not only boost accessibility and alleviate congestion but also enhance the overall quality of life for the local population and offset the negative environmental effects associated with mobility (Habibzai et al., 2017).

The integration of land use and transportation planning can help Afghanistan achieve its sustainable development goals. Kabul City was chosen as a case study due to its rapid urbanization and infrastructural challenges. Land use and transportation planning are integrated to address these issues, encompassing the reduction of urban sprawl, the improvement of public transportation, the promotion of mixed utilization, the preservation of natural resources, the enhancement of accessibility and equity, and the reduction of traffic congestion and air pollution. By locating amenities and employment opportunities close to residential areas, people can access these facilities more easily, reducing long commutes and excessive car use.

Investing in public transportation infrastructure, such as rapid bus systems, can provide affordable and convenient options, reducing congestion and air pollution. A mixed-use

development that combines residential, commercial, and recreational areas can also promote healthier lifestyles. By fostering sustainable mobility options and promoting equitable access to transportation services, Kabul can mitigate congestion, reduce emissions, and enhance the overall quality of urban life. Moreover, we should establish effective governance mechanisms to streamline decision-making processes, ensuring the successful implementation of integration planning strategies and ultimately guiding Kabul City towards a more sustainable and resilient future.

Problem statement / Description of the issue

Kabul City faces significant challenges in integrating land use and transportation planning for sustainable development. Rapid urbanization has led to sprawling development patterns, exacerbated traffic congestion, and caused environmental degradation. This fragmented approach has led to inefficient land use, with residential areas frequently located far from employment centers, resulting in lengthy commutes for residents. This reliance on private vehicles also contributes to air pollution and social inequity, especially for marginalized communities lacking adequate transportation options.

To address these issues, a holistic approach is needed, emphasizing compact, mixed-use development and investing in robust public transportation infrastructure. The problem definition is the first step in the research process, identifying the main issues and prioritizing the most pressing demands in the field of inquiry. The research objectives define the anticipated results and provide insight into the purpose of the study. These objectives include evaluating Kabul's existing transportation infrastructure, suggesting sustainable urban growth plans, and investigating methods for improving coordination of land use and transportation planning.

The scope of the study is a crucial component, as it establishes the study's parameters and determines whether it covers specific topics. Given Kabul City's specific land-use and transportation issues, the study focused exclusively on the city, providing a comprehensive review of local conditions. To understand long-term patterns and implications, the research decided whether to focus on current trends or past data.

Importance of research

The research on integrating in Kabul City holds paramount importance on multiple fronts. Firstly, it serves as a catalyst for informed decision-making by policymakers, urban planners, and stakeholders, offering a comprehensive understanding of the complex dynamics shaping the city's urban fabric. By elucidating the interconnectedness between land use patterns, transportation systems, and environmental sustainability, the research provides a roadmap for designing integration planning strategies that prioritize efficiency, equity, and resilience. Furthermore, the case study in Kabul City provides broader insights, providing valuable lessons and best practices that other urban contexts facing similar challenges worldwide can apply. Ultimately, the research underscores the urgency of adopting holistic approaches to urban development, highlighting the imperative of integrating land use and transportation planning as a cornerstone for building sustainable, livable, and inclusive cities in the 21st century.

Research questions

This research aims to answer the following key questions:

- R.Q.1. Is sustainable development a viable strategy for developing countries? Can these cities, specifically Kabul City in Afghanistan, successfully integrate land use and transportation systems?
- R.Q.2. Are the transportation problems in Kabul City, Afghanistan, primarily due to inadequate planning?
- R.Q.3. Do population growth forecasts and large-scale relocations have a significant impact on transportation issues in Kabul City, Afghanistan?
- R.Q.4. Do city authorities in Kabul have sufficient experience and expertise to effectively address challenges related to sustainable development, land use, and transportation planning?

Scope of the research

This section outlines the structure of the study to provide a more transparent overview for navigating the research. Initially, chapter one elaborated on the problems and challenges

related to the land use and transportation planning status in Kabul, Afghanistan. Additionally, chapter one outlines the research objectives and questions that the study will address in subsequent chapters.

Subsequently, chapter two first evaluated the theoretical background on transportation planning in Kabul, aiming to assess the existing knowledge and initiate a rational approach to investigating the topic. Secondly, bibliometric analysis is to enhance comprehension of public transportation systems in Kabul City through the integration of land use and transportation planning topics.

In the third chapter, the focus was on methodology and data analysis. The proposal, which includes a literature review of best practices, aims to integrate land use and transport planning into Kabul's planning process.

The focus of Chapter 4 was on the case study of Kabul city (Afghanistan), which provided essential information on transportation planning in Kabul city and an analytical approach to travel distribution. Chapter five discussed the main finding from the semi-structured interview. In closing, chapter six focused on conclusions and recommendations, considered the proposed research objectives and questions, evaluated the potential contribution of the proposed research to strategic transportation planning, and discussed its limitations and possible opportunities for future research.

Definitions

Land use planning involves the strategic allocation and management of land resources for various purposes, including residential, commercial, industrial, and recreational activities. Transportation planning, on the other hand, focuses on designing and managing transportation systems to facilitate the movement of people and goods within urban areas (Fattah, Morshed, & Kafy, 2022). In Kabul City, sustainable development emphasizes the harmonization of economic growth, social equity, and environmental conservation to meet the needs of the present without compromising the ability of future generations to meet their own. Integrating land use and transportation planning entails aligning these two domains to promote compact, mixed-use development, reduce dependency on private vehicles, and enhance accessibility to essential services and amenities while minimizing environmental

impacts. By clarifying these definitions, stakeholders can better understand the interconnected nature of land use and transportation planning and work toward more cohesive and sustainable urban development in Kabul City.



2. THEORETICAL BACKGROUND

2.1. Bibliometric Analysis

The integration of land use and transportation planning is a pivotal decision-making process intimately linked to sustainable urban growth. This connection influences the physical, economic, and social aspects of cities, affecting accessibility, environmental sustainability, and urban livability. In rapidly urbanizing areas such as Kabul, where population expansion and infrastructural difficulties converge, the interplay of land use and transportation planning is especially evident. Crucial elements include urban density, availability of basic services, public transit infrastructure, and governance systems that significantly influence the urban fabric.

The urban expansion of Kabul has posed considerable issues, including traffic congestion, air pollution, and unequal access to transit and housing. The absence of integrated planning between land use and transportation intensifies these problems, impacting overall quality of life and environmental sustainability. Addressing these difficulties requires a comprehensive strategy that acknowledges the interrelationship between land use and transportation to attain a sustainable and resilient urban environment.

This research seeks to examine the complex relationship between land use and transportation planning in Kabul City using a bibliometric analysis. Bibliometric analysis, a quantitative research tool, systematically assesses academic literature to discern trends, patterns, and significant contributions within a certain discipline. This method helps you understand the academic field better by focusing on important research contributions, thematic groups, and new trends in how land use and transportation planning are being combined.

This study utilizes bibliometric analysis to delineate the intellectual progression of the area, serving as a reference for urban planners, politicians, and scholars. This study examines worldwide literature on the integration of land use and transportation planning, highlighting key topics and approaches that have influenced the debate. The paper analyzes how these results might be contextualized to tackle the unique issues encountered by Kabul, such as inadequate infrastructure, rapid urbanization, and socio-economic inequalities.

In summary, the relationship between land use and transportation planning is fundamental to sustainable urban growth, especially in cities facing intricate socio-economic and environmental issues. This research enhances the comprehension of the information base via bibliometric analysis and offers practical insights specific to Kabul's setting. The results seek to connect worldwide research trends with local urban concerns, guiding future academics, planners, and politicians in creating more resilient and harmonious urban settings. This strategy aims to elevate living quality, augment environmental sustainability, and guarantee equal resource access for all inhabitants.

2.1.1. Methods

Bibliometric analysis is a crucial technique for statistically assessing and visualizing the academic landscape, allowing researchers to systematically discern trends, principal contributors, and nascent regions within a particular field of study. It offers a comprehensive framework for comprehending the intellectual architecture of a study topic, enabling informed decision-making and directing future research initiatives.

This research used bibliometric analysis to examine the amalgamation of land use and transportation planning for sustainable development, specifically in Kabul City. The study sought to delineate the worldwide research scene, identify significant works, and interpret these findings to tackle Kabul's specific difficulties. The bibliometric study used VOS viewer version 1.6.19, a prominent tool for generating useful and visually appealing bibliometric maps. VOSviewer has several benefits, such as its intuitive interface, capacity to handle extensive datasets, and availability as a complimentary tool. The Web of Science Core Collection database was the primary source of bibliographic data for this investigation.

The data acquired by scanning all papers in the Web of Science Core Collection database were exported in "tab-delimited file" format as a .txt file for analysis using VOSviewer. VOSviewer was used for many analyses in this study. These included co-author analyses to look at how researchers are connected, citation analyses (author, country, source, institution) to see how influential publications are, and bibliometric coupling analyses to find links between publications and research trends. The VOSviewer bibliometric mapping software was also used to do keyword co-occurrence analysis on information about residential site

choices to define the intellectual landscape, find developing domains, and reach other objectives. The table below enumerates the relevant analyses.

Table 2.1. VOSviewer analyses conducted in the study scope

Co-authorship	Authors
Citation	Authors
	Countries
	Sources
	Organizations
Co-occurrence	Key words

2.1.2. Findings

The research conducted on content indexed with the keyword " Land Use and Transport " in the "Web of Science" database as of December 16, 2024, resulted in 1121 publications. These include 825 articles, 207 Proceeding papers, 24 book chapters, 14 book review, 32 review article, 8 editorial materials, and 8 early access. Analyzing works from 1981 to 2025 reveals a significant increase in the number of publications, particularly since 2006, indicating sustained interest in the (Figure 2.1).

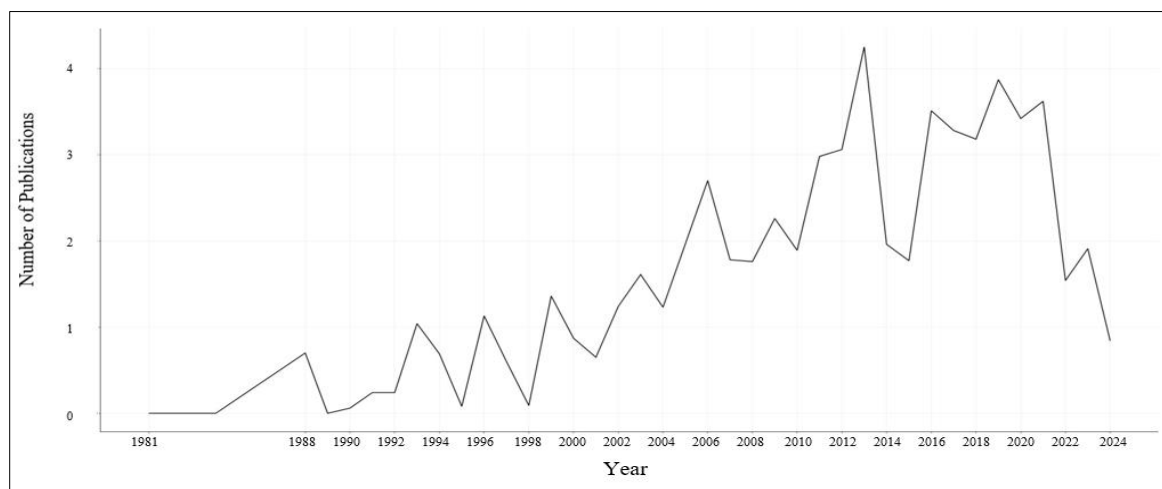


Figure 2.1. Distribution of publications on Land Use and Transport choices over the years.

Upon analyzing the research areas covered by the publications, "Transportation" ranks first with 450 studies, followed by "Transportation Science Technology" (298), "Environmental

Studies" (212), and "Engineering Civil" (176), "Urban Studies" (159), "Economics" (153), "Regional Urban Planning" (132), "Geography" (132), "Environmental Sciences" (76), and "Green Sustainable Science Technology" (66) contribute significantly to the topic, indicating diverse perspectives.

The analysis of meso-level citation topics reveals that transportation overwhelmingly dominates, accounting for 72% of publications. Secondary topics include forestry (12%) and nutrition & dietetics (5%). The remaining topics, such as telecommunications and remote sensing, each account for less than 5% of the total citations. At the micro level, the analysis highlights travel behavior as the leading topic, making up 68% of citations. Other significant topics include traffic flow (15%) and ecosystem services (7%). Minor topics, such as road safety and physical activity, each represent less than 5% of the analyzed publications. In terms of countries, the United States leads with 100 studies, followed by China (60) and the United Kingdom (35). The top 10 countries' contributions are detailed in (Table 2.2).

Table 2.2. Distribution of country land use and transport choice publications

Country	Number of Publications	Percentage (%)
USA	100	30
Netherlands	60	18
China	35	10.5
Canada	25	7.5
Australia	20	6
United Kingdom	20	6
Portugal	15	4.5
Norway	12	3.6
Italy	10	3
Belgium	8	2.4

2.1.3. Co-authorship analysis

For co-authorship analysis, considering authors with at least one publication and one citation, a total of authors 2331 were analyzed, resulting in a dispersed network with 146 clusters. The largest cluster comprises 22 authors.

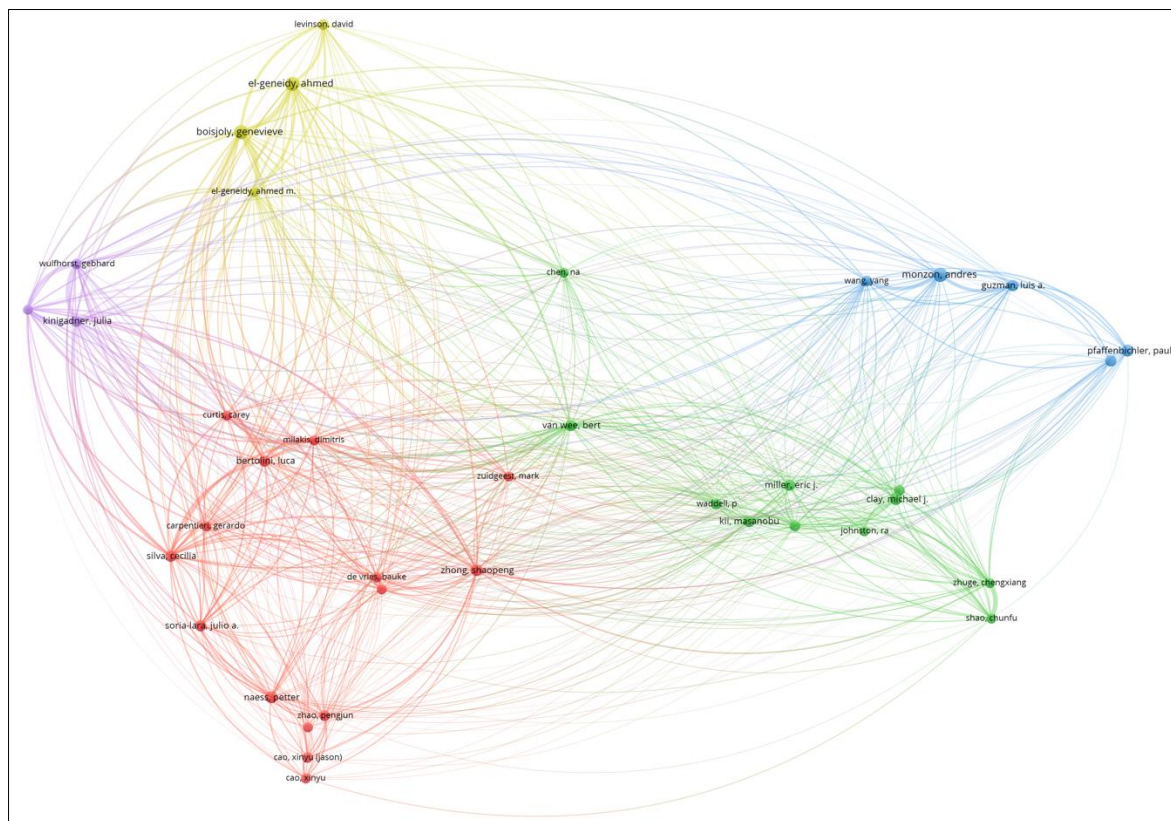


Figure 2.2. Co-authorship analysis-Vosviewer network map/main cluster

2.1.4. Author citation analysis

When both the number of publications and citations are considered, Monozon, Andres is positioned at the center of the largest cluster with 10 publications and 552 citations. The top five authors based on documents and citations are presented in (Table 2.3).

Table 2.3. Top five authors according to author citation analysis

Author	Number of Documents	Number of Citations
Monozon, Andres	10	552
Boisjoly, Genevieve	9	443
El-Geneidy, Ahmed	9	420
Clay, Michael J.	8	352
Naess, Petter	8	351

2.1.5. Country citation analysis

The country citation analysis, considering countries with at least two publications and one citation, includes 34 out of 63 eligible countries. The United States leads with 8228 citations, followed by the United Netherlands (2462), China (2087), Canada (1992) and Australia (1647).

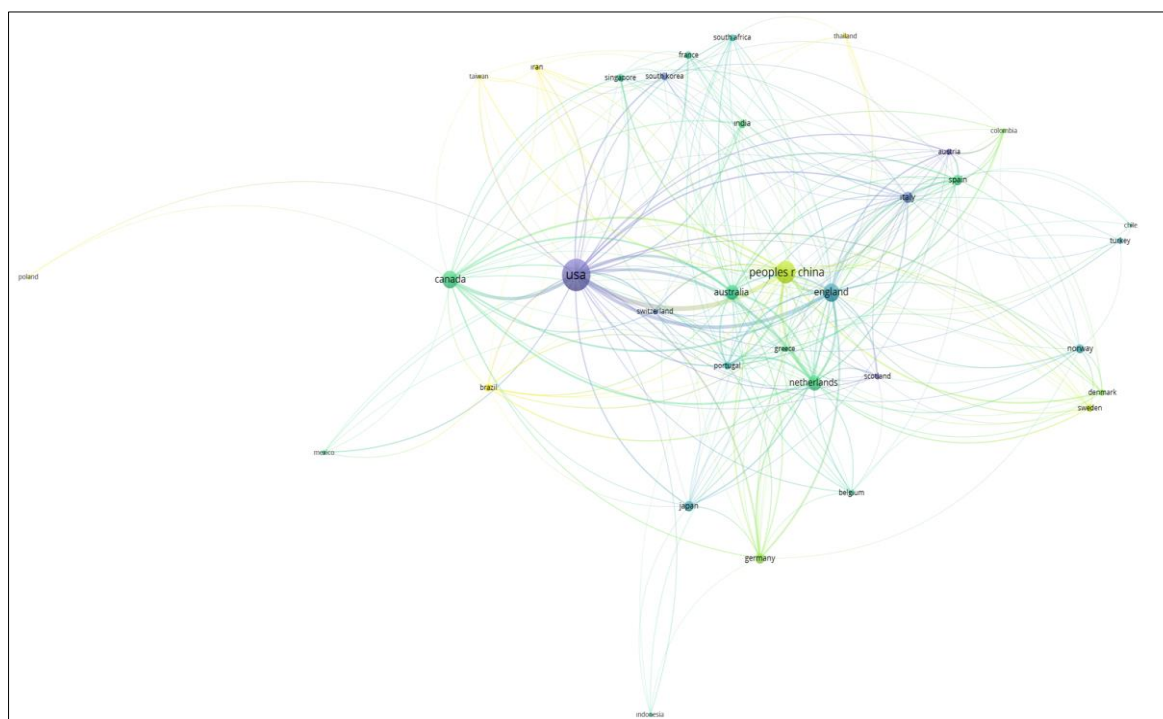


Figure 2.3. Country citation analysis

2.1.6. Keyword analysis

The keyword analysis was performed using 2143 keywords extracted from 320 publications, with VOSviewer identifying 481 keywords for inclusion. Figure 2.4. presents highly used keywords with strong connections.

The most frequently used keywords, along with their usage frequency, are listed in (Table 2.4).

Keyword	Usage Frequency	Percentages %
Land-Use	153	9
Travel	88	5
Built Environment	65	4
Model	63	4
Accessibility	58	4
Impacts	53	3
Transport	53	3
Travel Behavior	51	3
Transportation	50	3
Choice	49	3

Keyword	Usage Frequency	Percentages %
Land-Use	153	9
Travel	88	5
Built Environment	65	4
Model	63	4
Accessibility	58	4
Impacts	53	3
Transport	53	3
Travel Behavior	51	3
Transportation	50	3
Choice	49	3

The 2143 keywords formed 82 clusters based on co-occurrence, revealing patterns and connections in the literature. The most frequently used keyword, "Land use and Transport" forms the basis for clusters and stronger connections with other keywords, as detailed in (Table 2.5).

Table 2.5. Keywords strongly connected to " Land use and Transport"

Keywords
Community-Based Transportation Planning
Low-Carbon Transportation Systems
Transit-Oriented Development
Sustainable Urban Development
Non-Motorized Transportation
Multimodal Transportation Networks
Transportation Demand Management
Environmentally Sustainable Transport
Transportation Infrastructure
Climate-Responsive Urban Planning
Active Transportation Frameworks
Agent-Based Modeling
Economic Land Use Allocation
Urban Growth Management Policies
Comprehensive Mobility Strategies
Land Use Modeling
Integrated Regional Development
Public Transportation Accessibility
Sustainable Land Use Patterns
Transportation Equity Policies
Sustainable Mobility Frameworks

2.1.7. Source citation analysis

The search with the keyword "Land use and Transport" and the criteria of at least one document and one citation identified 390 sources. VOSviewer analysis reduced this number to 107. The top 10 sources are illustrated in (Figure 2.5).

2.1.8. Citation of organizations analysis

The organization citation analysis's findings show a concurrent trend in the quantity of publications and citations that nations have gotten. The three colleges in the United States rank in the top 10 of the organization's citation analysis, placing them among the top nations in terms of publication and citation counts. Only the universities of Cambridge and Leeds

are in the top 10 in the United Kingdom, which is among the top three nations in terms of publication and citation counts. The organization's citation analysis also includes the University of Hong Kong, China, in the top 10. This scenario, which at first look could seem contradictory, is caused by the nation's academic production being distributed rather evenly throughout several institutions. The study thoroughly investigates the distribution of citations by universities using the "Web of Science" database. It is found that 52 institutions share the 740 citations the nation has garnered from 69 publications.

An important reason for this is that there are a lot of research institutes and colleges that don't produce as much scholarly work or literature-related contributions as similar countries with similar populations. However, in smaller nations, the existence of a few but more effective institutions can make the reverse possible. The University of Toronto, one of Canada's most prestigious universities, is ranked first in the organization citation analysis with 642 citations, while the University of Polytech Montreal is ranked fourth with 464. The top 10 also includes German and Dutch universities that have made important contributions to the discipline. Table 2.6. displays the top 10 organizations based on the quantity of papers and citations.

Table 2.6. Results of organization citation analysis-Top 10

Institution	Number of Documents	Number of Citations
University of Toronto, Canada	10	642
University of Maryland, USA	8	584
University of Washington, USA	9	506
University of Polytech Montreal, Canada	14	464
Tech University of Munich, Germany	7	429
University of Cambridge, UK	5	397
University of Leeds, UK	4	351
University of Hong Kong, China	2	308
University of Carolina, USA	3	288
University of Amsterdam, Netherlands	1	263

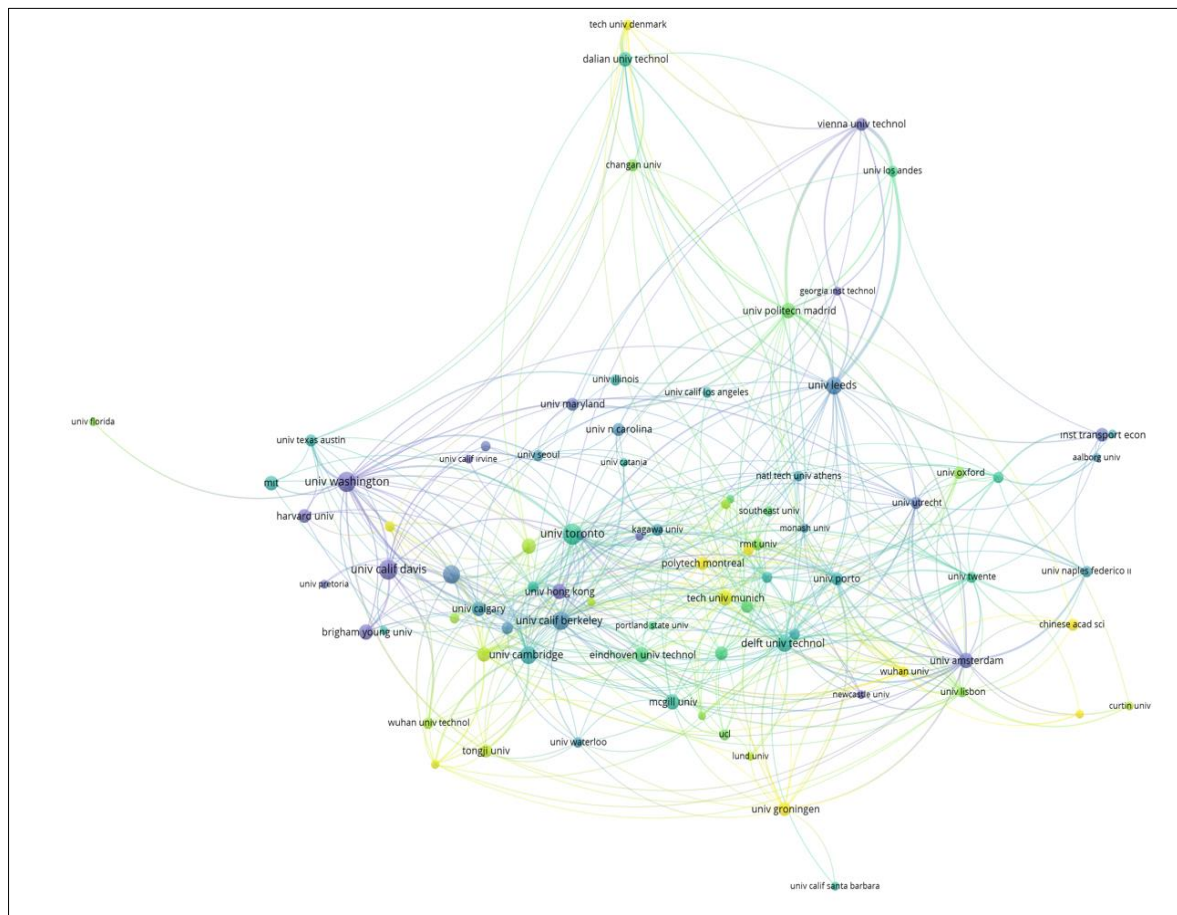


Figure 2.6. Results of organization citation analysis

2.1.9. Conclusion

It is acknowledged that integrating land use and transportation planning for sustainable development is a complicated process that involves decisions at the micro level as well as outcomes at the macro level. Along with broad impacts on social, economic, environmental, urban land use, and transportation systems at the local and federal levels, they also include household-level variables. The participation of other disciplines contributes to the complexity of this integration, expanding the field's scope and presenting challenges for researchers. It is necessary to investigate intricate connections between various domains, which takes a lot of time and work to build a strong academic basis for further studies.

In this regard, bibliometric analysis is seen as very helpful, as it makes it possible to identify research gaps, track advancement, and carry out significant investigations that are founded on thorough literature evaluations. The usage of bibliometric tools like VOSviewer, which

provide intuitive user interfaces and aesthetically pleasing findings, boosts researcher productivity by making it easier to find connections and trends in the literature.

This research uses bibliometric analysis to investigate how land use and transportation planning are integrated for sustainable development in Kabul City. The city's pressing issues are discussed, and important themes, trends, and knowledge gaps are found. This leads to insightful information that adds to the continuing conversation. Future studies aiming at furthering sustainable development goals are supposed to build on these results.

2.2. Integration of Land Use and Transportation Planning

A key idea in urban development theory is the integration of land use and transportation planning, which highlights the relationship between spatial patterns and mobility systems. With its roots in concepts like the "land-use transport feedback cycle," this theoretical paradigm asserts that transportation infrastructure shapes urban growth and that land use patterns significantly influence transportation demand (Shabtai et al., 2004). This integration is essential in Kabul City because of the city's rapid growth and changing transportation requirements. Planning well guarantees the optimal use of land resources while minimizing the negative effects on the environment, easing traffic, and promoting sustainable urban development. Kabul may benefit greatly from theoretical models like the Transit-Oriented Development (TOD) paradigm, which propose how mixed land-use development around transportation hubs might enhance livability and mobility.

The historical trends of uncontrolled growth and informal settlements in Kabul call for a theoretical change to organized land use frameworks that put accessibility, social justice, and environmental sustainability first (Shabtai et al., 2004). To ensure that theoretical concepts are in line with actual reality, applying these ideas to Kabul necessitates an awareness of the sociopolitical environment as well as the limits of the current infrastructure.

The goal of transportation planning theories is to minimize social and environmental costs while maximizing the flow of people and products. Understanding theories such as the Four-Step Travel Demand Model (trip creation, trip distribution, mode choice, and route assignment) is crucial for understanding travel behavior and predicting future transportation demands (Cruz, & Katz-Gerro, 2016). These models may assist planners in simulating

various situations and determining the best interventions in Kabul, where traffic jams and a lack of public transportation choices are common. Furthermore, network equilibrium theories can guide the development of balanced transportation networks, ensuring that new infrastructure expenditures mitigate current traffic issues rather than exacerbating them.

A major element in modern transportation philosophy is sustainability, which promotes systems that are socially inclusive, ecologically benign, and economically feasible. Frameworks like the "Avoid-Shift-Improve" (ASI) paradigm recommend minimizing travel (avoid), encouraging environmentally friendly transportation options like bicycles and public transportation (shift), and increasing vehicle efficiency (improve). Applying this approach in Kabul necessitates resolving present issues, including insufficient public transit, badly maintained infrastructure, and a lack of pedestrian amenities. Kabul's desire to lower air pollution, enhance public health, and provide an equitable transportation infrastructure that serves all socioeconomic levels is in line with the theoretical focus on sustainability.

The ease of access to desired services, employment opportunities, and facilities is the main emphasis of accessibility theory. Accessibility-centered planning places more emphasis on closeness and connectedness than typical mobility-focused strategies, which prioritize vehicle movement. Since many people in Kabul dwell in outlying informal settlements with no access to central services, this strategy is especially pertinent there (Almatar, 2023). To improve accessibility, we must rethink land use, ensuring that transportation networks connect residential areas with social and economic centers and ensure equitable provision of critical services. To enhance accessibility in Kabul, the concept of "complete streets," which accommodate bikers, pedestrians, and transit users, could prove to be beneficial.

Equity theories in urban planning underscore the importance of creating inclusive systems that serve a diverse range of individuals, particularly those who are underrepresented. In Kabul, uneven access to land resources and transportation reflects socioeconomic inequities. To prevent wealthy neighborhoods from disproportionately benefiting from infrastructure expenditures, theoretical frameworks like "just cities" and "right to the city" support inclusive planning procedures that empower all citizens. To address fairness, land use and transportation systems must be designed with social cohesion and inequality reduction in mind, considering the difficulties that each community faces.

Smart cities use technology in urban planning to enhance sustainability, efficiency, and quality of life. Smart systems in the transportation industry include real-time data collection, intelligent traffic control, and digital infrastructure. Even though Kabul is now facing significant physical and technological limitations, the theoretical framework of smart cities is presented as a vision for future progress (Almatar, 2023). Smart transportation systems can reduce congestion, enhance traffic flow, and improve public transportation services. To guarantee that technology is practical and available to all people, however, large investments in digital infrastructure and capacity building are required.

Informal settlements pose significant challenges to land use and transportation planning due to their frequent lack of adequate infrastructure and exclusion from official planning procedures. Informal urbanism theories emphasize the need for adaptable, flexible planning strategies that consider the reality of informal growth. Addressing these issues in Kabul necessitates establishing a connection between official goals and unofficial reality. Based on theoretical insights, we can use gradual upgrading procedures and participatory planning techniques to integrate informal settlements into the larger urban fabric, ensuring that all inhabitants have access to transportation and other necessities.

Environmental planning theories emphasize the significance of building resilient communities that can endure both natural and man-made calamities. Green infrastructure and ecological urbanism are two ideas that emphasize the need to strike a balance between environmental care and growth. Incorporating these ideas into land use and transportation planning is essential in Kabul, where growing urbanization has resulted in environmental degradation and increased susceptibility to natural calamities (Currie, & Rose, 2008). Resilient transportation systems may reduce environmental impact and improve the city's capacity to handle future difficulties by prioritizing sustainable modes and integrating green infrastructure.

Robust governance frameworks that match theoretical concepts with real-world application are necessary for efficient land use and transportation planning. Theories of collaborative governance and multi-stakeholder involvement recommend the inclusion of diverse players in the planning process, including local communities, corporate sector partners, and government agencies (Almatar, 2023). Building institutional capacity and encouraging a participatory governance culture can enhance the success of land use and transportation

policy in Kabul. To guarantee that planning initiatives support fair and sustainable urban development, theoretical insights may direct the creation of transparent, inclusive, and flexible policies.

2.3. Urban Mobility and Transportation Strategies for Sustainable Cities

The theoretical underpinnings of integrating land use and transportation planning in Kabul City draw upon a variety of concepts and frameworks from urban planning and sustainability literature (Noori, 2010). Transit Oriented Development (TOD), a key theoretical framework, advocates for compact, mixed-use development around public transportation hubs to reduce reliance on private vehicles and promote sustainable mobility patterns (Ahadi, 2020). Integrating land use and transportation planning is a critical facet of sustainable development in metropolitan environments. It entails synchronizing the arrangement of land use activities and transportation infrastructure to encourage effective and sustainable growth patterns.

An essential tenet of integration land use and transportation planning is to diminish the dependence on private automobiles and encourage the use of alternate modes of transportation, such as walking, cycling, and public transit. Implementing condensed and diversified development patterns that integrate residential, commercial, and recreational activities nearby can accomplish this, thereby minimizing the need for extensive travel (Sharifi et al., 2002). Mixed-use projects also promote lively and easily accessible communities, resulting in social and economic advantages.

Furthermore, the integration of land use and transportation planning can significantly reduce greenhouse gas emissions and climate change impacts by promoting dense urban development, enabling efficient public transportation services, conserving open spaces, and preventing urban expansion. This approach also enhances accessibility and fairness in metropolitan areas, allowing individuals from all socio-economic backgrounds to easily access job opportunities, educational institutions, healthcare facilities, and other essential services (Shabtai et al., 2004). However, the implementation of these strategies can be challenging, especially in rapidly expanding urban areas like Kabul. Stakeholder involvement is crucial for addressing these challenges and ensuring the long-term viability of land use and transportation plans.

The integration land use and transportation planning can reduce greenhouse gas emissions, combat climate change, and improve accessibility in urban areas. This involves advocating for dense urban development, promoting public transportation services, conserving open spaces, and promoting social integration. However, challenges like insufficient funding and conflicting political agendas may hinder the successful implementation of sustainable development policies (Ahadi, 2020). Therefore, stakeholder involvement is crucial for the long-term viability of these plans.

A case study technique is suitable for gaining a deeper comprehension of the integration land use and transportation planning in Kabul. This methodology entails examining the existing land use patterns, transportation infrastructure, and policy frameworks within the urban area. Additionally, it entails assessing the challenges and opportunities of integrating land use and transportation planning within Kabul's unique context, while also proposing potential strategies and best practices for this specific urban setting (Zhang et al., 2020).

Ultimately, the incorporation of land use and transportation planning is essential for attaining sustainable growth in metropolitan regions. Cities can improve their quality of life and environmental sustainability by advocating for compact and mixed-use development, decreasing dependence on private automobiles, and improving accessibility and fairness. The Kabul City case study will offer valuable perspectives and recommendations for the seamless integration of land use and transportation planning in a rapidly growing and evolving urban landscape.

The establishment of a sustainable urban environment heavily relies on the implementation of effective transportation planning, particularly in facilitating the development of an environmentally conscious transportation system. The growth of Urban Public Transit (UPT) is a significant concern in the global context of urban infrastructure development (Matsunaka et al., 2013). The mitigation of traffic congestion and the reduction of accidents are critical for creating a sustainable urban environment. To effectively tackle these challenges, it is essential to implement solutions such as the use of modular transit systems for efficient route management (Almatar, 2023).

Modular transit systems, consistent design standards, and eco-conscious systems are essential to address challenges in urban transportation. Techniques like stochastic and real-

time data utilization, multi-criteria decision-making, system dynamics simulations, Six Sigma methodology, and dynamic traffic analysis can enhance efficiency. The use of facial coverings is crucial during the COVID-19 pandemic (Wu et al., 2022). Big data and artificial intelligence methodologies can revolutionize the industry's operational framework and service ideology. UPT improves travel standards, facilitates urban development, and promotes societal cohesion. Utilizing big data and AI can strengthen the industry's business model and service concept (Fattah et al., 2022).

2.4. Best Practices

According to my thesis, combining best practices was crucial to overcoming Kabul's urban and transportation problems with knowledge from throughout the world. Based on Bibliometric Analysis and theoretical background I found tactics that might guide sustainable solutions for Kabul by examining successful examples from places like Curitiba, Bogotá, and Copenhagen. These cities showcased creative solutions, such as Copenhagen's pedestrian-friendly and non-motorized transportation system, Bogotá's participatory urban government, and Curitiba's affordable Bus Rapid Transit (BRT) system. These methods provided practical advice on how to create and execute inclusive, ecologically friendly, and resource-efficient systems. Instead of completely copying these models, I made key adjustments to their elements to better suit the socioeconomic, cultural, and physical realities of Kabul. For instance, Copenhagen's emphasis on walkability highlighted active transportation in places where bike infrastructure would encounter topographical obstacles, while Curitiba's BRT provided inspiration for Kabul's limited budget. My thesis ensured practical relevance for Kabul's sustainable urban development by contextualizing these best practices and offering locally feasible and internationally informed alternatives.

Table 2.7. Comparative SWOT Analysis of Land Use and Transportation Planning:
Afghanistan vs. Copenhagen, Ankara, Toronto, and Curitiba

Category	Afghanistan	Copenhagen, Ankara, Toronto, Curitiba
Strengths	Flexible Informal Settlements: Organic growth provides affordable housing despite infrastructure gaps. Historical & Cultural Land Use Patterns: Mixed-use development allows residential and commercial coexistence. Potential for New Urban Strategies: Opportunity to learn from global best practices in land use and transport planning.	Efficient Urban Planning: Strict zoning laws, mixed land-use, and sustainable development policies. Integrated Public Transport: - <i>Copenhagen</i>: Cycling infrastructure and pedestrian-friendly streets. - <i>Toronto</i>: Multimodal transport (subways, trams, buses). - <i>Curitiba</i>: Bus Rapid Transit (BRT) system as a global model. Sustainable Land Use Policies: Smart growth, green spaces, and climate-conscious planning.
Weaknesses	Lack of Proper Urban Planning & Zoning Laws: Uncontrolled urban sprawl and weak land tenure security. Poor Transportation Infrastructure: Limited public transport, congestion, and poor road maintenance. Weak Institutional Capacity & Corruption: Land ownership conflicts and lack of proper records. Security Issues Affecting Planning & Investment: Political instability limits infrastructure development.	High Costs of Sustainable Infrastructure: Requires significant investment in cycling lanes, public transport, and smart zoning. Urban Gentrification & Housing Crisis: - <i>Toronto</i>: Housing affordability crisis. - <i>Copenhagen</i>: Rising property prices due to strict regulations. - <i>Curitiba</i>: Struggles to maintain affordability while expanding transit-oriented development.
Opportunities	Urban Redevelopment & Land Ownership Formalization: Land registration systems to reduce conflicts and encourage investment. Public Transport Expansion: Potential for BRT, metro, or bus networks to ease congestion. International Collaboration & Smart Cities: Learning from best practices in transport and zoning. Use of GIS & Smart Technology: Improved planning and land use efficiency.	Smart City Innovations & Green Technology: AI-driven zoning, transit automation, and renewable energy integration. Sustainable Expansion Strategies: - <i>Copenhagen</i>: More green urban spaces, car-free zones. - <i>Toronto</i>: Expanding rapid transit to suburbs. - <i>Curitiba</i>: Scaling its successful BRT system for future growth.

Table 2.7. (continue) Comparative SWOT Analysis of Land Use and Transportation Planning: Afghanistan vs. Copenhagen, Ankara, Toronto, and Curitiba

Threats	Political Instability & Conflict: Uncertainty hinders long-term development. Lack of Financial & Technical Resources: Infrastructure funding relies on foreign aid. Unregulated Urban Growth: Expanding cities without proper transport planning worsens congestion. Climate Change & Environmental	Climate Change & Urban Overcrowding: - <i>Copenhagen</i>: Rising sea levels. - <i>Toronto</i>: Harsh winters. - <i>Curitiba</i>: Urban heat island effects. Economic Challenges & Budget Cuts: There is a Risk of reduced investment in sustainable infrastructure.
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2.4.1. Copenhagen, Denmark

Copenhagen is well known for being a pioneer in environmentally friendly city planning. It has become a model city for sustainable practices due to its ability to successfully integrate land use and transportation planning. Its strategy's main component is the smooth integration of eco-friendly, efficient transportation networks with urban growth, which guarantees lower environmental effects and better quality of life (Agranoff, 1986).

Since its inception in 1947, the Finger Plan has served as the fundamental framework for Copenhagen's urban growth. The city is envisioned as a hand, with the palm corresponding to the central business district and the five fingers stretching along rail routes, according to the layout design. Between these fingers, green areas serve to preserve nature and guide expansion into well-connected urban clusters (Alter, & Hage, 1993). The concept of transit-oriented development (TOD), in which residential, commercial, and recreational sectors are spatially positioned near public transport hubs, is given high priority in Copenhagen. This lessens reliance on automobiles, increases the use of public transportation, and fosters walkability, making metropolitan areas more environmentally friendly and accessible.

The city of Copenhagen has made cycling an essential component of its transportation policy. More than forty percent of commutes are made by bicycle, and the city has more than three hundred and ninety kilometers of bike lanes specifically designated for cyclists. Infrastructure that is designed specifically for cyclists, such as cycle superhighways and

bridges, improves convenience and safety, which in turn encourages more people to use this environmentally friendly form of transportation.

Copenhagen's public transportation system integrates buses, trains, and metro services to optimize connectivity. All modes harmonize the ticketing process, simplifying travel for passengers and enhancing the effectiveness of public transportation networks. With the impending light rail project, this all-encompassing system will get an additional degree of complexity (Alter, Hage, 1993). The use of renewable energy sources has resulted in the incorporation of sustainability throughout Copenhagen's whole transportation system. There is a congruence between the city's climate objectives with the implementation of energy-efficient trains, electric buses, and attempts to encourage electric automobiles. With these measures, Copenhagen is getting closer to achieving its goal of being carbon neutral by the year 2025.

To reduce the amount of urban sprawl, the city has implemented a compact urban development strategy. Areas with a high population density that are located close to transportation routes provide effective land use while simultaneously decreasing the need for large expenditures in infrastructure. Additionally, this planning concept encourages the development of rich, mixed-use communities (Geerlings, Stead, 2003). The city of Copenhagen incorporates green areas into its urban environment by providing people with public parks, gardens, and waterfronts that are easily accessible. Furthermore, these areas serve as biological buffers, improve air quality, and provide possibilities for recreational activities, all of which contribute to the sustainability of both the environment and society.

Participation from the local community is essential to the success of Copenhagen's planning efforts. It is possible for citizens to participate in decision-making processes via the use of regular consultations, seminars, and public forums. This helps to ensure that projects are in line with the requirements and priorities of the local community (Nadin, Seaton, 2004). In addition to transportation, Copenhagen combines land use and energy systems, which results in the creation of communities that minimize energy use. Urban design may combine sustainable energy solutions with transportation infrastructure, as shown by projects such as Nordhavn, which is a district that is carbon neutral.

Policies that discourage the use of automobiles include those that impose high parking costs, limit automobile access in key districts, and increase pedestrian zones. All these solutions, when coupled with an effective public transportation system and facilities for cycling, result in a considerable reduction in both pollution and traffic congestion (Geerlings, Stead, 2003). To improve the efficiency of land use and transportation, Copenhagen makes use of technologies that are associated with smart cities. Examples of the city's technologically advanced approach to sustainability include real-time traffic control systems, digital mapping for bikers, and applications for integrated trip planning.

Plans are underway to coordinate the construction of housing projects in Copenhagen with the public transit networks. Implementing projects that promote affordability, energy efficiency, and accessibility to employment and amenities creates communities that are both inclusive and sustainable (Cruz, Katz-Gerro, 2016). The city's planning procedures include measures for climate adaptation. Green roofs, permeable pavements, and flood-resistant infrastructure are some examples of preventative measures that can be used to make sure that transportation and land-use systems can handle problems with the environment.

Not only does the integrated planning strategy that Copenhagen leads to increased economic development, but it also helps to promote sustainability. Having transportation that is efficient cuts down on commute times, boosts productivity, and attracts investments, all of which contribute to the city's ability to compete on a global scale. Strong administration and clear rules contribute to Copenhagen's prosperity. The execution of integrated plans is guaranteed to be coherent and efficient when municipal agencies, regional authorities, and private players work together to establish a collaborative effort (Nadin, Seaton, 2004). Projects like the revitalization of Nordhavn and the construction of roadways specifically for cyclists demonstrate Copenhagen's comprehensive approach. These programs encompass residential, commercial, and green areas, in addition to environmentally friendly transit networks.

Despite its successes, Copenhagen continues to struggle with issues such as urban development management and guaranteeing affordable housing. The city remains committed to ongoing development, continuously refining rules to adapt to new technology and requirements. It is possible to learn useful lessons from Copenhagen's experience for cities all around the globe (Currie, Rose, 2008). The significance of long-term planning, the use of

community involvement, and the incorporation of sustainable practices into each facet of urban development are among the most important lessons.

With its integrated approach to land use and transportation planning, Copenhagen has developed a city that is both sustainable and livable, and it serves as a model for other cities across the world. The city of Copenhagen illustrates that sustainable urban growth is not only possible but also advantageous for all parties involved by placing an emphasis on transit-oriented development, green infrastructure, and community involvement.

2.4.2. Curitiba, Brazil

Brazil's Paraná capital, Curitiba, is renowned across the world as an example of sustainable urban planning. The city has successfully balanced land use and transportation planning over the last several decades, which has had positive social, economic, and environmental effects. This study examines Curitiba's creative approaches and how they affect sustainable development, providing knowledge and guidance for other cities throughout the globe (Carvalho et al., 2012).

The city's rapid urbanization and population increase tested Curitiba's infrastructure and standard of living in the 1960s. Under the direction of then-Mayor Jaime Lerner, the municipal administration recognized these problems and in 1965 began an ambitious urban development plan (Gustafsson, Kelly, 2016). To establish a sustainable urban environment, the city's Master Plan placed a strong emphasis on combining land use and transportation.

Fundamental integration techniques

- **System of Bus Rapid Transit (BRT):** In the 1970s, Curitiba invented the Bus Rapid Transit (BRT) system, which is now a vital component of its environmentally friendly transit system. The system's bi-articulated vehicles, pre-paid boarding stations, and dedicated bus lanes guarantee high capacity, effectiveness, and affordability.
- **Development Focused on Transit (TOD):** To link high-density residential and commercial sectors along important transportation routes, the city used a transit-oriented development concept. This strategy lessens reliance on private automobiles and urban sprawl.

- **Zoning for land use:** Curitiba's zoning regulations prioritize green areas and mixed-use projects. Low-density regions are maintained for ecological sustainability, while high-density zones are positioned strategically close to BRT routes.
- **Environmental Planning and Green Spaces:** Curitiba has added parks and green corridors to its urban fabric to improve biodiversity and fight the urban heat island effect. The city has one of the greatest ratios of green space in the world, with more than 50 square meters of green space per person.
- **Involved Planning:** Part of the reason for Curitiba's integrated planning effectiveness is participatory government. Public discussions and community participation have cultivated residents' sense of ownership, ensuring the acceptability and sustainability of the programs (Gustafsson, Kelly, 2016).

Principal accomplishments

- **A decrease in traffic jams:** Curitiba's BRT system serves over 2 million people daily, significantly reducing travel times and traffic.
- **Advantages for the environment:** By encouraging public transit and maintaining green areas, the city has significantly reduced its greenhouse gas emissions. Dependence on renewable energy sources further strengthens its environmental credentials.
- **Growth of the Economy:** Effective land use and transportation have increased local business, drawn investments, and raised economic output generally.
- **Enhanced Life Quality:** Curitiba's residents benefit from greater accessibility, affordability, and environmental quality, all of which improve social justice and general well-being (Rabinovitch, Hoehn, 1995).

Instructions and suggestions

- **Adaptability and scalability:** Although Curitiba's approach is unique to its location, other cities may adopt its ideas. Green areas, mixed-use zoning, and public transit prioritization are globally applicable tactics.
- **Long-Term Perspective:** A long-term vision backed by dependable investments and policies is necessary for the successful integration of land use and transportation.

- Participation in the community: When stakeholders are involved in the planning and execution stages, initiatives have a higher chance of acceptance and success.
- Creative Finance: Curitiba's cost-effective solutions, such as the BRT system, demonstrate the importance of innovation in financing sustainable urban projects.

Curitiba's integration of land use and transportation planning stands as a benchmark for sustainable urban development. By prioritizing efficiency, equity, and environmental sustainability, the city has transformed challenges into opportunities (Rabinovitch, Hoehn, 1995). Other cities seeking to achieve similar outcomes can draw inspiration from Curitiba's pioneering efforts, adapting its strategies to their unique contexts to foster sustainable development.

2.4.3. Toronto, Canada

The city, which is a fast-expanding metropolitan center, has realized that encouraging sustainability requires the smooth synchronization of these two crucial elements. Planning for land use and transportation together guarantees that urban development is controlled in a manner that minimizes its negative effects on the environment, improves accessibility, and fosters economic expansion (Su, 2012).

Historical Background Rapid population increase, suburban sprawl, and economic expansion are some of the variables that have influenced Toronto's urban development during the last century. Toronto had several issues related to inefficient land use, pollution, and traffic congestion in the middle of the 20th century (Parente, 2021). As a result, legislators and municipal planners started to see the need for a more comprehensive strategy that included land use and transportation planning. Eventually, this vision would turn into legislation that gives mixed-use projects, sustainable growth, and more funding for public transportation top priority.

Integration Objectives Reducing greenhouse gas emissions, easing traffic, and improving the general standard of living for citizens are the main objectives of Toronto's land use and transportation planning integration. The city wants to build thriving, mixed-use communities that encourage sustainable modes of transportation, including walking, bicycling, and public transportation, by coordinating land use with transportation infrastructure (Parente, 2021).

In the end, this integration is intended to help the city meet its sustainability goals by minimizing urban sprawl, encouraging more efficient land use, and lowering reliance on private vehicles.

Framework for Policy Several important regulations and strategic strategies serve as the foundation for Toronto's effective integration of land use and transportation planning. For instance, the Toronto Official Plan prioritizes the creation of whole communities where people can live, work, and play, as well as compact, transit-oriented development. Furthermore, the Metrolinx Regional Transportation Plan and the Places to Grow Act (2005) have established a framework for improving regional connectivity and promoting development around transit hubs. These frameworks provide a thorough road map for directing the city's development in accordance with sustainable objectives.

Development Focused on Transit (TOD) Transit-Oriented Development (TOD) is a key component of Toronto's strategy for integrating land use and transportation. By constructing high-density, mixed-use communities around important transit hubs, TOD aims to decrease the demand for private automobiles and facilitate residents' access to public transportation. The Eglinton Crosstown LRT, currently under construction, serves as a prime example of TOD. This light rail transit (LRT) project, in addition to promoting sustainable urban expansion, will connect neighborhoods throughout Toronto and create opportunities for new projects that are accessible by public transportation.

Increasing the infrastructure for public transportation. One of the main reasons Toronto's attempts to integrate land use and transportation have been successful is the growth of its public transit system. Millions of people utilize the vast bus, subway, and streetcar networks run by the Toronto Transit Commission (TTC) every year. The York-Spadina Subway Extension and the current Scarborough Subway Extension are two examples of the city's large expenditures in modernizing and extending its transportation system in recent years. These initiatives lessen dependency on automobiles, increase access to public transit, and aid in the city's efforts to build more livable, sustainable neighborhoods.

Development Along the Waterfront Another instance of effective land use and transportation integration is the renovation of Toronto's waterfront. Waterfront Toronto, a public-private collaboration, has been spearheading the transformation of the waterfront into a sustainable,

mixed-use urban space. A network of transportation choices, including the Arboriform Streetcar, connects the development's public parks, office buildings, cultural centers, and affordable housing. The waterfront project has helped to create a lively, sustainable urban environment and lessen traffic congestion by combining transportation with urban development.

Infrastructure for active transportation Toronto has made significant investments in infrastructure to encourage active transportation, such as walking and bicycling, as part of its larger sustainable transportation policy. The city has created a vast network of bike lanes, bike-share schemes, and routes that are convenient for pedestrians. Emphasizing non-motorized transportation encourages locals to prioritize walking and bicycling over driving, thereby reducing pollution and traffic and promoting healthier lifestyles. The Toronto Cycling Plan outlines the city's goal to expand cycling infrastructure and make riding a practical mode of transportation for more citizens.

Environmental sustainability and green infrastructure. In addition to improving mobility, Toronto's integration of land use and transportation planning aims to make sure that urban expansion is consistent with environmental sustainability. As part of new land developments and transportation projects, the city has put in place several green infrastructure projects, including urban forests, green roofs, and permeable pavements. By managing stormwater runoff, lowering the urban heat island effect, and enhancing air quality, these programs support the city's sustainability objectives.

The effects of integration on the economy Toronto have benefited economically greatly from the convergence of land use and transportation planning. Property prices surrounding transit stations have increased in the city because of mixed-use districts and transit-oriented development. In addition to bringing in more tax money, this has drawn private capital for commercial and real estate development. The city's general economic development has also been aided by the expansion of public transportation, which has made it simpler for companies to recruit and retain employees.

Social Results Toronto's integrated approach to land use and transportation planning has had major social advantages in addition to its economic and environmental effects. Residents' mobility has increased because of the development of transit-accessible communities,

especially for those living in lower-income regions who may not possess a vehicle. More social inclusion as well as improved access to jobs, education, and healthcare services have resulted from this. Additionally, the emphasis on mixed-use construction has improved the quality of life for locals by creating more lively, walkable neighborhoods.

Collaboration and public involvement. Toronto's dedication to cooperation and public involvement has been a major contributor to its success. To make sure that new construction and transportation initiatives represent the interests and needs of those who will be impacted, the city actively engages citizens, stakeholders, and neighborhood associations in the planning process. A feeling of ownership and support for integrated planning projects has been fostered by the meaningful input from a wide variety of voices made possible via public consultations, seminars, and online platforms.

Difficulties Met Although Toronto has made outstanding strides in combining transportation and land use planning, the city has also encountered several difficulties. Allocating funds and resources for major transportation projects has been one of the most difficult challenges (Newell et al., 2022). It has taken careful planning and discussion between the federal, provincial, and local governments to strike a balance between the needs of sustainable infrastructure and the demands of rapid urban expansion. Concerns about gentrification and displacement due to increased construction have also caused pushback from certain communities and groups.

Crucial Elements of Success Several factors contribute to the success of Toronto's integration initiatives. Strong political will and the backing of local authorities have greatly aided the advancement of sustainable development objectives. Additionally, policies at all levels of government from the city to the province have been aligned to guarantee the coherence and efficacy of the city's land use and transportation plans (Newell et al., 2022). Furthermore, Toronto has maintained its position as a leader in sustainable urban development because of the application of cutting-edge technology like intelligent traffic management systems and green construction techniques.

Analytical Perspectives Toronto has received international acclaim for its seamless integration of land use and transit planning. In contrast to other big cities such as New York, London, and Vancouver, Toronto has been able to combine urban expansion with a

sustainable approach (Cruz, Katz-Gerro, 2016). Toronto, unlike other cities that have primarily focused on car-centric development patterns, prioritizes both public transit and active transportation infrastructure (Reid, 2022). Other cities looking to combine land use and transportation for sustainable development might learn from Toronto's experience.

Prospects for the future in the future, Toronto intends to continue working to combine transportation and land use planning. Future includes adding additional light rail lines, boosting investment in infrastructure for electric vehicles, and extending the Subway Expansion Program (Reid, 2022). To improve the sustainability and effectiveness of the land use and transportation systems, the city is also looking at ways to use smart city technology. Mixed-use projects and ongoing investments in green infrastructure will support Toronto's lofty sustainability goals.

Kabul's attempts to combine land use and transportation planning in a manner that promotes sustainable development benefit greatly from the finest practices from Curitiba, Copenhagen, and Toronto. Curitiba and Toronto have taught us a lot about transit-oriented development (TOD), which has been a key component of their success. Kabul may promote mixed-use, higher-density construction along transit lines to improve public service accessibility and lessen urban sprawl. A sustainable alternative to relying only on cars is Copenhagen's emphasis on green spaces and bicycle infrastructure, which may be especially advantageous for Kabul's quickly growing metropolitan districts. These cities' experiences also underscore the need for community engagement and holistic planning that considers social equality and environmental sustainability. By tailoring these tactics to the city's particular circumstances, we can develop an integrated, sustainable urban framework to tackle the issues of rapid urbanization and improve the general standard of living for Kabul's citizens.

Nevertheless, based on most of the research, it appears that the future of sustainable transportation is shifting towards alternative avenues that prioritize more advanced methods of travel, such as Connected and Autonomous Vehicles (CAVs), flying vehicles, Shared Used Mobility (SUM), hyperloop technology, and Mobility as A Service (Maas). Certain writers have seen these advancements as the future's means of transportation, such as flying cars and the use of Hyperloop technology for future generations. They perceive Hyperloop

as a completely new and disruptive way of travel, capable of achieving speeds above 1000 km/h.

Both SUM and vehicle sharing may contribute to the development of a culture that promotes the use of mobility services on a demand-driven basis (Hasher, 2017). Globally, several prototypes of CAVs are currently in the developmental stage. However, the widespread adoption of CAVs raises ethical concerns that require attention, ultimately impacting the urban scene. Furthermore, (Davidson, & Spoonulas, 2015) suggest that the development of mobility packages using technology could completely replace private transportation methods for moving within major city centers. Initiatives in Finland, Germany, and Spain are relatively recent, and their advantages are mostly theoretical. However, when seeking transparent collaboration, the integration different travel modes is a significant barrier.

Enhancing urban mobility is a crucial and urgent task in the pursuit of creating cities that are more ecologically sustainable, productive, and equitable. These events are occurring amidst rapid climate change, urban land and service constraints, significant advancements in transportation and communication technologies, and a need for improved urban living standards and social fairness. Despite the growing perception of smart city techniques as a solution to numerous urban issues, the concept primarily stems from technical solutions. When considering technology as a solution, it is critical to conduct a thoughtful analysis of the objective (Wan et al., 2016). Regarding urban mobility, the primary objective should be to accommodate more environmentally friendly travel behaviors. Nevertheless, achieving this does not just depend on technology but might also include a traditional adjustment of urban layout, infrastructure, policies, mobility services, and travel patterns.

This is especially applicable to medium-sized cities, which tend to be more spread out and hence have a greater reliance on cars compared to larger metropolitan areas. Public transportation or active alternatives are frequently not competitive due to their low density and lack of critical mass or resources (Corazza et al., 2016).

Despite their inadequate research, medium-sized cities, home to a significant portion of the population, have the potential to bring about significant change. Nordic cities have emerged as leaders in digitalization and smart city rankings, making them a compelling subject for

study (Nesse et al., 2021). Additionally, Scandinavian countries are known for their culture and tradition of extensive and efficient stakeholder engagement.

Assessing smart city strategies and evaluating their impact on sustainability should be feasible and capable of achieving more sustainable development. Regarding urban mobility, this prompts the inquiry of how much the measures included in smart city initiatives contribute to sustainable mobility objectives and how responsible they are. Furthermore, it is necessary to consider whether intelligent solutions are the most efficient means to attain sustainable urban transportation. Hence, it is crucial to thoroughly assess the impact of smart mobility policies and initiatives, their feasibility, and their role in promoting sustainable urban mobility and development.

The field of urban mobility is currently experiencing various transformations, such as the adoption of electric and automated vehicles, the rise of shared mobility and micro-mobility, the implementation of MAAS, the promotion of active travel and walkability, and a greater emphasis on environmental sustainability and social equality and justice. To achieve the objective of minimizing adverse environmental effects, decreasing the number of traffic accidents, and improving urban surroundings, it is unavoidable that there will be a decline in private automobile transportation. As a result, there is an urgent need to reconsider urban travel and mobility space allocation. Given the perspective that considers "smartness" as only one of many methods to approach the urban sustainability agenda, it is crucial to evaluate smart city and smart mobility programs and their impact on sustainable urban mobility.

The European Commission's stance towards urban mobility has undergone a significant transformation during the last decade. A decade ago, its approach was still guided by the notion of "subsidiarity": refraining from becoming engaged in issues that might be legitimately addressed at the national, regional, or municipal level. Nevertheless, the European Commission's 2007 research revealed that urban transport was responsible for 80% of congestion expenses and 14% of total carbon emissions. Furthermore, metropolitan regions constituted 60% of Europe's population, while they contributed to over 85% of its economic production. These two factors led to the belief that local government management should not solely handle urban mobility.

The Environment Directorate first formulated the arguments in working groups in 2003 and 2004. The latter led to a report that served as the basis for the future advancement of Sustainable Urban Mobility Plans (SUMPs) (DGEnv, 2004). The Land Use and Transport Research cluster in the Commission's fifth research framework conducted innovative research that had a significant influence on working groups. This research was later summarized in a Decision-Makers' Guidebook on creating sustainable urban land use and transport policies (May 2005).

The Action Plan on Urban Mobility (EC, 2009) proposes to promote the implementation of sustainable urban mobility plans. In June 2010, the Council of the European Union expressed its support for the establishment of sustainable urban mobility plans in cities. Additionally, it advocated for the implementation of incentives, such as expert guidance and information sharing, to facilitate the formulation of these plans. The 2011 White Paper (EC, 2011) proposed an obligation for cities with a population exceeding 100,000 to have these plans. Additionally, it recommended that the distribution of regional and cohesion funding might be contingent upon the submission and examination of these plans.

To support this approach, the ELTISplus project provided recommendations on these strategies (ELTISplus, 2014). The project utilized the insights gathered from local transport planning in member states, along with guidance on the essential and preferred elements of the process (ELTISplus, 2012). ELTISplus (2014) bases the principles on eleven parts and 32 separate tasks, categorizing them into four main groups: thorough preparation, setting clear and logical goals, planning, and carrying out the plan.

First, the recommendations draw distinctions between the conventional method of urban transport planning and the recommended methodology for sustainable urban mobility plans. SUM places a stronger focus on creating a long-term vision, engaging citizens, and stakeholders throughout the process, defining goals and establishing targets related to all sustainability aspects, and devising effective sets of actions without excessive emphasis on supply-side solutions (May, 2015). The accompanying state-of-the-art report (ELTISplus, 2012) categorizes the member states into three groups and illustrates the magnitude of the remaining challenge in Europe.

- The first category consists of seven nations that have a well-established transport planning framework, including Flanders in Belgium and England and Wales in the United Kingdom.
- The 12 regions, including Wallonia in Belgium and Scotland in the UK, that are actively implementing sustainable urban mobility planning.
- Eleven regions, including Northern Ireland in the UK, have not yet implemented sustainable transportation planning.

Influential pro-car and infrastructure interest groups, insufficient collaboration between the transportation and land use sectors, limited expertise, inadequate funding for plan preparation, insufficient coordination between different levels of government, challenges from extensive public and stakeholder engagement, and political conservatism are the main obstacles to implementing such planning in these countries (Lindenau, Böhler-Baedeker, 2014).

2.4.4. Ankara Türkiye

The capital of Turkey, Ankara, features a well-organized land use and transportation system that combines a multimodal transit network with zoning laws. To ensure effective traffic flow, the city uses a hierarchical road system that includes collectors, local streets, and arterial routes. To lessen traffic and dependency on private automobiles, Ankara has made investments in public transit, like light rail systems, buses, and metro lines (Aslan Düzgün, et al., 2024). To reduce commute times, mixed-use development is encouraged, and pedestrian-friendly areas are supported by sustainable urban planning. However, issues like urban development and rising traffic demand necessitate ongoing enhancements to land management regulations and transportation infrastructure. One of the main topics of discussion is how Ankara's rapid urban growth has resulted in unplanned settlements, which have increased reliance on private vehicles and put stress on the city's transportation system. Similar to this, Kabul is experiencing extreme urban sprawl as a result of the growth of informal settlements without enough infrastructure, which has led to traffic jams and restricted access. Kabul's unstructured zoning laws have exacerbated the situation by creating a significant gap between land use and transportation planning.

Accessibility and public transit are also major concerns. To improve connectivity and lessen

traffic, Ankara has worked to include light rail, buses, and metro systems in urban design (Tezer, 1997). Kabul, on the other hand, relies largely on private vehicles, taxis, and unofficial minibuses due to its ineffective public transportation infrastructure. Kabul suffers from extreme traffic congestion, especially in the city's central districts, due to a poorly designed transit system. By implementing a transit-oriented development (TOD) strategy similar to Ankara, we can reduce reliance on private vehicles and manage urban mobility effectively.

Ankara has a well-organized road hierarchy that includes collectors, arterial routes, and local streets to facilitate effective traffic flow. However, Kabul's traffic system is still extremely crowded, mostly due to small streets, lax planning laws, and poor pedestrian infrastructure. Ankara's hierarchical road network and zoning techniques could inspire improvements in Kabul's transportation infrastructure.

Additionally, Ankara highlights mixed-use development as a crucial element in cutting travel times and promoting environmentally friendly forms of transportation like bicycling and walking. Long commutes are no longer necessary thanks to Ankara's effective promotion of land-use laws that combine public, commercial, and residential services. However, Kabul's urban form is still quite disjointed, with residential, commercial, and industrial zones not well integrated, which increases traffic and the demand for transit. In Kabul, enacting mixed-use zoning laws might greatly improve accessibility and lessen the need for vehicular transportation.

Land use and transportation planning are also heavily influenced by institutional, political, and economic issues. Implementing sustainable policies is difficult for Ankara, while Kabul confronts even more challenges due to security issues, poor governance, and a lack of funding for infrastructure development. These issues necessitate significant institutional adjustments and impede the adoption of sustainable urban transportation options.

2.5. Concluding Remarks

The existing literature reports that establishing sustainable cities relies heavily on the development of urban mobility and transportation systems. Prioritizing efficient and sustainable modes of transportation, such as public and active transportation, and integrating

technology and digital tools can enhance accessibility. Furthermore, integrating land-use planning with transportation planning is essential for creating compact, pedestrian-friendly communities. By promoting mixed land use, providing adequate infrastructure for cyclists and pedestrians, and designating car-free zones, cities can foster a more environmentally sustainable urban environment.

The literature also emphasizes the importance of strategies that encourage behavioral changes, such as promoting public transportation use and reducing dependence on private vehicles to address traffic congestion and lower greenhouse gas emissions. Additionally, sustainable urban mobility relies on investments in green infrastructure, including electric vehicle charging stations and bike-sharing programs. Successful implementation of such policies requires collaboration between governments, urban planners, transportation agencies, and the public, with community engagement being a vital component of the process. The best practices chosen for comparison with Kabul include the implementation of integrated land-use and transportation planning, investments in public and active transportation infrastructure, and behavioral change promotion strategies because they had the potential to address the city's current urban mobility issues, such as traffic congestion, a lack of public transportation options, and environmental concerns.

Comparing these best practices allowed for the identification of flexible alternatives that improved Kabul's transportation system and advanced sustainable development. One example was the effective reduction of private automobile reliance in cities with better public transportation systems and pedestrian-friendly infrastructure, which served as a model for attempts to change Kabul's urban environment. To develop a unified strategy for sustainable urban transportation in Kabul, it was beneficial to understand how other cities have promoted public-government cooperation.

3. METHODOLOGY

This thesis's study methodology provides a thorough method for tackling issues with Kabul, Afghanistan's land use and transportation planning. To make sure it's useful and relevant, it includes finding problems, coming up with research questions, theoretical foundations, methodological approaches, and useful tips. For sustainable urban development, this organized framework offers a road map for comprehending important problems, developing research questions, using appropriate approaches, and proposing evidence-based answers.

The framework starts with a precise problem description that is based on Kabul's urgent issues, including disjointed urban planning, rapid urban sprawl, traffic jams, sustainability issues, and governance deficiencies. Stakeholder conversations, in-depth literature research, and field observations were all used to identify these problems. The city's rapid urbanization and population increase exacerbated the institutional capability, agency coordination, and infrastructural problems identified in this rigorous evaluation.

Based on this knowledge, the study topic was reformulated to focus on how combining transportation and land use planning may support sustainable development in Kabul. Seeing the increasing need to address urban issues while promoting resilient and inclusive urban development gave rise to the study topic. Using both local context and international best practices, this integration was seen as a strategic solution.

Three fundamental elements support the research's theoretical framework:

- Important Theoretical Ideas: The foundation for examining the relationship between urban planning and transportation systems includes land-use integration, sustainable transportation, and urban mobility.
- Models of Kabul Integration: Regional research on Kabul revealed shortcomings that impede efficient planning and execution and offered insights into current frameworks.
- International Best Practices: As benchmarks, case studies from places like Copenhagen and Curitiba provided tried-and-true tactics, including governance models, transit-oriented development, and non-motorized transportation infrastructure.

These pillars made sure the study was based on what was already known while also offering fresh ideas that were appropriate for Kabul's setting.

To guarantee a solid and multifaceted approach, the analytical phase included many approaches. To map academic literature, examine citations and co-citations, and identify research needs, bibliometric analysis was used. To direct the literature research and find important studies, keywords like "transit-oriented development" and "sustainability in urban planning" were crucial. Spatial and GIS analysis provided a spatial dimension by assessing land use patterns, transit networks, accessibility, and environmental implications. These resources made it possible to fully comprehend the potential and problems related to mobility in Kabul.

Kabul was selected as the case study for pragmatic and subjective reasons. Kabul, the capital and biggest city of Afghanistan, is a prime example of the socioeconomic and urban issues that many emerging cities confront. Its expanding population, lack of coordinated planning, and fast urbanization make it an interesting place to examine sustainable development projects. Furthermore, the study was enhanced by my direct knowledge and access to local networks and data, which made sure that the conclusions were grounded in the realities of the city. The complexity of Kabul also offered a chance to investigate how excellent practices from throughout the world may be modified for a developing city setting.

A crucial part of the data-collecting method was semi-structured interviews, which allowed for the perspectives of a wide range of five land use and transportation experts. These interviews complied with ethical standards, which include securing informed permission, maintaining participant anonymity, and guaranteeing confidentiality. The interview format's flexibility enabled the investigation of new topics, adding qualitative depth to the study results. To guarantee adherence to study guidelines, ethical approval was acquired. After receiving approval from the Gazi University Ethics Commission on 22.07.2024, I began conducting interviews to collect the data.

The literature study was essential in helping to find answers to Kabul's urban problems. The study identified practical tactics, including transit-oriented development and the promotion of non-motorized transport infrastructure, by looking at case studies from places like Curitiba, Toronto and Copenhagen. Scholarly works on sustainable planning also

emphasized the significance of fortifying governance and policy frameworks to facilitate these endeavors. The literature influenced both the theoretical foundation, and the practical suggestions presented in the thesis.

To find best practices that might be modified to fit Kabul's socioeconomic and geographic features, the analytical phase made use of international comparisons. Lessons learned from Copenhagen's non-motorized transportation programs, Curitiba's Bus Rapid Transit (BRT) system, and transit-oriented development methods influenced the suggested solutions. These results were used to provide practical suggestions, such as plans for multimodal transportation, laws governing mixed-use development, improvements to infrastructure, and public education initiatives. A crucial component of long-term success was also underlined: strengthening institutional structures and governance.

Considering all factors, this study framework provides a comprehensive approach to integrate transportation and land use planning for Kabul's sustainable growth. It offers a thorough plan for dealing with the urban problems facing the city by fusing theoretical understandings, practical research, and international best practices. The emphasis on doable suggestions guarantees their applicability and promotes more equitable and sustainable urban growth in Kabul.

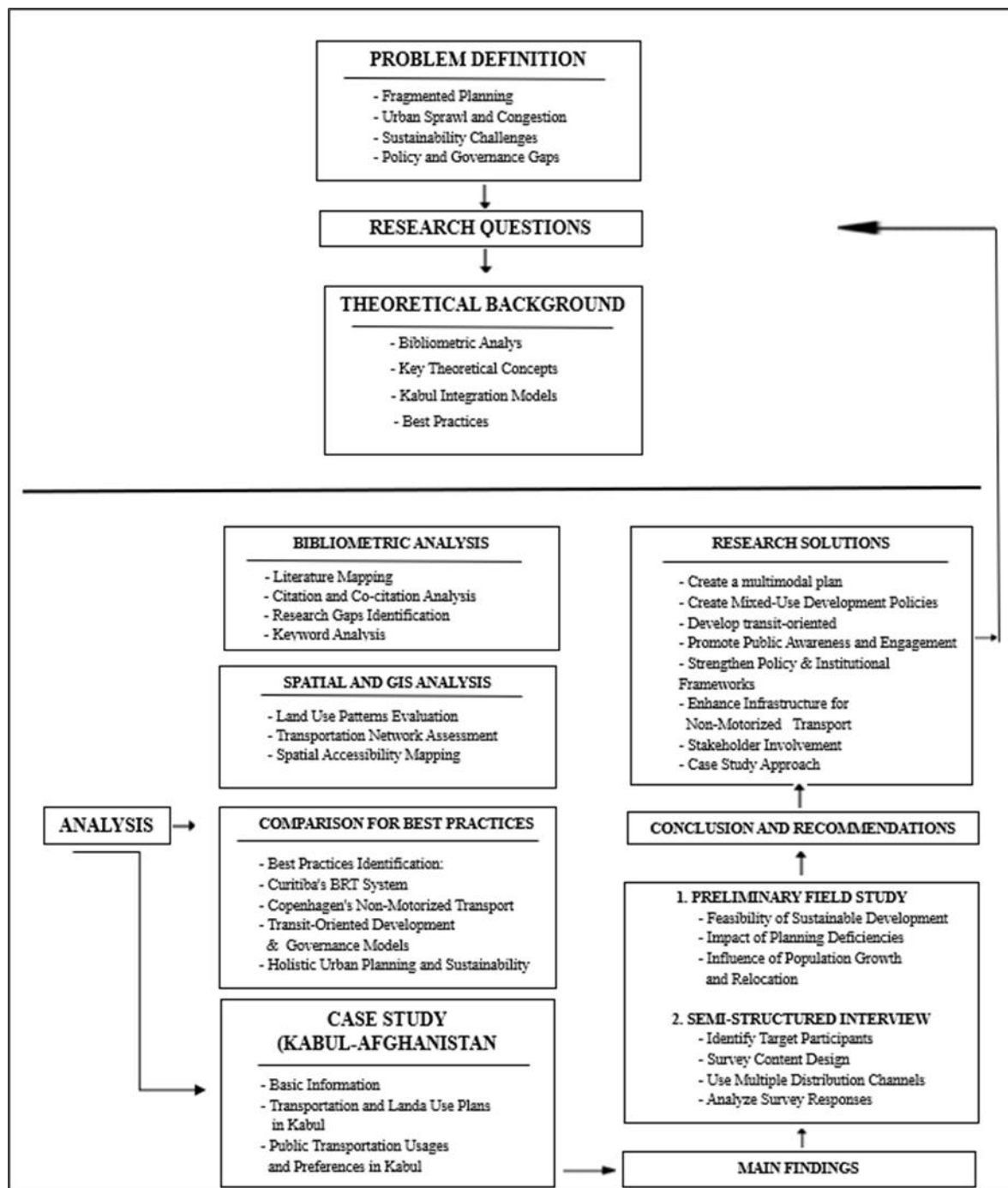


Figure 3.1. Research design

3.1. Concluding Remarks

This chapter offered a thorough road map for tackling Kabul City's integration of transportation and land use planning. The chapter established a precise issue statement, which was based on recognizing important difficulties and establishing targeted goals. This served as the foundation for the research's later stages. The study ensured relevance and

applicability by contextualizing global theories and practices within Kabul's local reality through a methodical literature review. In addition to capturing a wide range of insights, the use of surveys, case studies, and policy research enhances the findings' trustworthiness. This chapter laid the groundwork for creating realistic suggestions that tackle Kabul's transportation and sustainability issues by coordinating problem definition, analysis, and workable solutions. The chapter provides a crucial framework that directs the research toward its objectives while guaranteeing both academic rigor and practical relevance.





4. CASE STUDY : THE KABUL CITY (AFGHANISTAN)

4.1. Basic Information

Afghanistan's main and most populated city, Kabul, has a high population density, which presents special possibilities and problems for urban planning and development. The city's density has grown dramatically over the last 20 years owing to internal migration, economic possibilities, and the displacement of rural communities brought on by violence. Kabul's urban footprint is unable to handle the city's projected five million residents, which results in unplanned settlements, congested neighborhoods, and a burden on basic services. Informal dwelling zones make up a large portion of the metropolitan environment, often lacking adequate waste management, water, sanitation, and infrastructure. These situations worsen health, environmental, and social justice issues and lead to a worse quality of life.

Sharp contrasts characterize Kabul City's density. On the edges, there are a lot of unofficial settlements that aren't connected to anything and can't get to basic services. In the middle, there are a few districts with lots of homes and businesses. In addition to causing imbalances in the infrastructure and service delivery, this unequal density distribution exacerbates the city center's traffic jams, air pollution, and environmental deterioration. Furthermore, Kabul's mountainous terrain and scarcity of cultivable land further restrict urban expansion and make density-related issues worse.

Despite these problems, Kabul City's high population density offers potential for sustainable urban growth if properly managed. Compact urban designs may encourage walkability, lessen reliance on personal automobiles, and aid in the creation of effective public transit networks. Policies that emphasize vertical growth, mixed-use development, and densification in planned regions may reduce urban sprawl and maximize land usage. Furthermore, incorporating parks, green spaces, and recreational places into densely populated communities may improve livability and solve environmental issues.

Kabul's density issues require an all-encompassing and inclusive approach to urban planning. By using participatory planning techniques, strengthening institutional capabilities, and enforcing land-use restrictions, we can turn density into an advantage rather

than a burden. Kabul can make its densely populated urban environment more resilient and livelier by emphasizing fair and sustainable development. Urbanization, motorization, population expansion, and increased density have all exacerbated congestion and negatively impacted transportation efficiency, journey durations, air quality, and fuel consumption. Kabul, the densely populated urban center of Afghanistan, serves as a noteworthy subject for examining sustainable transportation systems. This part provides an analysis of sustainable transportation systems, evaluating the existing infrastructure, national regulatory frameworks, and urban initiatives. Furthermore, it highlights the significance of sustainable urban transportation. Also, this study presents a variety of public transportation solutions and tactics for the city of Kabul to foster long-term sustainable urban growth and transportation systems. The research underscores the need to adopt a more equitable approach to urban mobility in emerging countries.

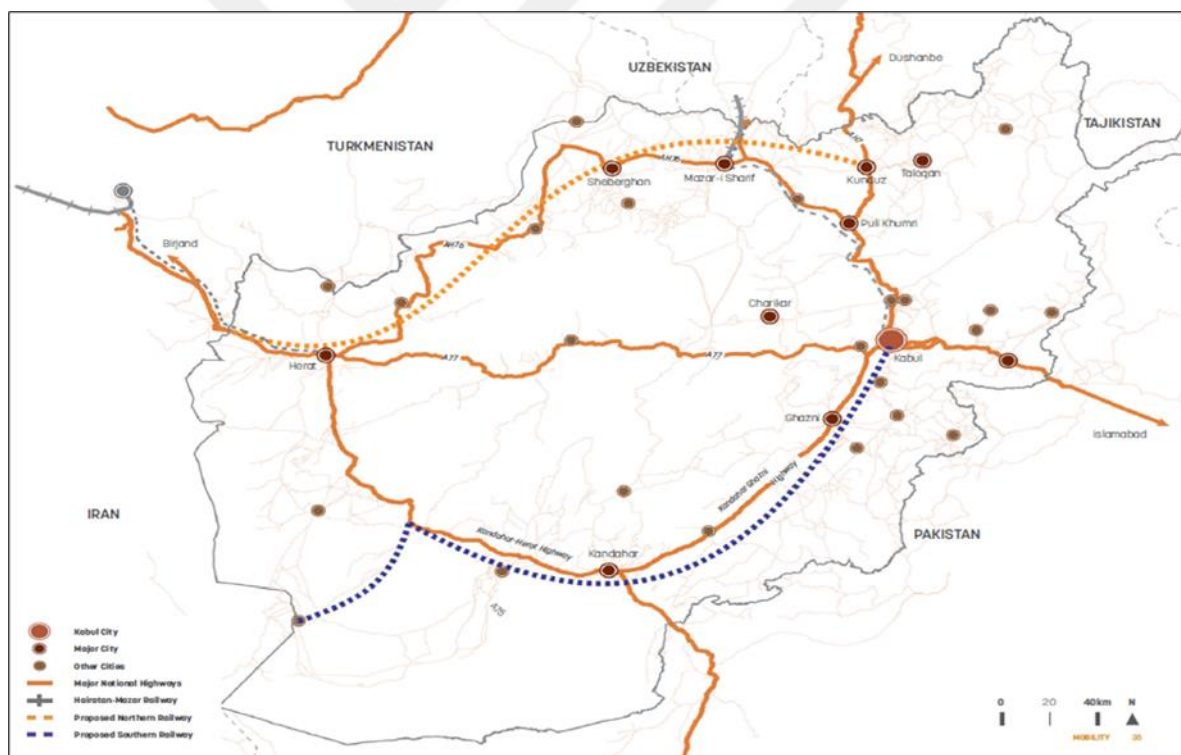


Figure 4.1. Regional & international mobility Source: Kabul Urban Design Framework (KUDF), 2017

Kabul, the capital of Afghanistan, has experienced rapid urbanization and suburbanization since its inception in the 18th century (Litman, 2003). The city population grew to around 90,000 after gaining independence in 1919. The city spans 1,023 square kilometers and has a population density of 4,500 people per square kilometer. The urban movement began in

the 1950s, leading to the construction of major infrastructure such as Kabul University, Maiwand Hospital, and Jaday-e-Maywand Road. Four master plans have been developed since urbanization began, with the most recent being designed for 4.2 million individuals (Noori, GieBen, 2010). Urban transportation is a critical issue in large cities worldwide, as accelerated urbanization and motorization directly impact sustainable development. The transportation industry will double its energy consumption and greenhouse gas emissions (Spaethling, 1996).

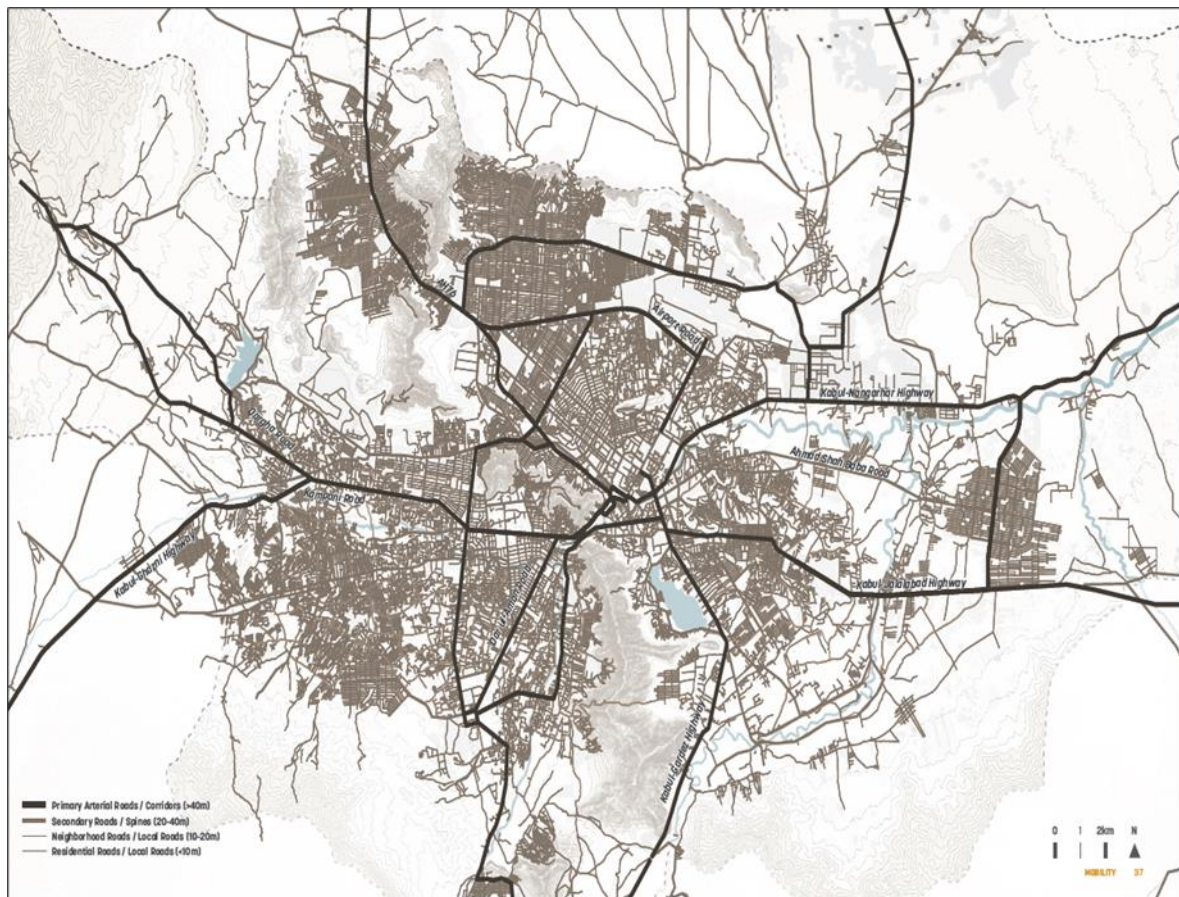


Figure 4.2. Current road network (KUDF, 2017)

The first was from 1962 to 1967 and encompassed 239 square kilometers with an intended population of 1 million. The second phase began in 1970, with a population of 1.5 million and a land area of 299 square kilometers, with an anticipated completion date of 1995. The third was in 1978, up to the intended year of 2002, with a population of 2.0 million and an area of 324 square kilometers (Habibzai et al., 2017). Government agencies continued to use the most recent one, constructed in 2008 and intended for 4.2 million individuals. In large cities all over the world, urban transportation is a critical issue. These cities' accelerated

urbanization and motorization directly affect sustainable development.

In terms of its transportation history, Kabul's public bus service, known as Millie Bus, is noteworthy during the 1960s. The city's urban electric trolleybus network, which used a fleet of Koda vehicles manufactured in Czechoslovakia, gained notable popularity because it was comparatively cheaper than the Millie Bus. Nevertheless, the ultimate cessation of trolleybus operations occurred in 1992 because of conflict, which inflicted substantial damage on the infrastructure. Construction delays hindered the implementation of the KM's 2017 proposal for a new bus rapid transit system. A strategic plan to increase the fleet to 200 vehicles, covering 16 designated routes, followed the introduction of American-made IC Bus buses in March 2021. Sustainable transportation is a multifaceted problem with several dimensions, including economic, social, environmental, and societal (National Research Council).

The literature review underscores the growing focus on developing sustainable transportation systems and conducting policy-oriented research to tackle environmental conservation, social equity, and economic effectiveness for both present and future populations. Since 1950, the population of the city has increased, and projections indicate that it will reach a total of 5.7 million people by 2030. The prediction was that this increase would occur at a rate exceeding 3.35% annually (Steg, Gifford, 2005).

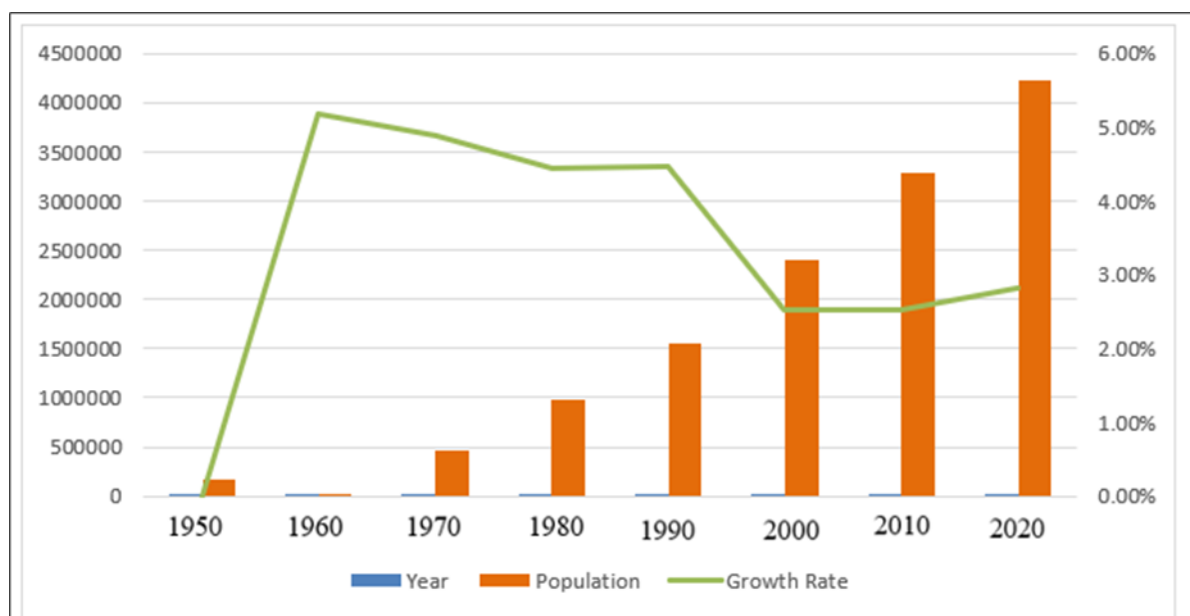


Figure 4.3. Kabul population and growth rate 1950-2020 Source: Kabul, Afghanistan Metro Area Population

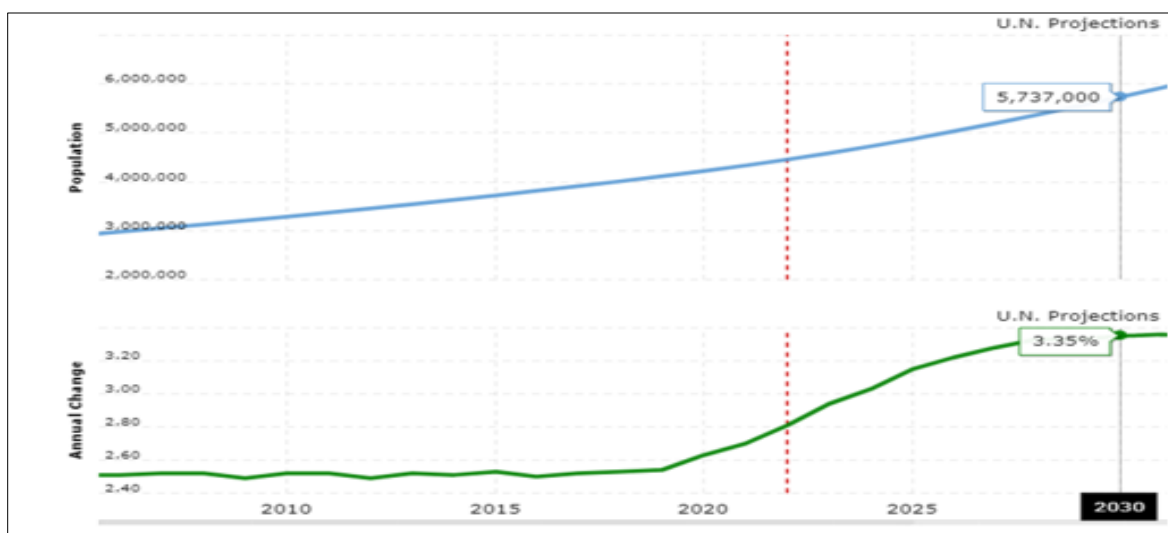


Figure 4.4. Kabul population and growth rate in 2030. Source: United Nations - World Population Prospects.

Due to fast urbanization, population expansion, and limited infrastructure, Kabul City, Afghanistan's capital and biggest metropolitan center, confronts considerable issues in its pedestrian and shared transportation networks. In Kabul, rickshaws, taxis, and minibuses are the main forms of shared transportation and form the foundation of public transportation. Although these modes are popular because they are inexpensive and flexible, they have drawbacks such as congestion, poor upkeep, and irregular timetables. Furthermore, especially during peak hours, traffic congestion and safety issues are made worse by the absence of official control and coordination among service providers. Inadequate investments in contemporary transit systems, including metro systems or bus rapid transit (BRT), which might lessen the demand on the existing infrastructure, further limit shared transportation in Kabul.

In Kabul, dangerous circumstances and insufficient amenities also make it difficult for pedestrians to move about. Many places lack adequate illumination, pedestrian crossings, and sidewalks, requiring pedestrians to share roadways with cars. This poses serious safety hazards, particularly for young people, the elderly, and those with impairments. Additionally, the urban environment often puts the requirements of cars ahead of those of pedestrians, paying little regard to accessibility and walkability. The simplicity and safety of walking as a practical form of transportation are further diminished by poorly maintained roadways, unlicensed street sellers, and encroachments that block pedestrian paths. Notwithstanding these obstacles, there is a great deal of room to enhance Kabul's pedestrian and

shared transportation systems. Efficiency gains and traffic reductions may result from the implementation of policies that give public transportation development priority, such as the establishment of organized bus services and transit hubs. A more welcoming and accessible environment would be produced for walkers via walkability-focused urban planning projects, such as the installation of designated sidewalks, pedestrian zones, and safer crossings. Enhancing pedestrian facilities and encouraging non-motorized transportation choices like cycling may also help create a more egalitarian and sustainable urban transportation system. Kabul may transition to a more integrated and people-centered approach to urban transportation by tackling these problems.

Residents' travel behaviors significantly shape Kabul's urban transportation system, which exhibits cyclical patterns. There are three primary modes of transportation: vehicles with two-powered wheels, which constitute more than two-thirds of the overall traffic; four-wheeled vehicles, including private autos, taxis, cars, minibuses, and buses; and the modes of walking and cycling, which comprise less than one-fourth of the total traffic volume. These numerous modes of transportation play a significant role in meeting the city's overall transportation needs.

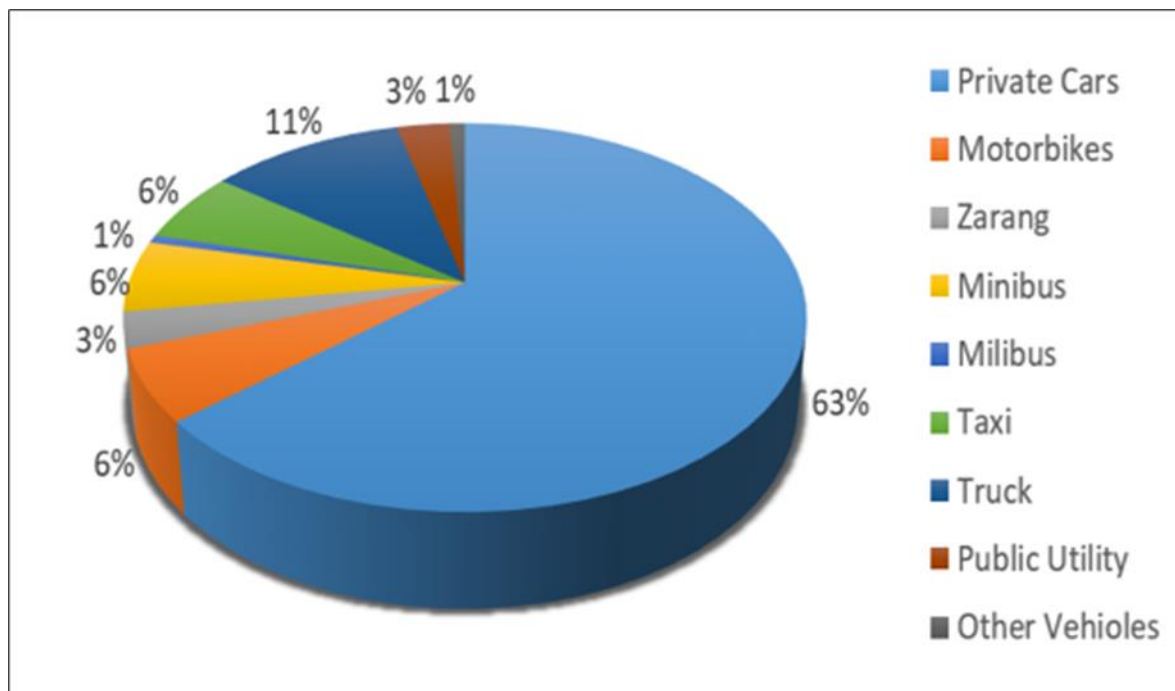


Figure 4.5. Mode share of vehicle types in Kabul City KUDF

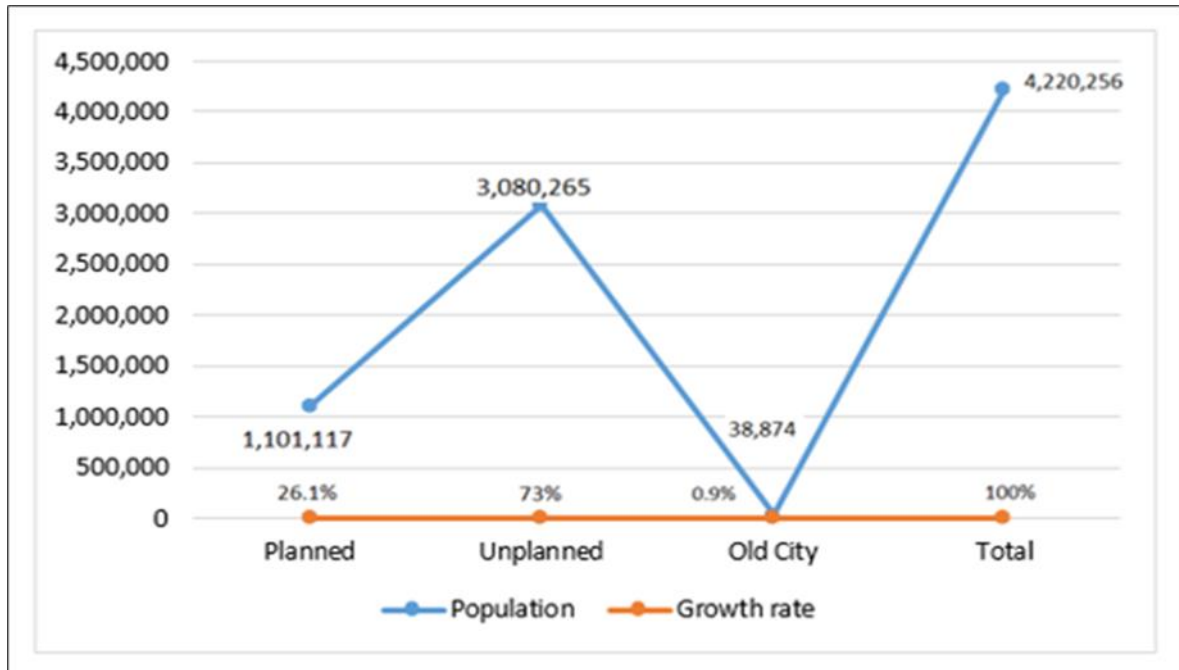


Figure 4.6. Assessed population by type of built-up region in Kabul City (2008)

An analysis of data from the KM revealed growth in Kabul's automotive fleet in 2008. Personal cars constituted the majority, comprising 63% of the fleet, while minibuses accounted for 11%, and public transit vehicles represented 3% of the total fleet. The city's rapid urbanization and economic growth have significantly increased travel demand, creating immense pressure.

The need for transportation infrastructure has seen rapid growth due to the country's significant reliance on roads and expressways, with about 70% of all motorized vehicles using these networks. The rapid increase in individual car ownership, coupled with the absence of economic mechanisms such as parking fees and road pricing, has led to significant congestion, especially in the central area of the city, thereby increasing the average duration of commuting in Kabul. The following table provides a comprehensive breakdown of the length and density of roads in every district within the Kabul region. There is significant variation in road density across different locations. The density value is below 5.0 km/km².

District 8th categorizes the districts with the highest population density, specifically districts 6, 9, 12, and 15. The density of official highways, excluding "other roads," also exhibits

significant variation. The predominance of medium-rise apartments in regions 3, 4, 5, 10, 11, and 15 significantly elevates the road density. The population density in outer-range districts is generally low, except for district 18, classified as a semi-urban area and founded before the others.

Table 4.1. Population of Kabul by district in 2008

Dist. No.	Road Class					Total	Density 1 (Km/Km ²)	Density 2 (Km/Km ²)
	Main arterial	Arterial	Secondary	Community	Other			
1	0.3	3.2	3.3	2.0	67.6	76.3	16.2	2.2
2	6.9	1.8	3.6	17.4	55.1	84.8	12.5	3.3
3	5.6	1.1	9.2	39.9	61.9	117.7	12.1	1.7
4	6.9	12.3	7.0	52.3	125.1	203.6	17.6	3.0
5	18.3	0.7	1.2	97.1	231.5	348.8	12.0	1.0
6	0	19.6	10.1	49.5	322.6	401.8	8.2	0.5
7	0	15.7	5.7	27.4	343.8	392.6	12.1	0.3
8	7.5	11.6	10.4	59.8	400.4	489.7	10.1	0.9
9	10.1	7.2	3.4	23.2	195.7	239.6	9.8	1.1
10	0	14.7	7.3	78.6	121.2	221.8	17.1	1.2
11	1.4	10	2.6	57.9	226.2	298.1	17.1	1.7
12	0.0	19.3	4.8	36.2	285.1	345.4	9.9	0.8
13	0.0	7.5	19.4	58.2	442.7	527.8	11.3	0.6
14	3	24.5	3.0	55.0	239.8	325.3	2.6	0.2
15	0	25.5	5.3	128.3	89.8	248.9	7.8	0.8
16	0.4	13.4	4.2	9.8	228.1	255.9	10.2	0.8
17	9.6	0.0	8.1	12.2	245.8	275.6	4.9	0.3
18	0	14.1	18.0	54.0	38.8	124.9	3.7	0.4
19	15.5	0.0	24.1	36.2	220.1	295.8	2.1	0.3
20	17.8	0.0	7.9	81.9	148.8	256.4	1.8	0.2
21	10.9	0.0	7.0	35.8	3.4	57.1	0.9	0.03
22	0	8.8	17.6	52.8	189.4	268.6	3.4	0.00
Total	114.1	211.0	183.2	1065.4	4282.8	5856.5	5.7	1.5

This part of the study examines urban transportation systems in Kabul City, focusing on their impact on economic, social, and environmental aspects. It evaluates transport and infrastructure systems, road networks, and non-motorized modes of transportation. The literature review highlights the importance of sustainable transport systems and policy-oriented studies for environmental preservation, social equality, and economic efficiency. The study proposes urban transportation alternatives and sustainable transport strategies in Kabul.

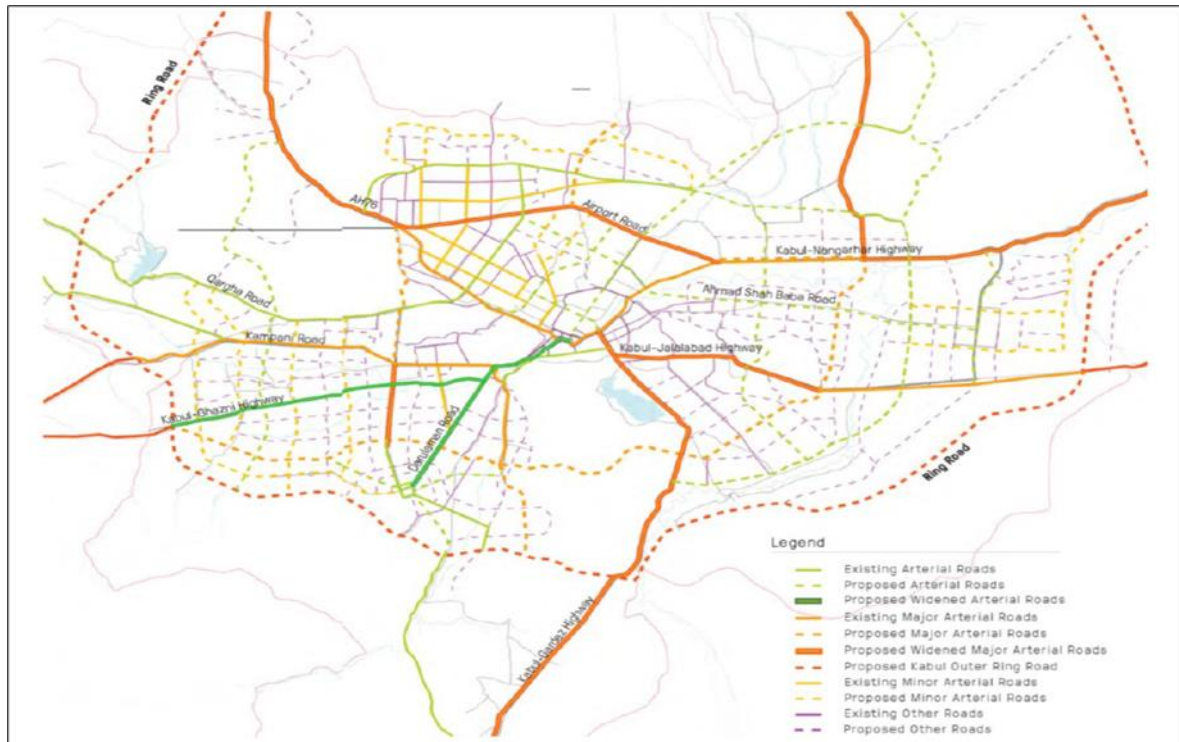


Figure 4.7. Kabul existing road network

The public transit network in Kabul is in poor condition, and the absence of traffic signals at crossings has led to an increase in car accidents. Addressing traffic problems is necessary, but devising a plan remains challenging. Other modes of transit were also under consideration in Kabul's metropolitan areas.

Transportation is a major contributor to air pollution and greenhouse gas emissions, causing global warming. It also has a negative impact on natural places, increases noise pollution, and harms ecosystems. Eco-friendly modes of transportation that provide secure travel while minimizing environmental impact were the way to address these issues. These eco-friendly modes of transportation would not only reduce air pollution but also contribute to a more sustainable urban environment.

Walking is an economically viable and ecologically sustainable mode of transportation that requires no expenditure on fuel or other associated costs, particularly for short distances. Engaging in this practice has significant benefits in terms of promoting general well-being, mitigating weight gain, and minimizing the release of pollutants from vehicles. Bicycles serve as an additional environmentally friendly mode of transportation, facilitating physical exertion, and mitigating health hazards associated with a mostly inactive lifestyle is crucial.

Most journeys have less than 3 kilometers, resulting in a reduction in both pollution levels and emissions of greenhouse gases.

The use of buses presents itself as a viable alternative for extended trips due to their comparatively lower fuel consumption per passenger and their potential to alleviate traffic congestion. Electric buses are characterized by their absence of greenhouse emissions, making them an environmentally friendly option. Furthermore, these buses exhibit minimal levels of pollution, establishing their potential as a feasible substitute for conventional buses.

In addition, thermal buses have a lower noise output compared to their counterparts, allowing them to improve urban living conditions by mitigating noise pollution from public transit vehicles (Mahmoud et al., 2016). The bicycle taxi has emerged as an increasingly popular means of transportation in urban areas as a response to the challenges posed by traffic congestion and environmental concerns. Taxi bikes exhibit reduced speed but demonstrate enhanced efficiency in congested urban areas, resulting in less environmental impact and fostering the principles of sustainable development, vitality, and dynamism.

By looking closely at the current transportation systems and rules, we might be able to find more environmentally friendly ways to build things, like new ways to get around, smarter ways to manage systems, and better living conditions. It is critical to avoid importing pre-existing designs from industrialized countries and instead consider the unique characteristics and circumstances of cities while also incorporating knowledge and skills from both northern and southern regions.

To improve Kabul's transportation infrastructure, many road and rail transport providers must be integrated. The absence of rail-based urban transportation has had adverse effects on the city since the railway system has been non-functional for an extended period owing to financial limitations, inadequate service provisions, and the absence of coordinated bus routes. The integration transport and land use planning are of paramount importance in facilitating the sustainable growth of urban transport (Messenger, Ewing, 1996).

Urban transportation systems and city design can synergistically optimize social benefits and long-term growth. It is very important to support transit-oriented development and public transportation because recent efforts to reduce traffic congestion, like building more roads,

(religious endowment), and it cannot be sold or transferred for private benefit. Since many property transactions take place informally within communities, tribal and customary rules also impact those with land rights.

Allocation and expropriation by the government:

The Land Management Law gives the Afghan government the power to take land for public use, such as infrastructural development. Despite the frequent payment of compensation, unscrupulous practices and unclear ownership documents often lead to disagreements. A significant portion of the urban population resides in informal settlements, constantly facing the threat of eviction. Issues with Land Tenure and Ownership Status Private, public, and community land are among the various types of land ownership in Afghanistan. However, there are serious legal and societal issues brought on by conflicting claims and inadequate proof.

People or families often acquire private land through purchase or inheritance. However, conflicting or missing records may lead to disputes over land titles. Government-managed land that is frequently used for national projects, military applications, or infrastructure. Local communities use communal land for grazing and agriculture, especially in rural areas. Councils or traditional leaders frequently oversee these lands.

- **Informal Settlements:** Many city people, particularly in places like Kabul, reside in unofficial settlements where they lack legal ownership rights and are therefore at risk of being evicted.
- **Planning for transportation and land use:** Land use policy and transportation planning are intimately related in Afghanistan, but obstacles like fast urbanization, poor administration, and little infrastructure investment have made planning difficult.
- **Planning for Urban Transportation:** Uncontrolled urban development and a dearth of integrated public transportation systems cause congestion in Kabul and other large cities.

Informal transportation services predominate, and road networks are not well maintained.

Funding constraints and security concerns have caused delays in the implementation of contemporary urban transportation alternatives, such as bus rapid transit (BRT) systems.

- **Regional and Rural Connectivity:** The Afghan Ring Road, which links important cities like Kabul, Kandahar, Herat, and Mazar-i-Sharif, serves as the country's main transit route. Accessing markets and services is challenging in many rural locations due to inadequate road infrastructure. Political unrest and security risks can have an impact on road development projects.

Given that Kabul currently exhibits a monocentric city model, with most economic and social activities concentrated in the Central Business District (CBD), it is essential to adjust the urban layout and land use pattern. To mitigate the negative consequences of excessive urban expansion, it is advisable to distribute urban functions by establishing new urban areas and urban fringes. Furthermore, commercial districts should be built in accordance with smart development principles.

Non-motorized transportation infrastructure, including elements such as sidewalks, crosswalks, strategically synchronized crossing lights, street lighting, and dedicated bicycle lanes, has the potential to reinvigorate non-motorized travel among economically disadvantaged communities (Haq, 1997). The formulation of urban transportation policies should include the identification and delineation of financial resources for transportation, the establishment of planning ideas, the allocation of road rights, the implementation of system operations and administration, as well as the promotion of education and enforcement of transportation laws. Such measures have the potential to significantly enhance the efficacy and use of public transit systems (Kamargianni et al., 2016).

Implementation of a Build Operate Transfer (BOT) model for the development of Kabul's forthcoming rail-based public transportation system to extend financial support to the socioeconomically disadvantaged segment of the population (Harris et al., 2021). The implementation of congestion pricing, area licensing schemes, cordon pricing, and high parking fees within the CBD of Kabul can effectively address the escalating proliferation of private vehicles. This approach would alleviate traffic congestion and pollution, enhance the overall quality of life, and optimize the utilization of public transportation services within the CBD.

Table 4.2. Proposed strategies for the urban transportation system of Kabul city

Serial Effects	Strategy	Purpose	
1	Transport operator integrated.	To offer an integration transportation system with interoperability across public transportation modes based on roads and rails.	This will enhance the interaction between rail-based and road-based public transportation, capacity distribution, and passenger transfer, as well as reduce capacity waste and passenger annoyance.
2	Transport and land use planning integrated.	To optimize the effectiveness of urban transportation systems considering environmental and municipal resource restrictions.	People's travel behavior and land use intensity are affected by transportation accessibility. To allow a sustainable transportation system, integration transportation and land use planning will enhance the efficiency of resource usage and mode options.
3	Support transit-oriented development and public transportation.	With the goals of decreasing reliance on private automobiles and increasing access to public transportation, mixed-use, walkable neighborhoods are being pushed forward.	Public transportation usage will increase, and automobile ownership will decrease under a compact mixed-community plan.
4	Modify the urban structure and land use pattern.	To prevent the CBD from becoming centralized and overdeveloped.	New urban areas and urban fringe regions will decentralize urban functions and balance work and residential zones.
5	Non-motorized transportation network.	To promote non-motorized travel as a sustainable method.	Non-motorized transportation is an energy-efficient, ecologically begin method of transportation that will improve urban mobility while reducing transportation-related pollution.
6	Create and execute rules and regulations governing urban transportation.	Creating a sustainable urban transportation system through the implementation of transportation laws and regulations.	This will determine the status of transport modes, sources of transport finance, transport planning concepts, the operation and administration of transport systems, and other transport-related concerns.
7	Low-cost transportation for low-income people.	To create vertical equality for disadvantaged people.	This will assist low-income commuters with discounted rates.
8	Reduce the use of cars by using economic tools.	To reduce vehicle, use and promote public transit.	This will minimize traffic and guarantee transportation for all social groups.

The planning situation in Kabul's city is intricate and arduous. In recent decades, the city has seen rapid urbanization and population growth, leading to considerable pressure on the current infrastructure and services. Traditionally, the planning in Kabul has been disorganized and lacked a unified goal. This may be partially attributed to the consequences of the Soviet invasion, civil war, and Taliban control, which led to a lack of structured planning systems and an emphasis on immediate, improvised growth.

The proliferation of informal settlements and unplanned projects has resulted in problems such as overpopulation, limited access to essential services, and inadequate infrastructure. The absence of comprehensive zoning restrictions and their enforcement has exacerbated the disorderly expansion of metropolitan areas. Recently, there have been endeavors to enhance the planning process in Kabul (Fattah et al., 2022). In 2011, Kabul established the Kabul Urban Growth Master Plan, outlining a comprehensive vision for the city's future and presenting measures to enhance growth and infrastructure. Additionally, the Kabul Municipality has been actively modernizing and enforcing diverse planning rules, such as building codes and land-use ordinances, to regulate development and enhance urban management.

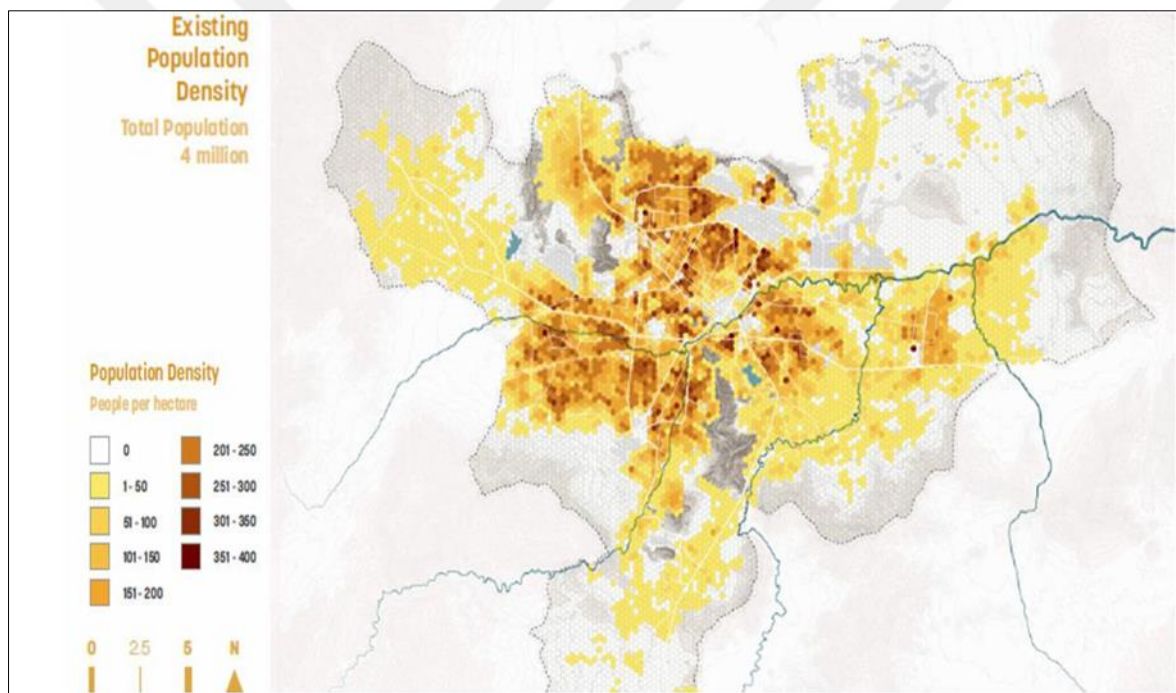


Figure 4.9. Existing population density (UN Habitat Land Use, 2014)

However, the implementation and enforcement of planning rules continue to face obstacles owing to limited resources, insufficient capacity, and a lack of coordination among essential government entities. Furthermore, the security situation in Kabul presents substantial challenges to the successful execution of planning and development initiatives. Furthermore, the arrival of refugees and internally displaced people in the city contributes to the intricacy of planning, as a significant number of them establish themselves in informal settlements or temporary shelters. In general, Kabul City's planning situation is still evolving, with ongoing

efforts to improve urban management and address the challenges brought on by rapid urbanization and informal growth.

Responsible authorities in Kabul are the KM is the primary governing body for urban planning and development in Kabul, Afghanistan. The Ministry of Urban Development and Land oversees Kabul City's urban development and land administration. The Kabul Metropolitan Development Authority (KMDA) is tasked with developing and planning the Kabul Metropolitan Area. The Kabul Urban Affairs Division, under the Ministry of Urban Development and Land (MUDL), makes planning decisions about urban areas in Kabul. The Kabul Urban Planning Department (KUPD), a division of the KM, oversees urban planning and decisions about land use, zoning, infrastructure development, and other planning activities. You should consult this information for accuracy, as it is subject to change.

The urban planning process in Kabul City involves a comprehensive analysis of the city's current situation, including population growth, infrastructure, land use patterns, transit systems, and environmental conditions. Kabul City created a thorough master plan that sets clear goals for different areas and describes the city's future vision. Zoning and land use planning then ensured the proper distribution of land for residential, commercial, industrial, and recreational uses (Hensher, 2017). Infrastructure implementation is crucial for future growth, including roads, utilities, water supply systems, sewage systems, and public transit networks. Community engagement and participation are essential, with public consultations and meetings organized to ensure the planning process accurately reflects the local population's needs.

A policy and regulatory framework are necessary for the efficient execution of urban planning initiatives. Continuous monitoring and evaluation are crucial to assess progress and detect deficiencies or obstacles. The implementation process requires coordination across various government agencies, departments, and stakeholders, as well as sufficient financing and resources. In Kabul City, urban monitoring entails collecting and analyzing data on various aspects of urban development to understand the city's current state and identify areas for improvement (Khwaja, Rasooly, 2012). The process involves data collection through surveys, field observations, satellite images, and existing sources. Data analysis then revealed trends, patterns, and issues related to urban growth. Population density, housing

affordability, transportation accessibility, waste management, and air quality were some of the key metrics that were developed to evaluate performance and development.

Urban planning law in Kabul City would likely encompass regulations and guidelines related to zoning, land use, building codes, infrastructure development, environmental protection, and overall city development. The design of these laws prioritizes orderly growth, efficient land utilization, and resident well-being, considering factors such as population density, transportation networks, public services, and environmental sustainability.

In Kabul, urban planning laws may specifically address issues such as:

- Zoning laws: Establish distinct zones for commercial, residential, industrial, and recreational uses.
- Building codes: Establishing standards for building heights, setbacks, safety precautions, and construction materials ensures structural integrity and public safety.
- Land use policies: which include provisions for public facilities, green spaces, and affordable housing, control the use, division, and development of land.
- Transportation planning: addressing road networks, pedestrian infrastructure, public transportation systems, and traffic management to encourage mobility and lessen congestion.
- Environmental regulations: Such as waste management, green building techniques, and urban greening programs, serve as examples of actions that safeguard natural resources, reduce pollution, and maintain ecological balance.
- Historical preservation: safeguarding historically significant locations, monuments, and architectural legacy to preserve the city's identity and cultural diversity.

Afghanistan's municipal authorities and urban planning departments play a crucial role in creating and implementing urban planning legislation, particularly considering persistent issues including political unpredictability, economic hardship, and resource scarcity. Promoting sustainable development, improving quality of life, and creating inclusive and resilient urban environments all depend on effective collaboration with pertinent stakeholders, such as government agencies, community organizations, developers, and residents (Mahmoud et al., 2016). To encourage cooperation on sustainability and planning, a broad variety of stakeholders, including government officials, urban planners, academics,

civil society, and local people, must be included given the current circumstances in Kabul. To encourage this form of collaboration, the following actions were suggested:

- **Multi-Stakeholder Engagement:** To promote collaboration across sectors, arrange frequent meetings and workshops with important stakeholders. By involving representatives from the municipality, community organizations, NGOs, and academia, it was possible to fill in knowledge and resource gaps and ensure the hearing of many points of view.
- **Contextual Data Collection and Analysis:** Create and use indicators that quantify the difficulties Kabul faces, such as waste management, energy consumption, transit accessibility, land use patterns, and air and water quality. This data's collection and analysis will highlight important areas for intervention and serve as a basis for well-informed decision-making.
- **Collaborative Sustainable Plan Development:** Develop long- and short-term urban development plans with sustainability as a top priority. Considering the socioeconomic reality of Kabul's citizens, these plans should prioritize the development of green areas, sustainable infrastructure, improved public transportation systems, and fair access to basic services.
- **Integrated Policy Framework:** Make certain that land-use plans, zoning rules, and construction requirements are all in line with sustainable goals. This integration should promote eco-friendly activities such as green infrastructure, efficient waste management techniques, and energy-efficient building designs.
- **Engage local communities in the planning and decision-making processes** by actively involving them. Public forums, interactive workshops, and community-driven initiatives that enable locals to express their needs and goals can help achieve this and guarantee that their plans consider their circumstances.
- **Capacity Building Initiatives:** To improve stakeholders' comprehension of sustainable practices, put in place training and capacity-building initiatives. These programs should cover topics such as efficient waste management, renewable energy sources, sustainable urban planning, and locally appropriate modes of transportation.
- **Sturdy Monitoring and Assessment:** To monitor advancement toward sustainability objectives, set up an extensive monitoring and assessment system. Frequent evaluations of completed projects will enable modifications and enhancements, guaranteeing that tactics stay applicable and successful in the face of shifting conditions.

These tactics will support the development of a cooperative atmosphere in Kabul that encourages sustainable urban planning, ultimately enhancing the resilience of the city and the standard of living for its citizens.

To sum up, promoting sustainable urban development in Kabul needs a multifaceted, collaborative plan that includes key players, thorough data collection, a well-thought-out policy, community involvement, skill development, and regular checks. These tactics are crucial for tackling the present and upcoming urban issues in Kabul. Because so few people possess cars, walking, bicycling, and unofficial carpooling have become the main modes of mobility in Kabul in recent years. Nonetheless, predicted economic expansion and a growing middle class will lead to a significant rise in private automobile ownership in the city over the next 20 years. Even though traffic is currently mild during peak hours, experts predict it will worsen with more vehicles on the road (Ahmadzai, 2019).

A combination of neighborhood roads, small, unpaved local roads, paved arterial highways, and minor roads with two to three lanes make up Kabul's road system, which extends outward from the city center. By paving numerous important roads and improving accessibility, the Kabul Municipality Development Program has improved road conditions. However, there are significant traffic jams because of the city's unusual topography, which includes steep mountains and little east-west connectivity. Roundabouts are used to control many junctions; traffic cops handle them manually, and more security checks exacerbate traffic problems (Mohamad, 2005).

The demand on Kabul's road system will climb as more people buy cars. Kabul requires dependable public transit choices that are quicker, safer, and less expensive than private vehicles to mitigate this. Enhancing public transit could encourage more middle-class people to use it.

Furthermore, extending the existing bicycle trend can lessen the negative effects of rising automobile ownership. By creating bike lanes, providing secure parking, and putting safety measures in place, more people were encouraged to use bicycles as their main mode of transportation, which decreased traffic and promoted a healthier, more sustainable Kabul.

Challenges in Kabul's Urban Mobility: Connectivity, Safety, and Public Transit Limitations.

- The primary roads that run through Kabul are radial, beginning in the city center and going outward, exhibiting limited neighborhood connectivity. The complex topography of Kabul divides it into several different metropolitan zones, with few connections between these urbanized areas.
- Unsafe Road Conditions: Due to a lack of pedestrian crossings at junctions and roundabout crossroads that do not stop freely moving traffic, people in Kabul frequently put their lives in danger simply to cross the street. Indeed, numerous road deaths occur annually.
- Kabul suffers from severe traffic congestion because of inadequate traffic control, slow community and secondary road renovation, on-road parking, and a poorly designed vehicle hierarchy.
- Limited Public Transportation Options: Kabul's official and unauthorized bus networks still lack a comprehensive system, schedule, stops, and signage, despite their increased structure.
- On-Street Parking: The amount of on-street parking, particularly in crowded, commercialized areas, affects traffic flow.

The following lists the primary stakeholders and their contributions to the development of Kabul's urban transportation and infrastructure.

- Ministry of Public Works (MoPW): MoPW is responsible for planning, designing, implementing, and maintaining transport infrastructure including roads and railways. Ministry of Transport and Civil Aviation MTCA is responsible for setting transport policies, as well as administering public transport services for trucks, buses, aviation, and others operated under the government management.
- Ministry of Urban Development and Housing (MUDH): MUDH is responsible for providing road planning and implementation in cities other than Kabul.
- Ministry of Interior Affairs (MoI): The MoI is the police body that regulates traffic and vehicular accidents. They are currently responsible for overseeing roundabout procedures and intersection traffic law.
- National Environmental Protection Agency (NEPA): NEPA provides environmental management services in transportation operations. It handles all environmental permitting and licensing as well.

- KM Department of Streets and Maintenance: The Kabul Municipality is responsible for maintaining local streets and upgrading them as needed.
- KM Department of Transportation: The KM Dept of Transportation is a newly formed department charged with planning and managing traffic operations throughout Kabul.
- Millie Bus Enterprise: Millie Bus enterprise is responsible for operating fleet buses in the city of Kabul.
- Asian Development Bank: The ADB is currently financing and implementing many projects related to road construction and rehabilitation through its Program Management Office.
- World Bank: The World Bank is currently funding the Rural Access Project to enable rural communities to benefit from all-season road access to basic services and facilities.
- UN Habitat: UN Habitat is working with MUDH, conducting research on the development of an Urban National Priority Program (U-NPP) that will set Afghanistan's urban priorities for the coming decade.
- USAID: USAID has funded major construction and rehabilitation projects throughout Afghanistan, amounting up to 2,000km of roads. It is currently supporting the Ministry of Public Works in establishing an independent Afghan government road authority and fund.
- Japan International Cooperation Agency (JICA): JICA has worked with KM pertaining to its transportation development. JICA has produced an extensive report on potential transportation development throughout the city, and some components have since been implemented.

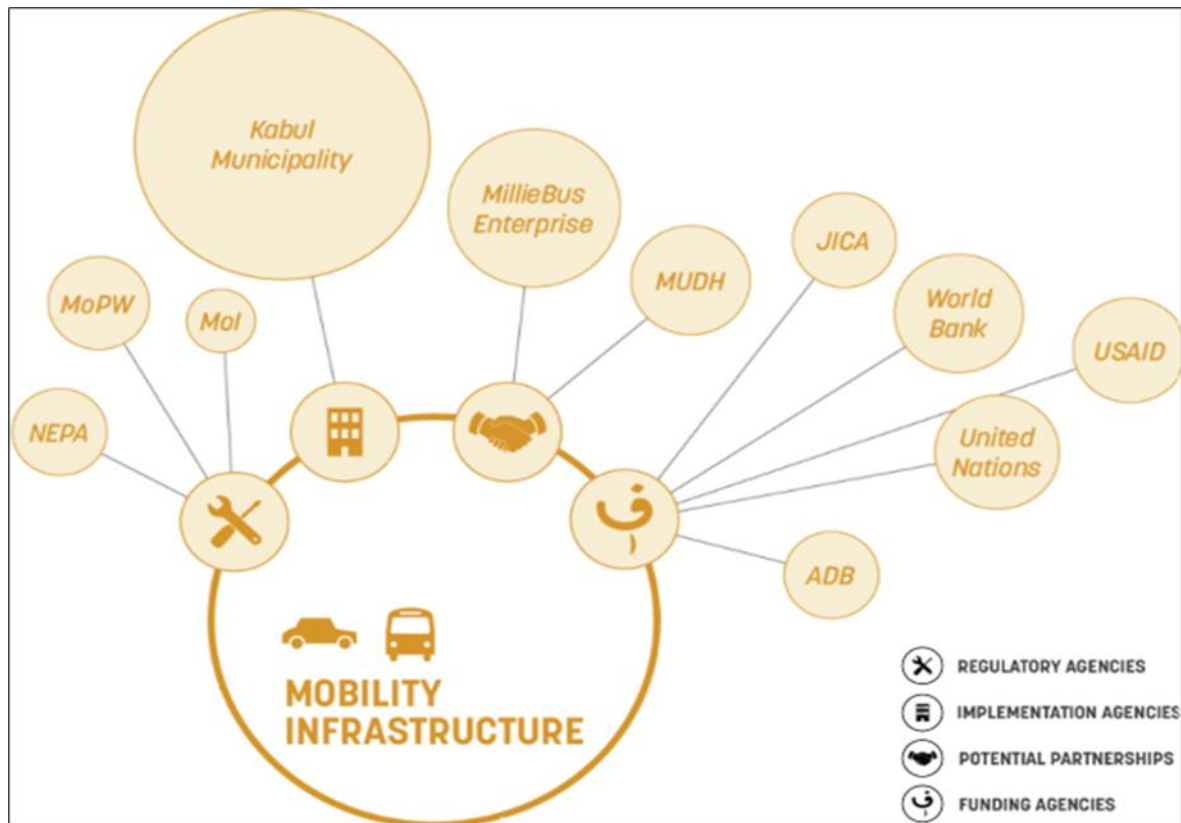


Figure 4.10. Transportation stakeholder map

To sum up, the analysis indicates that the transportation system is now facing a crisis, and it is evident that the existing urban design and transport rules have failed to provide a comprehensive strategy for the advancement of urban transport. It was anticipated that the execution of urban bus development projects will support urban transportation in the years to come. However, an evaluation through economic, environmental, and social lenses deems the present transportation system unsustainable. With an emphasis on environmental sustainability, this research offered several possible tactics that, if put into practice in Kabul, would improve the city's urban growth and transportation system.

Urban areas widely recognize the transportation industry as a significant contributor to detrimental environmental effects, primarily due to its substantial generation of greenhouse gas emissions and its role in exacerbating air and noise pollution. Policymakers and decision-makers need to prioritize the development of an integration technique for establishing a sustainable and environmentally friendly urban transportation system in the future. This system aims to transform urban transportation and mobility towards a more sustainable and environmentally friendly future. It does this by offering an innovative, cost-effective,

commercially viable, and people-oriented transport system.

4.1.1. Kabul's continuing efforts to integrate land use and public transportation

Recent years have seen efforts to better integrate land use and public transit to address Kabul's sustainability issues. The goal of several research studies and programs has been to improve public transportation accessibility and coordinate it with land use planning. The measures mentioned above aim to reduce traffic, boost mobility, and create a more sustainable urban environment (Ahmadzai, 2019). Important continuing initiatives include:

- **Research on Land Use Patterns and Public Transportation Accessibility in Kabul (2020):** To pinpoint regions in Kabul where transportation services are either underdeveloped or nonexistent, this study looks at the relationship between public transit networks and land use in various districts of the city. The encouraging higher-density, mixed-use developments close to important transportation hubs, the objective is to improve transit-oriented development (TOD).
- **Master Plan for Public Transportation in Kabul, 2021:** The Master Plan provides a detailed plan for developing and updating Kabul's public transportation infrastructure. To build more accessible and interconnected neighborhoods, it highlights how crucial it is to integrate new transportation lines with the current land use regulations and urban infrastructure.
- **Project to Coordinate Land Use and Buses (Ongoing):** By matching bus routes with land use patterns, this initiative aims to increase the effectiveness of Kabul's bus network and guarantee that public transportation is accessible in densely populated areas for both residential and commercial purposes. The project also covers the creation of transit corridors that connect important residential and employment regions.
- **The Integration Study of Public Transportation and Metro Stations (2022):** With a focus on multimodal integration, this study assesses how to more effectively link public transportation to Kabul's upcoming metro and bus rapid transit (BRT) systems. To increase commuter accessibility, it makes suggestions for how to integrate bus stops, metro stations, and pedestrian pathways.
- **The Smart Kabul Initiative (2023-Ongoing):** Integrating Public Transportation and E-mobility. To make Kabul a more sustainable city, the Smart Kabul project is adding e-

mobility choices to the city's public transportation fleet, including shared electric vehicles and electric buses. To support more environmentally friendly and economically viable transportation choices, this project also investigates how to incorporate these new technologies with the current land use planning framework.

Each of these initiatives advances the overarching objective of combining transportation and land use planning in Kabul, guaranteeing a more livable and sustainable city in the future.

4.2. Transportation and Land Use Plans in Kabul

Land use planning and transportation integration have been the main focuses of recent efforts in Kabul to handle the city's expanding problems with urbanization, traffic, and sustainable development. The goal of this case study is to create comprehensive plans for the integration of land use and transportation in Kabul, focusing on two notable initiatives implemented in 2018 and 2020 (Raharjo et al., 2022). These initiatives aimed to promote sustainable urban expansion, improve transportation, and lessen their negative effects on the environment. The following is a chronological list of the projects.

- The Integrated Land Use and Transportation Planning Framework for Sustainable Urban Development in Kabul City, 2018 (funded by the Kabul Municipality and the Ministry of Urban Development and Land)
- Kabul Urban Mobility and Land Use Integration Plan: Developing Public Transport Corridors and Pedestrian Pathways, 2020 (developed in collaboration with international urban planning consultancy firms).

The goal of both initiatives is to create a coherent urban plan that facilitates sustainable growth by matching land use and transportation infrastructure. To promote public transportation corridors, the first project focused on creating a strategic framework that combines land use rules with transportation networks. It achieved this by regulating zoning and managing urban density (Raharjo et al., 2022). With the goal of promoting walkability and lowering reliance on private vehicles, the second initiative prioritized improving pedestrian routes and public transportation networks. Both studies proposed combining pedestrian-friendly environments with high-capacity public transportation systems, like bus rapid transit (BRT), as the cornerstone of the city's mobility. Both local and foreign experts,

in their shared endorsement of these strategies, demonstrate the growing consensus on the necessity of integrated approaches to urban planning in Kabul that link land use with sustainable mobility solutions.

4.2.1. Public transportation usages and preferences in kabul

In 2022, the KM carried out a survey titled "Understanding Public Transportation Usage and Preferences in Kabul," with the objective of assessing the present condition of public transportation and pinpointing the primary areas that required enhancement. The study engaged 7,314 participants in total, both in-person and online, to ensure a large and representative sample. The survey's findings painted a clear picture of Kabul's public transportation landscape by showing that 62.8% of participants mostly took buses to work every day. Less than 15% of people relied on shared vans or minibuses, and just 8.5% of people used taxis as their primary mode of transportation. 10.3% of commuters in Kabul used private vehicles, demonstrating their comparatively strong reliance on public transportation (Almatar, 2023).

The poll also investigated the difficulties Kabul's public transportation passengers confront. A sizable 52.6% of participants identified overcrowding as a major problem that makes traveling uncomfortable and occasionally dangerous. Furthermore, 47.9% of respondents expressed worries about the bus services' dependability and timeliness, which frequently cause delays and interruptions to their daily schedules. The possibility of theft and harassment are only two examples of the safety concerns raised by 38.2% of respondents (Almatar, 2023).

Other problems included the absence of real-time information regarding bus schedules and routes, poor infrastructure at bus stations, and a lack of connectivity between various modes of transportation. 68.4% of respondents endorsed adding more buses as the most frequently suggested solution to reduce crowding and increase service frequency. 54.3% of the respondents mentioned a noteworthy suggestion: the creation of bus lanes specifically designed to expedite travel and reduce delays. For 45.7% of respondents, enhancing security measures on public transportation such as adding more security guards and video cameras was also a top concern. Additionally, 42.1% of participants said that there should be a more

seamless integration of the various public transportation options, including the development of a single ticketing system (Al-Malki, 2021).

The survey provided valuable insights, but some respondents raised concerns about the breadth and depth of the questions. While the survey highlighted important issues, it did not sufficiently explore the root causes of these challenges or offer specific solutions. Additionally, the results may not fully represent the experiences of marginalized groups, such as women and the elderly, who face difficulties in using public transportation. These concerns underscore the need for more comprehensive and inclusive research to ensure that future transportation planning considers the perspectives of all Kabul residents.

There were also critiques regarding the survey's ability to capture the complexity of issues surrounding the integration of transportation and land use in Kabul. Simplistic questions may lead to overly optimistic responses that fail to reflect real-world conditions. For example, questions that ask about support for a new public transit system should account for potential trade-offs, such as changes in bus frequencies or increased walking distances (Al-Malki, 2021). Furthermore, questions about non-motorized transport like cycling should consider practical factors such as weather, traffic, and safety concerns rather than assuming ideal conditions. Future surveys should incorporate more detailed and realistic scenarios to provide a more accurate understanding of public sentiment on transportation planning. Although the current research did not include such revisions, future studies could explore these aspects to gain deeper insights into the public's viewpoint on integrating land use and transportation in Kabul.

Kabul City's technical urban transportation infrastructure

Transit infrastructure refers to the systems and services that facilitate the movement of people, products, and data between various locations. These include roads, railroads, ports, intermodal systems, tunnels, bridges, airports, pipelines, traffic management systems, and water transportation. The infrastructure for public transit consists of parking lots, pedestrian crossings, bus and tram routes, terminals, and parking facilities. Advanced cities integrate rail and water transportation into their transit systems.

Kabul City's infrastructure for organized urban transportation

Transportation, which includes pipelines, air, land, freight, and telecommunication methods, alters the spatial properties of commodities, people, and information. Three types of processes were distinguished: local, regional, and global. The local land transportation system utilized a variety of transportation methods.

These include walking, cycling, taxi and paratransit services, buses, trolleybuses, street centers, locomotives, and metros. In terms of the personal transportation system, the two most important components are public transportation and individual mobilization. Passenger autos, helicopters, and helicopter planes are all examples of motorized options for personal movement. It is possible to divide public transportation into two categories: long-distance travel and short-distance travel. It is important to note that national train and airplane services are responsible for long-distance travel. Freight transportation utilizes a wide variety of modes of transportation, including roads, trains, ships, pipelines, and aircraft.

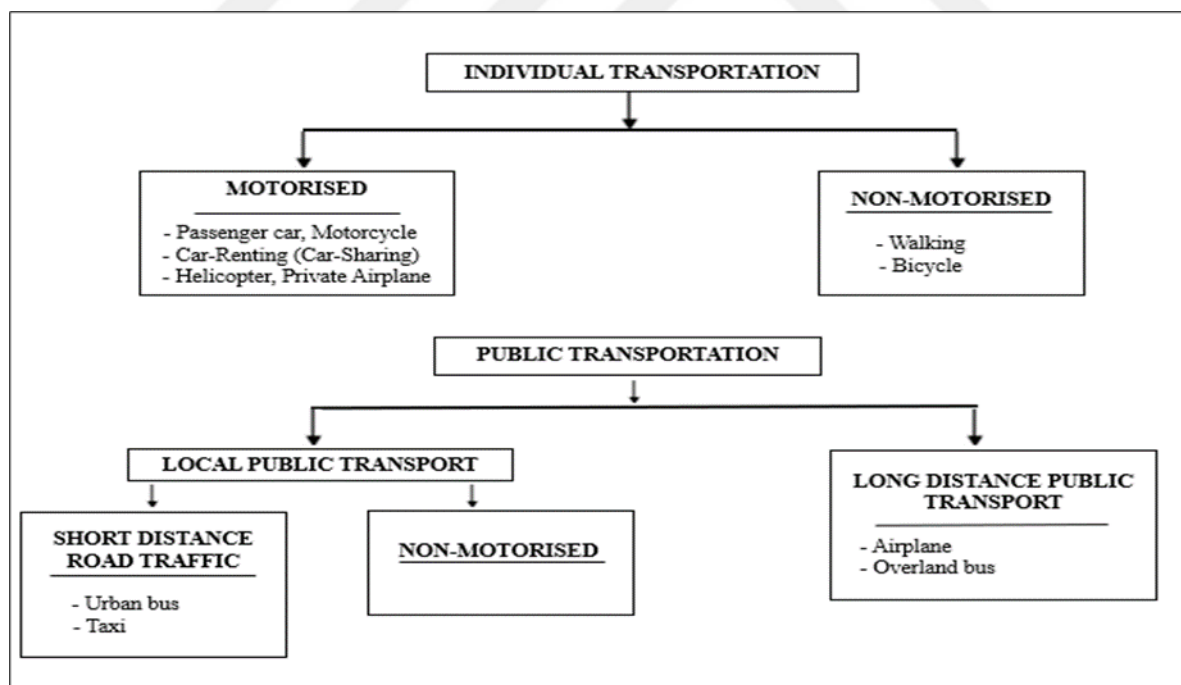


Figure 4.11. Division of private and public transportation

Transportation infrastructure encompasses the networks and facilities that support the movement of people, goods, and information between different locations. This includes roadways, railways, ports, intermodal hubs, tunnels, bridges, airports, pipelines, traffic

management systems, and water-based transport options. In urban settings, transportation infrastructure involves elements such as parking lots, pedestrian crossings, bus and tram routes, terminals, and other related facilities. Many modern cities have integrated rail and water transport into their broader transit networks to enhance connectivity and efficiency.

About 450 of the 926 buses owned by the Millie Bus Company are in Kabul City, and another approximately 380 are in service in other provincial cities. Because of a shortage of competent drivers, some 170 buses are still in the central depots at Zendabanaan and "Silo." Thanks in substantial part to donations and help from other nations, the Millie Bus Company has been able to provide some transportation services to the people of Kabul since 2003.

Table 4.3. Countries which donated buses to the Millie Bus company (2003)

Donor	Model and Capacity	Total
India	554 (TATA13 and Ashok Leyland) big cap.	631
	77 (TATA) small cap.	
Pakistan	100 (Hino) big cap.	111
	11 (Caster) small cap.	
Japan	98 (Isuzu) big cap.	98
Iran	50 (Shahabkhodro) big cap.	50
Italy	36 big cap.	36

Zendabanaan, which spans 53.8 hectares, Silo, which spans 40.8 hectares, Syahsang, which spans 19 hectares, and Timani, which spans 53.8 hectares, are the four depots that are managed by the Millie Bus Company. Depot No. 1 and Depot No. 2 (Silo) are the only two depots that are currently active at this specific time. There are a total of 39 municipal routes and 11 provincial routes that are serviced by Depot No. 1, whereas Depot No. 2 (Silo) is responsible for all the municipal routes and four provincial routes that are serviced by buses. These depots, when combined, aid with a total of thirty-two municipal routes and fourteen provincial routes that spread forth in a variety of directions (Al-Malki, 2021).

Table 4.4. Municipal bus lines (2023)

No.	Lines	Depot No.	Main Station	Length of double line operation km
1	Hesa-e-Awal Khairkhana	1	Charahi Sedarat	18.4
2	Hesa-e-Dowom Khairkhana	1		20.5
3	Hesa-e- Sewom Khairkhana	1		18.5
4	Qala-e-Najarha	1		22.8
5	Poroja-e-Panjom Khairkhana	1		24
6	Deh Kepak	1		12.8
7	Sharq-e-Panjsad family	1		20
8	Mirwais Maidan	2		14
9	Poroja-e-Taimani Golaye Park	1	Darwaza Shamali welayat	16
10	Qala-e-Fathulah	1		9
11	Chargala-e-Wazerabad	1		8
12	Kolola Poshta Tahya e Maskan	1		12.8
13	Sarak-e-Chelmeta-e-Taimani	1		14
14	Wazir Akbarkhan	1	Charrahi Malek Asghar	05.4
15	Microraion 3rd and 4th	1	Moradkhani (jonob Darya)	11.6
16	Maidan-e-Hawayi	1		13.4
17	Tangi Pul-e-Charkhi	1		42.8
18	Qala-e-Zamankhan	1		11.8
19	Dehkhodaydad	1		10.8
20	Qasaba-e-Khanasazi	1		
21	Shahrak-e-Khorasan	1		14.8
22	Microraion 1st	1		07.4
23	Chehelseton	1	Cinema Pamir Lab e Darya	12.7
24	Nohborja-e-Chehelseton	1		14
25	Dehdana Chehelseton	1		15
26	Waselabad	2		10.7
27	Char Qala-e-Sarai-e-Ghazni	2		21
28	Dasht-e-Barchi	2		22.1
29	Sharak-e-Omid-e-Sabz	1		31
30	Proja-e-Rahman Baba	1	Cinema Pamir	37
31	Sar-e-Tapa-e-Rahman Mena	1		15
32	Masjed-e-Etefaq	1		07.7
33	Karta-e-Naw and Nasaji	1	Jonob-e-Cinema Pamir	15
34	Rahman Mena	1		13.8
35	Qala-e-Hshmat Khan	1		11.3
36	Qala-e-Ahmad Khan	1		21
37	Qala-e-Hasan Khan Shewaki	1	Sepahi Gomnam	17.5
38	Syabhini Welayati	1		16.5
39	Qarya-e-Butkhak	1		35.5
40	Qarya-e-Hosainkhel	1		24.5
41	Qarya-e-Shina	1		25.5
42	Qarya-e-Kamari	1		25.5
43	Nohborja-e-Shewaki	1		24.5
44	Karta-e-Se	2	hah-e-Doshamshera	14.57
45	Pohanton	2		10.5
46	Mirwais Maidan	2		11.5
47	Dehdana	2		22.6
48	Dawazda Emam	2		09.8
49	Barchi	2	Cinema Pamir	30
50	Mirza Abdulqader	2		24.4
51	Reshkhoh	1		39
52	Company	2	Kota-e-Sangi	11.57

Table 4.5. Provincial bus lines from Kabul to the nearby provinces and districts (2023)

No.	Lines	Depot No.	Main Station	Length of double line operation km
1	Woloswali Char Asyab	1	Sepahi Gomnam	34.5
2	Mamozai	1		23.4
3	Wakh Jan	1		88
4	Welayat-e-Logar	1		130
5	Welayat-e-Maidan Wardak	2	Mirwais Maidan	60
6	Kota-e-Ashro	2		84
7	Woloswali Charkhab		Estgah-e-Logar	190
8	Woloswali Qarabagh	1	Dehkepak	69
9	Woloswali Mirbachakot	1		47
10	Woloswali Guldara	1		48
11	Hada-e-Shamali	1		16
12	Padshah Sahabe Paymunar	1		38
13	Paghman	2		25.8
14	Paghman Caster	2		25.8

Table 4.6. Capacity and fare price of transportation modes in Kabul City

Transportation mode	Available seats	Used seats	Fare Price per passenger in AFG. 2004	Fare Price per passenger in AFG. 2009	Fare Price per passenger in AFG. 2024
Millie Bus/ Private Bus	52	70	2	5	10
Millie Bus Small Bus/ Private Bus	32	50	5	5	10
Taxi share	5	8	10	20	25
Minibus	8	14	7	10	10
Rickshaw	4	7		5	10
Taxi	5	2	10 km ~70 Afg.	10 km ~120 Afg.	10 km ~150 Afg.

Serial numbers served as the basis for both the revenue collection and ticket purchase systems up until 1991. The conductors oversaw collecting fares and selling tickets. Additionally, there existed an alternative ticketing system known as "pass," which consisted of quarterly and annual tickets. According to a contract between the Ministry of Until 1990, volunteer students managed ticket and pass control for the Millie Bus Company in collaboration with the education sector (Hamad, Faghri, 2003). The Millie Bus Company did not compensate these students for their voluntary efforts. Unfortunately, the civil war and the breakdown of government administration after 1991 led to the collapse of the ticketing and control system.



Figure 4.12. Arrival of trolley buses to

Afghan engineers were responsible for designing the trolleybus routes and installing the overhead wiring. Pamir Cinema to Bagrami, Silo to Spinzar Hotel, and Pamir Cinema to Cinema Pamir comprised the three segments of the network. Cinema Pamir and Silo were designated as two transfer places.

The trolleybus system operated only from 1979 to 1991, and now only the remnants are stored at the Silo, owned by the Millie Bus Company. The Millie Bus Company's inability to repair these remains leaves their future uncertain, potentially leading to their sale on the open market (Hafizyar et al., 2022). Additionally, the impoverished stole copper power cables, sold them to material traders, and eventually found their way to Pakistan.

Three major issues that plagued the trolleybus system:

1. Poor road conditions, exacerbated by roadside vendors, complicated trolleybus operation, particularly in Kabul's Market Square, where overhead wiring interfered with market activities.
2. Private sector involvement has led to a rise in costs. While trolleybuses were the most affordable mode of transportation, their popularity led to overcrowding, with private buses charging up to five times the rate.

3. A system collapse was predicted. Even without the impact of war, the trolleybus system would likely have ceased to function due to the company's lack of technical expertise and maintenance efforts.

Public transportation continues to face these challenges. Road congestion and crowds hinder bus operations, and private transportation often outpaces public options due to quicker and less regulated service. Millie Bus faces additional challenges, such as insufficient engineers, spare parts, and well-equipped workshops (Jalal, 2015). Consequently, buses that break down after several years remain unrepaired and out of service. Moreover, low government wages have led to a high turnover of Millie Bus drivers, with 60% leaving for better-paying private sector jobs. The second section of the Millie Bus Company resumed operations in 2003 with diesel buses, and although the administrative changes post-2004 unified the two sections, they still operate from separate depots.

The official private transportation system refers to private transportation unions as those registered with the Private Transportation Sector Office and paying government taxes. Fleet operations (buses) and individual operations (taxies) are examples of public-private partnerships.

The Ministry of Transportation's new strategy mandates that private transportation companies (fleet operations) who wish to operate in the city pay an operational tax equal to around three percent of their revenue.

What advantage does registration offer private transportation companies, though? First, registration acknowledges them as official bus unions and grants them official authorization to operate on municipal routes. They also have access to the main bus terminals. The private transportation industry, in collaboration with Millie Bus, has arranged for the bus terminals to commence operations in compliance with the implemented plan.

Thirdly, each registered private transportation firm at the main bus station receives a delegate or dispatcher. For the registered buses, the dispatchers oversee managing and assigning operating priority responsibilities (Hafizyar et al., 2022). In addition, they illegally take money from informal public transportation (intermediate public transportation) because the IPT is not paying them for the people they are transferring. This indicates that to make

money, each public-private partnership company is unlawfully occupying a major municipal bus stop.

Only at the planned large bus terminals does this dispute arise. Members of the formal private fleet operating union assert that they pay the government three percent of their income in taxes. Therefore, the IPT operating within municipal boundaries authorizes them to collect revenue (taxes).

The three types of individual operations are autorickshaw, taxi, and intermediate operation; only the taxi is a subset of public transportation. However, the taxi industry uses a combination of private and public transit methods. To put it another way, the government relies on tax collectors to collect taxes, and they have the authority to operate under laws that regulate factors such as operating zones, road presence, and fare pricing. Compared to other forms of transportation, Kabul City's taxi network is more effectively organized (Jalal, 2015). Residents of Kabul City to receive superior services in addition to individual taxi rides through the taxi share system, which charges a lower rate. In Kabul, there are two varieties of taxis. Both inside-the-city taxis and outside-the-city taxis operate between Kabul City and its neighboring towns. The Kabul Traffic Department is responsible for managing and establishing taxi operating zones both inside and outside of the city (Jalal, 2015).

Taxis in Kabul City operate within designated zones, as indicated on the vehicle itself. Even though taxis can only operate within a designated zone, the enforcement of this restriction is often lax due to high demand. However, it is completely forbidden for outside taxis, also known as "Nema Shahri" (between districts and the city), and provincial taxis to operate within the city. Due to their tiny quantity and strong demand during peak hours, taxis are always overcrowded. Compared to other forms of transportation, the number of taxis in Kabul has not grown significantly over the past five years. There are five taxi unions in Kabul City. Despite the construction of three taxi unions in the last ten years by the Kabul Traffic Office to prevent traffic congestion, the number of taxis has not increased.

Table 4.7. Number of vehicles in(Kabul City from 2006-2009)

Transportation means	2006	2007	2008	2009
Private Cars	167182	184937	202607	240484
Taxis	26661	26661	26677	26761
Trucks	43850	46417	48091	53947
Buses	20299	21134	21755	23560
Motorcycles	12746	13319	13637	14660
Gov. Vehicles	27382	27968	38150	42897
Temporary No. Paltes	11123	11349	12131	12131
Gov. & NGOs Vehicles	5425	5589	5947	6367
United Nation	5179	5454	5651	5977
Core Diplomat		1439	1607	1831
Total				428615

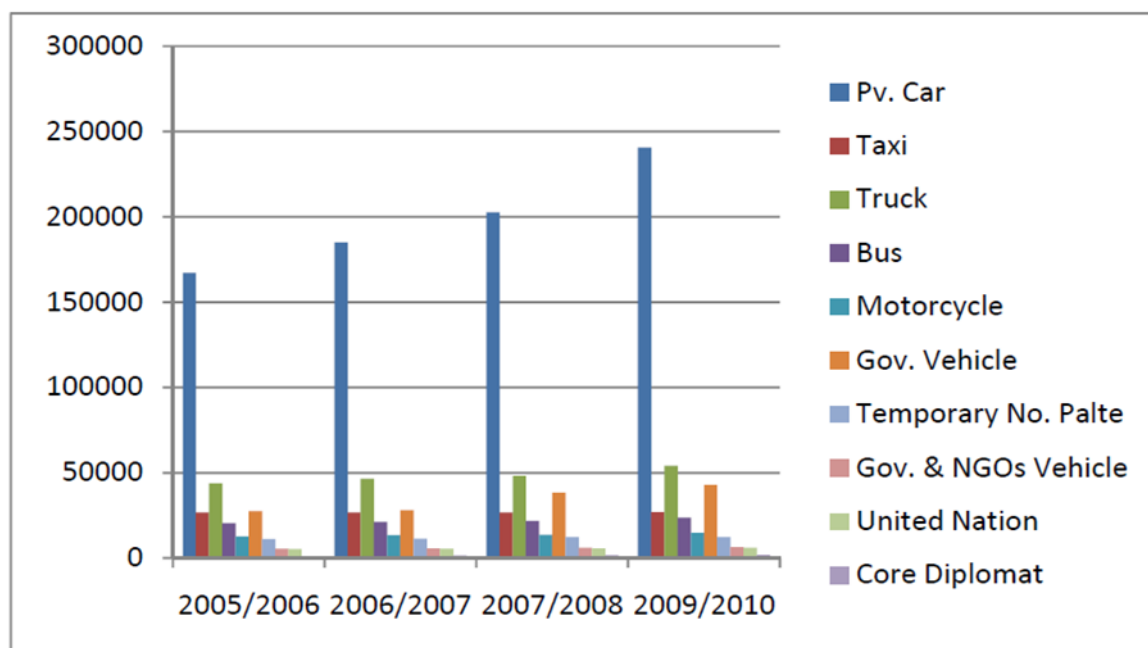


Figure 4.13. Increasing number of vehicles in

The cost of a taxi ride in Kabul varies based on the distance traveled and the time of day, with peak hours seeing the highest fares. A taxi journey typically costs 10 AFG per kilometer. For instance, a ten-kilometer ride from Khairkhana to the city center normally costs around 100 AFG, but during peak times, that amount might increase to 160 AFG.

There are extra costs, such as a 50 AFG surcharge for travel to the airport in Kabul. To guarantee that only approved taxis operate at the airport, cabs must register with the transportation administration of the airport and display a green stamp. Foreigners or newcomers may pay more because some drivers take advantage of their ignorance of local prices. Nonetheless, haggling is typical, with many tourists negotiating prices in accordance with their unique situation market (Hafizyar et al., 2022).

On the other hand, shared taxis are a more affordable choice, as each passenger pays a flat fare of 20 AFG (about 0.15 Euro) regardless of the location. Five to eight people can usually fit in a shared taxi, which frequently results in crowding. Eight people can fit in most Japanese Corolla models used for shared taxis: three in the back, two in the front, and three in the luggage compartment. Women and kids utilize the luggage area a lot to carry stuff, and it's less expensive than other sitting options. Shared taxis are more common than solo cabs because they are less expensive; 9.3% of passengers choose them over solo cabs.

In Kabul, people frequently refer to vans, shuttles, minibuses, and jitneys as intermediate modes of transportation. People frequently use Japanese Toyota minibuses, known as "Townace", for these services. These minibuses don't have set routes, timetables, or designated stops; they run on all municipal lines. Personal transportation unions oversee them and charge 10 AFG per roundtrip journey at municipal bus stops. They are also exempt from some rules and taxes. These minibuses can accommodate up to fourteen passengers, and some can even fit up to 32, despite having an eight-seat capacity.

Despite being relatively new, many of these minibuses pose a risk due to their right-hand drive design, which is incompatible with Afghanistan's left-hand traffic system. Mostly imported from Iran and Dubai, these cars cater to left-hand drive countries. Passengers entering and leaving the vehicle face a hazard because of the left-side doors and right-hand steering wheel. Even though the Afghan government forbade the importation of right-hand drive automobiles, a sizable portion of these automobiles including Japanese minibuses

remain in use. There are probably a significant number of right-hand drive vehicles on the road, mostly Japanese minibuses, due to administrative supervision concerns (field work 2007, 2008, 2009).



Figure 4.14. Private minibuses (IPT) in competition with Millie bus (Author, 2024)

Intermediate Public Transport (IPT) charges a flat fare of 10 AFG for most municipal lines, independent of the distance traveled. For instance, a single journey to Khairkhana (10 km) costs the same as a trip to Kabul University (5.2 km) in terms of transportation costs market (Hafizyar et al., 2022). The rationale behind offering this uniform fare across various distances remains unclear. One explanation would be that, even though they travel a greater distance, longer routes frequently have higher passenger turnover, which equalizes the revenue they create with that of shorter routes. Although this price system makes things simpler, it might not accurately represent the cost of delivering service over different distances.

Privately owned vehicles are operated for public use in Kabul. A sizable portion of the driving population makes their living exclusively from their cars. Small-scale car investments have increased significantly due to the large immigrant population and restricted access to other resources such as farms or real estate. During rush hour, the city frequently sees many unofficial private cabs.

Kabul mainly divides private cars into two groups: those that operate on a set timetable and those that run continuously, typically transporting people to and from their homes or places of employment. You can rent both varieties for solo and group travel at the same price as a public taxi, subject to the same rules. There has been a discernible rise in unlicensed taxis since the traffic authority in Kabul imposed additional restrictions on permits. Nowadays, many people use private cars as taxis, particularly during rush hours when the fares increase.

Motorized tricycle taxi in Kabul provides three-wheeled vehicles as an alternative mode of transportation. These tricycles, imported from China, primarily transport small goods. However, owners can modify their three-wheeled motorcycles into six-seat rickshaws for passengers by adding a frame. This mode of transport, while functional, is relatively new and not yet widespread in Kabul. It primarily serves short-distance routes in the city's western districts, including Company-Paghman, Kota-e-Sangi, and Pul-e-Sorkh.



Figure 4.15. Shows the conversion of three-wheeled motorbikes into passenger-transporting autorickshaws. (Author, 15.10.2024)

Three-wheeled motorcycles are the most cost-effective mode of transportation, considering both vehicle and travel expenses. The fee for each passenger's journey is five AFG. Despite their agility and speed, they are restless and perilous. Their 250-cc Chinese engine, priced between US\$300 and 700, exhibits substandard quality. Currently, China manufactures 50% of the motorcycles produced globally. The average cost of a Chinese motorcycle has decreased from US\$700 in the late 1990s to US\$200 now. As a result, China's market share has grown significantly, particularly in developing countries. Although the city currently has

a limited presence of three-wheeled Chinese motorbikes for public transit, projections indicate that their quantity will increase and spread throughout the city due to their lower cost and greater profitability (Jalal, 2015).

The Kabul Traffic Office classifies private cars as limousines, kombi, jeeps, minibuses, and four-wheel-drive pickups (small trucks). Large buses, privately owned trucks, and vehicles used by the United Nations, governments, central diplomats, or foreign organizations do not fall under this category. Kabul City's rapid population development is responsible for the high demand for urban transportation, which neither state-run transportation nor private formal transportation unions can meet. Consequently, the increasing population increases the need for private vehicles. Table 4.7 shows that in 2007, there were 240484 private passenger automobiles in Kabul, or 60 private vehicles per 1000 people.

Motorcycles since new, less expensive Chinese motorcycles started to enter the Afghan market in 2000, the quantity of motorcycles has surged. According to government data (survey Aug. 2009), there are 14660 registered motorcycles in Kabul City (Kabul traffic office), with approximately 4.5 percent of city dwellers only men using them.

For example, owners of small stores utilize motorcycles for goods delivery rather than just for leisure travel, because it is the least expensive method of delivering goods, it maximizes profitability by decreasing transportation expenses. Afghan culture prohibits women from riding motorcycles or bicycles. For this reason, compared to other forms of transportation, the number of motorcycles has not expanded as significantly. The traffic office's available statistics from the past five years show 114660 motorcycles registered and authorized (Jalal, 2015).



Figure 4.16. Motorcycle used for goods delivery (Airport Road) (Author, 23.11.2024)

In third-world cities, walking and passenger and freight vehicles propelled by humans or animals constitute the fundamental modes of non-motorized transit. In Kabul City, bicycles, handcarts, and animal transportation are common sights. These are typical of developing cities. Compared to other densely populated South Asian cities, Kabul City does not employ nonmotorized transportation as frequently. Human-powered vehicles provide public transportation in numerous South Asian cities, including Phnom Penh, as well as in villages in Indonesia and India. However, in Kabul City, bicycles are the most widely used form of personal transportation. People view bicycles as extremely primitive from a cultural standpoint, so they never conduct passenger transfers. However, Kabul City, like many developing cities, frequently uses bicycles and handcarts as modes of transportation for freight movement.

Because Kabul's public transit system is ineffective, a significant number of the city's inhabitants frequently rely on walking as their primary mode of transportation. Walks are the primary mode of transportation for most daily errands, including those to the neighborhood markets and schools. The city's unregulated urban development has resulted in small and unpaved roads. This development has impacted between sixty to seventy percent of Kabul's land use (Ministry of Urban Development, 2008). The lack of sufficient infrastructure encourages individuals to walk or ride bicycles instead of using public

transportation. In August 2009, a survey revealed that 5.83% of Kabul residents walk to the city center (Jalal, 2015). It is necessary to walk to reach bus stops or the nearest transit point in certain informal settlements that are situated on the foothills of the Sher Darwaza and Asmaye mountains. These settlements are in areas where roads do not exist.

The bus routes are also not well coordinated, which is another issue. One to two kilometers separates some of the planned bus stations located in different regions of the city center. Furthermore, there are no bus routes that connect them (for instance, between Cinema Pamir and Jada-e-Wilayat). As a result, walking becomes the only practical choice for those who live in these geographic areas (Mansoor et al., 2021).

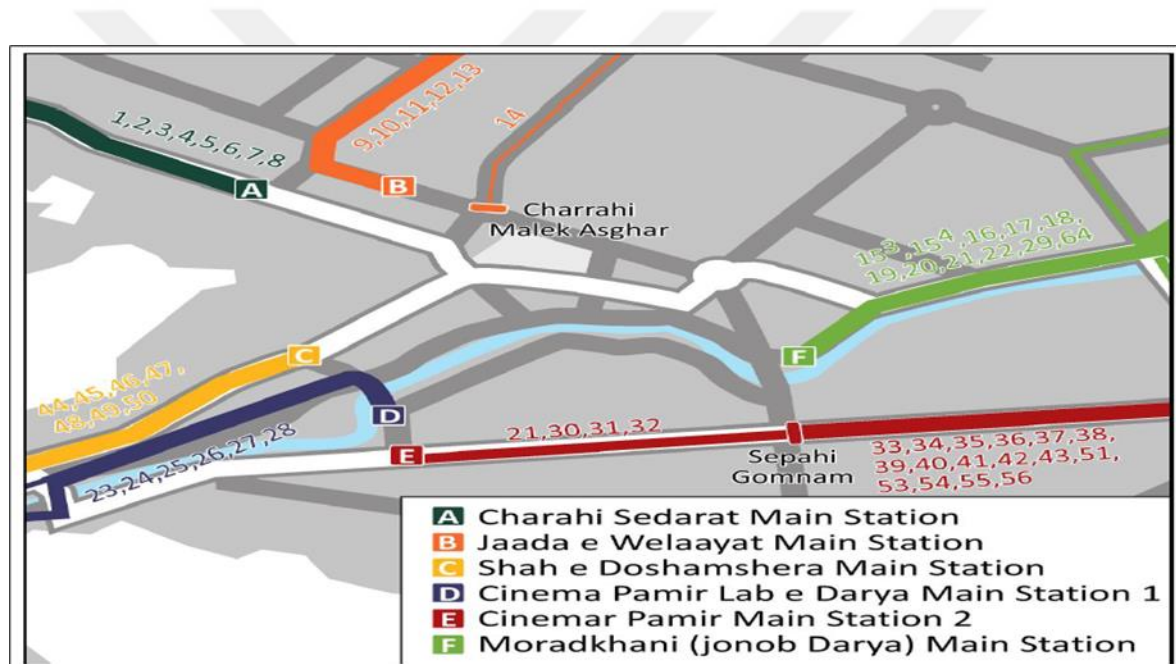


Figure 4.17. Main bus stations in Kabul City center (information based on field research 2008)

China imported about 340,000 bicycles into Afghanistan in 2007. In August 2009, a poll found that 8.42% of male residents in Kabul City ride bicycles. This is even though there are no precise statistics on the number of people who ride bicycles in Kabul City. A significant number of students, particularly male students, use bicycles as their primary form of personal mobility. Bicycles not only serve as personal transportation but also frequently transport commodities. For instance, a significant number of local retailers favor bicycles for their day-to-day requirements. In 2008, a shopkeeper in Khairkhana explained his decision:

"It is free of charge, and it saves me time." I must go to the main bazaar three times a week to replenish my inventory, and I must carry up to fifty kilograms of goods each time. Taxis are too expensive, and public transportation requires me to wait for over an hour."

The city's infrastructure does not properly integrate bicycles. Bicycles lack specific parking lots and bicycle lanes. The largest concentration of bicycles may be found in the vicinity of schools and colleges; however, these locations do not have adequate parking for bicycles, resulting in bicycles being left wherever there is sufficient space. Bicycles parked arbitrarily near businesses and marketplaces frequently obstruct the flow of regular traffic, posing this problem (Mansoor et al., 2021).

Handcarts are gaining popularity for moving goods, especially in the central business district where motorized vehicles are the only option (Mansoor, et al., 2021). These handbags are available in a wide range of configurations, including four-wheeled, three-wheeled, two-wheeled, and even one-wheeled models. In Kabul, handcarts serve as a versatile and essential tool for small-scale businesses, with some even functioning as mobile shops. Other vehicles are used for transportation.



Figure 4.18. Two wheeled handcart delivering goods (Jada-e-Maiwand) (Author, 2024)

Although the prevalence of motorized vehicles has resulted in a decline in the significance of animals in Kabul's transportation system, animals continue to play a function in the system. Throughout history, animals have played a significant role in the movement of both passengers and goods within the city. Only five years ago, the central business district of the

city still relied on horse-drawn carts for passenger transportation. Rickshaws, on the other hand, have taken their place in recent times. Animals were still employed to convey goods, even if horse carriages were no longer utilized to transport passengers.

Another option is to use animal-drawn carts in mobile shops. Farmers from the surrounding rural areas bring their agricultural products to the central business district to sell them, and on their way back, they bring items such as tea, sugar, and washing powder. Residential neighborhoods frequently see these mobile carts, where farmers not only sell their own food but also purchase vegetables and fruits from the main bazaars for local resale. In addition, farmers sell their own produce directly to customers (Naganathan, Chong).

One of the primary benefits of animal transportation is reducing motorized traffic. The environment benefits greatly from this, as it leads to a decrease in air pollution and its impact on the ecosystem (Rahmatyar, 2017). One potential drawback, however, is that animal carts can slow down traffic on important routes, resulting in congestion. Despite this, the overall advantages of utilizing animal-drawn carts outweigh the disadvantages, particularly regarding the influence they have on the environment and the support they provide for small-scale trade.

When it comes to the transportation of goods in Kabul, there are two primary categories that are distinguished: bulk commodities, which include both large and small shipments, and distance, which encompasses both short and long hauls. The government-run goods transportation firm, registered private goods transportation unions, and informal private transportation operators are the entities responsible for carrying out these activities. The government and official commercial unions manage most large-scale, long-distance freight operations, while informal private operators, using both motorized and non-motorized vehicles, generally handle most of the small-scale, short-distance transportation within Kabul.

The Central Freight firm is Afghanistan's only government-operated goods transportation firm, acting under the supervision of the Ministry of Transportation (Appendix 1). Kamaz is a term that dates to the 1980s, when Russia was providing help for the Afghan transportation sector. It is a merger of eight different freight businesses that were formerly known as Kamaz (Paktin, Mangal, & Afghan). During that time, the eight Kamaz firms oversaw conveying

government commodities. Kamaz numbers two, three, and four were responsible for short-distance transport within Kabul, while the remaining Kamaz businesses oversaw long-distance operations. Following the fall of the communist dictatorship and the subsequent privatization of assets, these enterprises merged to form the Central Freight Company.

One of the interviewees stated that:

“Now, the Central Freight Company is responsible for transporting both commercial and government commodities. 207 vehicles, including models from the Russian KAMAZ and the Japanese HINO, are in operation. Each of these trucks has an average capacity of 9 tons. The company primarily focuses on long-distance transportation between Kabul and territorial ports, but it also operates on a smaller scale within the city itself. Informal private operators are responsible for most of the activity. This pertains to transportation within Kabul over shorter distances. Although the government owns the Central Freight Company, shielding it from taxes and fees, the free market sets the prices for delivering commercial goods.”

In Kabul, there are not many formal private freight unions. They are not particularly prominent. Only a few companies are active in the city, and their primary concentration is on transporting large amounts of freight utilizing vehicles with high capacities. However, a combination of economic and practical considerations restrains their actions. Informal transport, comprising taxis, private cars, and non-motorized vehicles, handles a significant portion of the small-scale freight. This is because a 5% income tax discourages many entrepreneurs from starting their own businesses. These issues, along with the competition from non-motorized and informal modes of transportation, restrict the role of official freight unions in the city.

As previously noted, private transporters operating informally in Kabul carry out most of the commodity distribution. This category includes small trucks (pickups), private automobiles, taxis, motorbikes, and non-motorized options like animal carts, handcarts, and bicycles for transportation. Quite a few of the city's smaller shops and markets also have their very own little trucks, which they use to carry their wares to their consumers (Paktin, Mangal, Afghan). In the central business center, where the use of motorized cars is strictly restricted, non-motorized modes of transportation, particularly handcarts, play a prominent role (picture

3.6). In this region, the system for transporting commodities is conventional. A group of people operating handcarts controls every market, which consists of a variety of shops. The leader, also known as the "Kalantar" (elder), organizes the transportation of commodities, loads, and unloads those goods. The Kalantar is a reliable entity because it has been operating in the market for a considerable amount of time. Furthermore, the handcart operators themselves founded this system, enabling it to function without government involvement.

4.2.2. The study and strategy for kabul's priority public transportation network

The Kabul Public Transportation Network Study's goal is to prioritize infrastructure and create a comprehensive public transportation strategy that will enable public transit to become a practical and active form of transportation in the city. Unorganized and dispersed public transit networks, such as minibuses and private automobiles, predominate in the contemporary transportation system (Hamad, & Faghri, 2003). This adds to high pollution levels, inefficient travel routes, and traffic congestion. The absence of well-organized and dependable public transit infrastructure restricts accessibility, particularly for individuals with lower incomes.

The construction of a Bus Rapid Transit (BRT) system, which can offer Kabul's citizens dependable, high-capacity transportation, is another top goal. This plan should include the construction of dedicated lanes for BRT buses, ensuring faster travel times and reducing traffic on main thoroughfares. Facilitating the integration of land use planning with transit-oriented development (TOD) is crucial in Kabul. A multimodal transportation system should prioritize the combination of buses, walking, and cycling. Campaigns for public awareness and education are crucial to this strategy's success (Rahmatyar, 2017).

Supervising the development, execution, and administration of Kabul's public transit system necessitates a robust governance structure. Funding and investment will require significant investments in vehicle fleets, operating management, and infrastructure. Public-private partnerships are one example of an innovative financing approach that can help spread the costs and risks of developing and running a transportation system.



Figure 4.19. Current bus network

4.2.3. Current and Future Mobility Demand (Trip Generation)

The number of daily journeys will increase along with Kabul City's population growth. Due to the high demand for mobility, a comprehensive transportation infrastructure is required. As socioeconomic conditions improve, so will the number of trips taken by everyone per day. More individuals will travel to work, study, have fun, and live in cities daily. Distinct districts exhibit varying patterns of trip growth. For instance, the trip creation rate is already rather high in District 1. The city's eastward development and population growth are the primary reasons for the increase in upcoming travel.

Table 4.8. Population-based trip generation estimates

Current Planning Scenario				Medium-Term Planning Scenario			Long-Term Planning Scenario		
District	Estimated Total Population	Trip Gen Rate Trips/day/person	Estimated Trips/day	Estimated Total Population	Trip Gen Rate Trips/day/person	Estimated Trips/day	Estimated Total Population	Trip Gen Rate Trips/day/person	Estimated Trips/day
1	57,000	4.7	271,000	144,000	4-5	720,000	154,000	4-5	770,000
2	74,000	3.1	230,000	242,000	3-4	793,000	252,000	3-4	820,000
3	297,000	1.7	513,000	617,000	2-3	1,600,000	624,000	2-3	1,620,000
4	348,000	1.5	257,000	446,000	2-3	1,015,000	462,000	2-3	1,160,000
5	419,000	1.3	556,000	560,000	1-2	1,116,000	569,000	1-2	1,130,000
6	317,000	0.6	187,000	488,000	0.5-1	433,000	500,000	1-2	600,000
7	49,000	0.5	24,000	65,000	0.5-1	48,000	67,000	1-2	60,000
8	125,000	0.6	78,000	165,000	0.5-1	155,000	170,000	1-2	187,000
9	81,000	1.1	86,000	106,000	1-2	169,000	110,000	1-2	174,000
10	205,000	1.5	302,000	385,000	2-3	852,000	396,000	2-3	912,000
11	235,000	0.9	220,000	573,000	1-2	806,000	581,000	1-2	930,000
12	237,000	0.5	137,000	397,000	1-2	489,000	403,000	1-2	726,000
13	193,000	0.2	44,000	258,000	0.5-1	89,000	261,000	1-2	157,000
14	221,000	0.8	173,000	258,000	1-2	309,000	266,000	1-2	312,000
15	42,000	1.6	367,000	263,000	2-3	557,000	783,000	2-3	1,957,000
16	173,000	0.4	65,000	239,000	0.5-1	227,000	379,000	1-2	492,000
17	255,000	0.3	66,000	373,000	0.5-1	163,000	412,000	1-2	329,000
18	290,000	0.2	53,000	418,000	0.5-1	92,000	341,000	1-2	273,000
19	262,000	3.8	998,000	334,000	4-1	2,592,000	654,000	4-5	2,750,000
20	21,000	0.9	19,000	647,000	1-2	151,000	144,000	1-2	216,000
21	75,000	0.5	36,000	107,000	1-2	274,000	166,000	2-3	365,000
22	30,000	0.3	10,000	564,000	0.5-1	292,000	1,119,000	1-2	671,000
Total	4,074,000		4,660,000	7,550,000		12,940,000	8,810,000		13-18,000,000

*Based on potential population growth to 7.5 million people

** Based on potential population growth to 8.8 million people

Estimated 2017 Total Daily Trips = 4,660,000 trip/d

Estimated Long-Term Scenario Total Daily Trips = 13-18,000,000 trip/d

Current Low-Range Trip-Gen Rate 0.2 trips / person

Current High-Range Trip-Gen Rate 4.8 trips / person

Based on JICA 2011

Long-Term Scenario 1.0-3.0 trips / person

Low-Range Trip-Gen Rate

Long-Term Scenario 3.0-5.0 trips / person

High-Range Trip-Gen Rate

4.2.4. Estimates and Goals for future mobility modes (Mode Split)

In Kabul, walking accounts for almost one-third of all travel, while the microbus is the most widely used form of public transportation. Now, approximately 419,000 vehicles per day (VPD) pass by. However, this VPD number might climb tenfold due to the anticipated rise in private car ownership and the quick increase in transportation demand.

The road network will not function without a BRT network and significant ridership, as private automobiles will be the only means of traveling large distances across the city. In this scenario, private automobiles would overcrowd the roadways. In a fully functional BRT system, private vehicle ownership will decline, and the VPD will drop by over 75%. This is so that a single BRT can accommodate between 100 and 200 passengers, whereas a private vehicle can only accommodate a maximum of four. In Kabul, the modal split between private and public transportation might approach 40% in the absence of a BRT system, translating into about 4 million VPD for cars alone. Table 2.2 illustrates that with one BRT system, the number decreases to one million. This analysis suggests that the mobility sector, if not all infrastructure systems, should prioritize deploying BRT (Samizay, 1974).

Table 4.9. Mode split and vehicles per day estimates

Current Planning Scenario				Medium-Term Planning Scenario			Long-Term Planning Scenario		
Mode	Estimated % of Trips***	Trips/day	Vehicles Per Day (VPD)	Estimated % of Trips***	Trips/day	Vehicles Per Day (VPD)	Estimated % of Trips***	Trips/day	Vehicles Per Day (VPD)
Walking	33%	1,011,000	-	30%	3,880,000	-	25%	4,152,000	-
Private Car	4%	133,000	66,000	6%	777,000	388,000	10%	1,660,000	1,017,000
Mini Bus	6%	198,000	20,000	5%	647,000	65,000	3%	498,000	50,000
Micro Bus	18%	541,000	36,000	10%	1,290,000	86,000	3%	498,000	33,000
Large Bus	14%	436,000	15,000	10%	1,290,000	43,000	5%	830,000	28,000
Taxi	12%	359,000	179,000	8%	1,040,000	518,000	5%	830,000	554,000
Bike	9%	278,000	278,000	10%	1,290,000	-	12%	1,993,000	-
Motorcycle	2%	62,000	52,000	2%	259,000	216,000	5%	830,000	692,000
Trucks	2%	62,000	52,000	2%	259,000	216,000	2%	332,000	277,000
BRT	0%	0	0	17%	2,200,000	12,000	30%	4,982,000	28,000
Total	100%	3,080,000	419,000	100%	12,900,000	1,540,000	100%	16,600,000	2,770,000

*Based on potential population growth to 7.5 million people
 ** Based on potential population growth to 8.8 million people
 ***Primary mode on a single trip

Current Passengers per Vehicle Rates

Mode	Pass/veh
Private Car	2.0
Motorcycle	1.2
Local Bus	15
BRT	n/a

Long-Term Scenario Passengers per Vehicle Rates

Mode	Pass/veh
Private Car	1.5
Motorcycle	12
Local Bus	15
BRT	100-180

4.3. Strategic Goals for Kabul's Public Transport System

To tackle these obstacles, the research suggests an all-encompassing approach that centers around the subsequent objectives:

- **Creating a Priority Public Transportation Network:** It is critical to establish a network of bus rapid transit (BRT) and dedicated bus lanes as part of a priority public transportation system. This network should connect major residential neighborhoods, business districts, and important public services, providing a dependable and effective alternative to using private vehicles.
- **Encouraging Multimodal Integration:** Creating a smooth public transit experience requires integrating several means of transportation, including buses, minibuses, taxis, bicycles, and walking. Establishing multimodal hubs and making sure that various transportation modes are well connected are two aspects of this integration.
- **Infrastructure Improvement:** It is essential to upgrade Kabul's infrastructure to support the public transit system; Kabul's infrastructure must be upgraded. Kabul's infrastructure must be upgraded. This entails extending roadways, establishing bus-only lanes, designing walkways for pedestrians, and building bike lanes. With investments in transportation infrastructure, all drivers will experience increased safety and reduced traffic.
- **Introducing smart transportation solutions:** To improve the public transportation system, the secret is to use technology to its fullest. This can include data-driven planning to increase route efficiency and reduce delays, mobile ticketing apps, and real-time bus tracking.
- **Promoting Sustainable Modes of Transportation:** Promoting sustainable modes of transportation, such as walking and cycling, can aid in lowering dependency on personal automobiles. Establishing public awareness campaigns, building safe and accessible pathways, and offering incentives to use eco-friendly transportation methods can accomplish this.
- **Improving Security and Safety:** Implementing safety measures such as pedestrian crossings, traffic calming, and adequate street lighting will enhance the transportation network's security. More people should take public transit, so security on vehicles and at stops and stations is crucial.
- **Support for Policy and Regulation:** It is critical to create and put into effect policies and regulations that help public transportation grow. This entails drafting precise land-use rules, zoning laws that prefer transit-oriented development, and developing financial incentives for investments in public transportation.

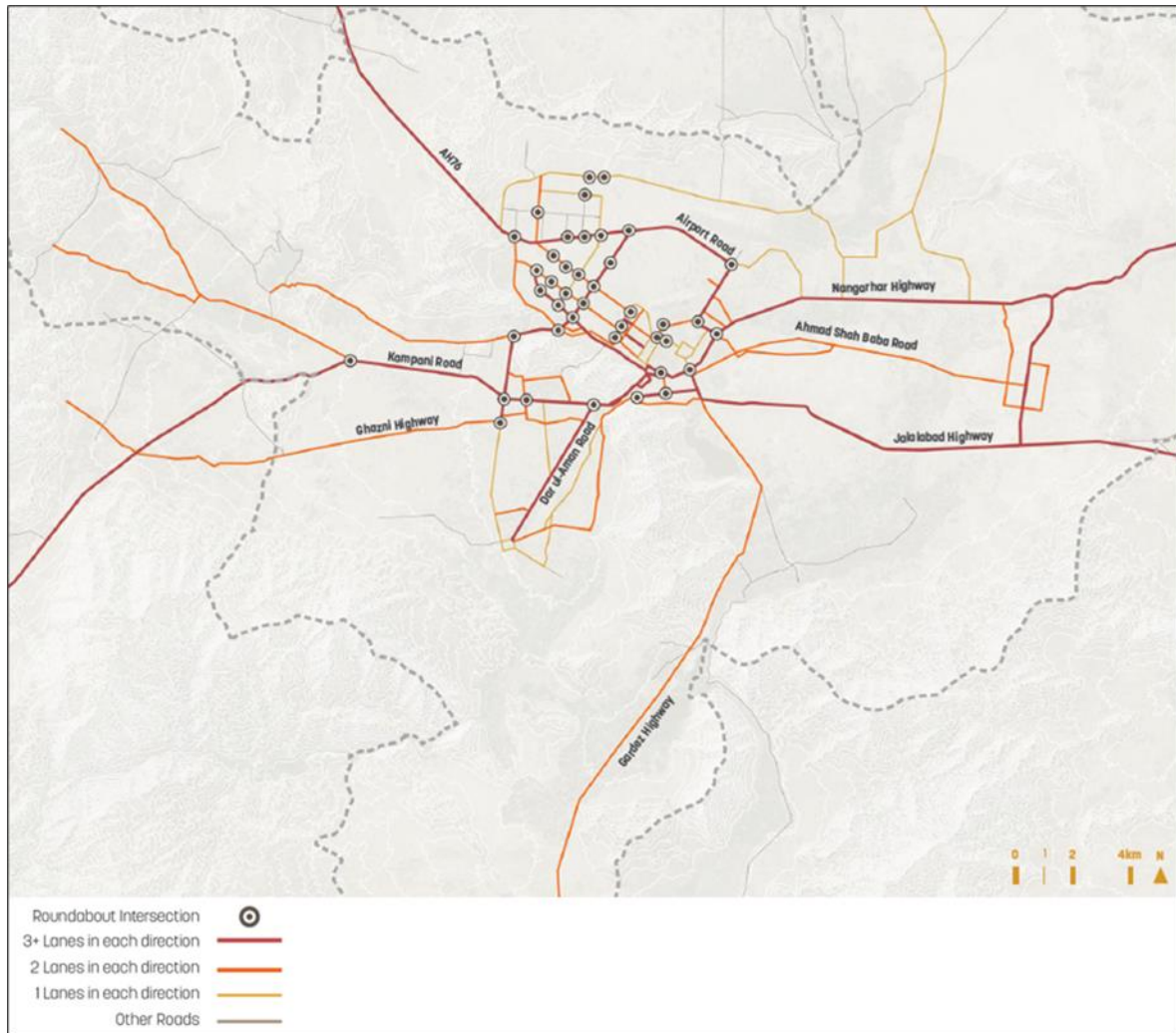


Figure 4.20. Kabul's transit map Source: GIS

Developing a robust transportation network

A key strategy for Kabul is the development of a comprehensive and robust transportation network that can efficiently connect different parts of the city. This network should include a variety of transportation modes, such as Bus Rapid Transit (BRT) systems, dedicated bus lanes, and improved pedestrian and cycling infrastructure (Samizay, 1974). The introduction of a BRT system, with dedicated lanes free from regular traffic interference, would provide a reliable and efficient public transportation option. This would significantly reduce travel times and provide an attractive alternative to private car use, helping to alleviate congestion. Furthermore, creating dedicated pedestrian pathways and cycling lanes is crucial for promoting non-motorized forms of transport. These infrastructure improvements would not only make walking and cycling safer but also encourage more residents to adopt these modes

of travel for short-distance trips. Integrating these pathways with public transportation hubs will create a multimodal network, making it easier for residents to switch between different modes of transport and reducing the overall dependence on private vehicles.

Aligning land use with transportation

To maximize the benefits of an improved transportation network, Kabul needs to adopt land use strategies that support Transit-Oriented Development (TOD). This involves focusing on higher-density, mixed-use developments around key transportation corridors and transit hubs. By concentrating residential, commercial, and recreational activities in areas well-served by public transport, the city can reduce the need for long commutes and promote the use of sustainable transportation options (Shahraki et al., 2020).

Implementing TOD requires careful planning and zoning regulations that encourage high-density development near transit stations while preserving open spaces and reducing urban sprawl. Policies should incentivize businesses and developers to invest in areas with strong public transportation links, creating vibrant, walkable communities. These strategies not only enhance the efficiency of the transportation network but also contribute to a more sustainable urban environment by reducing car dependency and supporting economic activity in well-connected areas.

Policy and governance frameworks

Effective integration of transportation and land use planning in Kabul requires strong policy frameworks and coordinated governance. Local government and planning authorities must work together to develop and enforce regulations that support sustainable urban development. This includes implementing zoning laws that prioritize transit-oriented development, establishing guidelines for infrastructure investment, and creating incentives for public transport usage.

Collaboration with stakeholders, including community groups, businesses, and public transport operators, is essential for ensuring that policies are inclusive and reflect the needs of the city's residents. Regular public consultations and stakeholder engagement can help build consensus and gather valuable input for planning decisions. Additionally, establishing

a dedicated urban mobility and planning body can provide the necessary oversight and coordination to implement integrated transportation and land use strategies effectively.

Leveraging technology and innovation

Technology can play a significant role in enhancing the integration of transportation and land use in Kabul. Smart transportation solutions, such as real-time traffic management systems, mobile ticketing, and GPS tracking for public transport, can improve the efficiency and reliability of transportation services. These technologies provide valuable data that can be used for better route planning, reducing delays, and optimizing the use of resources.

Geographic Information Systems (GIS) and spatial analysis tools are also essential for effective land use and transportation planning (Shahraki et al., 2020). These tools enable planners to analyze land use patterns, demographic data, and transportation flows, providing insights into where to prioritize infrastructure investments and how to design efficient transportation networks. By leveraging technology, Kabul can develop a more responsive and adaptive urban mobility system that meets the needs of its growing population.

To sum up, integrating transportation and land use planning is critical for addressing Kabul's urban mobility challenges and promoting sustainable development. By developing a robust transportation network, aligning land use with transportation corridors, and implementing supportive policies, Kabul can create a more efficient, accessible, and sustainable urban environment. These strategies will not only alleviate congestion and reduce environmental impacts but also enhance the quality of life for Kabul's residents, making the city more livable and resilient to future growth. With careful planning and the right investments, Kabul can transform its transportation and land use landscape, setting a model for other rapidly growing cities in the region.

4.3.1. Implementation status of the transportation project in Kabul

The darul aman palace road upgrade project

This project involved upgrading approximately 6 kilometers of road leading from Kabul city center to Darul Aman Palace. The work included resurfacing, building new sidewalks, and

installing street lighting. Since its completion in 2023, the project has improved access to the Darul Aman Palace, a popular destination for both locals and tourists.

The project was a significant effort by the Ministry of Public Works (MoPW) to improve the road infrastructure leading from Kabul city center to the historic Darul Aman Palace. The project aimed to enhance accessibility, ensure pedestrian safety, and boost the aesthetic appeal of the area surrounding the palace. The project designed the new surface to be more durable and capable of handling increased traffic loads, ensuring a smoother and safer driving experience. High-quality asphalt and other materials were used to resurface the road to increase its longevity and reduce the frequency of maintenance. To ease traffic flow and reduce congestion, especially during peak hours and tourist seasons, lane extension was also done in certain portions to allow two lanes in each direction.

The construction of new sidewalks on both sides of the road, designed to accommodate a high volume of foot traffic, enhanced pedestrian accessibility. Concrete and other durable materials were used to construct the sidewalks, and features like tactile pavement for people with visual impairments were included. The design also included ramps at junctions to facilitate easier access for those with impairments. To improve the walkways' aesthetic appeal and provide pedestrians shade, landscaping elements, including trees and decorative plants, were positioned beside them.

Street lighting installation improved visibility by installing modern LED lights along the entire stretch of road, reducing the likelihood of accidents and crime incidents. The road design also incorporated flood prevention to prevent water accumulation and flooding, common issues during Kabul's rainy seasons. Traffic management and safety features included new traffic signals and road signage to regulate traffic flow and provide clear directions to drivers. To provide safe crossing locations along the road, designated pedestrian crossings were installed, complete with traffic lights and zebra markings.

Early 2021 saw the start of the project as part of a larger initiative to revitalize Kabul's historical sites and enhance urban mobility. Phases of construction were implemented to minimize disruption to daily traffic, with key milestones including road resurfacing, sidewalk construction, and the installation of street lighting and drainage systems.

The project's success serves as a model for future infrastructure projects in Kabul, demonstrating the Ministry of Public Works' commitment to improving urban infrastructure and highlighting the importance of integrating modern design and safety features into road development. The project is a key component of Kabul's broader urban development plan, which aims to create a more livable, sustainable, and accessible city for its residents.



Figure 4.21. Darul Aman corridor dimension



Figure 4.22. Darul Aman Corridor major urban anchors



Figure 4.23. Darul Aman Corridor (Author, 12.05.2024)

Kabul ring road project

By providing an alternative route around the city's center, the Kabul Ring Road Project aims to alleviate traffic congestion within the city. The Ring Road covers approximately 95 kilometers and encircles the central areas of Kabul, connecting major highways leading out of the city. They are implementing the project in phases, completing the first phase in late 2022, which covers the southern and western segments of the ring road. This phase included the construction of new roadways and the rehabilitation of existing ones.

The project has significantly reduced traffic congestion in the city center by diverting heavy trucks and through-traffic away from busy urban areas. Improved connectivity has made it easier to access markets and resources, promoting economic activity and development in areas adjacent to the ring road. Safety improvements have helped to reduce traffic accidents by providing a safer route for heavy vehicles.

The Kabul City roads rehabilitation project

The project focuses on upgrading and rehabilitating existing roads within the city to improve the overall quality of the road network. The project entails the rehabilitation of over 200 kilometers of roads in various Kabul districts. The work undertaken involves resurfacing roads, filling potholes, improving drainage systems, and installing new road signs and markings. By mid-2024, more than 70% of the designated roads will have been restored, with the remaining segments scheduled for completion by late 2025.

BRT system

The Ministry of Public Works initiated a pilot project to implement a Bus Rapid Transit (BRT) system to address public transportation needs in Kabul. The pilot BRT route covers approximately 18 kilometers, running from the Kabul International Airport to central Kabul, passing through key commercial and residential areas. Along the route, dedicated bus lanes have been built to guarantee that buses run without being delayed by other traffic. There are now ticketing systems, and real-time information displays at contemporary bus stations.

The BRT system has attracted commuters who previously relied on private vehicles, helping to reduce traffic congestion and emissions. The dedicated bus lanes have significantly reduced travel times along the route, providing a reliable alternative to driving. The pilot project serves as a model for expanding the BRT system to other parts of Kabul, with plans to extend routes based on the initial phase's success.

Pedestrian bridge construction projects

To improve pedestrian safety and reduce traffic congestion, the KM and MoPW has constructed several pedestrian bridges across busy roads in Kabul. The design of these bridges prioritizes accessibility, incorporating ramps for individuals with disabilities and cyclists. Construction of these pedestrian bridges has been ongoing since 2019, with several bridges completed by 2024.

4.3.2. Parking and accessibility issues

Making certain that the infrastructure surrounding transit hubs is usable and accessible for a variety of transportation modes is a crucial part of integrating public transportation with land use in Kabul. This entails not just offering parking spaces but also making sure that pedestrians and bicyclists have simple access to public transportation. Kabul's recent measures have started to solve this problem, although difficulties still exist.

To encourage the use of bicycles as a last-mile connectivity option, the Kabul City Administration established bicycle parking facilities at several important bus terminals in 2021. Initially, the Kabul City Administration designed these parking lots to accommodate

a limited number of bicycles, with early installations capable of accommodating up to 10 bicycles in specific locations. But as time has gone on, there has been a greater need for bicycle parking, and the spaces are now too full. The number of bicycles parked frequently outnumbered the number of spots available, indicating the need for increased capacity and more extensive deployment throughout the city.

Between 2021 and 2023, the researcher made several field observations to evaluate the condition of bicycle parking spaces in Kabul's main transportation hubs. Data gathered from several transit stations indicated an increasing pattern of parking lots usage, even though the facilities frequently couldn't keep up with demand. For instance, between 2021 and 2023, the number of parking spaces at the Kart-e-Naw bus station went from 5 to 10. However, on multiple occasions, more than 15 bicycles were observed in a space intended for just 10. Two major transit hubs, Pul-e-Surkh and Dehbori, also experienced similar problems.

Accessibility concerns for public transportation

While basic bicycle infrastructure has made significant progress, there are still several significant issues that require resolution. For example, a huge number of the current parking lots lack proper security, weather protection, and integration with the wider transportation system. Furthermore, there is no uniform design for bicycle parking at various locations, which results in inconsistent usability and quality.

In addition, some stations have installed bicycle ramps to make it easier for users to access platforms; however, not all exits have this equipment. The unequal distribution of amenities frequently forces bicycle riders to take alternate, less convenient routes, deterring them from using bicycles for commuting.

Institutional regulation framework

There are regulatory obstacles in the way of integrating bicycles into Kabul's public transportation system. Currently, there are no explicit rules in the city ordinances governing the use of bicycles on public transportation. For example, there are no official regulations specifying when and how bicycles can be transported onto public transportation, even though there is a growing public demand for the opportunity to carry bicycles on buses and in transit

stations. This lack of clarity frequently confuses both riders and transportation authority's frequently become confused because of this lack of clarity.

Speaking with a local public transportation official, it became clear that although the administration encourages bicycle use, there is no detailed plan in place to govern how bicycles integrate into the current public transportation system. Several locals have expressed their dissatisfaction with the uneven enforcement of the law, asserting that even during off-peak hours, some have faced denials of access to buses or transit stations while cycling.

A local biker, talked about her attempt to ride her bike on the public transportation system after returning from a training session. Even though it was beyond rush hour, a transport official informed her that bicycles were not permitted at that hour. This kind of inconsistency has deterred many cyclists from using public transportation as part of their commute, underscoring the need for a clear legislative framework that supports bicycles.

Suggestions for the upcoming integration

Several recommendations were proposed to provide a more efficient integration of land use and non-motorized transportation with Kabul's public transit system: Increase and Standardize Bicycle Parking Facilities: More people will choose bicycles as their last-mile method of transportation if there are safer, weather-protected bicycle parking spaces available at all major transportation hubs. Standardizing these amenities will guarantee uniformity throughout the city.

- Establish Unambiguous Bicycle Transportation Policies: The city administration of Kabul ought to create and implement unambiguous regulations regarding the manner and times in which bicycles can be utilized on public transportation. These guidelines ought to be in line with global best practices and ought to cover both peak and off-peak times.
- Improve Bicycle Access Infrastructure: To facilitate bicycle access to platforms and buses, stations should be upgraded with stairways, elevators, and ramps. This will lower the obstacles to cycling and taking public transportation together.

- **Public Awareness Campaigns:** Raising awareness of the advantages of incorporating bicycles into public transit through neighborhood gatherings and instructional initiatives will contribute to the development of a more bike-friendly culture in Kabul.

Through the resolution of these infrastructural, regulatory, and cultural obstacles, Kabul can establish a more cohesive and environmentally friendly transportation system that successfully integrates public transportation with long-term land use planning.

4.4. Concluding Remarks

This case study examines the complex interrelationship between Kabul City's land use and transportation planning, highlighting the benefits and difficulties of creating a sustainable urban environment. A dedication to meeting the city's increasing mobility needs and rapid urbanization highlights the continuous attempts to combine land use with public transit. The city's strategic transportation plans, which prioritize public transit networks and enhance accessibility, provide a clear vision for future growth despite the substantial socioeconomic and infrastructure constraints it faces.

The examination of present and future mobility needs, public transit preferences, and mode split forecasts demonstrates the dire need for coherent and flexible policies. For Kabul to achieve its long-term urban planning goals, strategic objectives, including improving the effectiveness of public transportation, resolving parking concerns, and promoting sustainable means of mobility, are considered crucial.

In the end, cooperation between legislators, urban planners, and citizens is necessary to integrate land use and transportation in Kabul. Promoting an all-encompassing strategy that prioritizes sustainability, equality, and innovation may lead to a more integrated, accessible, and resilient urban future for Kabul.

5. MAIN FINDINGS

5.1. Preliminary Field Study

To better understand how land use planning and transportation are integrated and to identify the difficulties in creating a suitable methodology, a preliminary field study was carried out in Kabul, as mentioned in the thesis introduction under the methodological approach. Even though there have been many studies done on land use and transportation planning in Kabul, they frequently concentrate on other areas of urban planning, including housing development or road infrastructure, rather than the crucial connection between land use and transportation. Despite some attempts to integrate these components, the preliminary field survey revealed inconsistent efforts and a lack of a cohesive strategy.

Many of the proposed projects remain unrealized, and those that have been implemented exhibit significant flaws. The results of the field study made it clear that the thesis needed to change its focus from just listing the land use and transportation plans that are now in place to looking into the fundamental causes of their non-implementation and the gap between policy and practice. The exploratory fieldwork served as a guide for this study approach and ultimately resulted in the choice to investigate these difficulties through in-depth interviews with relevant stakeholders. A semi-structured interviewing technique was created to enable targeted discussions on the issues found, based on observations made during the fieldwork.

The field study analyzed Kabul's public transportation and land use systems, visiting key sites like the central business center and residential districts to assess the state of infrastructure and its integration with land use planning. Observations at bus stops and crossings evaluated pedestrian amenities, accessibility, and traffic flow. The study followed a volunteer participant's regular trip by public transit from a West Kabul residential neighborhood to a central business sector.

To examine peak-hour traffic patterns and public transportation utilization, the trip began at the Dashte Barchi bus station on a weekday morning at around 8:00 a.m. It finished at the Pul-e-Surkh crossroads, a significant hub in the city's transportation system. Dashte Barchi, a heavily populated residential area, and Pul-e-Surkh, a central business center, were

specifically chosen to illustrate the difficulties in combining land use and transportation planning. Rather than providing an exhaustive overview of all transport and land use concerns in Kabul, the initial fieldwork attempted to give a picture of present realities to guide the thesis process. To ensure the observations were relevant and applicable, the researcher reviewed existing literature on urban planning and transportation in similar situations, as shown in figure 5.1, to focus on aspects influencing the success of integrated planning approaches.

The preliminary findings of the field study identified several significant challenges. Kabul's small public transit system, coupled with crammed buses and shoddy scheduling, makes for inconsistent and ineffective service. The absence of designated bus lanes exacerbates congestion and delays. Walking becomes dangerous when pedestrian facilities—like sidewalks and crossings are not well maintained, especially in places with high population density. Because the bus stations under observation lacked appropriate shelters and signage, they were less accessible and useful. Moreover, the disorganized growth of residential neighborhoods, business districts, and transportation hubs demonstrated the gap between land use planning and transportation infrastructure.

The lack of planning provisions and designated pathways to enable smooth transitions between various land uses has an adverse effect on the mobility and standard of living of the local population. These findings highlight the necessity of integrating connection, accessibility, and the development of pedestrian-friendly surroundings into land use and transportation planning. Based on the results of the initial field study, semi-structured interview questions were created to learn more about the challenges facing Kabul's integrated land use and transportation plans.

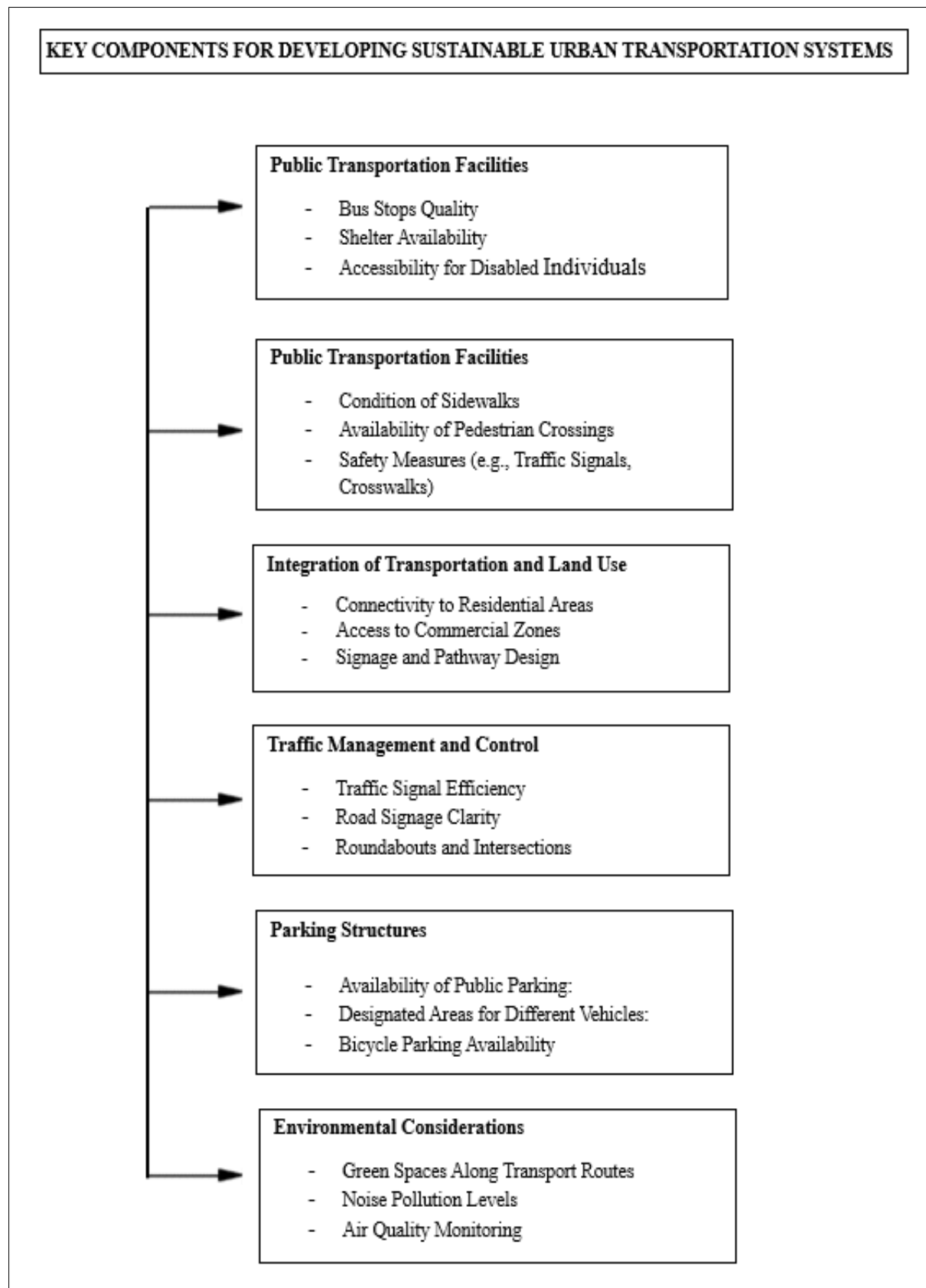


Figure 5.1. Key components for developing sustainable urban transportation systems

The study yielded the following results:

Public transportation facilities

- **Bus stop quality:** The bus stops in central Kabul are often crowded and lack basic facilities. While some stops have simple shelters, many are open to the elements, making commuters more susceptible to inclement weather. Furthermore, current bus stop designs often neglect accessibility requirements, making it challenging for people with disabilities to effectively utilize public transportation.
- **Shelter Availability:** Although there are now shelters at bus stops in several of Kabul's busiest districts, they are still insufficient in terms of quantity and quality. The shelters that are available are frequently ill-kept and can get very crowded during rush hour. There were no shelters at all at a few of the survey areas, leaving commuters unprotected from the sun, rain, or dust.
- **Accessibility for People with Disabilities:** The infrastructure necessary to assist people with disabilities is conspicuously lacking. Ramps are absent from many bus stations, and those that are present are sometimes overly steep or blocked. More inclusive transportation planning is required because there aren't many, if any, tactile paving surfaces to direct commuters who are blind or visually impaired.



Figure 5.2. A bus stop with a shelter in a busy commercial area, showing the inadequate size and lack of maintenance.(Author, 12.05.2024)

Pedestrian facilities

- **Condition of Sidewalks:** Some more recent or affluent neighborhoods have well-kept sidewalks that offer safe passage for pedestrians. But in a lot of other areas of the city, the sidewalks are either nonexistent, unkempt, or uneven, causing people to stroll along the roads, which raises the possibility of accidents.
- **Availability of Pedestrian Crossings:** There are not many pedestrian crossings, and many of them lack proper signage. When they do exist, cars frequently ignore them, making it dangerous for pedestrians to cross the street. This lack of infrastructure discourages walking and affects the general safety of non-motorized road users.
- **Safety measures (such as crosswalks and traffic signals):** There aren't many traffic lights intended only for pedestrian use. Poorly designated crosswalks and malfunctioning pedestrian lights at crossings create a confusing and frequently dangerous environment for pedestrians.

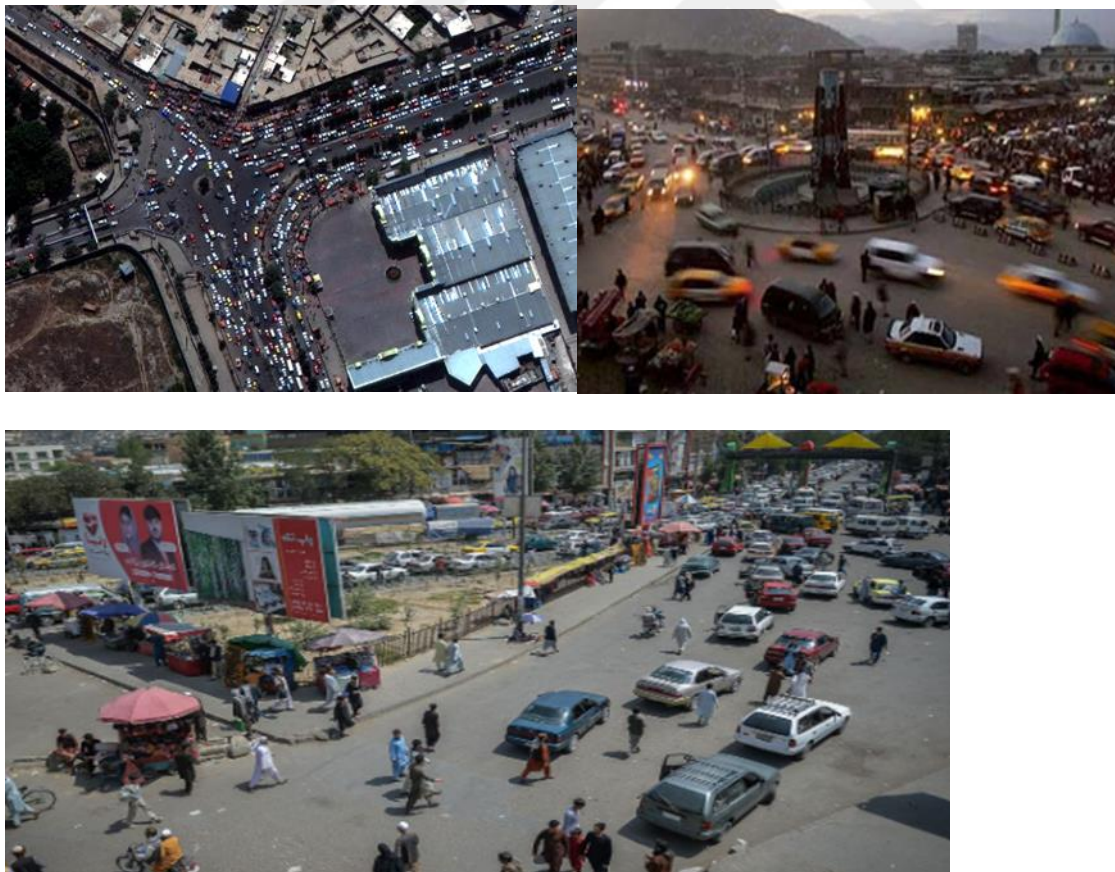


Figure 5.3. A busy intersection lacking pedestrian traffic signals (Author, 2024)

Integration of transportation and land use

- **Connectivity to Residential Areas:** Major residential zones are often well-served by public transit routes; nevertheless, there are occasionally gaps, especially in recently constructed areas. These places frequently lack easily accessible public transit, which may cause residents to rely more on their own cars and unofficial transportation choices.
- **Access to Commercial Zones:** Major commercial zones are generally accessible by public transportation, but there is frequently insufficient infrastructure linking these zones to their surroundings. Inadequate road conditions and heavy traffic exacerbate accessibility issues, impeding the smooth flow of both people and products.
- **Signage and Pathway Design:** Both locals and visitors may become confused due to inconsistent and frequently invisible signage. There is a dearth of explicit direction in pathway designs for bikes and pedestrians, which could enhance mobility and safety.



Figure 5.4. Residential area with limited access to public transportation, showing the need for better connectivity (Author, 2024)

Traffic management and control

- **Traffic Signal Efficiency:** Although traffic signals are present at significant crossroads, they are frequently out-of-date or mis synchronized, which results in frequent traffic

bottlenecks and inefficient flow. One of the main causes of congestion during peak hours is the incoherence of traffic signals.

- **Road Signage Clarity:** Oftentimes, road signage is missing, broken, or obstructed. When there are signs, they could not be simple to read or see, which leads to confusion and raises the risk of accidents.
- **Roundabouts and Intersections:** Traffic jams and accidents frequently occur at Kabul's roundabouts and intersections. Poorly planned intersections and a lack of clearly marked signage contribute to peak-hour traffic jams.



Figure 5.5. A roundabout with poor design leading to traffic congestion (Author, 2024)

Parking structures

- **Public Parking Facilities:** There aren't many public parking spaces available, particularly in populated commercial and residential districts. Because there aren't enough permitted parking spots, people park illegally, which impedes traffic and makes driving even riskier.
- **Clear Designations for Parking Different vehicle categories:** Different vehicle categories, including cars, motorcycles, and bicycles, lack designated parking spaces. Mixed-use areas are the result of this disorganization, which can be both dangerous and ineffective.

- **Bicycle Parking Availability:** Despite an increase in the number of bikers, Kabul has very few locations specifically designated for parking bicycles. This lack of infrastructure discourages bicycle use and restricts the possibility of incorporating cycling into the city's larger transportation plan.



Figure 5.6. Lack of designated bicycle parking leads to informal parking (Author, 2024)

Environmental considerations

- **Green Spaces Along Transport Routes:** There aren't many green spaces along major transportation routes, which causes pedestrians to retain more heat and have less shade. More green space could improve air quality and commuter satisfaction.
- **Levels of Noise Pollution:** Noise pollution is a serious issue, particularly in places with heavy traffic. Lack of sound barriers and noise reduction techniques exacerbates the problem, lowering the standard of living for both locals and commuters.
- **Air Quality Monitoring:** Along key transportation routes, there is not much infrastructure for monitoring the quality of the air. Data currently available point to significant pollution levels, mostly from vehicle emissions, which calls for more environmental management regulations.



Figure 5.7. Vehicle emissions affect air quality in Kabul's major traffic region
(Author,2024)

With an emphasis on Kabul, Afghanistan, the exploratory field study seeks to investigate important issues regarding sustainable development and its viability as a development strategy for developing nations. R.Q.1 explored whether Kabul can effectively integrate land use and transportation systems and whether sustainable development may be a workable strategy for cities in underdeveloped countries. According to preliminary findings,

sustainable development has a tremendous deal of promise to solve urban problems, but its application in Kabul necessitates a customized approach that considers the city's sociopolitical, economic, and environmental circumstances. According to the report, the main obstacles to successful integration include inadequate institutional frameworks, low levels of public awareness, and budget limitations.

R.Q.2 explores how Kabul's transportation issues are a result of poor planning. Preliminary research indicates that inadequate design primarily causes the city's problems, while other elements such as antiquated infrastructure, informal settlements, and a lack of enforcement tools exacerbate them. R.Q.3 delves into the impact of projected population expansion and significant relocations on Kabul's transportation system. Preliminary field research indicates that unplanned relocations and increasing urbanization have overloaded the current infrastructure, exacerbating accessibility and traffic problems. To solve Kabul's transportation and urban development issues, these study topics collectively highlight the necessity of strategic, data-driven planning and policy initiatives. R.Q.4. The results indicate that city authorities in Kabul lack sufficient experience and expertise to effectively address the challenges of sustainable development, land use, and transportation planning. Analysis of stakeholder feedback and policy evaluations reveals significant gaps in technical knowledge, coordination, and the integration of sustainable practices into urban development strategies. Findings from semi-structured interviews with urban planners, government officials, and community leaders highlight the absence of comprehensive training programs and a reliance on outdated planning methods. Furthermore, a lack of collaboration between agencies and insufficient engagement with international best practices were identified as key factors limiting the effectiveness of current planning efforts. These challenges underline the need for targeted capacity-building initiatives and a more integrated approach to urban planning that aligns with sustainability objectives. Addressing these shortcomings is critical to overcoming the obstacles to effective governance and ensuring the long-term development of Kabul City.

According to the initial results, there are still a lot of holes in Kabul's transportation system, despite some efforts to strengthen it. These findings will guide further investigation, including expert discussions and interviews, to formulate all-encompassing suggestions for merging transportation and land use planning for sustainable urban growth in Kabul.

5.2. A Semi-Structured Interview with Kabul's Planning Authorities

In a semi-structured survey, there were predetermined questions or topics that we wanted to cover, like a structured survey. However, unlike a structured survey, the semi-structured survey allowed for more flexibility and open-ended responses, akin to an unstructured format. This type of survey typically provides a set of guiding questions or prompts, but respondents were free to elaborate on their answers, offer additional information, or express their thoughts in their own words.

This approach allowed for deeper exploration of topics and provided richer qualitative data compared to strictly structured surveys. Qualitative research methodologies such as interviews, focus groups, or open-ended questionnaires often employ semi-structured surveys. They were particularly useful when detailed insights and perspectives came from participants while maintaining some level of structure in the data collection process. The survey questions aimed to address the research question, field of study, and hypotheses of the study.

Table 5.1. Interviewee codes and their status, general information about the professional experts interviewed (01.08.2024)

Interviewee (Expert) Code	Interview Relationship with the Transportation and land use projects	Profession	Period of Service	The interview will conduct as,
1	Director of Transportation Planning at KM	Transportation Planner	15 years	In person
2	Expert in the Urban Development Department KM	Urban Planner	29 years	Online
3	Expert in the Kabul Transportation System Project	Transportation Planner & Urban Designer	18 years	Online
4	Expert in the Land Use and Sustainable Development Project	Urban Planner	24 years	In person
5	Expert in the 13th District Zoning Project	Academician & Urban Planner	10 years	online

Table 5.1. explains the relationship between specialists and cycling projects, as well as their professional backgrounds, length of service, and interviewing techniques. This section of the study was grouping the topics covered in the survey questions under headings.

To find important patterns, trends, and roadblocks, this chapter combines information from surveys, bibliometric analysis, and qualitative research. The results were intended to provide

evidence-based suggestions for resolving problems with urban transportation and advancing sustainable development plans.

Key Challenges for sustainable development strategies in developing countries

Aiming to strike a balance between the needs of the economy, society, and environment, sustainable development plans are essential for long-term progress and stability in emerging nations. But these approaches have a lot of obstacles to overcome, like lack of funding, poor infrastructure, and problems with governance. This part examines professional perspectives on the main obstacles to putting sustainable development plans into practice in developing nations, with an emphasis on the experiences of different stakeholders in areas under social, environmental, and economic strain.

Experts in sustainable development were inquired, "What do you perceive as the primary challenges encountered by developing nations in executing sustainable development strategies?" The divergent opinions reflected the intricacies of every situation. Interviewee 1, 3, and 4 highlighted the importance of inadequate infrastructure and poor governance as major obstacles. Interviewee 2 identified financial reliance and economic volatility as the main problems. Interviewee 5 presented a more comprehensive analysis that considered societal issues, including public awareness and education.

It is thought that understanding each expert's perspective on sustainable development regarding their professional experience is essential to understanding their opinions. Table 4.8 below displays the areas of expertise and difficulties mentioned by each interviewee.

Table 5.2. Experts' Areas of Expertise and Highlighted Challenges for Sustainable Development

Code	Area of Expertise	Key Challenges Identified
1	Infrastructure Planning	Weak infrastructure, resource constraints
2	Economic Development	Economic instability, dependency on aid
3	Urban Development	Governance issues, political instability
4	Environmental Policy	Lack of environmental regulation enforcement
5	Social Development	Low public awareness, inadequate education

One of the interviewees stated that:

“Implementing the goals in developing nations poses considerable obstacles, contingent upon their policies and other national contexts. The Agenda for Sustainable Development seeks to achieve equitable economic, social, and environmental progress on a worldwide scale, with a specific emphasis on the most impoverished and marginalized populations. A comprehensive report by UNDP and UNRISD examines current patterns in six key domains: poverty, disparities, demographics, environmental deterioration, climate change, shocks, development collaboration, financing, and technology advancement. While many trends are favorable, unfavorable ones provide substantial threats to the attainment of the Sustainable Development Goals (SDGs). Identifying inadequate infrastructure as a significant challenge, underscoring the need for a robust foundation for the successful implementation of any sustainable development plan. Developing countries often lack essential infrastructure, such as transportation networks, energy supply, and sanitation systems, which are crucial for fostering economic growth and ensuring environmental sustainability. Without adequate infrastructure, it is practically impossible to achieve long-term growth. For example, if people lack access to even the most basic services, it is impossible to expect them to embrace greener technology. For these areas, creating a thorough strategy that incorporates sustainable practices into transportation and urban planning is crucial. Governments should prioritize building infrastructure that promotes long-term sustainability above short-term financial advantages, which is a prevalent problem in many emerging nations.

One of the interviewees stated that

“Since the late 1980s, sustainable development has gained significant momentum in the pursuit of a more sustainable world. However, the challenges of sustainable development persist due to population growth and issues surrounding climate change, necessitating the implementation of new initiatives. Achieving sustainable development strategies is faced with several challenges, including a lack of effective leadership and high population growth rates. There is a shortage of resources, including human capital, well-coordinated partnerships, investments, successful implementation, and data collection indicators. I believe that economic instability and financial dependency on external aid represent the most significant hurdles to sustainable development.” Countries in regions like Sub-Saharan Africa and parts of Southeast Asia are highly reliant on international aid, which often comes

with conditions that do not align with local priorities. Many developing nations cannot implement sustainable policies because they depend on foreign aid, which often has strings attached. These conditions may push countries to focus on short-term results rather than long-term sustainable goals. Furthermore, volatile economies make it difficult to plan for sustainability when there are immediate needs for food and healthcare. Economic instability also hinders investments in green technologies and infrastructure, which are crucial for long-term sustainability.”

Interviewee 2 argues that for sustainable development to succeed, developing countries must reduce dependency on external funding and work towards stabilizing their domestic economies.

One of the interviewees expresses the problems related to the subject as follows:

“In terms of government policy and awareness, developing nations face distinct challenges in adopting sustainable development methods.

- Insufficient knowledge and comprehension of public awareness: Most of the public, especially local communities, lacks comprehensive knowledge about sustainable development goals (SDGs) and their significance. This may diminish popular support for governmental initiatives towards sustainability.
- Lack of emphasis on sustainability: Many governments prioritize urgent problems like poverty, unemployment, and basic infrastructure, resulting in inadequate attention to long-term environmental and *social consequences*.

I believe that political instability, corruption, and a lack of proper governance frameworks as key barriers. Governments in developing countries often lack the capacity or will to implement sustainable policies, and political instability exacerbates the problem by shifting priorities away from long-term planning. Governments in many developing countries change frequently, and this makes it challenging to implement a consistent policy for sustainable development. Corruption is another issue. Political interests and financial incentives for key stakeholders often lead to improper enforcement of set policies.”

According to interviewee 3, without strong institutions and governance frameworks, any progress toward sustainability would be fragile and prone to collapse when political power shifts. This is a challenge seen in countries across Africa, Asia, and Latin America.

One of the interviewees stated that:

“Identifying the lack of environmental regulations and enforcement as a major challenge. Even when regulations exist on paper in many developing countries, they often lack effective enforcement. This leads to practices that degrade the environment, such as deforestation, water pollution, and overuse of natural resources. Weak institutions, lack of funding, or conflicting economic interests often prevent governments from enforcing environmental regulations. For example, illegal logging and mining are rampant in many developing countries, even though regulations exist to protect forests and water bodies. Also, stronger international cooperation and capacity-building programs are essential to help developing countries enforce environmental regulations and incorporate sustainable practices into their economic and social policies.”

One of the interviewees stated the following regarding the question

“Emphasizing the role of education and social awareness in achieving sustainable development, one of the biggest challenges is the lack of public understanding of sustainability issues. Many people in developing countries prioritize immediate economic concerns, such as securing food and shelter, over long-term sustainability goals. People need to understand how sustainability impacts their daily lives. Without education, it’s impossible to create a culture that values sustainable practices. Governments and organizations need to invest in raising public awareness and incorporating sustainability into education systems from a young age. Furthermore, without social buy-in, even the best-designed sustainable development plans would face difficulties in implementation.”

One of the interviewees has an opposing view with the opinion of interviewee 5:

“While many emphasize the importance of education and social awareness in achieving sustainable development, meaningful progress doesn’t always depend on public understanding. Governments, industries, and innovators have led many successful

sustainability initiatives without requiring widespread public buy-in or educational reform. Technological advancements, regulatory frameworks, and top-down policies can create significant change regardless of the population's awareness of the underlying sustainability issues.

In developing countries, prioritizing immediate economic needs over long-term environmental concerns may be practical. Governments and organizations can implement policies that ensure sustainable practices without placing the burden on individuals to comprehend complex sustainability concepts. For example, regulatory measures on industries, incentives for renewable energy, and investment in green infrastructure can foster sustainable development more efficiently than focusing on mass public education. In this view, strong governance and strategic planning are far more important than social awareness in driving sustainability forward.”

The challenges to sustainable development in developing countries are complex and multifaceted. Interviewees agree that weak infrastructure, economic instability, poor governance, a lack of environmental regulation, and low public awareness are critical barriers. To overcome these challenges, developing countries must adopt a holistic approach that addresses each of these areas in tandem. This includes strengthening institutions, reducing reliance on foreign aid, enforcing environmental regulations, and educating the public about sustainability. Only then can we effectively implement sustainable development strategies to ensure long-term economic, social, and environmental prosperity.

Opinions and suggestions about land use and transportation planning in Kabul City

In this section, the Opinions and suggestions about land use and transportation planning in Kabul City was discussed.

In this section, the coordination process between institutions involved in land use and transportation planning in Kabul City is discussed. Interviewee 1 (Director of Transportation Planning at KM), interviewee 2 (Expert in the Urban Development Department KM), and interviewee 3 all expressed concerns regarding the lack of coordination among institutions, which negatively impacts the effectiveness of these plans and projects. In fact, interviewee 5 emphasized that poor inter-institutional coordination is one of the most significant

challenges facing land use and transportation planning in the city. On the other hand, interviewee 4 had a different perspective, viewing the large number of ongoing studies on land use and transportation as a positive development. He mentioned that the municipality's land use study had been completed prior to the independent consultancy's transportation plan. The interviewees were asked the following question regarding this issue: "Several institutions are involved in land use and transportation planning in Kabul City." Is there coordination among these projects, especially those carried out around the same time? Could you share your insights on this matter?"

One of the interviewees stated that:

"Two distinct teams have been working on land use and transportation plans in Kabul: one from the Municipality's Urban Planning Division and the other from an international consultant. Despite the absence of a direct dispute between the institutions, it's crucial to understand their connection to the government. The difficulty lies not in coordinating between institutions but rather in internal conflicts within the same governing body. Kabul's administrative system closely links to political dynamics, leading many departments—even within the same institution to conduct concurrent tasks. There is a problem with this internal division. It is regrettable that various methods of land use planning are divided in this manner."

One of the interviewees stated that:

"The absence of coordination amongst important entities is one of the main obstacles to Kabul's urban and transportation development. Although Kabul has enormous potential, planning has become a major issue due to the absence of a cohesive approach. Several institutions are working on similar projects without efficient collaboration, and both parties frequently blame each other for this. I participated in coordination sessions; However, no agreement was made. The lack of communication hindered the implementation of a comprehensive plan in Kabul. For example, other issues such as parking lot management and conflicting departmental objectives hampered the efficacy of a well-planned transportation route.

Interviewee 3's comments indicate that several problems come up during the planning and execution stages. Incomplete efforts result from institutions having to solve issues beyond land use and transportation, which makes these projects much more difficult.

One of the interviewees had similar concerns, too:

"One of the main challenges is the lack of cooperation. Establishing a department that is completely responsible for transportation planning is one of our ideas. If not, planning adds to the already overwhelming workload of overworked institutions. For instance, the procedure would probably be more effective if a separate unit was established to manage transportation, as the municipal planning department is already overburdened."

Interviewees 1, 2, and 3 concur that one major issue facing Kabul is the absence of dedicated resources and coordination. They draw attention to the fact that organizations find it difficult to devote the necessary time and resources to these projects. Moreover, unanticipated difficulties that crop up during implementation impede development even more. Interviewee 4 presents an alternative viewpoint, stating:

"The study on urban transportation was finished in the early months of 2022. This study was more of a reactionary one, finished in response to pressing requirements. Unfortunately, there was no long-term vision. Although it isn't necessarily a bad thing for different institutions to collaborate on these initiatives, it is crucial that their efforts aren't abandoned. It's a positive start since at least both teams offered a comparable plan for the city."

This shows that there is some agreement on the direction of land use and transportation planning in Kabul, despite the difficulties that persist. Nonetheless, the absence of uniform execution continues to impede advancement.

The authorities' opinion about integration

This section discusses Kabul's perceptions about the integration of transportation planning and land use. There is a marked lack of integration between land use and transportation planning initiatives, according to Interviewees 1 (a representative of the Urban Planning Authority) and 2 (the head of the Kabul Transportation Board). They pointed out that

although both industries are vital to the growth of the city, there is little cooperation in the creation and execution of integrated plans between transportation authorities and urban planners. Other interviewees did not express conflicting views about the lack of integration between these industries. However, interviewee 5 acknowledged that, in a recent transportation project, there was excellent coordination among the many governmental organizations involved urban planners not included.

Current research suggests that the creation of transportation and land use plans often occurs independently, with little coordination. To learn more about this problem, interviewers were asked the following questions: According to recent publications, land use and transportation planning are not integrated. Does anybody agree with this statement? If yes, what observations may be made on the situation?

One of the interviewees stated that:

"The integration between land use and transportation planning is very weak, and this is a major issue in Kabul. While there have been attempts to address both aspects, the processes remain fragmented. The focus has been more on immediate transportation concerns than considering how land use policies can support long-term mobility goals. Furthermore, the pandemic disrupted many projects, and while there were attempts to involve different stakeholders, the level of collaboration was minimal."

When asked about the reasons behind this lack of integration, Interviewee 2 elaborated:

"International consultants or agencies drive most of these projects, with limited input from local planners. Often, international consultants or agencies rush these projects, prioritizing quick results over long-term strategies involving in-depth collaboration between land use and transportation planners. Additionally, the standard project models often fail to fully engage civil society and local planning boards, as their inputs challenge them. This leads to minimal consideration of how transportation projects align with the broader urban development plans."

One of the interviewees expressed similar viewpoints on the issue.

"The Urban Planning Authority was not a stakeholder in recent transportation planning initiatives. They only included us in the presentation phase, after they had already finalized the plans. This disconnect between planning teams prevents effective integration and limits the potential for developing a cohesive strategy for Kabul's growth."

Based on these insights, it is evident that, despite claims of coordination in various reports, there is little meaningful integration between land use and transportation planning in Kabul. This lack of collaboration hinders the development of well-rounded urban strategies that could improve the city's infrastructure and sustainability. Moving forward, both local planners and transportation authority's emphasize the need for greater cooperation and participatory processes to effectively align these two critical areas.

Successful Examples of Other cities' compatibility with transportation users

This section examines successful examples from other cities that have successfully combined the requirements and preferences of various transportation users with transportation planning. The primary study issue in this section was the successful modification of city transportation systems to accommodate diverse modes of mobility, including walking, bicycling, public transportation, and private automobiles. It is evident from expert interviews and case studies that both the planning phase and the alignment of transportation policy with the requirements of all users are critical to effective implementation.

For example, cities like Copenhagen and Amsterdam have become models for integrating bicycle transportation with other forms of transport.

One of the interviewees points out that:

"Copenhagen's Bicycle Master Plan was not just a symbolic document but a legally binding part of the city's overall transportation strategy. This guarantee led to the construction of bicycle lanes in accordance with the plan, incorporating specific infrastructure for cyclists and pedestrians."

One of the interviewees explained that:

“A clear legal framework that supports cycling as an essential part of the urban transportation network drives Copenhagen's success. The city allocates a significant budget for bike infrastructure, recognizing it as a cost-effective and environmentally friendly mode of transport.”

One of the interviewees stated further elaborates on Amsterdam's approach:

“Amsterdam has managed to incorporate cycling into the fabric of its urban development through consistent policies and public engagement. The city treats cycling as a priority, with clear targets set in its transportation master plan. Importantly, these plans are legally binding, and the city ensures coordination across all levels of government and stakeholders, from local councils to transportation departments. Cycling can seamlessly integrate with other transportation modes thanks to this level of commitment.”

One of the interviewees emphasizes that”

“Both Amsterdam and Copenhagen involve citizens and transportation users at every stage of the planning process. Regular workshops, questionnaires, and public consultations were conducted to get feedback from commuters of all stripes, including cars, bikers, and public transportation users. The resultant transportation network will benefit the whole population, not just certain groups, thanks to this participatory approach.”

These examples highlight that the success of transportation plans depends not only on their approval status or technical design but also on the broader framework that supports their implementation. Legal recognition, public participation, and cross-departmental coordination all contribute to making transportation systems more inclusive and functional for all users.

One of the interviewees summarizes:

“Cities like Amsterdam and Copenhagen show that with the right mix of legal frameworks, public engagement, and inter-institutional cooperation, it is possible to create transportation

systems that accommodate everyone from cyclists to pedestrians to car users while maintaining efficiency and sustainability."

Investment in Infrastructure for Pedestrians and Cyclists

This section discusses the importance of funding bicycle and pedestrian infrastructure, providing examples from various locations that have effectively prioritized non-motorized transportation. Building infrastructure for various user groups not only increases mobility but also improves public health, safety, and the general standard of living in cities, as shown by expert interviews and case studies.

One of the interviewees emphasized:

"Cities like Copenhagen and Amsterdam have reaped substantial benefits from investing in dedicated bike lanes and pedestrian zones. "These cities didn't just add bike lanes they built entire networks that connect all parts of the city, ensuring safety and convenience for cyclists and pedestrians alike."

He further explained how pedestrian-friendly streets and well-maintained cycling infrastructure can reduce traffic congestion and pollution, leading to healthier cities.

Interviewee 2 highlighted the economic and environmental benefits of these investments:

"Investment in cycling and pedestrian infrastructure is relatively inexpensive compared to large-scale transportation projects like highways or subways. Yet, it can drastically reduce a city's carbon footprint and improve the livability of urban spaces. In cities where such infrastructure exists, people often prefer walking or cycling over driving, which results in lower greenhouse gas emissions and healthier populations. In addition to reducing environmental impacts, pedestrian and cyclist infrastructure can improve urban mobility."

Interviewee 5 pointed out the example of Bogotá, which has implemented the "Ciclovía" network of bicycle paths and car-free streets:

"Bogotá's success with its cycling infrastructure is a testament to how strategic investments can promote a shift toward sustainable mobility. Ciclovía has transformed the way residents navigate the city and significantly reduced the reliance on motor vehicles. The key to Bogotá's success was not only the investment in physical infrastructure but also the promotion of a culture that values walking and cycling."

However, the development of this infrastructure is not without challenges. As Interviewee 4 mentioned:

"Walking and biking infrastructure is essential for public health, sustainable transportation, and attractive, equitable cities. Private vehicle use decreased, carbon emissions decreased, health improved, equity promoted, availability enhanced, and economic benefits were realized. Vision Zero reduced traffic fatalities and injuries by encouraging bike and pedestrian safety.

- Traffic calming and speed limit enforcement reduce accidents and make non-motorized transportation safer.
- Walkable and bike-friendly transit networks reduce car ownership and promote multimodal integration.
- Building secure, interconnected networks near schools, parks, and business hubs in densely populated areas is wise.
- Walking-friendly urban architecture. Public advertising may promote bike-buying or bike-sharing tax breaks, as well as habit change. Amsterdam, New York, and Barcelona prosper from investments.

Finally, Infrastructure for bicycles and pedestrians was required for economic, public health, and urban mobility reasons. Implementing Vision Zero, building resilient networks, integrating public transportation into the infrastructure, and promoting policy advocacy are all important.

In cities where there is a strong car culture, convincing policymakers to allocate budgets for pedestrian and cyclist infrastructure can be difficult. There is often a perception that these

investments serve a small portion of the population, but they benefit everyone by improving air quality, reducing noise pollution, and making cities more vibrant. Successful cities have demonstrated that investing in infrastructure for pedestrians and cyclists can lead to numerous economic, environmental, and social benefits. While challenges remain, particularly in cities with entrenched car cultures, the long-term rewards of these investments are undeniable."

The potential for bicycle transportation in Kabul has been discussed across various dimensions. New challenges related to planning and implementation processes have emerged beyond those initially anticipated. To gain insight into the future of bicycle transportation, the following question was posed to the experts:

"Do you see a future for bicycle transportation in Kabul?"

Experts generally express optimism about bicycle transportation but acknowledge significant hurdles that hinder its development. These include issues such as low public awareness, political factors, insufficient technical and budgetary resources, lack of decisive action from authorities, and the absence of a legally binding bicycle master plan. These factors collectively cast doubt on the bright future of bicycle transportation in Kabul.

One of the interviewees stated that:

"I believe that integrating bicycles into the city's transportation mix could lead to healthier urban mobility with relatively simple solutions. However, the lack of implementation has stunted progress."

Interviewee 2 highlights the inadequacy of current bicycle initiatives and societal awareness, emphasizing that projects without respect for cyclists' needs are ultimately futile:

One of the interviewees stated that:

"Kabul's bicycle transportation efforts in a recent article, acknowledges the importance of the Bicycle Paths Regulation and participatory planning but expresses concern about incomplete implementation."

I have observed the Bicycle Master Plan for Kabul and see potential, but significant progress has been lacking. There has been minimal implementation beyond initial projects, and political divisions between local authorities have stalled advancement. The absence of cohesive authority and budget constraints contribute to these issues. Investments like bike-sharing and infrastructure improvements are positive steps but insufficient without a comprehensive and well-implemented plan. The current approach seems to neglect fundamental requirements, impeding the development of an effective bicycle transportation system."

Interviewee 4 reflects on the missed opportunities for improving bicycle transportation, noting that lack of urgency and inadequate regulations have delayed progress:

"The pandemic presented a chance to boost bicycle transportation, but it was not effectively utilized. Despite some promotional events, there has been little real progress in making bicycles a viable transportation option. Local and district-level initiatives are lacking, and there is no integrated system connecting bicycle paths to major transit lines. The focus should be on creating safe, well-connected bike lanes and promoting bicycles as a primary mode of transport. Without significant changes in infrastructure and political support, ongoing efforts may not achieve desired outcomes."

Interviewee 4's statements summarize the overall situation of bicycle transportation studies in Kabul and highlight delays in implementation and the lack of adequate regulations. Interviewee 4 says:

"The COVID-19 pandemic offered Kabul's bike transportation a significant opportunity to progress, but local authorities did not take it." As a result, bicycle transportation has not changed. The historical data from past transportation plans shows that Kabul has a very low rate of bicycle use, which is indicative of a larger pattern of insufficient adoption. Despite occasional promotional events and campaigns, there has been minimal focus on bicycle infrastructure, leading to no sustainable improvement.

For instance, the city's transportation system has not successfully incorporated bicycle paths and bike-sharing systems, despite significant progress in these areas. Initiatives at the municipal and district levels are required to fully address this problem. Although there was

a small spike in the number of people using bicycles for short excursions during the epidemic, this did not result in the construction of essential infrastructure, such as bike lanes and parking lots. Bicycles remain underutilized *as a practical mode of transportation due to the significant emphasis on driving*.

A well-planned network of secure bike lanes connected to important transit routes, along with public awareness initiatives to promote their use, would be beneficial for Kabul. The idea of a "15-minute city," where important services were reachable by bicycle in a short ride, needed to be investigated.

within a short commute. However, existing investments and studies might not provide meaningful results without significant infrastructure upgrades and stronger political commitment. Early excitement for bicycle transportation has not persisted, and current initiatives run the risk of collapsing for lack of well-thought-out preparation and execution."

Defining 'compatibility' in the context of Kabul's transportation users involves addressing these challenges and developing a more integrated and supportive approach to bicycle transportation. This requires not only improved infrastructure and regulations but also increased public awareness and commitment from local authorities.

Defining 'compatibility' in transportation users' context

This part explores the meaning of "compatibility" in relation to Kabul's transportation users, emphasizing the need to ensure that various modes of transportation, such as walking and cycling, can coexist and function as intended. Interviews with transportation experts indicate varying perspectives on the challenges and opportunities of creating a more integrated and user-friendly transportation system in Kabul.

One of the interviewees stressed the significance of taking user demands and mode compatibility into account:

"The goal of transportation compatibility is to ensure that all users whether they be cyclists, walkers, or drivers can move securely and effectively. Due to Kabul's unclear non-motorized transportation infrastructure, users frequently clash, especially on the city's congested

roadways where vehicles predominate. Also, I want to mention the conflict that arises between various user groups when there are no designated areas for bikers and pedestrians, which raises safety issues and inefficiencies."

Interviewee 3 emphasized the difficulties of integrating different forms of transportation in Kabul's densely populated urban setting:

"The idea of compatibility necessitates planning that guarantees motorized and non-motorized transportation can coexist. This calls for careful urban planning that considers the requirements of all road users, not just the creation of dedicated lanes for automobiles and cyclists. Achieving this balance is especially challenging in Kabul because of the city's limited area and clogged highways."

He made the point that compatibility is not only a technological problem but also a cultural one, requiring education and awareness campaigns to change people's perceptions of various modes of transportation.

One of the interviewees highlighted Kabul's inadequate infrastructure to accommodate diverse mobility needs:

"Kabul's infrastructure was heavily biased toward motorized cars, with minimal room left for walkers and bikes." Ensuring everyone travels safely, regardless of their method of transportation, requires egalitarian infrastructure, such as bike lanes, walkways, and traffic calming measures. This is the definition of genuine compatibility.

He emphasized that compatibility means making sure that the transportation system is usable for everyone, including the elderly and children, as well as accommodating various modes of transportation.

The 1 interviewee spoke about the political and practical difficulties in establishing compatibility in Kabul's transportation system:

"Due to conflicting priorities, it is difficult to develop compatibility amongst transportation users in Kabul. Rather than making infrastructure investments for non-motorized users, the emphasis is frequently on building more roadways for automobiles. The needs of bicycles and pedestrians will remain unmet until there is a political commitment to building a more

inclusive transportation system. To build a system that benefits everyone, she emphasized the necessity of a coordinated approach including a variety of stakeholders, including government officials, urban planners, and local communities."

Interviewee 4 emphasized the potential benefits of focusing on compatibility:

"By making diverse modes of transportation compatible with one another, Kabul's safety and mobility could significantly improve. By providing designated spaces for bicycles, pedestrians, and automobiles, and ensuring everyone adheres to the same regulations, the system functions more effectively overall. Typically, this not only reduces the number of accidents but also improves traffic flow.

Compatibility in the context of transportation, he stressed, is essential for sustainable development since it promotes the use of non-motorized transportation, which lowers pollution and enhances public health.

But as Interviewee 5 noted, there are many obstacles in the way of creating appropriate infrastructure:

"It's difficult to persuade legislators to invest in infrastructure for bikes and pedestrians in a city where the culture is strongly car centric. Although it's widely believed that these investments only help a small portion of the populace, they actually improve the efficiency and environmental friendliness of the transportation system as a whole."

The respondent went on to discuss the importance of public awareness initiatives to change the notion that non-motorized transportation is a useful and viable component of the city's transportation system.

Considering the demands of different road users and designing a well-balanced system that allows motorized and non-motorized transportation to coexist are key components of defining compatibility in the context of Kabul's transportation users. This calls for a confluence of legislative modifications, cultural reforms, and physical infrastructure advancements toward more environmentally friendly and inclusive transportation solutions.

Compatibility is not only a technological problem but also a social and political one that calls on stakeholders and local government to make a sustained commitment.

5.3. Concluding Remarks: General Evaluation

Numerous studies have been undertaken to emphasize the importance of transportation and land use planning in Kabul; however, practical issues have rendered these initiatives predominantly theoretical.

- A multitude of study initiatives have been conducted concerning the amalgamation of transportation and land use in Kabul. Nevertheless, the implementation of spatial planning and infrastructure has been ineffective, resulting in the failure to achieve the objectives specified in these studies.
- The survey questions about transportation lack validity because it's unclear if they're based on expert-developed frameworks, which raises questions about how accurately the results reflect real-life conditions in Kabul. Municipal authorities are not liable for assessing the scientific validity of these surveys.
- There are deficiencies in the integration of land use and transportation planning, resulting in variations in strategy implementation. The absence of coherence among various transportation systems, including buses and non-motorized modes (e.g., walking and cycling), has led to disjointed processes that fail to provide mutual support.
- People have consistently highlighted the necessity of resolving Kabul's transportation issues. Detailed analysis reveals that short-term objectives have motivated numerous transportation studies, with insufficient contributions from civil society and professional specialists. The absence of inclusivity has led to plans that do not address the wider needs of the population and lack a thorough, long-term strategy.
- Two expert panels independently advocated for the integration of transportation and land use planning in Kabul, representing a constructive advancement towards a more comprehensive strategy.

Nonetheless, both proposals have encountered considerable challenges in execution. Discussions with specialists indicate multiple fundamental concerns:

- Both factions suggested analogous solutions yet failed to collaborate efficiently.

- Civil society and NGOs have poorly communicated the strategy, resulting in limited public engagement and comprehension of the plans.
- There is a deficiency of proficient personnel and inadequate financial resources to implement initiatives.
- Unlike the master transportation plan, these projects lack a clear legal framework and are not considered binding or enforceable documents.
- Experts express pessimism about the future of Kabul's transportation and land use planning due to a lack of significant implementation.

Evaluation of kabul utilizing this framework:

Spatial design and transportation execution face significant problems and shortcomings. The local administration has shown insufficient commitment to project implementation and has failed to assign the necessary staff and resources. Conflicts among professional specialists, NGOs, and the local populace, together with insufficient societal backing, have impeded progress. Despite the demand for improved mobility alternatives, it has not sufficed to galvanize local authorities. Inadequate cooperation and planning ensnare Kabul's transportation and land use planning. It is essential to address these difficulties and implement the requisite measures to guarantee the sustained success of transportation and land use initiatives.

The following are the answers to the research questions, derived from insights gathered through semi-structured interviews.

R.Q.1. Is sustainable development a viable strategy for developing countries? Can these cities, specifically Kabul City in Afghanistan, successfully integrate land use and transportation systems?

The semi-structured interviews revealed mixed opinions about the viability of sustainable development in developing countries, particularly Kabul. Several respondents expressed optimism about the concept of sustainable development, acknowledging its long-term benefits in terms of economic growth, environmental protection, and quality of life.

However, they also highlighted significant barriers, including political instability, lack of financial resources, and weak institutional frameworks. When discussing the integration of land use and transportation systems, interviewees pointed to the challenges posed by rapid urbanization, informal settlements, and a lack of cohesive urban planning. While there is potential for Kabul City to successfully integrate these systems, many interviewees stressed the need for substantial investments in infrastructure, capacity-building for local authorities, and improved coordination between different government agencies.

Some interviewees also noted that the successful implementation of sustainable development strategies would require overcoming systemic issues such as corruption, bureaucratic inefficiency, and inadequate public participation in decision-making. Overall, the responses indicate that Kabul's unique context, characterized by ongoing conflict and socioeconomic challenges, makes it challenging to fully realize sustainable development in the short term. The integration of land use and transportation systems is possible but will likely require significant external support and long-term planning.

R.Q.2. Are the transportation problems in Kabul City, Afghanistan, primarily due to inadequate planning?

According to most interview participants, inadequate planning is a central factor contributing to Kabul City's transportation problems. Many respondents emphasized that past urban planning efforts have been fragmented and reactive rather than proactive, often failing to account for rapid population growth and the increasing demand for transportation infrastructure. Interviewees pointed out that the lack of a comprehensive, long-term transportation strategy has led to issues such as traffic congestion, insufficient public transit options, and poorly maintained roads. Additionally, respondents frequently mentioned the lack of coordination between transportation and land use planning as a key weakness, citing instances where development projects proceeded without considering the impact on transportation networks.

However, some participants also noted that other factors, such as limited financial resources, political instability, and corruption, exacerbate the challenges of transportation planning. Interviewees identified inadequate planning as the primary cause of the city's transportation

problems but acknowledged that addressing these issues requires a multi-faceted approach that also tackles broader governance and infrastructural constraints.

R.Q.3. Do population growth forecasts and large-scale relocations have a significant impact on transportation issues in Kabul City, Afghanistan?

The interviews revealed a strong consensus among participants that population growth and large-scale relocations have had a profound impact on Kabul's transportation issues. Many respondents highlighted that the city's rapid population increase driven by both natural growth and the influx of internally displaced persons has placed immense pressure on existing transportation infrastructure. Several participants highlighted the inadequate expansion of transportation systems to meet this growing demand, resulting in overcrowded streets, traffic congestion, and a strain on public transportation services.

People also viewed large-scale relocations, especially from rural areas to urban centers like Kabul, as a critical factor. Some interviewees pointed out that these relocations are often poorly planned, with informal settlements springing up in areas that lack basic infrastructure, including road networks and public transit options. Kabul's urban development strategy frequently cited the lack of foresight in planning for population growth and relocation as a significant oversight, further compounding the city's transportation problems. Overall, the interviews suggest that population growth and relocation are indeed significant drivers of Kabul's transportation challenges, and addressing these issues will require more strategic planning and investment in transportation infrastructure.

6 CONCLUSION AND RECOMMENDATIONS

Transportation systems are leading the way in this regard, especially given their continued heavy reliance on fossil fuels. This reliance carries heavy financial costs in addition to hastening environmental damage. A move toward renewable energy and environmentally friendly transportation methods is necessary to lessen these effects. Like many other cities, Kabul's sustainable transportation planning must consider land use and the creation of effective public transit networks.

Achieving sustainable urban expansion requires integrating land use and public transit. Strategic planning is required for this to be successful; this includes developing transit-oriented developments, making public transportation more accessible, and encouraging compact urban growth. Coordinating public transportation networks in Kabul with the city's land-use planning can reduce energy consumption and carbon emissions, while enhancing citizen mobility.

Implementing important policies was necessary for the successful integration of public transportation and urban land utilization. These include making sure that public transportation was accessible and reasonably priced, establishing clear regulations that encourage high-density, mixed-use developments near transportation hubs, and carefully organizing the spatial arrangement of transportation networks to meet the city's needs. Planning must consider Kabul's particular environment, which includes the city's physical layout, existing infrastructure, and population. Failure to fully recognize these factors could result in incomplete or poorly implemented strategies, leading to ineffective systems and low public transit usage.

It is essential to invest in infrastructure that facilitates land use integration and public transportation. Ensuring the connection of important residential and commercial districts to public transportation choices, such as expanding bus, metro, and dedicated pedestrian routes, is crucial. Furthermore, encouraging a culture of public transportation use requires measures that support social acceptance of the mode, such as community outreach and education initiatives.

The establishment of governance and legal structures is necessary to facilitate this integration. This calls for the creation and enforcement of land use and transportation laws that prioritize sustainable urban design, as well as the provision of financial incentives to both public and private developers to promote these initiatives. Effective collaboration between local government, urban planners, and transportation authorities will be required to ensure consistent and methodical application of the policy.

In Kabul, integrating land use and public transportation can greatly improve the city's sustainability. Kabul can lessen its impact on the environment, improve livability in urban areas, and reduce traffic congestion by placing a priority on transit-oriented development and implementing a multimodal strategy. Public transportation, in addition to being a mode of transit, will become a catalyst for sustainable urban development by combining these concerted efforts.

Prior to providing the study results, it is important to examine the commonalities between two land-use integration and public transportation projects, which are important parts of this thesis. The execution of both programs, which combined land use with public transportation systems, encountered comparable challenges. Key parallels include:

- A larger urban planning plan included both initiatives.
- They received assistance from abroad to advance environmentally friendly transportation.
- To improve accessibility and mobility, the main goal of both projects was to integrate public transit networks with urban land use.
- The ideas suggested building networks to link public transportation hubs, such as bus and train stations, with residential, commercial, and open spaces.
- The studies took a piecemeal approach, concentrating on important cities to progressively extend integrated transportation networks.
- Reducing conflicts with private car traffic was one way to improve public transportation passengers' safety, efficiency, and convenience.
- Both programs had the public as their target audience, with an emphasis on encouraging public transit as a preferred means of mobility.
- Because neither initiative had mandatory legislative authority, its realization required the support of the local administration and political will.

- While acknowledging the value of public participation, only one project included stakeholders in its planning process on a proactive basis.
- The teams in charge of each project worked independently, even if their objectives and areas of interest overlapped.
- The projects exchanged some technical information, but there was little overall coordination.
- Both programs had thorough plans for combining land use and transportation, but they were devoid of quantifiable instruments to evaluate how well the ideas they offered would work.
- Due to issues with institutional commitment and resource constraints, only a small portion of these initiatives are currently underway. The parallels between these projects and the expert interviews allow for several inferences.
- The lack of prioritization by decision-makers and local authorities hinders the integration of public transportation with land use. The lack of institutional and political will largely prevents the implementation of these plans as part of a larger urban development strategy.
- For planning purposes, both proposals divided the city into smaller sections; however, local governments were not required to implement these divisions because they lacked legal support. Local political disputes made execution much more difficult.
- Experts emphasized the significance of creating interconnected public transit networks that connect areas with more expansive urban hubs. However, the political division among various agencies has hindered the implementation of these networks.
- The funding that local governments set aside for land use integration and public transportation is a major factor in these projects' success. A lack of finance and committed staff has either partially implemented these strategies or caused them to stagnate.
- Both programs offered sensible plans for combining land use and public transportation, but because of inadequate spatial data and uncontrolled planning procedures, they were unable to offer a thorough framework for assessing the results.
- Despite the lack of sufficient consultation with non-governmental groups and other current transportation stakeholders, the construction of the projects still prioritized future public transit consumers. Planning objectives and public demand were not in line with one another because of this lack of stakeholder participation.

- The initiatives received less public support because there was no participatory planning procedure in place. The contributing factor to the low level of social acceptance was the incomplete involvement of stakeholders, such as NGOs and professional groups.
- Gaining support from the public and ensuring long-term success require open and inclusive planning processes. Since reports were not always available, it was hard for the public to learn about project results and experts to evaluate them.
- A single organization does not oversee the integration of land use and public transportation, leading to dispersed efforts across several projects without a unified, well-coordinated plan.
- The lack of legal standing of these proposals has raised serious concerns among experts, casting doubt on their full implementation. Without legislative support, local governments have little reason to devote funds or staff to these programs.

To sum up, these initiatives confront several similar difficulties, namely in the areas of political will, resource distribution, and public involvement. To accomplish sustainable urban development in Kabul City, the research findings address the larger research concerns and emphasize the necessity of better governance and integrated planning efforts.

Experts have expressed concerns about broader structural difficulties in the city's transportation planning initiatives, as presented in Section 5.5. which highlights the importance of investing in pedestrian and cyclist infrastructure, showcasing successful examples from cities like Copenhagen, Amsterdam, and Bogotá. These investments improve urban mobility, public health, and reduce pollution. Despite these benefits, challenges such as entrenched car cultures, lack of political will, and budget constraints hinder progress in Kabul. Experts emphasize the need for cohesive planning, public awareness campaigns, and political commitment to create an effective bicycle transportation system, though current efforts in Kabul remain limited and fragmented. The research findings have led to the development of several important recommendations, categorized into three primary areas: governance, social engagement, and spatial planning. The purpose of these proposals is to encourage a more efficient integration of public transportation and land use in Kabul City, specifically with the goal of supporting sustainable development.

Recommendations

Spatial recommendations

Growing population and rapid urbanization in Kabul City have created major issues for land use planning and transportation. Ineffective land use, increased traffic congestion, pollution, and a decline in inhabitants' quality of life are all consequences of the absence of coordinated urban planning. Sustainable development has emerged as a critical issue as Kabul works to restore and upgrade its infrastructure.

Integration of land use and transportation planning is crucial for promoting sustainable growth in Kabul. This strategy ensures that transportation networks support effective land use patterns, improving accessibility, reducing environmental effects, and boosting economic growth. Kabul can effectively address present issues and prepare for future expansion by integrating transportation infrastructure with urban development.

The goal of this case study is to create a more resilient, livable, and sustainable urban environment by offering spatial ideas for integrating land use and transportation planning in Kabul City. To establish a sustainable future, the recommendations seek to strike a balance between the demands of mobility and environmental preservation as well as fair access to resources.

- During the research process, several participants' insights shed light on the issue of integrating land use and transportation planning for sustainable development. One significant challenge highlighted by Interviewee 4 was the lack of coordination between transportation development and urban planning in Kabul. Interviewee 4 noted that public transport infrastructure often develops independently of land use patterns, resulting in inefficient routes, congestion, and limited accessibility for residents. Interviewee 4 emphasized that the current transportation network lacks connectivity with key residential and commercial areas, making commuting both time-consuming and environmentally unsustainable. To bridge the gap between land use and transportation in Kabul, this issue might be further investigated by including a variety of stakeholders, such as community members, urban planners, and transportation authorities. Even though several interviewees mentioned this topic, only Interviewee 4

offered thorough insights derived from both professional and personal observations made throughout the semi-structured interview process. However, the integration of these systems is not the main research subject in this thesis, which focuses largely on sustainable land use regulations and modes of transportation. Therefore, not every participant was asked specific questions about this integration.

- When analyzing the existing transportation infrastructure in Kabul, particularly the integration of public transit and land use, it becomes evident that inconsistencies in design and implementation limit its effectiveness. For instance, the development of public transport hubs like bus terminals and minibus stops often lacks coordination with surrounding land use patterns, leading to underutilized areas and disconnected routes. Like the case of bike and ride systems in other cities, the lack of integration between transport modes and urban planning in Kabul hampers sustainable mobility options for residents. A deeper investigation of this issue reveals that there is little to no public information available about the locations of key transit hubs or how they connect to nearby residential and commercial areas. While central Kabul boasts a more developed transport infrastructure, the neglect of peripheral zones often leads to inefficient travel routes and extended commute times. A comprehensive assessment of Kabul's main transit corridors and their surrounding land use could further explore this lack of integration and information transparency. Examining specific case studies such as the development of new bus routes in the city's northern and southern districts would provide more insight into how land use and transportation planning can be better aligned for sustainability.
- The integration of land use and transportation planning in Kabul City necessitates the construction of bike lanes connected to public transportation terminals. Furthermore, these stations must have secure parking spaces both inside and outside. For smooth cycling around the station grounds, turnstiles, staircases, and elevators must also be adapted.
- Additional information is required regarding the possibility of installing an electronic bike system. This thesis explores how conversations with pertinent officials and experts can accomplish this. However, since this topic is outside the purview of the research, we have not gathered specific information about Kabul's lack of an e-bike system in recent years.

- Every infrastructure project requires consistent execution and clearly defined usage rules. Furthermore, public awareness and commercial activities should support these efforts.

Finally, it is crucial to plan for ongoing maintenance and repairs once infrastructure is in place. As Interviewee 4 pointed out, improper infrastructure design has resulted in the need to turn several roads in Kabul into one-way streets, demonstrating that it is not a long-term viable policy.

Social (Participation) recommendations:

In Kabul, the public, professional organizations, and civil society have mostly ignored bicycle transportation planning, which has led to a lack of ownership and support from these groups. This top-down approach might impede the development of bicycle transportation infrastructure and cause tension between civic society and government agencies. To tackle these issues, we must implement the following actions:

- NGOs should analyze the active cycling advocacy groups in Kabul to better understand their needs and demands.
- Increase stakeholder involvement by participating in unofficial or underappreciated cycling groups, ensuring all opinions are heard.
- Involve NGOs and experts in the planning process by encouraging candid communication and keeping them informed about planners' viewpoints and limitations.
- Transparency in decision-making should be evident in planning reports, showing that recommendations from NGOs or civil society were considered.
- Adopt an inclusive and participatory planning framework, including public consultations, feedback-sharing draft plans, and stakeholder access to data and decisions.
- Use precise, grounded questions supported by science. For example, asking, "Would you use bicycles and public transportation together?" could help clarify cyclists' limitations, such as time limits on public transportation.

By implementing these suggestions, Kabul's bicycle transportation planning can better serve its residents' needs and encourage sustainable growth through active transportation.

Governance recommendations:

To successfully integrate land use and public transit in Kabul, effective governance is essential. It is imperative to establish regulations that are both physically and socially effective. The appropriate governmental bodies must create and approve these regulations to ensure their long-term effectiveness and compliance with the law. Without official backing, initiatives frequently end up as theoretical papers with no real bearing.

- **Legal Framework:** The lack of a defined legal framework is one major obstacle to the implementation of land-use and transportation regulations. Legislation's lack of support renders many plans and reports unenforceable. Any transportation plan must have official government endorsement to be considered legally valid, particularly those that promote public transportation. Legal frameworks must be in place to ensure the implementation of integrated transportation strategies.
- **Institutional Accountability:** The lack of specialized organizations or divisions responsible for managing mobility modes such as bicycles, buses, and pedestrian walkways hinders development. The division of labor in transportation responsibilities among many departments hinders concentrated attempts to combine public transportation and urban development. Establishing a dedicated organization is necessary to oversee and manage these duties, ensuring the allocation of sufficient funds, personnel, and resources.
- **Public involvement and clarity:** It's critical to inform the public about new laws, rules, and infrastructure developments. Users must receive clear and unambiguous communication about the rules governing the use of related infrastructure and public transportation. Uncertainty, or a lack of clarity regarding regulations, was often the reason for the underutilization of new systems. For instance, individuals struggle to fully utilize the available services due to a lack of knowledge about public transit systems.
- **Enforcement and Regulation:** The infrastructure supporting public transportation is susceptible to abuse and neglect in the absence of adequate enforcement measures. For

instance, parking illegally in zones intended for buses or paths for pedestrians might reduce the system's efficacy. To preserve the integrity of the transportation system, penalties for such infractions need to be precisely defined and strictly executed.

- **Campaigns and Public Awareness:** As interviewees mentioned that to develop a culture that embraces sustainable mobility, a strong public awareness campaign is also required. Public awareness campaigns that highlight the advantages of public transportation and stress its relevance can influence social attitudes and behavior. In addition, this may increase public demand for integrated transportation solutions, which in turn may stimulate legislative action.
- **Safety and Protection for Users:** Ensuring the safety and protection of individuals who use public transportation is of utmost importance. Throughout the design process, all users of public transportation must be safeguarded, but this was particularly important for the weaker user groups, such as bicycles, pedestrians, and bus passengers. By putting user protection first, efforts to promote the use of public transportation may not fail because of safety concerns.
- **Data Access and Transparency:** Planning and execution must be transparent. Providing the public with access to master plans, transportation data, and ongoing projects can increase public participation and trust. However, if these strategies are opaque or inaccessible, they may face disdain. Ensuring the validity, reliability, and public availability of transportation data will facilitate improved decision-making and promote accountability.

By addressing these governance issues, Kabul can make significant progress in the integration of land use and public transit, fostering a more sustainable and effective urban environment.

Future research recommendations:

This research brought to light several issues and challenges related to Kabul City's integration of land use and transportation planning, particularly in relation to public transit. Considering the results, more study was advised in the following fields:

- **Stakeholder viewpoints and institutional barriers:** Public sector employees and urban planners frequently avoid talking about the obstacles to putting integrated land use and transportation strategies into practice. To investigate the reasons behind the lack of progress in adopting such regulations, future studies could concentrate on identifying institutional restrictions through in-depth interviews with government officials, transportation authorities, and urban planners.
- **Diversity in Stakeholder Perceptions:** The study revealed disparities in perspectives among community leaders, urban planners, and local government officials. A more comprehensive examination of the factors causing these divergent opinions, perhaps with the use of typologies specific to Kabul, could shed light on the challenges of creating a cohesive framework of policies for sustainable urban development.
- **Public Transportation and Land Use Alignment:** This study shows that ineffective transportation services in Kabul are a result of a lack of coordination between public transportation systems and urban land use. An in-depth investigation into the integration of residential and commercial zoning restrictions with bus lines, metro systems, and other public transportation options may shed light on how to enhance accessibility and lessen traffic.
- **Accessibility and Spatial Equity:** One of the major concerns is the uneven availability of transit services in various parts of the city. Future studies should examine spatial disparities in the accessibility of public transit, focusing on low-income areas and informal settlements. A more inclusive set of policy recommendations could result from analyzing this in conjunction with land use patterns.
- **Possibility of Non-Motorized Transportation Options:** Future research may examine the viability of including non-motorized transport modes, such as walking and cycling, into the public transportation system, even if the focus of this thesis is on public transit. Implementing trial programs in specific neighborhoods and collecting input from citizens, public transportation users, and officials could provide data on the feasibility of such solutions in Kabul.
- **Governance and Policy Implementation:** The absence of strong legislative frameworks and governance structures to promote sustainable development is a major barrier to urban planning in Kabul. Further investigation may examine governance frameworks and policy instruments from other cities experiencing comparable difficulties, assessing their suitability for Kabul's circumstances. Achieving sustainable

development objectives may depend on looking into ways to bolster enforcement protocols, enhance interagency cooperation, and cultivate political will to execute land use and transportation integration.

Finally, further study may investigate the possibility of implementing cutting-edge transit options in Kabul, like smart urban mobility systems or electric buses. These innovations could help the city meet its expanding population's transportation needs as well as its environmental concerns. Speaking with professionals engaged in carrying out such initiatives around the world may assist in determining workable plans for Kabul.





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APPENDECES

APPENDIX -1. Semi- structured in ed interview form

INTERVIEW FORM FOR EXPERT OPINIONS IN KABUL TRANSPORTATION PLANNING

The developed interview form to support the master's thesis research title "*Integrating land use and transportation planning for sustainable development: a case study in Kabul city*", which is being conducted at the Institute of Science and Technology at Gazi University. The objective of the interview is to gather expert perspectives on transportation and land use planning in the city of Kabul, organized under four overarching themes.

- Kabul Land Use Plan.
- Kabul Transportation Plan.
- Land Use and Transportation Master Plan.
- Institution and Coordination in Land Use and Transportation Projects.

The study will not disclose your personal information to any third parties.

Thank you and appreciate your anticipated input and useful insights.

Date: Click here to enter a date		At:	
Personal Details			
a	Gender	☐ Woman	☐ Man
b	State of Education	☐ B.Sc.	☐ MSc. ☐ Ph.D.
c	Profession	Choose an item	
d	Period of Service		
e	Employed institution / Organization		
Name (Optional): Click or tap here to enter text.			

In the interview, we discussed land use and transportation projects.	Click or tap here to enter text.
Authorized institution or organization	Click or tap here to enter text.
Planning Year	Click or tap here to enter text.
target year of the plan	Click or tap here to enter text.
Approval status of the plan	Click or tap here to enter text.
If approved, how much of the plan has been implemented?	Click or tap here to enter text.

APPENDIX -1. (continue) Semi- structured in ed interview form

Interview question may change depending on the transportation plan discussed and the course of the interview. The following questions will be asked, and answers will be arranged.

1. What are the key challenges in developing countries face in implementing sustainable development strategies?
2. What is your opinion and suggestion about the status of land use and transportation planning in Kabul city?
3. How do you perceive the level of integration between land use and transportation planning in Kabul city?
4. Have you observed any successful initiatives or examples from other cities that have effectively addressed compatibility issues among transportation users?
5. Do you think there should be more investment in infrastructure and facilities for pedestrians and cyclists?
6. How do you define the term "compatibility" in the context of transportation users in Kabul City?
7. What specific transportation problems have you observed in Kabul City that you believe stem from a lack of effective and proactive planning?
8. How do you think the lack of effective transportation planning impacts economic development and opportunities in Kabul City?
9. Can you elaborate on how the relocation of population has contributed to transportation problems in this area?



Gazili olmak ayrıcalıktır