



Journal of  
Contemporary  
Urban Affairs



Alanya University

# Journal of Contemporary Urban Affairs

Vol. 8 - Issue. 2 2024 ISSN 2475-6164

## In this issue:

Afaf Ebrahim Mohamed, Najla Allani, Fatma Bengü Yoğurtçu, Almula Köksal, Funmilayo Lanrewaju Amao, Rokhsaneh Rahbarianyazd, Oluronke Omolola Odunjo, Güllü Bozdoğan, Tan Kamil Gürer, Khilda Nur, Andrew Butt, Serene Ho, Mittul Vahanvati, Lounis Ibtissem, Leulmi Lamia, Gherzouli Iazhar, Lazri Youcef, Mohik Acharya, Nafis Sadat, Hameem Sheikh, Md Asaduzzaman, Nimmy Benny, Sharat Sunder R, Prajitha T K, Manoj Kumar Kini, Nor Suzylah Sohaïmi, Nur Aili Hanim Hanafiah, Azhani Abd Manaf, Tülay Zıvalı, Olufunmilola Adetayo Obakin, Samuel Kehinde Afolami, Oluwafemi Kehinde Akande, Sarah Binte Haque, Moumita Roy, Zereen Afroz Tanha, Shahed Alhadyan, Mohammad AlRahahleh, Mysaa Khwaileh, Shahrîar Iqbal Raj, Inmaculada Mohino, Farjana Khatun, Upendra Vinay Joshi, Snehal Nagarsheth, Uttam Kumar Roy, Deeksha Sharma, Youssef Askar, Taher Abdel-Ghani.

- People, Places, and Perceptions: Assessing Spatial Quality Attributes of Urban Third-place With Projective Survey* Can Urban Design Foster Greater Inclusivity for Women in Public Spaces?
- Comparative Spatio-Temporal Dynamics of Urban Sprawl in Algerian Cities Skikda and Tébessa (1985-2024) Using GIS and Landsat Imagery* Urban Regeneration Strategies for Enhancing Livability: A Case Study of the Chaktai Commercial Area, Chattogram, Bangladesh
- Socio-Economic Impact of the Mass Rapid Transit (MRT) System in Dhaka: A Case Study of Mirpur Stations* The Morphological Impact of Restructuring Routes: Atatürk Boulevard's Palimpsest Phenomenon
- How Urbanization Drives Socio-Spatial Conflicts in Coastal Land Reclamation?* Economic Implications and Public Readiness for Urban Green Space Development in Agra: A Strategic Evaluation in the City of Taj
- Adapting Mobility Infrastructure to the Needs of a Liveable City: The Case of Beirut Street Markets* District-based Rental Value Coefficients for Shopping Mall Development in Istanbul
- Mapping the Discourse: Scientometric Analysis of Affordable Housing Research Trends* Evaluating Urban Heat Island Mitigation Strategies in Rajshahi, Using ENVI-Met: A Remote Sensing Approach
- How Socio-Economic and Cultural Factors Shape Privacy in Ibadan's Public Housing Estates* Countering Urban Redundancy with a Multipronged Strategy: Lessons from Ashram Road, Ahmedabad
- A Tactical Urbanism and Economic Inclusivity: Evaluating the Impact of Spacena Project in a Marginalized Urban Area* Causative factors of Abandoned Urban Housing Projects and Strategies for Revitalization in Ibadan, Nigeria
- The Role of Users' Socio-spatial Behaviour in Fostering Sustainable Retail District Projects in Bahrain*

ISSN 2475-6164 (online)



Journal of Contemporary Urban Affairs  
Volume 8, Issue 2, December 2024

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Volume 8, Issue 2, December 2024

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ISSN 2475-6164 (online)

URL: [www.ijcua.com](http://www.ijcua.com)

Email: [editor@ijcua.com](mailto:editor@ijcua.com)

Publisher: Alanya Üniversitesi

Address: Faculty of Architecture, Alanya University, Cıkıllı Mah. Saraybeleni Cad. No:7 07400,

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# Journal of Contemporary Urban Affairs

Publisher: Alanya Üniversitesi

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E-mail: editor@ijcua.com



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Main Title	Journal of Contemporary Urban Affairs	ISSN (online): 2475-6164
Serial key title	Journal of Contemporary Urban Affairs	Website: <a href="https://www.ijcua.com/index.php/ijcua">https://www.ijcua.com/index.php/ijcua</a>
Abbreviation: JCUA		Editor-in-Chief: Assoc. Prof. Dr. Hourakhsh A. Nia
Serial type: Journal		Editors: see » Editorial Team
Publisher: Alanya Üniversitesi		Frequency: 2 issues per year (June and December)
Postal Address: Alanya University, Cıkıllı District, Saraybeleni Street No:7 07400 Alanya/Antalya/TÜRKİYE		Status: Active
Publisher: Alanya Üniversitesi		First Year Published: 2017
Licensing: Creative Commons Attribution 4.0 International license CC-BY / @Authors.		The DOI Prefix allotted for JCUA is 10.25034
Publication Medium: Electronic version		Content-Type: Academic/Scholarly
		Language: English
		Key Features: Abstracted and Indexed, Refereed, Double-Blind Peer Review.
		Indexing Databases: see » Abstracting and Indexing

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- Section A- Citizenship Rights and Responsibilities: Citizenship Rights, Governances and practices, Urban and Social Identities, Walkable cities, Participatory projects, Urban ecology. Urban and social Identities, Well-Being, Acoustics, Smellscape, Authenticity, Quality of urban life, Public Health, Human behaviour and cities, Multiculturalism: Inequalities and diversities, Social distress, Psychology.

- Section B-Territorial dynamics: Urban Landscapes, Human urban geography studies, Spatial analysis: GIS and remote sensing, Spatial divergences, Interregional migrations, Urban Competitiveness, Globalization, Territorial planning, Conflict and Divided Territories, Urban Sprawl, Wadi territories, Regional Planning, Gated communities, Housing,

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- Accept without revisions
- Accept with revisions
- Request a resubmission
- Reject

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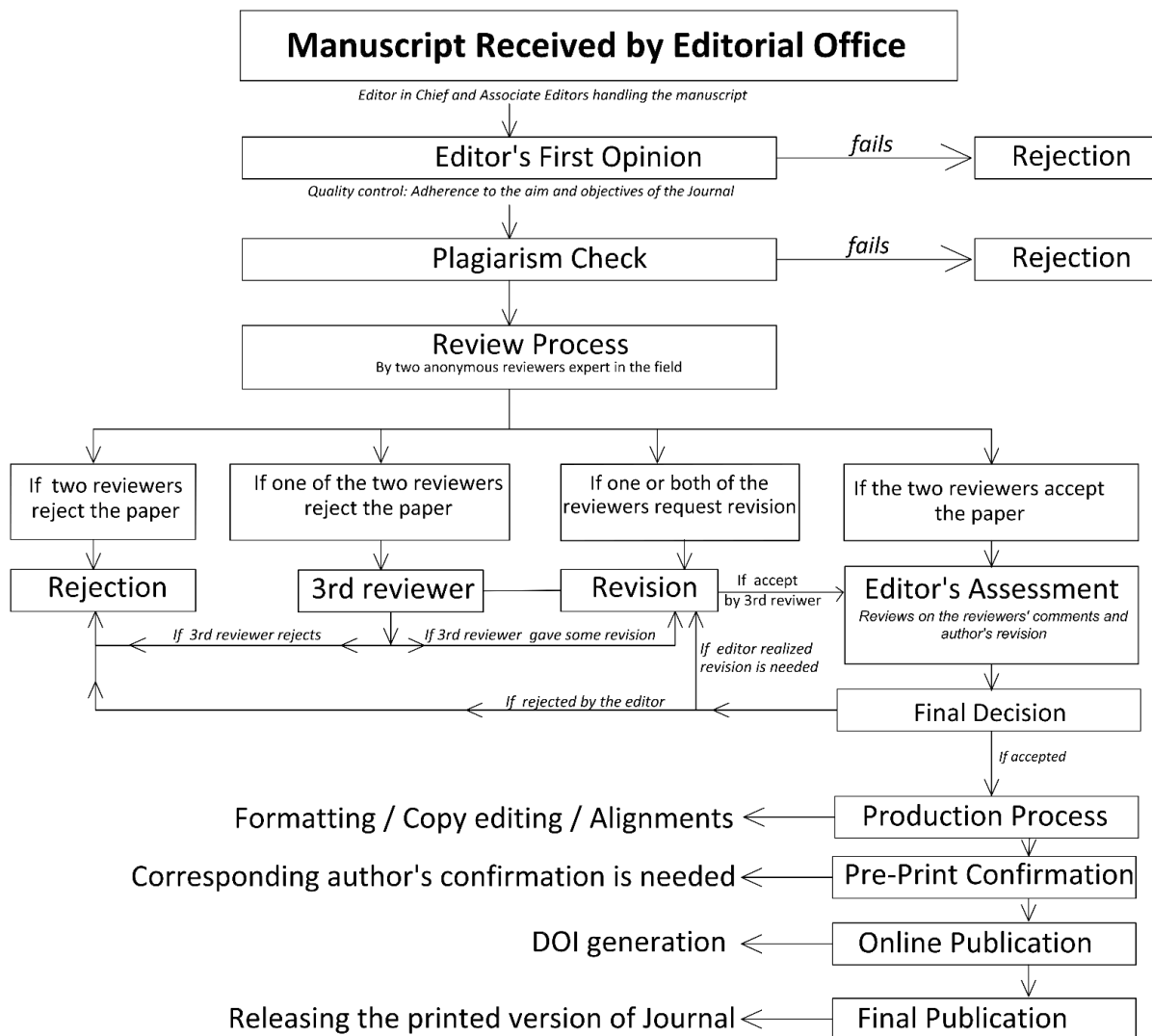


Figure 1. Peer Review Process.

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*Adapted from: Bella H. Plagiarism. Saudi J Med Sci 2014; 2:127*

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All papers submitted to the *Journal of Contemporary Urban Affairs* will undergo a plagiarism check using the iThenticate software, part of the CrossCheck Plagiarism Screening System. Any papers found to contain plagiarism or self-plagiarism will be immediately rejected. The journal is committed to upholding the highest standards of academic integrity and expects all submissions to be original works of the authors. Proper citation and acknowledgment of sources are mandatory. Authors are responsible for ensuring that their manuscripts are free from any form of plagiarism, including duplicate publication of their own previous work without proper citation. The journal reserves the right to report any instances of plagiarism to the authors' institutions and relevant authorities. By submitting a manuscript, authors agree to these terms and acknowledge that failure to comply may result in sanctions.

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3. Investigation: An impartial investigation will be conducted in accordance with the guidelines of the Committee on Publication Ethics (COPE).
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Availability of data	Template for data availability statement	Policy
- Data is openly available in a public repository that issues datasets with DOIs	The data that support the findings of this study are openly available in [repository name ] at xxx .	All
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# Journal of Contemporary Urban Affairs



Publication Frequency: 2 Issues per year (June & December)  
www.ijcua.com , editor@ijcua.com  
ISSN 2475-6164 (online)  
Publisher: Alanya Universitesi

## Aims and Scope

The Journal of Contemporary Urban Affairs is an international, peer-reviewed, open-access journal published biannually (June and December) by Alanya University. In an era of increasing social and economic inequalities and rapid urbanization, the journal recognizes the urgent need to address these challenges. Acknowledging that balancing social and economic development with resilience in the built environment requires innovative and interdisciplinary dialogue, the journal publishes articles that critically explore the interplay of these factors shaping today's urban landscapes. It distinguishes itself by examining the widening gaps in modern urban societies and proposing actionable solutions to bridge them. Therefore, the primary aims of the journal are to advance original, cross-disciplinary academic contributions that analyze these divides and propose strategies to mitigate them.

By focusing on three core areas—Citizenship Rights and Responsibilities, Territorial Dynamics, and Urban Transformations—the journal provides a multidisciplinary perspective on issues relevant to both scholars and practitioners. This comprehensive approach illuminates the complex factors contributing to inequalities and examines how social and economic considerations influence urban development and architectural practices. Ultimately, the journal aspires to inform policy and practice, fostering more inclusive, resilient, and sustainable cities.

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## Table of Contents

- How Urbanization Drives Socio-Spatial Conflicts in Coastal Land Reclamation?, Khilda Nur, Andrew Butt, Serene Ho, Mittul Vahanvati .....289–304  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-1>
- The Role of Users' Socio-spatial Behaviour** in Fostering Sustainable Retail District Projects in Bahrain, Afaf Ebrahim Mohamed, Najla Allani .....305–323  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-2>
- The Morphological Impact of Restructuring Routes: Atatürk Boulevard's Palimpsest Phenomenon, **Güllü Bozdoğan**, Tan Kamil Gürer .....324–341  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-3>
- A Tactical Urbanism and Economic Inclusivity: Evaluating the Impact of Spacena Project in a Marginalized Urban Area, Shahed Alhadyan, Mohammad AlRahahleh, Mysaa Khwailah .....342–363  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-4>
- Adapting Mobility Infrastructure to the Needs of a Liveable City: The Case of Beirut Street Markets, Youssef Askar, Taher Abdel-Ghani .....364–384  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-5>
- Urban Regeneration Strategies for Enhancing Livability: A Case Study of the Chaktai Commercial Area, Chattogram, Bangladesh, Sarah Binte Haque, Moumita Roy, Zereen Afroz Tanha .....385–403  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-6>
- Comparative Spatio-Temporal Dynamics of Urban Sprawl in Algerian Cities Skikda and Tébessa (1985–2024) Using GIS and Landsat Imagery, Lounis Ibtissem, Leulmi Lamia, Gherzouli Iazhar, Lazri Youcef .....404–420  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-7>
- Mapping the Discourse: Scientometric Analysis of Affordable Housing Research Trends, Nor Suzylah Sohaimi, Nur Aili Hanim Hanafiah, Azhani Abd Manaf, Tülay Zivalı .....421–435  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-8>
- Socio-Economic Impact of the Mass Rapid Transit (MRT) System in Dhaka: A Case Study of Mirpur Stations, Shahriar Iqbal Raj, Inmaculada Mohino, Farjana Khatun .....436–459  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-9>
- How Socio-Economic and Cultural Factors Shape Privacy in Ibadan's Public Housing Estates, Funmilayo Lanrewaju Amao, Rokhsaneh Rahbarianyazd, Oluronke Omolola Odunjo .....460–474  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-10>
- District-based Rental Value Coefficients for Shopping Mall Development in Istanbul, Fatma Bengü Yoğurtçu, Almula Köksal .....476–487  
DOI: <https://doi.org/10.25034/jjcua.2024.v8n2-11>

Countering Urban Redundancy with a Multipronged Strategy: Lessons from Ashram Road, Ahmedabad, Mohik Acharya .....489–508

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-12>

People, Places, and Perceptions: Assessing Spatial Quality Attributes of Urban Third-place With Projective Survey, Upendra Vinay Joshi, Snehal Nagarsheth .....509–528

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-13>

Economic Implications and Public Readiness for Urban Green Space Development in Agra: A Strategic Evaluation in the City of Taj, Uttam Kumar Roy, Deeksha Sharma .....529–545

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-14>

Evaluating Urban Heat Island Mitigation Strategies in Rajshahi, Using ENVI-Met: A Remote Sensing Approach, Nafis Sadat, Hameem Sheikh, Md Asaduzzaman .....546–556

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-15>

Can Urban Design Foster Greater Inclusivity for Women in Public Spaces?, Nimmy Benny, Sharat Sunder R, Prajitha T K, Manoj Kumar Kini .....557–581

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-16>

Causative factors of Abandoned Urban Housing Projects and Strategies for Revitalization in Ibadan, Nigeria, Olufunmilola Adetayo Obakin, Samuel Kehinde Afolami, Oluwafemi Kehinde Akande .....582–602

DOI: <https://doi.org/10.25034/ijcua.2024.v8n2-17>



Original scientific paper

# How Urbanization Drives Socio-Spatial Conflicts in Coastal Land Reclamation?

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## ARTICLE INFO:

### Article History:

Received: 13 May 2024

Revised: 5 August 2024

Accepted: 1 September 2024

Available online: 5 September 2024

### Keywords:

Coastal Land Reclamation,  
Community Engagement,  
Indonesia,  
Metro-megapolitan Cities,  
Spatial Conflict.

## ABSTRACT



*In many cities, coastal land reclamation (CLR) is viewed as essential due to the impacts of urbanisation and to address the challenges of land scarcity. However, these approaches often involve complex environmental concerns, technological challenges, and community conflict. This study aims to explore socio-spatial conflicts that occur across different levels of cities in Indonesia, considering their unique characteristics and differences in geography, population (homogeneous, mesogeneous, and heterogeneous), and city status (megapolitan and metropolitan). This research focuses on three cities in Indonesia that have proposed CLR solutions to urbanisation: Jakarta, Makassar, and Denpasar. Data were gathered through observations and a desktop literature review. These data were then qualitatively analyzed using the directed content analysis method with ATLAS.Ti software. The study underscores that political interests significantly influence discussions on land reclamation in heterogeneous cities. In contrast, mesogeneous cities are driven by economic and legal factors, while traditional customs and practices dominate homogeneous areas. Comprehending the issues surrounding reclamation will inform the priorities of government policies based on the area's context.*

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 289–304.

<https://doi.org/10.25034/ijcua.2024.v8n2-1>

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### Highlights:

-The study highlights the factors affecting coastal land reclamation (CLR) across different types of cities in Indonesia, specifically Jakarta, Makassar, and Denpasar. It demonstrates that political interests, economic and legal factors, and traditional customs significantly impact CLR discussions and decisions in heterogeneous, mesogeneous, and homogeneous cities, respectively. By examining these influences, the study underscores the complexity of CLR projects and their implications for urban planning in diverse city contexts.

### Contribution to the field statement:

This research contributes to urban planning and socio-spatial studies by providing a nuanced understanding of how socio-spatial conflicts related to coastal land reclamation manifest across different city types in Indonesia. It emphasizes the need for context-specific approaches in CLR projects, highlighting how local characteristics and priorities should inform government policies and decision-making processes to effectively address the challenges of urbanization and land scarcity.

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### How to cite this article:

Nur, K., Butt, A., Ho, S., & Vahanvati, M. (2024). How Urbanization Drives Socio-spatial Conflicts in Coastal Land Reclamation. *Journal of Contemporary Urban Affairs*, 8(2), 289–304. <https://doi.org/10.25034/ijcua.2024.v8n2-1>

### 1. Introduction

Indonesia is an archipelagic nation comprising over 17,000 islands, with 108,000 km of coastline and an estimated 180 cities located in coastal areas (Bintari, 2018; Kharis, 2023). Coastal cities, accounting for 60% of the urban regions in Indonesia, play a crucial role in driving regional development and rely on the wealth of marine resources available. Consequently, expanding land through sea reclamation becomes necessary, albeit controversial. As cities develop and populations grow, changes in land use occur. The lack of a nuanced understanding of planning regulations and implementation strategies tailored for various tiers of cities contributes to significant socio-spatial conflicts around CLR, such as the exploitation of new spaces ranging from neighbourhood scale to state territories (Bhunia et al., 2021; Grydehoj, 2015; Storey, 2018.; Xu et al., 2021), the political elite actors in contestations and tensions by simultaneously encouraging urbanization and leading to highly dense urban development and potentially changing design and crucial management in inland (Grydehoj, 2015; Moretti, 2023), the absence of specific construction guidelines has led to violations (Anggraini, 2019), and organised illegal activities reported by community groups to the court (Bintari, 2018). Spatial conflict can be described as a condition where at least two parties aim to utilize resources, properties, or aspects of a designated area in ways that are incompatible with each other when individuals, neighbourhoods, or communities express intentions to access the public space surrounding their residences for various purposes (Harsritanto et al., 2018). Understanding the issues surrounding reclamation will inform the priorities of government policies based on the area's characteristics. Therefore, this paper aims to understand socio-spatial conflicts arising in various tiers of cities in Indonesia, including different characteristics, populations, and the size and status of the city. Like numerous countries in the developing world, Indonesia has historically depended on and utilized Western technocratic planning methods, characterized by top-down and classical approaches that were prominent during the early post-World War II (Abidin et al., 2011; Prana et al., 2024). The emergence of city divisions based on urban, metropolitan, and megapolitan areas still largely adopts colonial Dutch spatial planning concepts. The status of megapolitan and metropolitan cities as consequences of urbanisation and agglomeration is believed to influence the upheaval of reclamation in city regions.

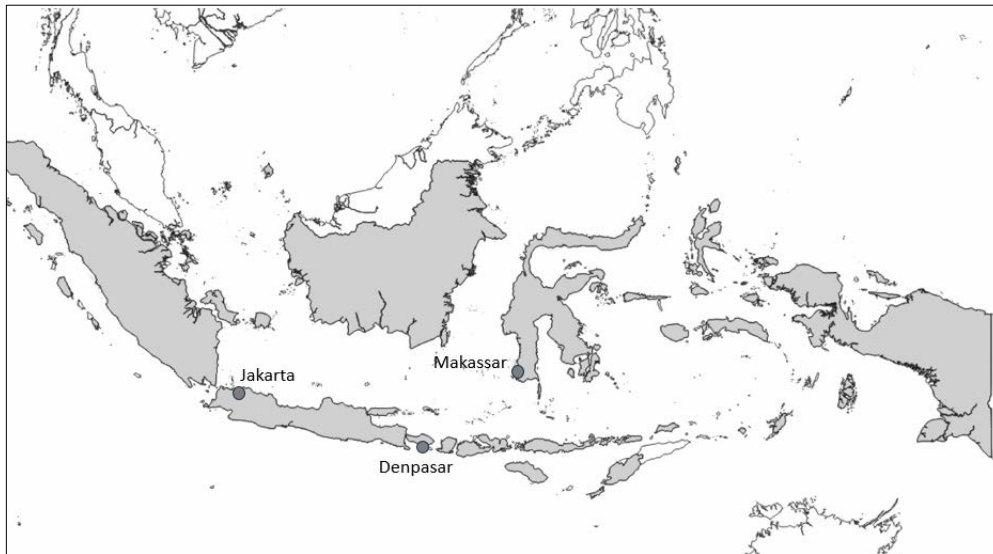
**Table 1:** Criteria of Selected Case Study.

	City and Level of Status		Coastal Reclamation Project	Level of Heterogenous – Mesogeneous – Homogeneous Population and Publicity
	City	Megapolitan-Metropolitan Areas		
1	<i>Jakarta</i>	<i>Jabodetabekpunjur</i>	<ol style="list-style-type: none"> <li>1. <i>Jakarta</i></li> <li>2. <i>Mamuju</i></li> <li>3. <i>Makassar</i></li> <li>4. <i>Denpasar</i></li> <li>5. <i>Manado</i></li> <li>6. <i>Tangerang</i></li> <li>7. <i>Ternate</i></li> <li>8. <i>Padang</i></li> <li>9. <i>Semarang</i></li> <li>10. <i>South Aceh</i></li> </ol>	<ol style="list-style-type: none"> <li>1. <i>Jakarta</i></li> <li>2. <i>Makassar</i></li> <li>3. <i>Denpasar</i></li> </ol>
2	<i>Surabaya</i>	<i>Gerbangkertasusila</i>		
3	<i>Bandung</i>	<i>Cekungan Bandung</i>		
4	<i>Medan</i>	<i>Mebidangro</i>		
5	<i>Palembang</i>	<i>Patungraya Agung</i>		
6	<i>Semarang</i>	<i>Kedungsepur</i>		
7	<i>Makassar</i>	<i>Mamminasata</i>		
8	<i>Batam</i>	<i>Batam Raya</i>		
9	<i>Bandar Lampung</i>	<i>Balameka Pringtata</i>		
10	<i>Pekanbaru</i>	<i>Pekansikawan</i>		
11	<i>Padang</i>	<i>Palapa</i>		
12	<i>Malang</i>	<i>Malang Raya</i>		
13	<i>Samarinda</i>	<i>Sambo Tenggara</i>		
14	<i>Denpasar</i>	<i>Sarbagita</i>		
15	<i>Tasikmalaya</i>	<i>Priangan Timur</i>		
16	<i>Serang</i>	<i>Serang Raya</i>		
17	<i>Pontianak</i>	<i>Pomekurala</i>		
18	<i>Banjarmasin</i>	<i>Banjarbakula</i>		
19	<i>Surakarta</i>	<i>Solo Raya</i>		
20	<i>Mataram</i>	<i>Mataram Raya</i>		
21	<i>Manado</i>	<i>Birmindo</i>		

This study selects three cities out of approximately ten cities in Indonesia engaging in CLR. Apart from the criteria in Table 1, this study establishes Jakarta, as the former capital city of Indonesia and the first city to conduct reclamation; Makassar, which represents the only city with its city centre located in the

central business district on the Indonesian waterfront and undergoing reclamation; and Denpasar, as a case study due to its critical and controversial location concerning reclamation, considering the powerful Indigenous and cultural factors. Three case studies embody metropolitan or megapolitan city status, each with distinct geographical, social, and economic contexts, allowing for a comprehensive analysis of reclamation projects' diverse impacts and challenges. The outcome is highlighted:

1. Heterogeneous city: Jakarta, with a diverse population scale as megapolitan.
2. Mesogeneous city: Makassar, a metropolitan area of medium size in population composition.
3. Homogeneous city: Denpasar illustrates a metropolitan area characterized by a uniform population in terms of local values.



**Figure 1.** Map of Indonesia and Selected Cities.

The previous literature on reclamation in the three case studies has been presented separately in some references, mainly from marine and fisheries engineering perspectives and social and economic aspects, and typically focuses on individual case studies. There has not been any research comparing more than one or two reclamation projects, especially within the scope of spatial conflicts. As a result, this research can fill that gap by providing a detailed comparison among these CLR, examining their similarities and differences, which have not been undertaken before. This article provides an overview of the types of urban categories and the factors that contribute most to each case study, distinguishing them from other places' reclamation implementation in Indonesia.

This paper is structured: the subsequent part offers methods, followed by a literature review on reclamation efforts in Indonesia, focusing on three specific sites and the observed patterns in the reclamation process. Subsequently, we elaborate on the status of each city concerning its population and urban agglomeration, as well as the factors influencing reclamation. Finally, we present a conceptual framework for land reclamation in Indonesia based on city characteristics.

## 2. Methods

The methodology is qualitative, including socio-spatial and planning regulatory data. The method is a case study, with the case under investigation being the spaces that are reclaimed and their relationship with planning processes and social perspectives. This paper also uses a comprehensive review of policy, publicly available regulatory decisions, and public media addressing the developments and conflicts. Two of the reclamation projects (in Jakarta and Makassar) were visited for direct observation. Based on academic articles and online news, the literature review methodically collected and summarized existing literature into spatial planning with a socio-maritime scope, including Maritime Spatial Planning (MSP) and marine-eco-engineering. Specifically, several articles on project company websites, such as property



developers and global services providers operating locally or internationally in the maritime infrastructure and dredging services sectors, were identified and used.

The qualitative analytical method identifies recurring themes, patterns, and areas of knowledge gaps while abstaining from conducting fresh empirical studies. After scrutinizing articles from scholars in both English and Bahasa Indonesia sources, policies, and regulations, they were reviewed to eliminate irrelevant articles. All gathered data will then be classified based on reclamation project location and then extracted and analyzed using ATLAS.ti software. This software will highlight the keywords and significant information through Word cloud Verbatim, then appear in the network based on uploaded documents.

### 3. Spatial Conflict and Coastal Land Reclamation

Based on Gresch & Smith (1985), spatial conflicts may arise regarding the exact location of development, but their effects may extend to broader regional consequences. The peaceful utilization of space within a region is hindered when conflicting approaches to spatial control emerge, whether stemming from competing elites and counter-elites within a singular socio-spatial framework or across various socio-spatial systems led by distinct elite groups (Biagini, 1993). Land conversion and urban expansion can manifest in planning across multiple scales, ranging from regional issues triggered by individual spatial conflicts. Spatial conflict also represents the interactions between humans and their land and embodies a competitive process and a strategic allocation of spatial resources driven by their scarcity and the overflow of functions (Zheng et al., 2022). Areas that are highly accessible, such as the central districts of cities, zones in transition changing, and expanding areas needing land for diverse purposes, are susceptible to spatial conflicts. In Southeast Asia, coastal land reclamation reveals conflict at these scales. Massive reclamation activities have disturbed security, stability, and peace. On a large scale, in the South China Sea, for instance, China continues to build artificial islands in disputed areas where the Philippines, Taiwan, Malaysia, Vietnam, and Brunei also have claims. More widely, Dong et al., (2023) suggest that from 1990 to 2020, there was a notable increase in artificial surfaces, constituting 9.2% of the total area across SEA in port cities in coastal areas. The conversion of cultivated land emerged as the primary factor driving the substantial growth in artificial surface, both in terms of overall expansion and spatiotemporal alterations.

Additionally, CLR requires imports and movements of sand as the primary material, which has triggered conflicts across the region. For example, Singapore has significantly expanded its land, largely through sand sourced from neighbouring countries such as Malaysia, Indonesia, and Cambodia (Cipriani, 2022; Maru, 2023). The issue of private companies' sand extraction from Indonesia has resulted in ecological problems spilling over to Malaysia (Koh & Lin, 2006).

The discourse surrounding technology in CLR is significant for sustainable development and addressing environmental concerns. Several countries increasingly undertake reclamation through Coastal Dune Protection and Restoration and Integrated Coastal Zone Management (ICZM). In terms of material and method replacements, for example, Kitazume (2022) outlines the Tokyo Port project that utilized various materials, including dredged soil, waste, calcium, fly ash, and plastics, to replace conventional materials. In Palm Jumeirah, Dubai, the Integrated Greening of Grey infrastructure (IGGI) involves various techniques such as modifying the composition of building materials, transplanting organisms onto other substrates to gain multiple biodiversity benefits, and adding topographic complexity (Firth et al., 2020, 2024). Due to logistical and financial constraints, the IGGI experiments have been limited to a small scale in operational construction (Firth et al., 2024). Many coastal countries mandate the establishment and management of Marine Protected Areas (MPAs) as an effective tool for safeguarding biodiversity and supporting communities in CLR. Public participation in MPAs has effectively reduced conflicts and promoted sustainable management practices by empowering local communities and participatory planning. MSP is still in its early stages in SEA, with limited implementation.

The land reclamation process has also been significantly influenced by ethnic and community relationships, particularly regarding the relationships between indigenous peoples and new settlers, as seen in Malaysia and Taiwan. The history of land reclamation in Taiwan reflects the expansion of the Han Chinese population onto the island, resulting in the displacement and marginalization of Indigenous groups



(Chen, 1998). Meanwhile, in Malacca, the 'war of sand' is not just about acquiring real estate or resource procedures with severe ecological and environmental consequences but rather an implicit conflict targeting *Bumiputera* (Indigenous) and religious communities (Cipriani, 2022). The reclamation policy indicates coordination in both international and community engagement (Tarigan & Tirtamulia, 2023; Wilke, 2023). Japan's traditional knowledge system, known as "*satoumi*," combines local wisdom and scientific knowledge to manage coastal areas. Public participation has been presented in the scope of ASEAN since its formation in 1985 through the "ASEAN Agreement on the Conservation of Nature and Natural Resources". This policy regulates public involvement in environmental issues. The trend of GDP per capita is related to CLR reclamation while damaging coastal wetlands (Tian et al., 2016). In Malaysia, coastal communities face pollution, disrupted livelihoods, habitat loss, decreased biodiversity, landscape changes, erosion, tourism threats, and wave surges from land reclamation (Chee, 2023; Hossain et al., 2019). The coastal cities are particularly susceptible to environmental shifts that affect intricate socio-ecological systems (Abustan et al., 2023; Arifin et al., 2023). The lower socioeconomic status is further impacted by losing agricultural land and residential to erosion, hindering their ability to adapt due to limited resources and infrastructure and territorial disputes (Ritohardoyo et al., 2017; Sparke et al., 2004).

#### 4. Land Reclamation in Indonesia

CLR conflicts in Indonesia are vertical (government vs. community, central vs. regional) and horizontal (pro vs. contra communities, inter-agency conflicts). Authority disputes among agencies, such as the Ministry of Agrarian and Spatial Planning, the Ministry of Maritime Affairs, and the Ministry of Transportation, have emerged (Faiqotul Mutia et al., 2019; Mutia & Asteria, 2018; Mutia & Herdiansyah, 2019). In Indonesia, self-reliant community organizations and non-governmental organizations such as WALHI (Indonesia Forum for Environment) have actively raised public awareness of environmental policy and provided legal assistance for advocacy, including CLR, deforestation, and other harmful environmental practices. However, their efforts have been hindered by some who are opposed to development, even from communists. Additionally, the emergence of political ecology as a powerful force shaping public perceptions and actions in narratives and discourse about environmental problems serves to legitimize all involved actors, resulting in a slight difference in the outcomes between pro and contra-reclamation (Faiqotul Mutia et al., 2019).

##### 4.1 Jakarta Reclamation

Jakarta, Indonesia's capital city, is a megapolitan area influenced by two distinct urbanization processes. One process centre on the expansion of a dominant primate city, while the other involves the integration of smaller cities within the Jakarta-Bogor-Tangerang-Bekasi-Cianjur (Jabodetabekpunjur) area, each with relatively equal significance. This transition positions Jakarta to evolve into a megaregion akin to its global counterparts like Kuala Lumpur and Singapore. Based on (2015), megaregions are expansively urbanised areas driven by their size or global importance and intricate urban and power dynamics. Megapolitan regions represent integrated networks comprising principal cities, metropolitan areas, and micropolitan areas (Lang & Knox, 2009). Jakarta has a magnetic influence as a political hub, playing a crucial role in shaping the transformation of surrounding metropolitan areas and regencies.

As Jakarta experiences rapid urban growth, there is significant pressure to expand its land area to meet the needs of its exploding and growing population and infrastructure demands, which are closely connected to national and international hubs. Jakarta's strategic location creates reclamation in a crucial area for the region's development, facilitating international logistics connections and streamlining transportation networks. Conflicts of interest arise from the expectation that commercial and business areas will generate more revenue for the region despite the environmental and social issues raised in areas like North coastal Jakarta from 1985 to 2005, based on Spatial Plan DKI Jakarta. The first reclamation is situated at the intersection of port areas and informal settlement zones and is set to be developed into a luxurious district catering to the elite. The reclamation of Jakarta Bay's 17 islets is causing controversy as residents are excluded from the project. The emphasis on reclamation tends to prioritize economic growth over addressing ecological and social considerations, as demonstrated by the financial losses for marginalised

people such as fishermen due to the reduction of fishing zones and the increased poverty rate in waterfront settlements (Mutia & Asteria, 2018; Patawari et al., 2022), and disrupt marine biota (Adharani et al., 2019; Faiqotul Mutia et al., 2019). Land reclamation in Jakarta has detrimental impacts, such as water crises, flooding, and land subsidence, leading to economic problems (Abidin et al., 2011, 2015; Colven, 2023). The sinking of land in Jakarta can stem from four main factors: excessive withdrawal of groundwater, the weight of buildings and infrastructure, densely populated real estate development, the natural settling of alluvial soil, and tectonic movements. Even though tectonic activity appears to have the most minor influence, while excessive groundwater extraction is recognized as a significant contributing factor, all ecological effects correlate with post-construction reclamation (Abidin et al., 2011). The North Jakarta reclamation, part of the 2014 National Capital Integrated Coastal Development (NCICD) plan to combat land subsidence, became a major issue in the 2017 DKI Jakarta Governor Election when Anies Baswedan defeated incumbent Basuki Tjahaja Purnama by pledging to halt the project (Charles, 2018). Criticized for benefiting the wealthy and linked to a corruption scandal, the project faced significant controversy.



**Figure 2.** Existing and Proposed Jakarta CLR in Jabodetabekpunjur Megapolitan Areas (source of images: adapted from Google Earth, 2024).

#### 4.2 Makassar Reclamation

CLR in Makassar has been implemented in several areas, particularly along the west coast. Notably, the reclamation of Losari Beach commenced in 2003, followed by the reclamation of the Central Point of Indonesia beginning in 2013. The pattern and motive behind the reclamation in Makassar initially originated from government-led initiatives in the northern and western parts of the city. Government buildings under provincial authority will be constructed on the reclaimed land alongside high-end housing and associated facilities. Subsequently, private entities, including local and national entrepreneurs, took charge, seeking to acquire coastal land for both formal and informal residential areas. The process of urbanisation has accelerated informal settlement and, consequently, led to increased reclamation activities by communities. This is driven by the growing need for space to accommodate various activities and reshape the city's waterfront morphology. Reclamation is also justified to enhance community access to the sea and small islands. A linear promenade was initially established along the Losari Beach waterfront to facilitate local street vendors. However, it has since been extended through reclamation efforts, facilitating direct access to the water environment. The dredging company Boskalis was chosen for the project, but controversy arose regarding land acquisition issues within the Mamminasata Metropolitan Area and across provinces.

Despite the general understanding that natural elements like geomorphology, weather, vegetation, and artificial factors such as policies, institutions, socio-economics, and technology often influence land-use changes, highlight specific factors along the Makassar coastline (Maulana et al., 2023; Xu et al., 2021). The noticeable accumulation of quickly settling organic matter is influenced by water currents that cannot transport it far into the sea. This phenomenon is also affected by bathymetry, aquatic substrates, human activities, and aquatic vegetation. Initially, autonomous governance from provincial and city governments played a significant role, with a heightened focus on all reclamation actors. However, attention gradually diminished over time due to internal disputes among agencies related to policy and decision-making

involving private property companies. Consequently, some land reclamation projects have experienced delays, and others have been indefinitely halted.

The issue of displacement is not as widespread as in Jakarta because Losari remains a public space that stretches towards the sea, serving as a gathering place for locals. However, the threat to local livelihoods remains significant, especially for jobs like fishermen, shellfish farmers, and street vendors. As compensation for the economic development mainly targeting the upper-middle class, high-rise apartments like Lette public rental flats are provided for housing allocation.



**Figure 3.** Current and Proposed Makassar CLR in Mamminasta Metropolitan Areas  
(Source of images: Google Earth, 2024).

### 4.3 Denpasar Reclamation

The Coastal Land Reclamation (CLR) started in 2012 as part of projects such as the construction of highways and other facilities, as Bali was designated a focal point for tourism in Indonesia's development master plan. CLR led to protests by the Bali People's Forum to Reject Reclamation. Known as Ngurek, these protests symbolize sacrifice for a higher purpose, similar to Puputan battles in Balinese history. Moreover, Bali's status as a premier tourist destination has intensified local community opposition to reclamation projects, which conflict with local religious and cultural beliefs. Today, the Balinese people are determined to fight against investors seeking to develop Benoa Bay, covering 1,988 hectares, which holds strategic importance for tourism and politics, situated in the 'golden triangle' linking Sanur, Kuta, and Nusa Dua. This resistance represents a modern-day puputan, echoing historic battles against colonial rule. The Benoa Bay reclamation project has drawn public attention, with several community groups opposing it due to concerns about potential flooding in fishing villages. Demands to halt the reclamation plan involve calls to revoke the Presidential Regulation (Perpres) No. 51/2014, signed by former President Susilo Bambang Yudhoyono. This regulation changed Benoa Bay's status from a conservation area to an economic and tourism zone. Benoa Bay is a significant investment focus within the Masterplan for the Acceleration and Expansion of Indonesia's Economic Development (MP3EI), identified as part of the Economic Corridor for Bali and Nusa Tenggara.

According to Wisha et al., (2018), reclamation projects affected seawater flow patterns, with simulations showing a decline in 2016 compared to the stable flow in 1995. Apart from environmental issues, the most distinctive aspect of reclamation in Bali lies in the integration of religious and cultural elements, called the "anti-reclamation movement," drawing upon religious and cultural values as new colonialism. The movement eventually embraced Balinese identity as a unifying force, transcending class, and regional divisions to mobilize widespread opposition to reclamation projects. The highlights of the environmental, economic, and social impacts of reclamation, led to significant protests representing a supermajority of Balinese. The movement's success challenges the notion that ethnic identity only gains political significance when it forms minimum winning coalitions, showcasing the power of collective identity in shaping political action (Tans, 2021). Furthermore, reclamation in Bali has become a subject of art linked to the development of a civilization that indicates green governmentality (Wittesaele, 2021).

Based on Cipriani, (2022) and Simic (2020), the local community embraces various 'spaces' and levels of coastal reclamation, often dealing with insufficient potential across different periods, ranging from traditional city development, modernism, and contemporary times, each having distinct meanings for the acquisition process: 1) they physically reclaim the site, 2) they reclaim the right to a space for all, not just for the interests of a few, and 3) they reclaim their own racial, religious, cultural and political systems and identities. The reclamation plan aims to generate profit by creating new land for development, benefiting large investors with exclusive areas. Waterfront areas face issues related to underutilization across various periods, whether traditional, modern, or contemporary urban contexts.

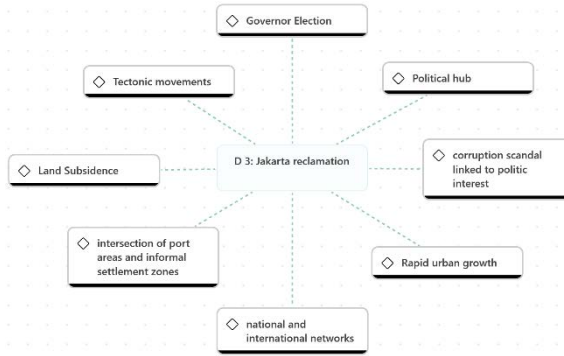
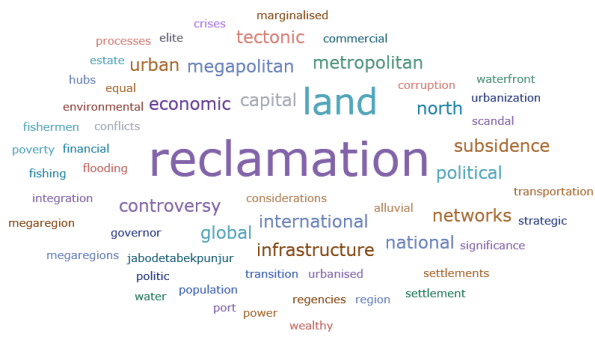
The controversial CLR project poses a significant threat to traditional cultural holy sites, encompassing 60 sacred, 30 Indigenous villages with unique religious rituals and customs practised in surrounding villages (Ardhana & Farhaeni, 2017; Subekti et al., 2020). The Benoa reclamation plan contradicts the Tri Hita Karana principle, cherished by the Hindu community. This concept emphasizes the harmonious relationship between humans and other humans (Pawongan), humans and God (Parahyangan), and humans and nature (Palemahan). The reclamation enables ritual land, contrary to the philosophy of Rta (Natural Law) - a buffer of the world in Balinese Hinduism (Subekti et al., 2020). In sum, the reclamation response in Bali is an application of bio-social entities, which presents the involvement of planetary urbanism encompassing natural materials, earth, and local culture (Catterall, 2014).



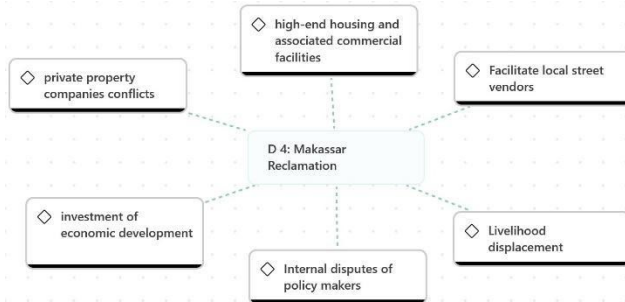
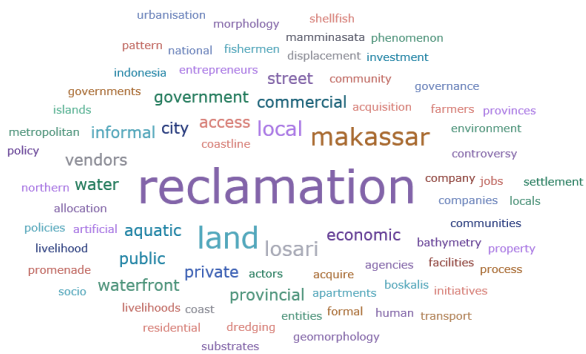
**Figure 4.** Existing and proposed Bali CLR in Sarbagita Metropolitan Areas  
(Source of image: Google Earth, 2024).

#### 4. Results

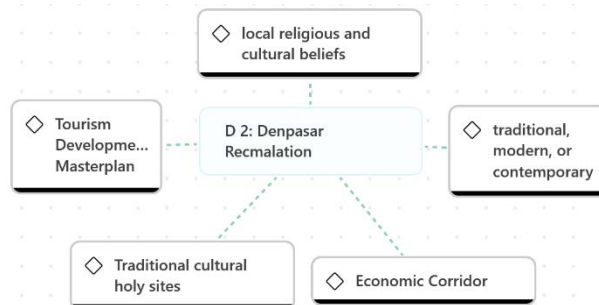
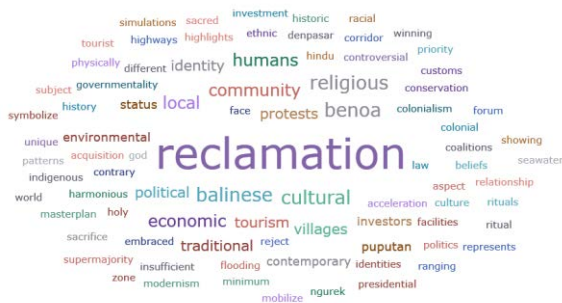
The presence of CLR in various cities in Indonesia is closely related to urbanization. Urbanisation indicates that politics influence space and becomes transactional for the stakeholders involved. This systematic approach reflects the conflicts arising from horizontal interactions among regional agglomerations, including municipal and district scales within megapolitan or metropolitan areas, and vertical interactions between central policymakers and local governments. The city is the medium for contestation with its complex relations between social and spatial forms (Gibson, 2023; W. Soja, 2014). According to Chang & Huang, (2011), there are three critical elements of reclamation: access, land use functionality, and local symbol or identity—vital elements for other cities undergoing inevitable transformation. The city transformation in megapolitan, or metropolitan urbanisation marks a unique stage in the evolution of industrial capitalist cities as land reclamation practices. Urbanisation driving CLR is an accumulation of mega and metropolitan areas. Based on the literature review, each case study has its own highlights. The results of this literature review are summarized in a verbatim word cloud analysis that identifies key terms and then highlights the factors most influential in CLR.



a. Jakarta Reclamation



b. Makassar Reclamation



c. Denpasar Reclamation

Figure 5. Word Cloud Verbatim and Atlas Analysis from Literature Review.

Table 2: Metropolitan Areas and CLR Case Studies. Source: compiled by the authors 2024.

Case Studies	Metropolitan Areas	Area (km <sup>2</sup> )	Estimated Population	Estimated Land Reclamation		
				Locations	Coast Line (km)	Reclamation Area (ha)
Jakarta	Jabodetabekpunjur <ul style="list-style-type: none"> <li>● Special Capital Jakarta</li> <li>● City of Bogor-City of Depok</li> <li>● City of South Tangerang</li> <li>● Bekasi Regency</li> <li>● Cianjur Regency</li> <li>● Tangerang Regency</li> </ul>	7,062.47	33,430,285	<ul style="list-style-type: none"> <li>● Special Capital Jakarta</li> <li>● Tangerang Regency</li> </ul>	120	5100
Makassar	Mamminasata <ul style="list-style-type: none"> <li>● City of Makassar</li> <li>● Gowa Regency</li> <li>● Maros Regency</li> <li>● Takalar Regency</li> </ul>	2,667	2,621,168	<ul style="list-style-type: none"> <li>● City of Makassar</li> </ul>	100	157
Denpasar	Sarbagita <ul style="list-style-type: none"> <li>● City of Denpasar</li> <li>● Badung Regency</li> <li>● Gianyar Regency</li> <li>● Tabanan Regency</li> </ul>	732.67	2,388,680	<ul style="list-style-type: none"> <li>● City of Badung</li> <li>● Badung Regency</li> </ul>	633.35	1998



Table 2 depicts Jakarta's extensive metropolitan area, Jabodetabekpunjur, based on Presidential Regulation 54/2008, including five satellite cities and three regencies in West Java Province and South Tangerang Province. With a population exceeding 33 million and categorized as a megapolitan area, this urban agglomeration underscores the intensity of urbanization and spatial conflicts within Jakarta and its neighbouring areas. The issues of CLR encompass a range of complexities, from governance and economic viability to environmental sustainability and diplomatic relations even before and after the relocation of Indonesia's capital city.

With a population exceeding 2.6 million as a metropolitan city, Makassar underscores the significant demographic concentration amidst ongoing reclamation projects along the coastal areas scattered in three neighbourhood regencies from *Mamminasata* Metropolitan Areas, namely Sungguminasati-Gowa Regencies, Maros City-Maros Regency and Takalar City-Takalar Regency. Despite being dominated by Bugis and Makassar ethnic groups, the influx of urbanisation has transformed this city into a metropolitan area in population scale, size and infrastructure availability, driving spatial dynamics that reflect the interplay between urbanization and cultural heritage. Its status as the largest city in the eastern region of Indonesia has made it a key economic driver for the surrounding area, particularly through the expansion of reclaimed land with the development of Meetings, Incentives, Conferences, and Exhibitions (MICE) activities, which collectively represent the convention and events industry. However, this growth is not accompanied by clarity regarding who is responsible for the reclamation efforts undertaken by both private and public sectors. The Denpasar metropolitan area, known as Sarbagita, encompasses the city of Denpasar and neighbouring regencies like Badung, Gianyar, and Tabanan, which feature a robust tourism industry. With a population of over 2.3 million, the region is shaped by the dominance of Indigenous customs and traditions, particularly among the strong-rooted ethnic groups, contributing significantly to the urbanization process in Denpasar City and Badung regency, priority areas for coastal reclamation projects.

## 5. Discussion

The pace of urbanization increasingly influences the acceleration of spatial needs for living, resulting in the creation of new spaces for activities such as land reclamation occurring not only in megapolitan and metropolitan areas but also extending to the scale of districts, which can be termed micropolitan, signifying the transition from rural to urban areas. The three case studies involve private and government actors, posing challenges for government intervention due to personal connections, including family or colleagues, with local authorities. Policies and regulations regarding reclamation have sparked disputes among various departments within ministries, provincial governments, and municipal governments.

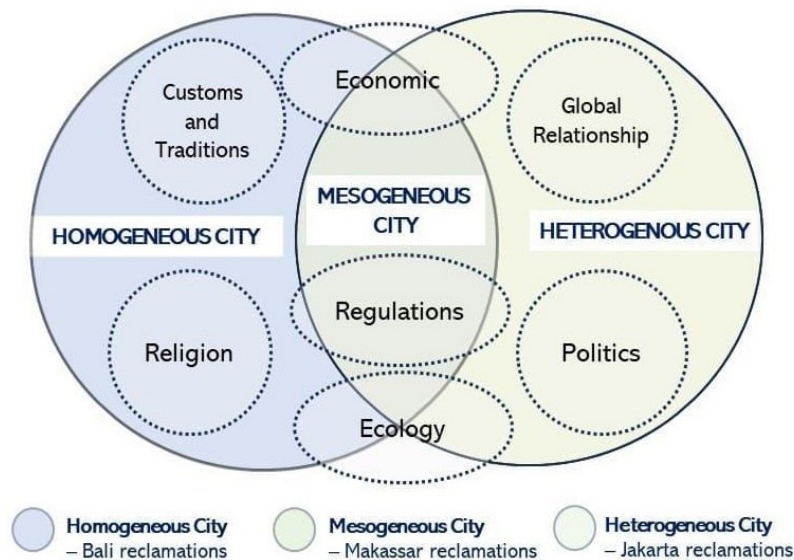
The trend of mega projects, such as reclamation, often arises from fear, especially when conducted without transparency in scientific processes, and can harm residents' livelihoods (Baba et al., 2023). It continues to unfold in Indonesia, extending beyond megapolitan and metropolitan cities to encompass secondary urban centers. Jakarta stands as an initial case study, revealing the intricate dominant factors and effects of reclamation, which proves challenging due to its status as the capital city and the surrounding conurbation, making it a victim of political agreements. The city's heterogeneous, pluralistic, and religiously diverse further complicates matters, turning every space into a contested arena. The population and ethnic configuration of Jakarta were documented, and Jakarta was home to at least seven prominent ethnic types.

In Makassar, reclamation efforts have primarily been initiated by the government despite ample undeveloped lands in the Southern areas capable of meeting land use requirements. The delineation of coastal land targeted for reclamation remains ambiguous. Environmental concerns regarding reclamation are shared among districts on the coast and small islands. The boundaries of territories pose challenges in determining the location of reclamation and the pivotal roles of the agencies involved. This reality aligns with what Elden, (2010); Paasi, (2009); and Storey (2018) stated about territory networks. Although Makassar appears ethnically diverse, its population primarily comprises ethnic groups native to the Sulawesi islands, notably the Makassar and Bugis, with smaller representations from other Sulawesi-based

ethnicities like Toraja, Mandar, and Buton, among others. This diversity falls between heterogeneous and homogeneous, with social and territorial boundaries still manageable.

In Bali, where cultural heritage and tourism are paramount, reclamation efforts must balance economic gains with preserving indigenous customs and traditions. Similarly, in Jakarta, conflicts over reclamation projects highlight the importance of considering public access to coastal zones amidst rapid urban expansion. Meanwhile, the transformation into a metropolitan area in Makassar underscores the need to safeguard local identity while addressing the economic imperative driving land reclamation initiatives.

CLR in Bali is deemed necessary, given its status as a premier tourism destination. However, the situation is exacerbated by the ownership of reclaimed lands falling into the hands of foreign investors, particularly international companies, despite regulations governing ownership percentages. In Bali, renowned as a representative of Hindu religions in Indonesia, local communities have the privilege of spearheading development projects. Most of Bali's population is of Balinese ethnicity, with approximately 86% adhering to the Hindu religion. The significant influence of social media as a response reclamation is the highest authority in halting any endeavours deemed inappropriate with religious principles. This reflects a homogenous principle, given Bali's status as the only province with a predominantly Hindu population. Based on the discussion, Figure 6 illustrates the connections between the criteria selected for the chosen CLR case studies.



**Figure 6.** Urban Character, Scale, and Land Reclamation Factors.

CLR in Indonesia is primarily driven by the urgent need for infrastructure development to cope with land scarcity and population growth. The lack of a specific sustainable reclamation model, especially in Jakarta, exacerbates environmental challenges (Azwar et al., 2013). Unplanned and poorly executed initiatives in Bali and Makassar highlight the absence of government oversight, leading to detrimental future consequences in spatial planning. The unique challenges in SEA stem from a combination of factors such as diverse ethnicity, varied landscapes, and limited resources, making it difficult to establish standardized policies for CLR. In SEA, political motives often drive reclamation efforts, unlike in Western countries where local traditional or cultural elements have limited influence due to stringent adherence to environmental, engineering, and economic considerations. Projects in cities like Jakarta become tools for political campaigns, resulting in biased decision-making processes that neglect environmental concerns. In developed countries, conflicts related to local fishermen are less common, as reclamation projects are typically executed with thorough consideration of environmental impact assessments, engineering feasibility, and livelihood. However, in Asia, local fishermen often oppose such projects, fearing harm to their catch and increased transportation costs due to travelling further out to sea. Religion plays a minimal role in Western countries' reclamation due to the separation of religion and state; decisions are based on technical, economic, and environmental factors. In contrast, in SEA, where cultural and religious factors often influence decision-making, the lack of standardized policies exacerbates challenges in balancing



economic development with environmental sustainability in coastal land reclamation. Despite differing approaches, Western countries and SEA nations both prioritize economic development. They share concerns for environmental sustainability, although emphasis varies, with both regions recognizing the need for regulation. Additionally, political influence, complex decision-making processes, and opposition from local communities are common challenges in both Western and SEA contexts.

## 6. Conclusion

CLR poses challenges and requires varied approaches across various areas. In Indonesia, the absence of standardized policies and the constraints of politics and budgets hinder the effective implementation of sustainable reclamation practices. In the context of the three case studies in Bali, Jakarta, and Makassar, the significance of land reclamation extends beyond mere economic development. These projects profoundly impact land use functionality, public access to coastal areas, and the preservation of local identity. In Jakarta, a megapolitan city, reclamation is mainly driven by political and economic factors. In Makassar, a metropolitan area with diverse populations, economic considerations are prioritized, but there is uncertainty regarding legal responsibilities. In Bali, cultural and religious factors intertwine with spatial considerations, influencing the discourse on reclamation and its impact on spatial character. In future research, we can improve upon this aspect by conducting a more comprehensive analysis, ranging from the regional scale of SEA to individual countries and then down to the micro-scale of cities. This research has limitations due to its broad scope and could benefit from more detailed exploration in maritime studies, urban governance, law, and quantitative simulation informatics. A more focused approach would offer deeper insights into land reclamation's specific dynamics and impacts.

## Acknowledgments

The first author would like to thank the School of Global, Urban, and Social Studies, RMIT University, and Future Earth Australia (FEA).

## Funding

This research is funded by the Indonesian Education Scholarship (BPI), Ministry of Education, Culture, Research, and Technology.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

## Institutional Review Board Statement

Not applicable.

## CRedit author statement

Conceptualization: K.N., A.B., S.H., M.V. Data curation: K.N., A.B., S.H., and M.V. Formal analysis: K.N., A.B., S.H., M.V. Funding acquisition: K.N., A.B. Investigation: K.N., A.B., S.H., M.V. Methodology: K.N., A.B., S. H., M.V. Project administration: K.N. Writing—original draft: K.N., A.B., S.H., M.V. Writing—review and editing: K.N., A.B., S.H., M.V. All authors have read and agreed to the published version of the manuscript.



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**How to cite this article:**

Nur, K., Butt, A., Ho, S., & Vahanvati, M. (2024). How Urbanization Drives Socio-spatial Conflicts in Coastal Land Reclamation. *Journal of Contemporary Urban Affairs*, 8(2), 289–304. <https://doi.org/10.25034/jcua.2024.v8n2-1>



Original scientific paper

# The Role of Users' Socio-spatial Behaviour in Fostering Sustainable Retail District Projects in Bahrain

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## ARTICLE INFO:

### Article History:

Received: 14 June 2024  
Revised: 18 August 2024  
Accepted: 15 August 2024  
Available online: 5 September 2024

### Keywords:

Social Sustainability,  
Retail Districts,  
Vitality,  
Human Behaviour,  
Urban Design,  
Bahrain.

## ABSTRACT

*This study examines users' socio-spatial behaviour in promoting sustainable retail district projects in Bahrain. It evaluates how customer behaviour and movement impact the social sustainability of contemporary open-space shopping districts. By employing qualitative methods such as questionnaires, on-site observations, and expert interviews, this study investigates factors influencing consumer preferences and attractions to shopping districts. Findings reveal that the vitality of shopping districts is closely linked to meeting users' needs, which fosters social sustainability. The study identifies key elements for a framework that can integrate social sustainability measures into shopping district designs. This framework aims to support stakeholders and designers in planning sustainable commercial projects in Bahrain, ensuring long-term success and vitality. Research highlights the importance of considering socio-spatial interactions in retail environments to enhance livability and user experience. By understanding these dynamics, designers can create retail districts that not only attract consumers but also contribute to the well-being and sustainability of the community. Insights gained from this study can guide the development of future retail projects, emphasizing the significance of socio-spatial behaviour in achieving sustainable urban design and planning.*

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 305–323.

<https://doi.org/10.25034/ijcua.2024.v8n2-2>

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### Highlights:

- Social sustainability plays a great role in the vitality of shopping districts in Bahrain.
- Employing a SWOT Analysis on the selected case studies can determine factors affecting the projects' social sustainability.
- The quality of the spatial design and the comfort considerations in the space can contribute to the project's success.
- The paper highlights factors that encourage the connection between people and space.
- The findings contribute in developing a framework of criteria to successfully achieve socially sustainable retail projects.

### Contribution to the field statement:

The goal of this research is to evaluate the social sustainability of commercial district designs by closely analysing consumer behaviour in Bahrain's modern open-space shopping areas. The findings emphasize the socio-spatial interaction and important role in the sustainability of shopping districts, which could assist stakeholders and designers in creating a framework that would promote the sustainable planning of Bahrain's new commercial projects and ensure its vitality.

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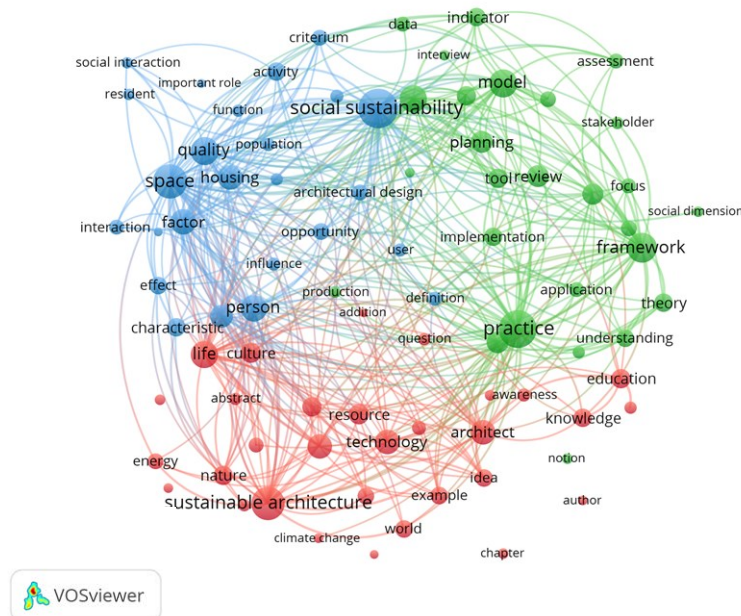
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### How to cite this article:

Mohamed, A. E., & Allani, N. (2024). The Role of Users' Socio-spatial Behaviour in Fostering Sustainable Retail District Projects in Bahrain. *Journal of Contemporary Urban Affairs*, 8(2), 305–323. <https://doi.org/10.25034/ijcua.2024.v8n2-2>

## 1. Introduction

Developments for commercial districts are a part of a vibrant city. Numerous variables might have an impact on an architectural project's success. Many obstacles, such as those related to cost, time, and performance, might prevent these projects from achieving their goals (Beleiu et al., 2015). Previous studies have shown that a project's social dimensions are one of the main factors impacting its performance (Rausell-Köster et al., 2022). According to Lotfata & Ataöv (2020), even though social issues are crucial to a project's success, the sustainability agenda did not incorporate them until the late 1990s. The popularity and profitability of the project are boosted by the social significance of these commercial areas which entails a sustainable project (Baghaee et al., 2020). The relationship between the built environment and social sustainability is the subject of numerous research that attempt to explore its applications in the literature (Figure 1), intending to connect social and spatial identities to enhance the quality of social and human life and its impact on sustainable architecture (Viry et al., 2022). Accordingly, social sustainability is a method for developing thriving, long-lasting communities that enhance well-being by considering the needs and desires of the residents for their way of life (Winston, 2022). This study suggests addressing the gap in knowledge found in the literature by identifying a project's social sustainability components that can serve as a barometer for Bahrain's retail districts' performance. This study aims to address the following queries: Are commercial/shopping projects socially sustainable? What factors influence the architectural design's effectiveness of shopping districts to make it a long-term societally viable project?



**Figure 1.** Co-occurrence analysis of keywords using VOSviewer.

The findings of this research can contribute to creating a framework for measuring social sustainability that will allow the stakeholders to assess community health and quality of life in the context of Bahrain's new commercial districts' sustainable design (Liu et al., 2020). To do this, the study looks at how shoppers behave in Bahrain's contemporary shopping locations in terms of their socio-spatial behaviour within the built environment. The following sections demonstrate the extensive analysis applied of people's attitudes and behaviours in these open-space shopping areas to address this issue. In order to achieve this, A thorough analysis of the literature on a basic concept regarding the social sustainability of urban retail projects forms the basis of the study. Additionally, survey research was conducted to examine and assess the socio-spatial characteristics of Bahrain's retail areas on a local level. As a result, information was gathered and participants' experiences were integrated into their cognitive processes through the use of questionnaires, in-depth interviews with experts, and on-site observation.

## 2. Theoretical Background

### 2.1 What is social sustainability?

It is imperative to understand the meaning of social sustainability to be able to measure its impact on the sustainability of a project. Bahrain is one of the countries that follow the Sustainable Development Goals (SDGs) (Ministry of Sustainable Development, 2022) which are contained in the United Nations Agenda 2030 to measure and track sustainable social, economic, and environmental development in all nations (United Nation, 2015). The objective is to track advancements and be the leader in global sustainable development. Specifically, (SDG11) measures sustainable development inside cities, with an emphasis on the urban setting. To achieve these goals through economic development that satisfies present demands without jeopardizing the ability of future generations to satisfy their own, numerous earlier research and studies have attempted to define sustainable development in a way that stresses “human livelihoods” (Chaigneau et al., 2022). The social aspect was introduced after numerous discussions of sustainability, especially due to the focus of public and governmental concerns on climate change, sociology has been ignored in professional social scientific circles (Eizenberg & Jabareen, 2017).

According to Mehan & Soflaei (2017), social sustainability is the process of figuring out what people require from their places of employment and residence to build successful, sustainable environments that improve well-being. It combines the social and physical worlds' designs, offering social amenities, a structure for cultural and social life, ways for citizens to get involved, and flexibility for places and people to adapt throughout time. There aren't many useful materials that specifically answer the issue raised by Woodcraft (2015) "How can we develop locations that are socially sustainable?" There are a few shared traits that other definitions of the literature on social sustainability point to. The first Factor is future focus. Research suggests that the main goals of social sustainability are to uphold the existing conditions, which include people, communities, and societies, while also valuing and safeguarding the positive aspects of cultures for future generations. The second factor is the satisfaction of needs, which includes basic needs and access to resources. It is related to both humans and society, whether at the individual level or social as well as physiological following Maslow's hierarchy of needs (Hale et al., 2019). A third factor is an urban unit that is both physically and socially cohesive. It focuses on both the individual and relational facets of society. The importance of the interactions between the social and physical worlds has grown in recent decades (Shirazi & Keivani, 2017).

### 2.2. Social Sustainability and Built Environment

Sustainability is a major issue in architecture and urban planning. It is defined by a variety of (social, environmental, and economic) components that address a variety of frequently conflicting goals. This is to suitably satisfy every requirement of intricate urban and architectural projects (Lami & Mecca, 2021). Of the three aspects of sustainable development, social sustainability is the least researched and understood, but since the turn of the twenty-first century, it has been recognized as an essential part of sustainability in the built environment (Costa et al., 2019). Multidisciplinary research has spent the last half-century concentrating on increasing the efficiency, equity, and sustainability of cities; one major challenge is encouraging cities to become more competitive while maintaining a focus on the welfare of citizens within a framework of sustainable development (Sugandha et al., 2022). Taiwo et al. (2021) believes that an architect can recognize a range of social sustainability indicators and apply them as tactics to keep the project succeeding. These signals could result in the provision of healthy and safe environments as well as the adherence to moral standards that should be upheld throughout the recommended design. Spaces ought to be adaptable and designed with the user's needs in mind. It is important to preserve the region's history and culture (Emekci, 2023), and ensure that users may access infrastructure services and be integrated into the local setting.

To determine the architectural needs for social sustainability, a thorough examination of the relationship between people and space in society is necessary. According to Norberg-Schulz (1980), a sense of place refers to what makes a particular place unique and deserving of protection beyond its outwardly visible characteristics. The bond between the individual and the place is a result of Knowledge, feelings, beliefs, and behaviours (Ujang, 2017). Because human behaviour tends to occur in places and settings that offer opportunities for interactions, architectural and urban spaces are essential hubs for the growth and achievement of social sustainability (Ibrahim & Mikhail, 2016). Social sustainability in architecture

aims to create planned environments that foster social interaction, equity, and inclusion (Santi et al., 2019). It entails developing surroundings that promote human health and well-being and improve community quality of life (Stokmane, 2021; Yıldız et al., 2020). It is becoming more obvious that social and cultural components of the built environment must also be considered in sustainable design to guarantee that buildings and spaces are designed with people and communities in mind (Yıldız et al., 2020). Designing spaces that promote social interaction and connection is essential to social sustainability in architecture, according to (Netto et al., 2019). This means designing spaces that encourage congregating, mingling, and collaboration by creating spaces that offer opportunities for civic involvement and engagement (Agboola et al., 2018).

A "sustainable" relationship between the built environment and people is characterized as architecture that integrates human behaviour into its design and creates spaces that are as long-lastingly compatible with human behaviour and lifestyles (Kefayati & Moztafzadeh, 2015). Developing physically appealing areas that satisfy the environmental, social, and commercial requirements of their surroundings is a prerequisite for developing socially viable environments (John-Nsa et al., 2023). By putting people and communities first and working with local stakeholders, architects may create places and structures that are not just environmentally sustainable but also socially and psychologically healthy (Sadri, 2019). This will ensure the vitality of the built environment making it more desirable and creating an attachment to the place that offers social activities and encourages cultural exchange (Hajialiakbari et al., 2021). According to Lynch (1961), Vitality is recognized as one of the indicators of a sustainable urban design in which it integrates performance and human needs, which can be measured by the pedestrian flows in the space that if not achieved successfully will reflect in the image of the place being undesirable (Li et al., 2024). The more the flow, the more the space is alive (Zhang et al., 2024).

### 2.3. Retail Development

One of the most important social activities of our day is shopping. The retail industry is incredibly dynamic. Its evolution is evident in many different ways, and over the past few decades, numerous experts have tried to focus their studies on these changes. One of the most important aspects of how people interact, consume, and exchange value is the retail sector (Askholm & Gram-Hanssen, 2022). Retail has always been one of the most popular urban activities, therefore what may attract customers the most are the amenities and services they offer. Apart from urban growth, human development is reflected in the social component (D'Auria et al., 2018). With the increased recreational offerings that most shopping malls currently provide, their influence on our culture is expanding. As a result, malls that were once primarily used for business are now regarded as recreational spaces. The world of retail establishments affects people's shopping behaviour. The retail industry's utility can be characterized by several factors, such as shop count, diversity of retailers, accessibility, scale, and travel time (Baghaee et al., 2020). Retail settings offer a great way to research consumer behaviour as well as the physical and social aspects that characterize a community; these in turn influence the characteristics of the area. According to Maria Soares & Georges Elmashhara (2020), shopping is a meaningful experience that is permeated with social and emotional aspects that are overlooked in traditional consumer research that emphasizes objective factors like time and location.

The importance of storefront retail stems from its ability to promote social interaction, pedestrian-oriented urban design, and street life (Talen & Park, 2021). It is necessary to ascertain the preferences of consumers, their location, and their ability to pay for the merchandise before attempting to find retail locations. Consequently, the majority of shopping complexes are constructed near their target clientele, typically in outlying areas. According to social sustainability, locational disadvantages constitute a kind of social exclusion and have to be reduced. Howard & Stobart (2018) determined in their study that many city centre retail markets are no longer as desirable as they once were for both customers and businesses looking for places to open stores. Thus, maintaining social vibrancy in neighbourhood shopping areas and promoting social inclusion should be key objectives of a successful retail policy. The traditional urban retail systems are changing due to the emergence of new retail forms, which are also challenging the current retail hierarchies in shopping centres (Guimarães, 2023). From the beginning of the 20th century, malls have changed, introducing social and recreational activities along

with new shopping trends. Today, they serve as venues for engaging in interactions between store owners and their patrons.

In the old days, traditional markets, known as souqs, were a social destination more than for shopping. A place where people meet and socialize on a daily basis making it a part of their daily lives activity (Khan et al., 2021). (Elsayed et al., 2019) highlighted the factors that make the significance of traditional markets. Due to the market's harmony and compatibility as well as its synergistic relationships with adjacent city center uses, a synergy is found between various functional uses in historic marketplaces. Creating a space that won't draw people is a challenging task. Though traditional public squares encourage a great deal of social contact, the new design strategy for commercial districts inspired by traditional marketplaces should aim to create communal areas that are economically, socially, and environmentally sustainable. There is proof that traditional markets have a host of social issues when there are insufficient local resources, services, and community support.

Arabs have used traditional shopping settings to satisfy their social, psychological, and economic requirements. These settings are crucial to Arab and Islamic cities, serving as the city's centre. In the research done by Qualizza & de Luca (2022), the modern shopping environment is found to be integrating the traditional city centre where people gather daily, and exchange experiences, with the complex virtual and physical infrastructure networks. The physical and geographical layout of towns all across the world, including the Arabian Peninsula, usually centres around marketplaces. The souqs are public pedestrian markets featuring plazas, arcades, and numerous stores where people typically gather to trade goods, mingle, and stroll. As urban populations increased, souqs moved from beyond city walls to city cores. In Islamic nations, the Friday Mosque typically serves as the hub of the town, and the nearby souqs are a crucial location for daily activities (Major & Tannous, 2020).

Since the start of urbanization, souqs have fulfilled the role of being the centre of communication and trade throughout the Arabian Peninsula because they enable both scheduled and unplanned encounters among a range of urban users, souqs continue to address social, economic, and cultural needs, leading many to conclude that they are crucial to the long-term health of Middle Eastern cities (AL-Habsi, 2023). Urban morphogenesis and souqs' socioeconomic sustainability are linked, as modern growth in many of these places has taken away the traditional urban fabric. The spaces found in souqs usually serve a wide range of people's demands for social interactions, financial transactions, and random encounters in daily communal life. These kinds of places can provide civic value to foster a feeling of community and raise the bar for urban space to support the growth of sustainable cities (Major & Tannous, 2020).

#### **2.4. Commercial Development in Bahrain**

The Bahraini market is distinguished by a sophisticated customer base that is increasingly drawn to individualized and immersive purchasing experiences. E-commerce has grown significantly as a result of shifting consumer preferences for convenience and online purchasing, with online merchants and delivery services prospering. The growth of digital payment methods and e-commerce was also further accelerated by the COVID-19 pandemic, as many consumers shifted to online purchasing due to its convenience and security (Gu et al., 2021). People have been drawn to outdoor retail shopping because it is believed to be safer during a pandemic. To satisfy customers and contribute to a sustainable future, the retail sector needs to adopt eco-friendly procedures. One major issue that still has to be addressed is how to reconcile sustainability with environmental difficulties.

According to 6Wresearch (2023), several significant growth factors are driving the retail market in Bahrain. First, efforts by the government to diversify the economy, encourage foreign investment and strengthen the tourism industry have created a favourable environment for retail expansion. Second, because of economic growth and a thriving expat community, the population's increasing disposable income and purchasing power are driving consumer consumption. Thirdly, the popularity of malls and retail centres has grown, drawing in customers with a wide range of shopping experiences from local and international stores to high-end luxury labels. Together, these elements support Bahrain's retail market's continuous expansion.

The retail industry in Bahrain has shown resilience and adaptability. Among hundreds of shopping destinations across the country, there is a changing retail environment marked by the development of modern shopping districts like the Sa'ada Waterfront Project, Juffair Square, and Al Liwan mixed-use project, coexisting with historic souqs like Souq Al Qaisarya, one of the oldest parts of Muharraq, which

used to have shops selling everything from pearls and other jewellery to spices and teas, turning it into a well-liked social hub for both residents and visitors. By examining user socio-spatial behaviour and investigating the factors that make some shopping district projects more appealing to users than others, this study seeks to evaluate the social sustainability of these projects.

### 3. Material and Methods

It is imperative to examine consumer behaviour in Bahrain's modern shopping centres to measure the impact of their socio-spatial behaviour within the built environment on the vitality of the space. This will allow stakeholders to assess the quality of life and community health within the framework of sustainable design for Bahrain's new commercial districts. Through a thorough examination of the attitudes and actions of people in Bahrain's contemporary shopping districts, this study seeks to find answers to questions through the study design such as: Do current retail spaces give adequate utility to improve the social conditions of our city and community? For an architectural design to be a long-term, socially feasible project, what design aspects are necessary? To what extent do consumers think that shopping in retail districts is welcoming and comfortable? The exploratory nature of all these questions supports the choice to use a qualitative approach as one of the methods to develop the research questions that will be investigated and refined during the process Mason (2002). Qualitative research is exploratory, flexible, data-driven, and context-sensitive, according to her description. However, integrating quantitative in the qualitative research processes, to attain the understanding that will also be employed in expressing the human experience (Creswell, 2024). Two projects were chosen as case studies based on the participant's responses to the questionnaire, and a cross-method triangulation of qualitative and quantitative approaches was used to assess the critical components that impacted the vitality of both spaces. To meet the research goals, the research methodology is broken down into three sections (Figure 2a). In the first stage, a qualitative approach based on the literature review, five key indicators were set as criteria for social sustainability assessment for architectural projects as suggested by (Kefayati & Moztarzadeh, 2015) which are used in the analysis of the case studies in the third stage of the research methodology (See Table 4). The demographic questions pertaining to the participants in this stage of the study, which help the qualitative research by providing more context, illustrate the quantitative approach's presence in this stage. The second stage uses a qualitative method which includes in-depth expert interviews were primarily intended as a way to interact with representatives of professional stakeholders to provide further insights, contextualize the results, and reinforce any possible connections between the experiences of users and practice. This is followed by an analysis of the spatial characteristics of the projects selected as case studies conducted through on-site observations. The third part with a qualitative approach aims at interpretation, data analysis, and integration of SWOT analysis (Figure 2b) to assess the social sustainability of the selected case studies.

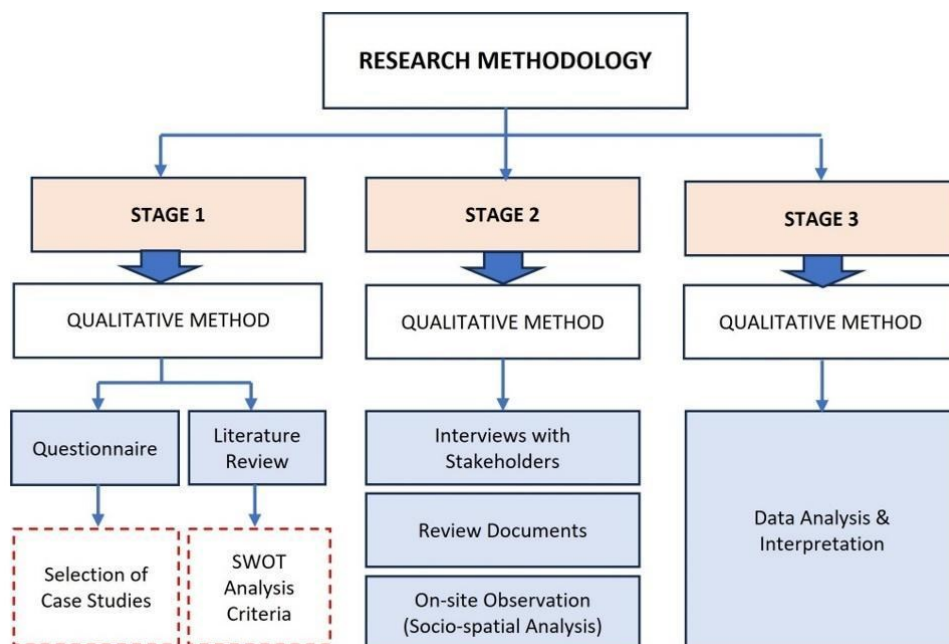
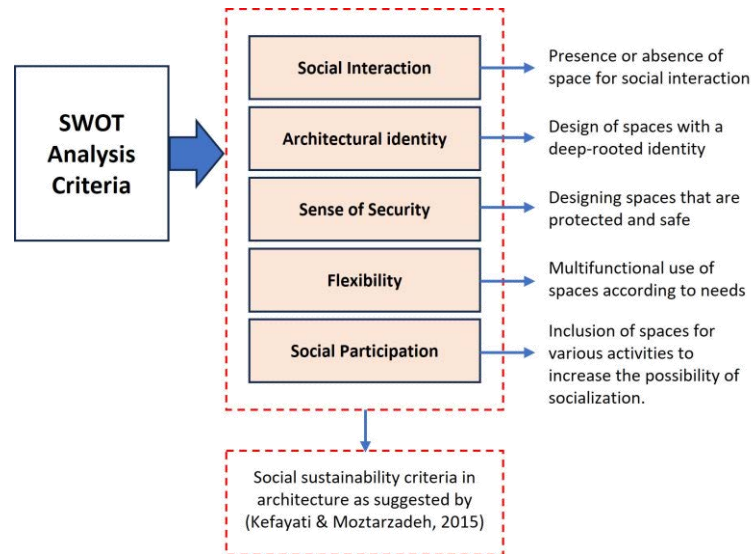


Figure 2a. Research Methodology – Structure of study design.



**Figure 2b.** SWOT Analysis Criteria as derived from the literature review.

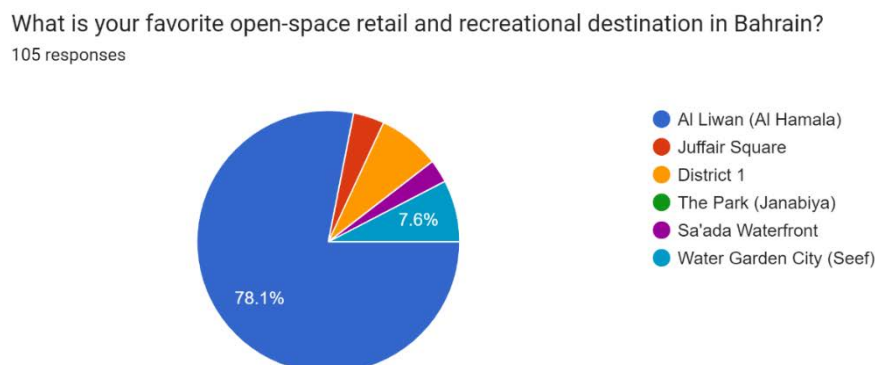
#### 4. Results

The first part of data collection was through a digital questionnaire that was randomly circulated to the respondents. There were 105 respondents in all who provided data for this study. In response to seven questions about sociodemographic traits and their opinions of environmental aesthetics, safety and security, accessibility, comfort and use, and connectivity—among the features of retail districts—respondents were asked about their perceptions. Table 1 shows the demography of the respondents. The respondents were mainly females 71.4% compared to the male respondents who were at 28.6%. The survey received responses from a variety of age groups, however, the majority were from the young generation of 10-20 years of age.

**Table 1:** Demography of Respondents.

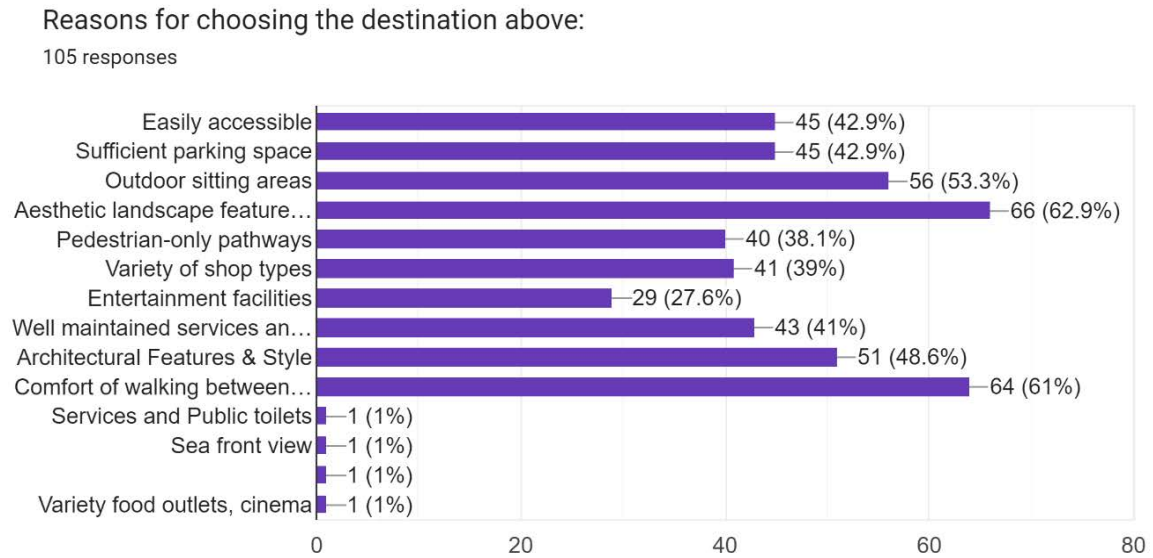
		% of Participants	
1	Gender	Male	28.6%
		Female	71.4%
2	Age Group	10-20	29.5%
		21-30	21%
		31-40	18.1%
		41-50	22.9%
		51 & above	8.6%

The questionnaire included a list of retail districts in Bahrain to choose the most popular among them. 78.1% preferred Al Liwan project as the best destination, while the least chosen was Al Saada Waterfront at 2.9% of the participants’ choices (Figure 3).



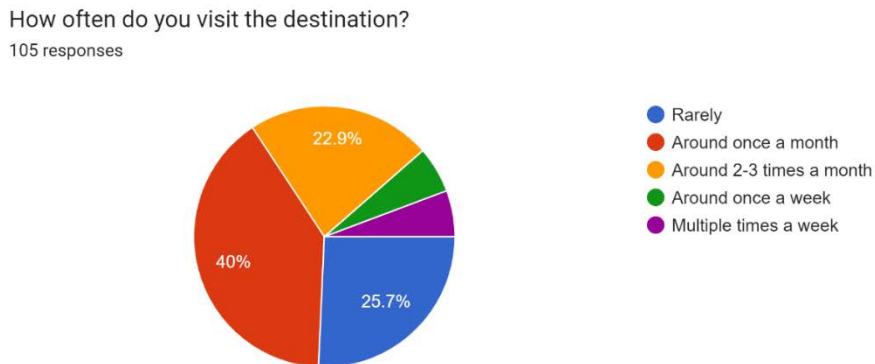
**Figure 3.** Results of the respondents' favourite open-space retail destination in Bahrain.

The reasons for choosing the destinations are stated in the below results as shown in Figure 4. 62.9% chose aesthetic landscape features as one of the main reasons for choosing the destination, followed by 61% choosing the comfort of walking between the facilities as a valid reason for visiting the retail district.



**Figure 4.** Reasons for choosing the favourite open-space retail destination in Bahrain by respondents. By Author.

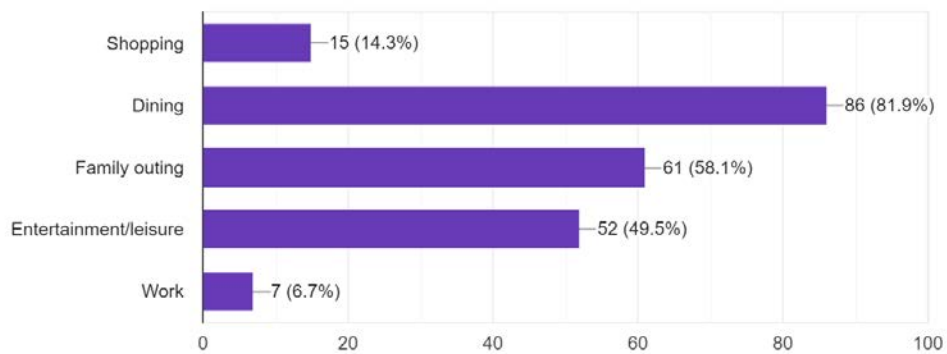
According to the findings, 40% of the participants make monthly visits to the selected location, primarily for eating experiences and family activities (Figure 5a & 5b).



**Figure 5a:** Frequency of respondents' visits to the retail district destinations.

What are the reasons for the visit?

105 responses



**Figure 5b:** Purpose of respondents’ visits to the retail district destinations.

The last question in the survey reflects people’s perceptions of what makes a destination more desirable and popular than other similar projects. The majority of respondents strongly agree that taking into account climatic conditions and the convenience of walking outside in hot weather is one of the primary elements, as shown by the comparison of differing perspectives in Table 2. However, a considerable number of respondents were concerned about the location of the project and that traffic congestion can have a negative impact on public attractions to the destination.

**Table 2:** Respondents' Opinions on given Statements related to the retail district destinations.

No.	Statement	Opinion			
		Strongly Agree	Agree	Disagree	Strongly Disagree
1	"I like shopping in open-space retail districts"	43	50	12	0
2	"I feel safe in pedestrian-only retail destinations"	53	48	4	0
3	"Air-conditioned retail destinations encourage more shoppers"	65	36	4	0
4	"The more visitors the better the experience"	19	43	40	3
5	"The short walking distance from the car park to the retail facilities encourages more visitors"	58	39	8	0
6	"We need more open-space retail districts than malls"	49	42	12	2
7	"I visit my favorite retail district even if it's located in a very congested area"	21	38	31	15

Adhering to the methodological framework of interviewing experts and professional stakeholders, two of the most successful developers in the country were interviewed as the initial step in the study process. Interviews were conducted with the developers of the destinations that were found to be the most and least favorable, which are the Sa'ada Waterfront project in Muharraq City, and Al Liwan shopping district in Al Hamala area. The questions were broad and open-ended, covering topics like the biggest obstacles the experts had to overcome for their projects, and the experiences these projects had given them. There was a discussion of a few issues that were specifically related to the case studies that highlighted methods, choices, and plans for planning, management, and design elements. Further supporting material related to the case studies was also asked for. To get the interviewees' viewpoints on the research's central theme, the third important area involved questioning them about their expectations and any changes they had noticed in the way people used the retail district projects over time. Clarifications and thoughts on subjects pertinent to the research setting were also sought during the expert interviews (*e.g. variety of leisure activities, open space management, walkability, public*

facilities and services, social interactions, and safety considerations). Table 3 displays the transcription and recording of the interview.

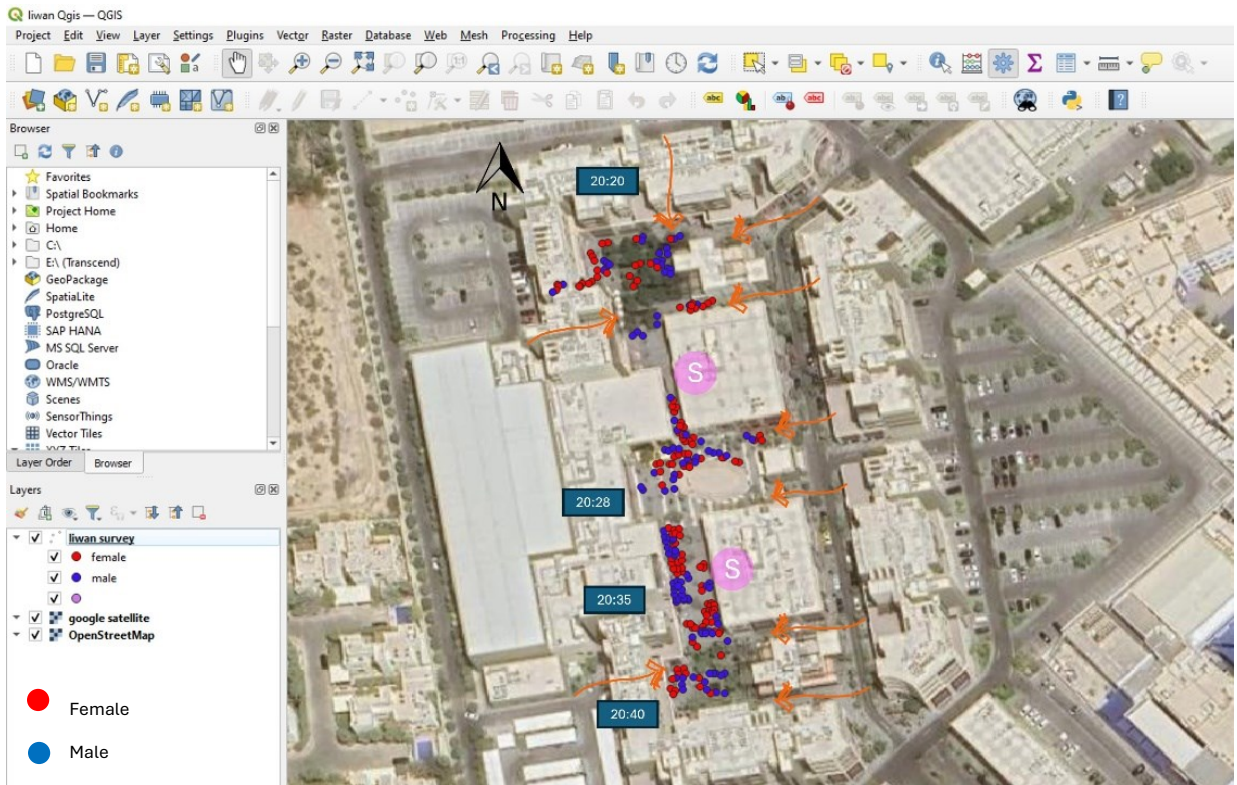
**Table 3: Experts Interview - Questions and Responses.**

No.	Questions	Answers by Expert Interviewee	
		Al Liwan Project	Sa’ada Waterfront Project
1	What was your inspiration behind this project?	As developers, our constant goal is to invent new things and lead the way in novel ideas. The Al Liwan project launched a brand-new open-space mixed-use development to build a small community with a cosy social setting that offers a pleasant experience with a range of amenities all in one location.	Touristic offering that links the waterfront to the historical and heritage sites, Muharraq Souq
2	Why did you choose an open shopping district instead of a closed mall?	The idea is to create a comfortable retail destination with a sense of street retail environment. The country is saturated with closed shopping malls, it is time to provide new experiences to the users.	Moving away from conventional closed malls and toward venues that provide guests with unique experiences is part of the current market trend. The shopping area is used since it has a lovely waterfront frontage as well.
3	What is the outcome of this project even since the opening?	The project has gained a lot of publicity since the day it opened. It is becoming the most popular destination in the country attracting many visitors of different ages, individuals and families, Bahrainis, and visitors from GCC countries, especially in good weather.	The project is quite a popular destination, especially for visitors living close to Muharraq.
4	Have you done any survey on the number of visitors per week/month?	We can observe when the project gets busier during the year and when it receives fewer visitors. However, we are in the process of installing a technique to count the traffic to the project through the security cameras and the car parks for a more accurate count.	No. This can be done once we have full occupancy of rented spaces. So far it is 80% occupancy.
5	What are the best months and worst months with high numbers of visitors?	Usually, it gets packed with visitors during the good weather months, starting from October to March. Nevertheless, visitors are noticed to visit the project during summer due to the summer programs offered in the facilities.	The best days observed to have more visitors are the weekends and the best months are during winter – November, December, January, and February
6	What are the strengths of this project? What makes it successful?	There are many factors affecting the success of the project. One factor is the design of the layout in creating the zones where people can enjoy moving from one to another. The element of surprise yet with a comfortable environment. The spaces are allocated for a variety of shops and brands as well as many dining options in the same place. The outdoor facilities encourage people to walk around the different zones and enjoy the landscaping and water features. Families mostly enjoy the dining places and the family entertainment facilities provided in the project.	The waterfront feature and the location. It is easily accessible and close to the Capital, Manama.
7	What are the weaknesses in your opinion? What would you change/improve to overcome these weaknesses?	The only weakness that can be highlighted is the traffic on the surrounding roads. The project is located in an area that is limited in accessibility from the main highway.	Because of their vast proportions, the units don't draw in more retailers or eateries for greater leasing prices. In order to meet the needs of the general public, additional research should be

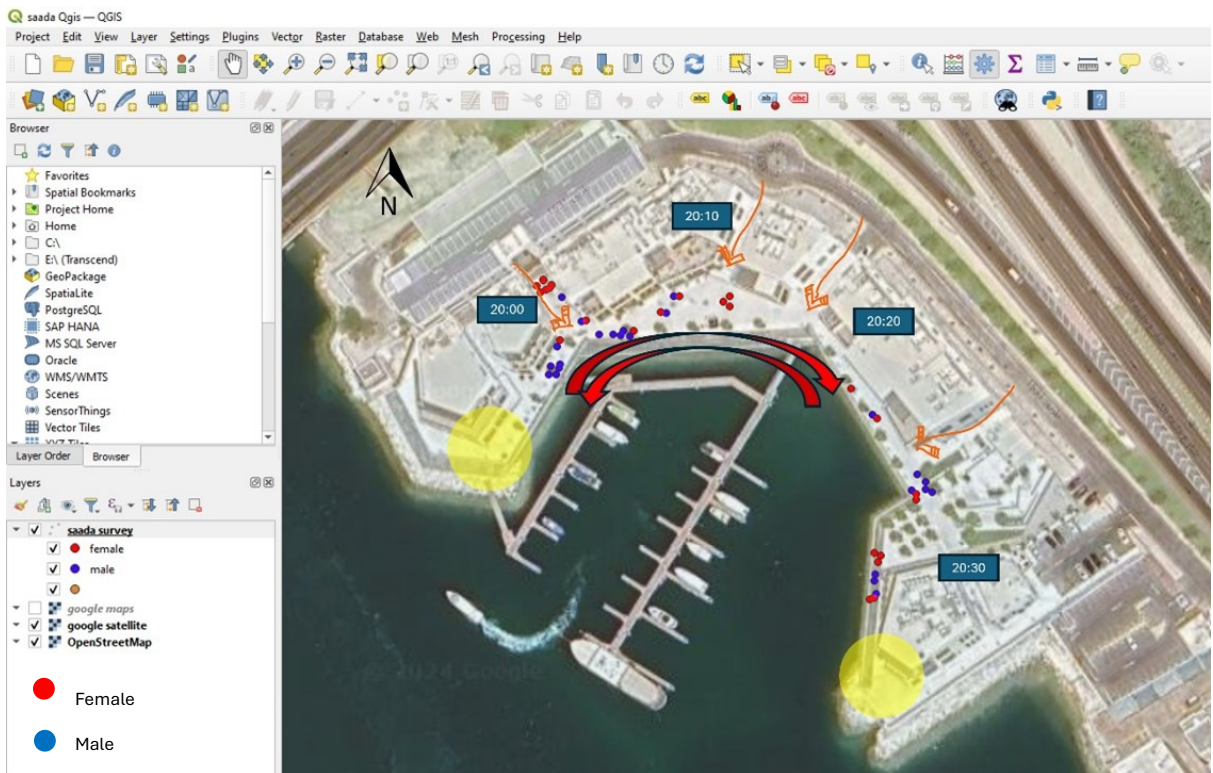


8	What are the opportunities you see in the future of this project? E.g. expansion, duplications,..etc.	We are looking towards expanding the project and adding more facilities according to the demand of the visitors, rather than duplicating the project somewhere else. As a developer, we always find new ideas and concepts for different locations instead of repeating a successful project.	done on the property's mixed-use tenancy and spatial organization. cooperation with the Bahrain Tourism & Exhibitions Authority to increase attendance at events and host more of them. increased foot traffic by collaborating more with the marina operator to introduce new pathways. Interactions between Edamah's adjacent development plots, Sa'ada East, and Muharraq Waterfront 1 and 2.
9	What factors affect the success of the project? Now and in the future? How do you think this project added value to social sustainability?	We are trying to provide the best service that will attract more visitors to the project. We are focusing on continuous maintenance, a clean environment, safety & security, new tenants, and shops, etc. The success of the project depends on the visitors, the more we attract them the more the project will maintain its success. Maintaining the project socially will lead to timeless success.	Variety of tenancy use. Availability of car parking, good landscaping, and well-maintained services. For future Success, our target is better marketing, efficient utilization of outdoor spaces, and hosting more events.

According to the responses related to the preference of destination, the on-site observation was carried out in two of the destinations. The first one was the Al-Liwan retail district for being the most favourable destination in the results, and the Sa’ada waterfront development was the least preferred one. Both locations were observed on a weekend night between 8 pm-9 pm. The observation was to monitor the users’ behaviour at different zones of the projects as indicated in Figures 6a and 6b. It was observed that the visitors were reaching the observed zones from the closest parking lots near each zone. This also reflects the response of 58% of respondents strongly agreeing on the factor of the short distance between the car park and the destination to encourage more visitors to the destination. It was also observed that more visitors were using the pedestrian-only promenades and walkways than the roads that vehicles can access. In comparison between the two locations, it was observed that more visitors were in Al Liwan than in Sa’ada Waterfront.



**Figure 6a:** on-site observation of users’ behaviour and circulation pattern on a weekend night time at Al Liwan using GIS for cluster analysis. Image source: <https://www.google.com/maps>. Analysis by: Author.



**Figure 6b:** On-site observation of users’ behaviour and circulation pattern on a weekend at Sa’ada Waterfront development using GIS for cluster analysis. Image source: Sa’ada brochure by developer. Analysis by: Author.

The Socio-spatial analysis in both locations shows that the visitors gather around areas that have public facilities and operational shops, mostly crowded at the food outlets. The vacant shops have fewer people

around them even though these are facing an outdoor feature with shaded sitting areas and greenery. However, Sa’ada’s spatial layout being a linear format with dead ends on both sides restricted the public in movement, while Al Liwan’s spatial layout allowed the visitors to loop around the area and had more freedom of movement in between the blocks which encouraged a continuous pedestrian circulation in the area.

SWOT analysis was used as a qualitative tool to evaluate the social sustainability potential of these two case studies (Table 4). The utilization of SWOT analysis enables the targeted enhancement or exploitation of particular project features, hence facilitating the development of the five critical factors that were identified from the literature as prerequisites for attaining sustainable architecture.

**Table 4:** SWOT Analysis of the Selected Case Studies Assessing the Social Sustainability Using Five Key Indicators.

Criteria	Sa’ada development	Waterfront	Al Liwan Project
<b>1 Social Interaction</b>	The project lacks interactive nodes or gathering spaces due to its linear arrangement focusing mainly on the middle waterfront		The project consists of multiple gathering spaces and nodes that facilitate social interaction among the users. These spaces can be identified in Al-Ain, Albaraha, and Alhadiqa.
<b>2 Architectural identity</b>	The location offers the link of the waterfront to the historical and heritage site, Muharraq Souq. Targeting the residents of Muharraq mainly due to their social connection with the site location.		Adapting a contemporary style of architecture featured with traditional spatial layout of creating open spaces and gathering piazzas in between the blocks giving the visitors a more nostalgic experience and convenient circulation pattern on site.
<b>3 Sense of security</b>	Narrow corridors in between the units leading to non-socially active areas reduce the sense of security in the area. However, the pathways are pedestrian-only with no hazard potential from vehicles.		The spatial connections between the different components and spaces of the project give a strong sense of security in being socially active in every corner. The boulevard area allows vehicle accessibility, however, the narrow road area is designed for a slower pace of vehicle movement, promoting the sense of safety in this area.
<b>4 Flexibility</b>	Limitation of expansion and multifunctional use of the space due to the waterfront layout and linear arrangement of the components.		The project consists of potential areas for multifunction use according to the public need. The layout with continuous looping around the blocks provides maximum use of areas around the site that can be accessible by the visitors.
<b>5 Social participation</b>	The lack of cultural, social, and recreational activities reduces the potential for visitors’ involvement and engagement with the site.		Continuous social, cultural, and recreational activities and campaigns on site encourage the visitors’ interest in the place and increase socialization.

The above SWOT analysis explains the reasons why the majority of the participants in the questionnaire selected Al Liwan Project as their preferred shopping destination compared to the Sa’ada waterfront development. It is evident that the Al Liwan is more socially sustainable due to incorporating vital elements that make the space socially active and show a good sense of vitality in its urban location.

#### 4. Discussions

In an analysis of the above findings, the study results indicate that open-space retail districts are preferred over closed malls. Therefore, many aspects should be taken into consideration to ensure social sustainability in these projects. Safety aspects concerning vehicle restrictions and the provision of pedestrian-only pathways are one of the key elements to be considered. Another element is environmental aesthetics, which is highlighted in the literature and is also evident in how the public responds to certain elements like water features, landscaping, and covered outdoor seating places. Another point that can be realized from the findings is that social sustainability does not necessarily relate to the number of visitors and the crowdedness of the place, but rather the quality of the spatial design and the comfort considerations in the space that would attract more visitors to the destination.

The feedback from the expert's interview supports the notion that a retail project's success depends on social sustainability. An examination of related literature reveals several connections across conceptions of urban social sustainability: social engagement is fostered, human needs are met, the future is emphasized, social interaction (cohesion and inclusion) is incorporated, and the quality of life is improved (Mehan & Soflaei, 2017). To encourage walkability in open urban settings, conceptual planning combined with a thorough strategy is required (Arslan et al., 2020). The results of the questionnaire support the argument of Vural Arslan et al. (2018) that cities can be designed to foster connections between people and places by emphasizing, among other things, factors like use, comfort, connectedness, crime prevention, and traffic safety. Moreover, the participants highlighted the importance of environmental aesthetics as a critical element in the walkability attributes of these projects, which calls for greater research and in-depth analysis. Although the information and data collected from the expert's interview were important to understand the case study in depth, one interview with an expert in this field is not sufficient to draw an overall framework to foster sustainable retail districts in Bahrain. The perspectives of several stakeholders are essential to generalizing crucial factors in the framework. A bigger sample of respondents will eliminate the bias preferences. In addition to that, on-site observations will need to be conducted several times at different timings to give a wider range of possibilities and a better perception of users' behaviours throughout different circumstances. Comparative analyses of more case studies with different geographic locations, demographic profiles, and environmental conditions might be able to help overcome the challenges the research technique has in influencing people's opinions and social interactions.

#### 5. Conclusions

In this research, the importance of social sustainability on the vitality of shopping districts in Bahrain is explored. The chosen methodological framework addressed the research concerns in the context of factors affecting the sense of belonging and attraction to retail environments. It is evident from the findings that social sustainability can be achieved by thorough analysis and study at the planning stage of any project. The quality of design and provision of human needs are key elements that can shape the framework towards a sustainable retail project. The selection of the location is a key element towards the success of the project. In order to determine the factors that make up a precise foundation for the future development of the retail industry, a proper and well-studied research strategy is employed to explore the experiences and significance within the socio-spatial setting of these projects. This gives stakeholders confidence in the project's success and social sustainability. Additionally, by analyzing the results, suggestions can be made, such as highlighting the areas that the current projects can be improved in terms of a variety of facilities, attributes, and characteristics (physical and social aspects), along with recommendations on elements that ought to be considered for future projects. Based on a review of the socio-special activities and user behaviour seen in the two spaces, it is clear that the layout and architecture of the space play a critical role in fostering a sense of security, attachment, and inclusion. This could affect the social function that retail districts play in terms of how long customers spend and where they cluster in the shopping area.

Although this research is limited to a small sample of participants and focused on mainly two projects as case studies, the findings may be helpful to the stakeholders who are involved in the process of developing retail spaces. In addition, using them to improve Bahrain's commercial and retail developments by considering their essential features as shopping places that fulfil the users' needs in the space. Following a framework of criteria and including chosen qualities might help designers create environments that are more motivating and successful in achieving social sustainability in these projects. Given the country's extensive



development of retail districts, it is imperative to give greater thought to enhancing the social impact of these projects to ensure their sustainability in the future.

### **Acknowledgements**

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Funding**

This research received no funding in the public, commercial, or not-for-profit sectors.

### **Conflict of Interests**

The Authors declare that there is no conflict of interest.

### **Data availability statement**

The research data is available within the article or its supplementary materials.

### **CRedit author statement:**

Conceptualization: A.E.M. and N.A. Data curation: A.E.M. and N.A. Formal analysis: A.E.M. and N.A. Investigation: A.E.M. and N.A. Methodology: A.E.M. and N.A. Project administration: A.E.M. and N.A. Writing—original draft: A.E.M. and N.A. Writing—review and editing: A.E.M. and N.A. All authors have read and agreed to the published version of the manuscript.

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**How to cite this article:**

Mohamed, A. E., & Allani, N. (2024). The Role of Users' Socio-spatial Behaviour in Fostering Sustainable Retail District Projects in Bahrain. *Journal of Contemporary Urban Affairs*, 8(2), 305–323. <https://doi.org/10.25034/ijcua.2024.v8n2-2>



Original scientific paper

# The Morphological Impact of Restructuring Routes: Atatürk Boulevard's Palimpsest Phenomenon

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## ARTICLE INFO:

### Article History:

Received: 14 June 2024  
Revised: 18 August 2024  
Accepted: 25 August 2024  
Available online: 5 September 2024

### Keywords:

Restructuring Route,  
Palimpsest,  
Urban Memory,  
Atatürk Boulevard,  
Urban Morphology.

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**Publisher's Note:**

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Restructuring routes are significant urban elements that lead to physical changes in cities to meet modern needs, often resulting in traumatic transformations. This study investigates the morphological impact of the palimpsest phenomenon on Istanbul's Atatürk Boulevard, an exemplar of restructuring routes. The Boulevard's construction disrupted the organic urban fabric, creating a new structure and altering the area's identity. By employing a typomorphological analysis based on Conzen's Town Plan Analysis, this research examines changes in the street, building, and subdivision systems. The study utilizes historical and contemporary maps to reveal the effects of Atatürk Boulevard on urban morphology, demonstrating both positive and negative consequences of restructuring routes. Findings indicate that the boulevard increased the economic value of the area but also led to the fragmentation and loss of historical urban elements, contributing to a complex urban palimpsest. The study highlights the need for sensitive urban planning to preserve the city's historical identity while accommodating modern developments. The insights gained are crucial for architects and urban planners in managing urban landscapes, ensuring sustainability, and respecting historical contexts in future developments.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 324–341.

<https://doi.org/10.25034/ijcua.2024.v8n2-3>

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### Highlights:

- The study also highlights the identity-changing role of the traumatic character of the restructuring routes.
- The study emphasizes the impact of restructuring routes on the urban fabric, revealing how they disrupt and reshape urban memory.
- A novel typomorphological analysis is introduced, demonstrating the interplay between modern urban development and historical preservation.
- Atatürk Boulevard serves as a case study illustrating how restructuring routes increase economic value while fragmenting historical urban elements.

### Contribution to the field statement:

This study introduces a novel typomorphological analysis of restructuring routes, using Atatürk Boulevard as a case study to explore their impact on urban morphology and collective memory. By uncovering the complex interplay between modern developments and historical preservation, the findings provide a framework for urban planners and policymakers to balance contemporary needs with cultural heritage conservation, thereby enriching the existing literature on urbanization's socio-economic consequences.

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### How to cite this article:

Bozdoğan, G., & Gürer, T. K. (2024). The Morphological Impact of Restructuring Routes: Atatürk Boulevard's Palimpsest Phenomenon. *Journal of Contemporary Urban Affairs*, 8(2), 324–341.

<https://doi.org/10.25034/ijcua.2024.v8n2-3>

## 1. Introduction

Cities, as complex living organisms, are subject to change in order to meet current needs. These changes result in a range of morphological transformations within urban environments. The presence of urban artifacts that embody the morphological characteristics of different historical periods ensures the continuity of urban memory. The term "urban artifacts" is used to describe the various physical elements that are a part of the urban fabric. These include streets, buildings, building blocks, territories, and routes. The restructuring routes, which may be considered as an urban artifact, can be seen to result in the formation of traumatic routes that are created within existing urban fabrics as a consequence of changes in current needs. Restructuring routes, which are characterized by a dynamic structure, are formed as a result of the necessity to combine pre-existing poles – social structures that have been formed by the combination of spatial hierarchies – with new ones (Maretto, 2021). These routes serve to create a palimpsest, thereby influencing the formation of urban identity and texture as elements that disrupt the continuity of urban memory. In this study, the concept of palimpsest is employed as a metaphor to illustrate the overlapping and intertwined layers. The palimpsest metaphor represents the multi-layered nature of cities, which is shaped by attempts to erase existing elements and create new layers (Huysen, 2003).

This study examines the impact of Atatürk Boulevard on the identity and memory of the urban fabric, with a particular focus on its role as an example of a restructuring route. The results of the literature research indicate that there is a notable absence of analysis within the urban morphology on this subject, with the exception of the work of Giuseppe Strappa. In the context of urban morphology, Strappa's contributions have highlighted the significance of restructuring routes, yet a detailed examination of this phenomenon remains unworked. This study was conducted to address this gap in the existing literature. The principal objective of this study is to delineate the morphological processes of Atatürk Boulevard, a prominent urban image and a focal point for Istanbul, as a palimpsest. Furthermore, it seeks to elucidate the vestiges and traumatic consequences of restructuring routes in urban memory from a multidimensional standpoint. In order to analyze the dialogue of restructuring routes with regard to the intertwined concepts of texture and memory, situated within the urban context and spatial hierarchy, the Town-Plan Analysis proposed by Conzen (1960, p.43), comprising street, building, and subdivision parameters, is taken as a reference point. This analysis is then used to inform the development of a town plan reading model. In this regard, the study examines the traumatic effects of restructuring routes in the spatial context by employing a typo-morphological approach to the comparative interpretation of data obtained from various maps.

In light of the aforementioned considerations, the following research question is identified as the primary focus of this investigation:

- How can restructuring routes affect palimpsest formation in the urban fabric and memory with their multifaceted outputs?

The study is of significant importance for the protection and management of the urban landscape, as it allows for the identification of restructuring routes. The analysis is of great value in demonstrating that any forthcoming changes should be implemented with the utmost care and sensitivity, in order to ensure that the urban landscape is passed on to future generations in an unaltered state. The outcomes of this study are important for architects and urban planners to assess the built environment from an urban morphological perspective when intervening for new formations to the morphology of the city.

The study consists of three main sections. The initial phase of the study explores the nexus between space and identity, while also investigating the influence of the palimpsest phenomenon on urban collective memory in the context of restructuring routes and Atatürk Boulevard. In the subsequent phase, the palimpsests of Atatürk Boulevard and the restructuring route were subjected to typo-morphological analysis. Finally, the findings of this analysis are interpreted, and a methodological proposal for the interpretation of potential restructuring routes is presented.

## 2. Materials and Methods

The study is principally founded upon a typomorphological analysis of urban form. The selection of this method is based on the fact that a typomorphological approach allows for a comprehensive analysis of

urban form by integrating the characteristics of buildings and subdivisions. One of the traditions of typomorphological research has its roots in Italy. Consequently, this study is grounded in the taxonomic framework proposed by Strappa, a prominent figure within the Italian school of typomorphological research. Therefore, the concepts of ‘street, building and subdivision’, which are the parameters defined by Conzen’s Town-Plan Analysis and Strappa in his article ‘Reading a Built Environment as a Design Method’ (2018), are categorized among urban artifacts related to the concept of urban fabric. According to Strappa’s conceptualization, the routes consist of buildings -that can be classified as basic and special- and poles. Streets are distinguished by areas formed by ‘sub-divisions’.

In order to present the palimpsest phenomenon in an accurate manner, the study makes use of both contemporary and historical maps. The maps in this study are Ayverdi Maps (1875-1882), Alman Mavileri Maps (1913-1914), Pervititch Insurance Maps (1922-1945), aerial photographs of 1966, and contemporary plans of 2024. The selected maps were selected on the basis of Doğan Kuban's (1969) article, entitled ‘The Historical Structure of Istanbul’.

In the research, the selected maps are to be interpreted through three main layers: the street fabric, the building fabric, and the subdivision systems. These layers may be defined as palimpsests of the study area. By superimposing the selected maps, an analysis of the morphological changes between the palimpsests was conducted. Moreover, the impact of restructuring routes on the urban fabric was examined by comparing the changes observed with the construction of Atatürk Boulevard as a restructuring route.

The following sources were utilized in the analysis of the street fabric: Ayverdi Maps, Alman Mavileri Maps, Pervititch Insurance Maps, Prost Plans, and aerial photographs dated 1966 and present-day -2024- plans. The Pervititch Insurance Maps, and aerial photographs dated 1966, and present-day -2024- plans were employed for the purposes of building fabric and subdivision analysis.

In the street fabric analyses, the street forms in the study area and their relations with the building blocks, the forms of the building blocks after the construction of Atatürk Boulevard as a restructuring route, and the changes in the street fabric were traced through the cause-effect relationships created by the palimpsests.

In the building fabric analyses, the building information was extracted from the identified maps in order to examine the evolution of building distribution among the palimpsests in the study area. Moreover, the influence of restructuring routes on the architectural typology and volumetric composition was investigated. The impact of restructuring routes on the balance of basic and special buildings in the urban fabric was interpreted through the concept of palimpsests.

In the subdivision analyses, the impact of the restructuring routes on the subdivisions in the area was investigated through the use of comparative techniques, with the methodology of following the palimpsests employed.

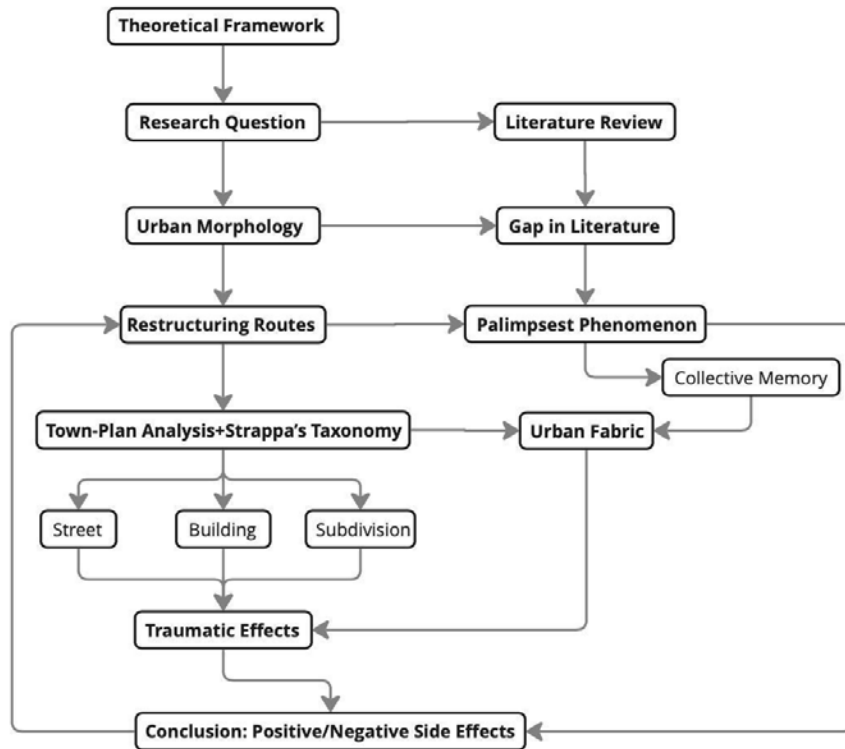


Figure 1. The framework of the study.

### 3. Literature Review

Space is a conceptual entity that is defined by its physical boundaries and imbued with meaning through social relations. The space is perceived and committed to memory to the extent that it can be visually represented in the minds of its users. The spatial plane represents a significant area where both individual and collective memories are recorded.

On the other hand, the city is a living entity that has been created and developed by humans over time. Aldo Rossi (1984, p.2) defines the city as "a giant man-made object; a vast, complex, time-growing work of engineering and architecture.". According to Aldo Rossi (1984, p.5), the city develops in a manner that is organic and self-conscious. It gains a sense of consciousness and memory, and during the process of construction, the initial themes remain consistent, yet the city modifies these themes in accordance with its own evolution, giving them a more distinctive form. Rossi proposed that the city should be defined in terms of the collective memory of its inhabitants. He further asserts that the city is the locus<sup>1</sup> of collective memory. In brief, the manner in which a location is integrated into one's memory is contingent upon the manner in which individuals perceive spatial relationships. Urban spaces are embedded in memory and transmitted to future generations in the way they can be perceived.

The concept of urban identity can be defined as the sum of a city's unique character, structure, and texture, as well as the characteristics that distinguish it from other cities. As Tekeli (2009, p.84) argues, an abstract place acquires an identity when it becomes meaningful to the people who live there. A space, particularly an urban space, acquires identity to the extent that it can be perceived and imagined. Accordingly, urban space can be located in memory to the extent that it can be identified. The collective memory of a city is formed by the urban fabric, which bears the traces of different periods. This process is the first step of the palimpsest phenomenon. De Quincey, who refers to the human subconscious as a palimpsest, highlights that it is, in fact, the layer that enables the recollection of lost memories, along with the associated contextual values, and that it develops through the addition of new elements (De Quincey, 1998, p.144). In addition to De Quincey's conceptualisation of the relationship between the subconscious and the palimpsest, Baudelaire also established a relationship between the palimpsest and memory (Huysen, 2003, p.24). Although there are similarities in their definitions, palimpsest and memory differ in their practical functioning. A palimpsest is created by inscribing one layer of writing

<sup>1</sup> In Aldo Rossi's definition, locus is the relationship between a particular place and the buildings within it. It is at once singular and universal (Architecture of the City, 1984, p.3).

on top of another, whereas memory is formed by the addition of one layer to another. In contrast, Freud, in a synthesis of the aforementioned theories, posits that cities are palimpsests (Bartolini, 2014, p.523). Similarly, Freud (2001, p.82) emphasises the representation of the layers of the human unconscious through experiences and the expression of overlapping existences, as is evidenced by the layering of a city.

The process of palimpsest formation reveals the principles of urban identity, as the urban memory is formed. The concept of a palimpsest can be defined as a method of accessing the fundamental essence of a given subject matter, whereby the layers of information are gradually revealed through a process of gradual unravelling. Huyssen (2003, p.7) posits that cities represent the primary arena in which societies express their perceptions of the past and present and asserts that cities are, in essence, the oldest parchments of history, the carving of time in stone, and places of memory that expand in both time and space. This perspective offers a compelling insight into the relationship between palimpsest and architecture. The structure of the palimpsest refers to the examination of the layers of a 'thing'. Therefore, the interpretation of the palimpsest in a spatial perspective necessitates an understanding of the layers that comprise the space. The palimpsest phenomenon observed in urban spatial is evidenced by the destruction of city-specific elements and the subsequent creation of new layers. While the multi-layered nature of cities reflects their cultural richness, the inability to fully preserve the traces of past layers and the potential for the "new" to emerge by destroying the "old" can lead to confusion regarding the urban identity. This situation results in the dissolution of the emotional bond between city dwellers and their city, as well as the erasure of their memories of the city.

### 3.1. Routes as Urban Morphological Elements

Kropf (2009, p.107) defines urban fabric as the urban form, which he describes as the patterns formed by the combination of streets, subdivisions, and buildings. He views these elements as the basic physical components of the city. The field of urban morphology examines the formation and development of cities, as well as the elements that comprise their urban fabric. As outlined by Strappa (2018, p.161), the genesis of an urban fabric is contingent upon the establishment of routes. These routes, which connect the two most significant poles within a defined area, exert a profound influence on the pattern of land use. In essence, the concept of land use patterns is understood in relation to the urban fabrication process, whereby the roads that structure the territory prior to urbanization are taken into account. In accordance with the definition proposed by Caniggia and Maffei (1979), the term "pole" represents an extension of the term "node." It encompasses a greater degree of continuity than a node and refers to two axes that originate and terminate at a single point, with the potential for intersection. The level of analysis is the determining factor in whether something is classified as a node or a pole. In accordance with Strappa (2018, p.167), a route can be defined as the interaction between opposed and complementing poles. The term "pole" is used to denote the source of routes.

The concept of "routes" is employed here to denote the nourishment of objects whose origins are connected to the idea of "fabric." In this sense, the term "fabric" is used to describe the totality of the features that identify the creation of a building fabric, which are decided upon during the process. There are four principal route types that, when represented schematically, correlate with the phases of urban fabric growth and transformation:

- **Matrix Route:** The route in question represents the pre-existing route that was utilized by the city's inhabitants prior to the commencement of the construction process.
- **Building Routes:** The routes are arranged in a chronological sequence that follows the matrix route and is connected to it. They proceed in depth according to the building.
- **Connecting Routes:** These are routes that connect to building routes.
- **Restructuring Routes:** These routes are traumatic in nature and serve to meet the current needs of mature tissues that have completed their functional role (Strappa, 2018, p.162).

#### Restructuring Routes

Restructuring routes are traumatic routes that settle on dysfunctional urban fabrics to meet current needs. As outlined by Strappa (2018, p.163), restructuring routes occurs at the conclusion of the construction process, with the introduction of new connectivity requirements and the intervention in existing, established

urban fabrics. In this context, the formation of a new fabric gives rise to 'traumatic' changes that coincide with an outdated organism that is unable to respond to current needs or to provide the necessary volume to meet those needs. In the study, the term "traumatic" is employed to describe both its positive and negative effects on language. The restructuring routes that alter the dysfunctional spatial organization of urban fabrics can also have positive effects, including the reshaping of subdivisions and the valuation of buildings. The general characteristics of restructuring routes can be enumerated as follows:

- They have an organic structure that is conducive to the creation of numerous subdivisions of irregular size or shape.
- The areas acquired through demolition experience a significant change in economic value and result in a higher density of special buildings.
- It meets the need by allowing wider road axes on mature tissues that cannot meet the need (Strappa, 2018, p.165).

An examination of the fundamental attributes of restructuring routes unveils their transformative impact on urban morphology, delineated by the reconfiguration of collective memory, alteration of urban architectural typologies characterized by trapezoidal and irregular configurations, proliferation of special buildings, enhancement of economic value, and embodiment of modernity through the development of extensive thoroughfares.

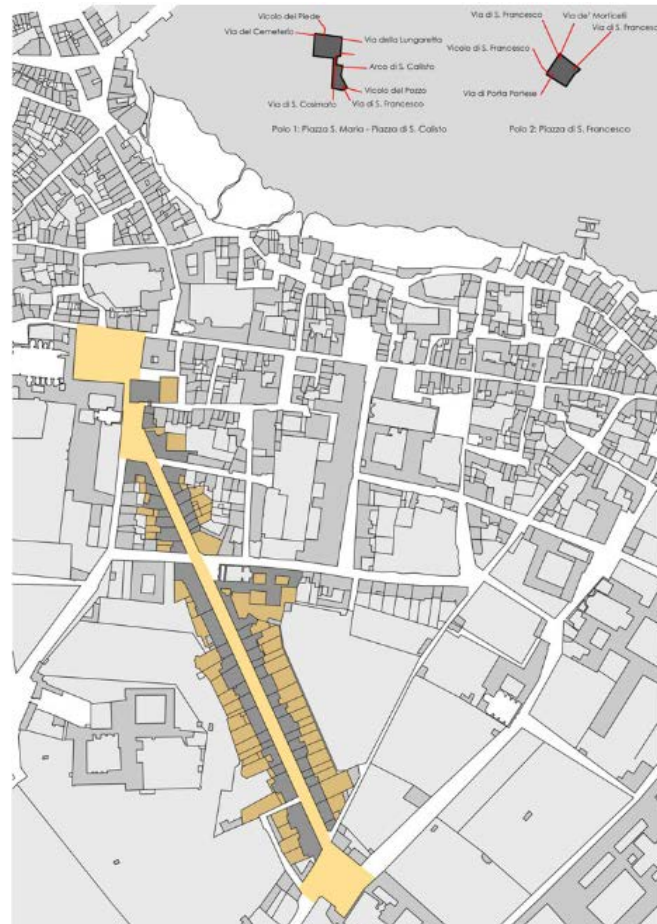
One of the pivotal aspects of restructuring routes is their ability to modify the economic structure of the environment in which they are implemented. The restructuring routes can result in the formation of irregular subdivisions and the demolition of existing structures, which may in turn lead to the construction of special buildings, including those of significant economic value. Once construction is complete, restructuring routes are created, paving the way for subsequent smaller construction processes. The demolition of buildings can result in the creation of empty plots, which may experience an increase in value due to the restructuring routes that reorganize and consolidate urban life. It has been observed that buildings with high economic returns have been constructed on subdivisions located on restructuring routes that have a high potential to attract users due to the needs of users (Strappa, 2018, p.163).

Distinct from conventional routes, restructuring routes emerge as primary catalysts for the transformation of buildings and subdivisions, shaping them through simultaneous processes of formation and demolition, thereby generating irregular subdivision conducive to diverse architectural forms. This dynamic interplay contributes to the diversification of urban planning in terms of both built structures and land subdivisions.

Moreover, restructuring routes play a pivotal role in facilitating the development of large-scale roads, integrating disparate subdivisions and enhancing their functionality, thereby reflecting the imperative of accommodating the evolving needs of urban environments precipitated by the Industrial Revolution and the advent of vehicular transportation (Strappa, 2018, p.163). In this context, the restructuring of routes in numerous European cities served to accelerate the transition to a more modern era.

One of the most evident examples of restructuring routes is the Viale di Trastevere in Rome. Situated between Piazza di San Francesco d'Assisi and Piazza di Santa Maria, the restructuring route is formed on the matrix route, connecting the two poles (Strappa, 2018, p.165). Described by Strappa (2018, p.165) as "*an evident example of the traumatic passage to modernity in Roman fabric*", Viale di Trastevere shattered the building blocks it passed through. While the fundamental building blocks around Viale di Trastevere exhibit a rectangular configuration, irregular plots can be observed in the fragmented building blocks that have been de-fragmented by restructuring routes (Figure 1).

In conclusion, while restructuring routes may induce disruptions to urban collective memory and introduce novel contextual dynamics, they concurrently exhibit the capacity to manipulate both individual and collective memory, engendering diverse urban fabric configurations and contributing to the creation of palimpsests.



**Figure 2.** The Gregorian Cadastre's Trastevere region (1816–35) includes markers of Paolo Vaccaro's restructuring route, which runs between Piazza Santa Maria and San Francesco D' Assisi. (Strappa, 2018, p.164).

### 3.2. Palimpsest of Istanbul Atatürk Boulevard as a Restructuring Route

In Turkey, Istanbul Atatürk Boulevard exemplifies the restructuring route characteristics, and this study finds it necessary to analyze the boulevard in this way. The location of Atatürk Boulevard is in Istanbul's Fatih neighbourhood. The avenue is currently one of the most significant thoroughfares in the historical peninsula, commencing at Aksaray Square and extending to Atatürk Bridge. The study does not encompass the entirety of Atatürk Boulevard, limiting its scope to the section situated between the Bozdoğan Aqueduct and the Golden Horn. The history of the axis where Atatürk Boulevard is located can be traced back to the Byzantine period when the layers beneath it were analyzed. The boulevard axis is home to a multitude of historical sites, as well as public buildings, trade centers, and transit points. In examining the palimpsest on Atatürk Boulevard, the research proceeded according to the historical intervals delineated by Doğan Kuban (1969) in his article on the Historical Structure of Istanbul.

The axis of Atatürk Boulevard is analyzed under the title of Byzantium due to the presence of temples built along the Golden Horn, despite the fact that it was outside the city when the city was named Lygos, Byzantium, and Antonina (Diker and Cünük, 2017, p.19). The period between 330 A.D., when the city of Istanbul was defined as the capital for the first time, and 1453, when the Turks came to Istanbul, was examined under the Byzantine period (Kuban, 1969, p.2). The period from 1453 to 1923 was considered as the Ottoman period. The period from 1923 to the construction of Atatürk Boulevard is studied as the Early Republican period.

#### A. Pre-Byzantine Period

The city of Byzantium was founded by Byzas of Megara in the 5th century BC and selected the hill where today's Topkapı Palace is situated as its principal residence. Nevertheless, Byzantium is not the sole city within the present boundaries of Istanbul. In addition to Byzantium, there were other settlements in and around Istanbul. These included Halkedon in and around Kadıköy and Sykai in and around Galata (Kuban, 1969, p.28).

It is hypothesized that the city limits of Byzantium during the Byzantine period encompassed the neighbourhoods of Sirkeci-Ahırkapı, as proposed by Müller-Wiener (2001). According to Eyice (1953, p. 250), it is thought that a valley once existed in the area now occupied by Atatürk Boulevard. This valley is located in the area between the third hill, where the Süleymaniye Mosque was built, and the fourth hill, where the Fatih Mosque is located. It is predicted that the valley was filled with earthquakes in history. The two hills are connected by the Bozdoğan Aqueduct (Diker and Cünük, 2017, p.258).

### **B. Istanbul as a Byzantine City**

In 330, Istanbul emerged as the Eastern Roman Empire's capital. Constantinople was designed to serve as a symbol of the Roman Empire and to reflect the traditional Roman character. It was intended to become the new center of the empire and to be recognized as such. As Doğan Kuban (1969, p.28) notes, the imperial city constructed during the reign of Constantine did not develop in a manner that could be considered a "natural continuation of Byzantium." In fact, the architectural style of the Late Roman world was influenced by the construction activities that were carried out in a single, unified effort.

New city walls were constructed to reinforce the city's defensive capabilities. These new fortifications are estimated to have commenced in the vicinity of the Unkapanı area in the Golden Horn, traversing the southern portion of the Sultan Selim Mosque, the western side of the Fatih Complex, and culminating in the vicinity of the Bayrampaşa Stream (Kuban, 1969, p.29). According to İsmailoğlu (2018, p.22), the construction of these walls resulted in the area where Atatürk Boulevard is located being excluded from the necropolis area and entering the city limits. As demonstrated by Procopius' "Structures," the Unkapanı and Cibali region is within the city limits initially established by Constantine (İsmailoğlu, 2018, p.22).

In the Byzantine period, the urban traces left from the Byzantine period enabled the determination that Zeugma and Plateia neighbourhoods, including the Port of Antonius, was formed in the part of Atatürk Boulevard between Bozdoğan Aqueduct and Unkapanı Atatürk Bridge (İsmailoğlu, 2018, p.23).

### **C. Istanbul as an Ottoman Capital**

With Mehmet the Conqueror's capture of Constantinople in 1453, the Ottoman Empire was established in Istanbul. Mehmet the Conqueror designated Istanbul as the capital and initiated a new phase of urban reconstruction to transform it into the administrative, governmental, and religious center of the empire (Çelik and Deringil, 2010, p. 53). In Ottoman Istanbul, particularly during the 15th century, as the city began to develop in an organic manner, with neighborhoods emerging from a central node, a secondary and self-developing street structure emerged in place of the main arteries connecting large squares that had been characteristic of the Byzantine period. Compared to the 15th century, Istanbul's population had grown dramatically by the 16th century. The growth of the population provided the impetus for the emergence of new neighborhoods. The formation of new neighborhoods and the expansion of existing neighborhoods eroded the Byzantine streets that had previously served as the city's arteries. By the end of the 16th century, these streets had shrunk significantly (Çelik and Deringil, 2010, p.58). At the end of the 16th century, the Gazanfer Aga Madrasah was constructed on the site of Atatürk Boulevard. The construction of the madrasah indicates that educational activities were spreading from the Fatih Mosque area to the Atatürk Boulevard axis. Accordingly, as İsmailoğlu (2018, p.48) posits, the proliferation of numerous modest mosques, baths, madrasas, and fountains erected during the Ottoman era signifies the emergence of a residential district in the vicinity of the boulevard's inauguration, situated between the Zeyrek and Süleymaniye neighborhoods. Despite the diminishing political and economic influence of the Ottoman Empire, Istanbul experienced significant growth and transformation during the 17th and 18th centuries. This period saw the implementation of modest reconstruction efforts (Çelik and Deringil, 2010, p.62).

A seminal event in the urban evolution of Istanbul was the occurrence of a series of destructive fires within the city. Despite the city's reorganization and the construction of new roads following the destructive fires, the fire districts became a testing ground for Ottoman urban planners. The dense and wooden construction of Istanbul contributed to an elevated risk of fire incidents within the city. Prior to the 1840s, reconstruction efforts following fires typically entailed restoring the affected area to its original state. However, following the 1840s, activities aimed at preventing fires increased, and it became evident that the street structure of Istanbul required reorganization to prevent fires from spreading over a wide area (Çelik and Deringil, 2010, p.74). In order to organize the street structure of

Istanbul, which was born in the light of daily needs with an organic form and developed in a labyrinth-like manner on its own without being subjected to planning, important engineers and architects from Europe were called to Istanbul.

#### **D. Istanbul as an Early Republican City**

It is evident that Atatürk Boulevard represents a tangible manifestation of the modern planning efforts that were initiated during the Early Republican Period. Designed by Henri Prost, Atatürk Boulevard occupies a pivotal position in the historical development of urbanization and Turkish architecture. It reflects the modernisation ideology of the Early Republican Period. The boulevard, which still exists today, represents a modern monument amidst the traditional neighbourhood pattern and historical buildings. With the establishment of the republic in 1923, a distinct climate emerged in Turkey, marking a departure from the past. The 1920s, during which the capital was relocated from Istanbul to Ankara and economic challenges were encountered as a country emerging from wars, were characterized by a lack of progress in Istanbul planning. In the 1930s, following the resolution of the economic crisis and the public acceptance of republican reforms, an official cultural policy was implemented in Turkey, leading to innovations in numerous fields, including architecture (Uluskan, 2007, p.121).

According to İnalçık (2013, p.68), the urban fabric inherited by Istanbul from Byzantium and the Ottoman Empire was not based on social status, but on religious and ethnic distinctions that led to spatial differentiation. The "irregular traditional texture" created by different identities based on class differentiation, which continued in the Ottoman Empire, especially in the Historic Peninsula, is also evident in the Early Republican period (Akpınar, 2010, p.111).

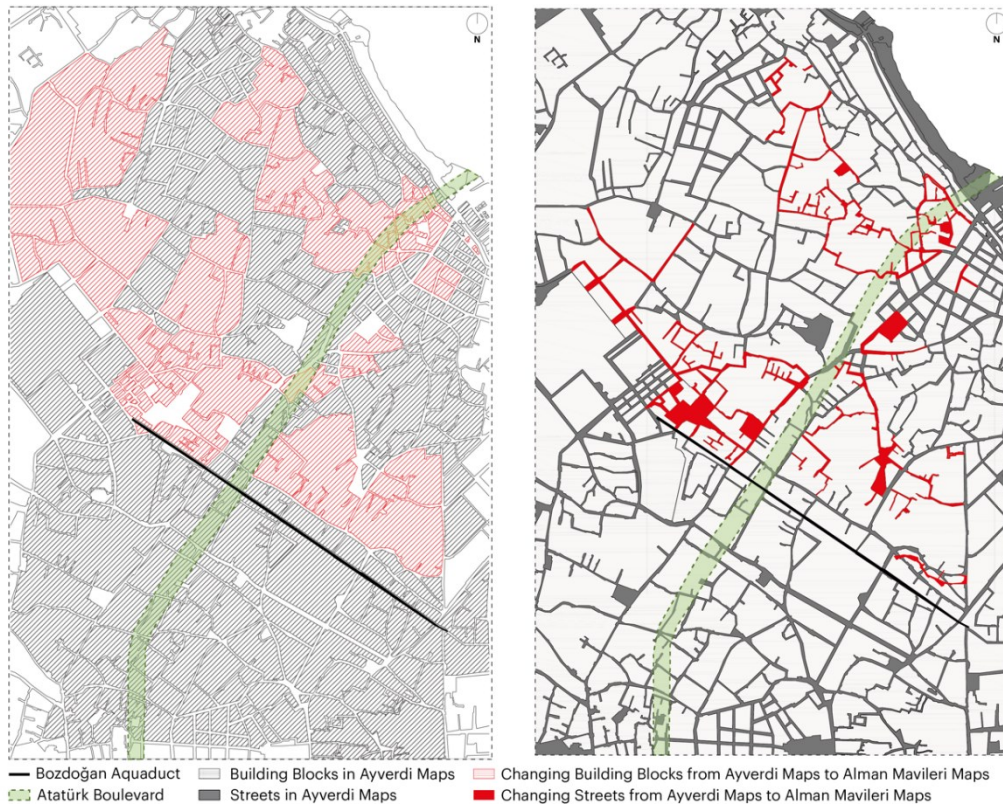
As observed by İpek Akpınar (2010, p.112), Istanbul is a Mediterranean city with a complex ethnic-religious tapestry. In this context, political forces are pursuing urban modernization through a large-scale project. For this purpose, Henri Prost, a "foreign planner" who had previously worked on planning in Mediterranean cities such as Morocco and Italy, was invited to participate in planning studies in the city. Prost was well-versed in Mediterranean cities and had received training in the Western style. Prost was invited to the city through a competition organized by the Istanbul Municipality during the period he was working in Paris. He served as the city's planner until 1950, according to the contract he signed with the Istanbul Municipality in 1936 (Bilsel, 2010). In Prost's planning works, the conditions of Turkey during the period in question are discernible. As stated by İpek Akpınar (2010, p.114), Prost exemplified the reforms of the nation-state in the urban context through the creation of "free spaces" (*escapes libres*).

### **3. Results**

The research consists of superimposing five maps representing the palimpsests of Istanbul's Atatürk Boulevard and analyzing the traumatic impact of the restructuring routes on the urban fabric by following the morphological changes in the study area. By the comparison of the maps, it was possible to observe the changes in the street fabric, building fabric and subdivision system with the construction of Atatürk Boulevard in the study area.

#### **3.1. Street Fabric**

The traditional street fabric was analyzed by reading the Ayverdi Maps (1875-1882)- the oldest available map of the study area. Despite the prevalence of labyrinthine street fabrics and organically shaped building blocks on the Ayverdi Maps, the occurrence of grid-planned street fabric experiments on the coast of the Golden Horn attracted attention. A comparison of the two maps revealed that the form of the 64 building blocks had undergone a transformation from the Ayverdi Maps to the Alman Mavileri Maps (1913-1914) (Figure 2). The Alman Mavileri Maps show that the traditional features of the street fabric are largely preserved, although the grid-planned street fabric is beginning to emerge. The large blocks in the Ayverdi Maps are divided and 90 new blocks are created in the Alman Mavileri Maps (Figure 3).

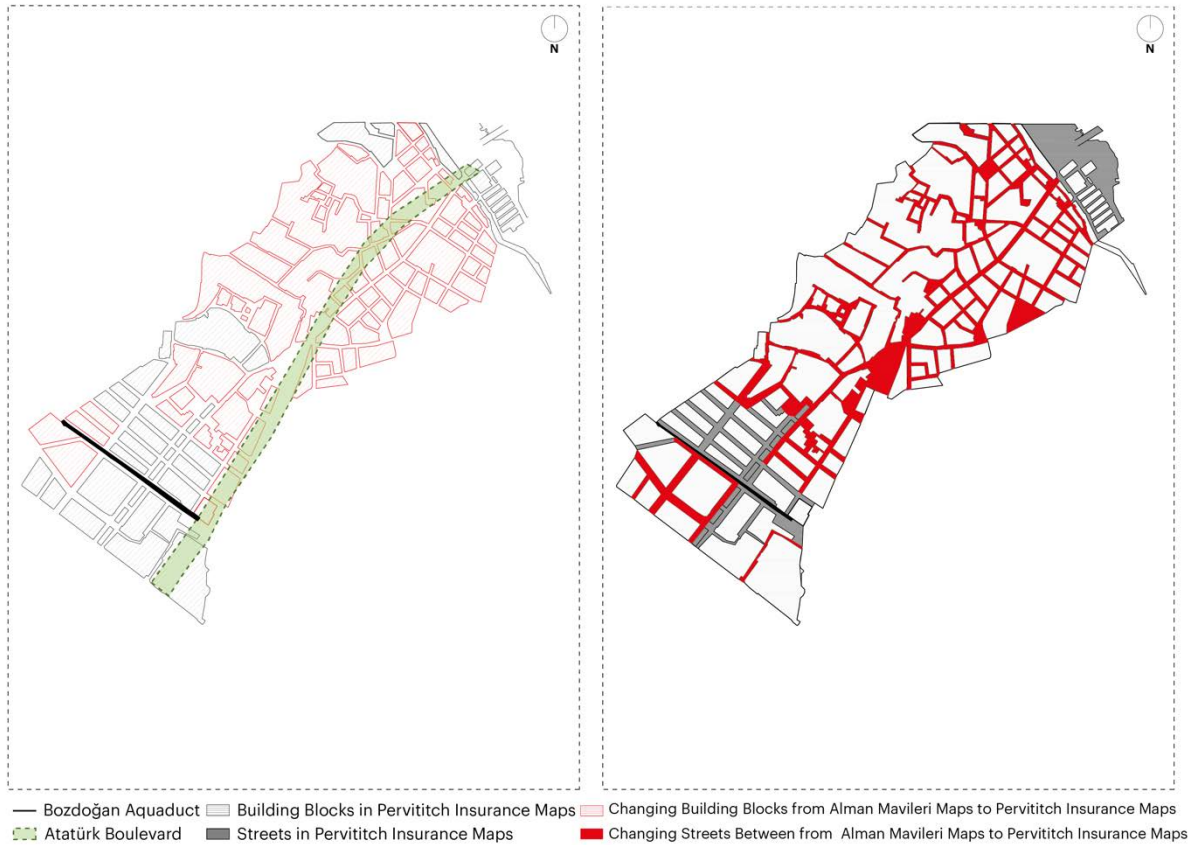


**Figure 2.** The changes in street fabric and building blocks in Ayverdi Maps (1875-1882).



**Figure 3.** The changes in street fabric and building blocks in Alman Mavileri Maps (1913-1914) from Ayverdi Maps (1875-1882).

Despite the limited number of maps available, the Pervitich Insurance Maps (1922-1945) demonstrate a significant transformation in the street fabric. The planned street fabric, which was established through the settlement of the grid, resulted in the destruction of the traditional street fabric in the study area. In contrast, the number of rectangular-shaped building blocks increased, while the number of organic-shaped building blocks decreased. It was determined that 85 new building blocks were produced by dividing the large-scale building blocks on the Alman Mavileri Maps (Figure 4).



**Figure 4.** The changes in street fabric and building blocks in Pervitich Insurance Maps (1922-1945) from Alman Mavileri Maps (1913-1914).

In 1943, the Atatürk Boulevard project was initiated. The construction of Atatürk Boulevard resulted in the demolition of 16 building blocks. The 1966 aerial photograph reveals the loss of the traditional street fabric in the study area. Upon examination of the 1966 aerial photograph, it became evident that the building blocks had been merged and enlarged, resulting in the production of 49 new building blocks that were not included in the Pervitich Insurance Maps (Figure 5). The blocks, which have been divided and reduced since the Ayverdi Maps, are reunited for the first time. In the present day (2024), the majority of the large-scale building blocks have been divided and reduced in size once more.



**Figure 5.** The changes in street fabric and building blocks in 1966 Aerial Photograph from Pervitich Insurance Maps (1922-1945).

### 3.2. Building Fabric

The evolution of the physical structure of the building between the palimpsests, the changes caused by Atatürk Boulevard on the physical structure of the building and its impact on the distribution of basic and specialized buildings were analyzed. In the Pervitich Insurance Maps, the first palimpsest where building information can be obtained, it is observed that the building fabric displays organic development with dispersed settlement. In the Pervitich Insurance Maps, the building fabric exhibits a less dense configuration in the vicinity of the Bozdoğan Aqueduct. Conversely, the density of the building fabric increases in the vicinity of the Golden Horn. The 1966 aerial photograph reveals a rapid increase in urbanization within the study area, accompanied by a uniform increase in the density of the building fabric. The construction of Atatürk Boulevard has facilitated the erection of large-scale buildings, which have been constructed on the foundations of the growing building blocks. Upon analysis of the current building fabric in the study area, it becomes evident that the density of buildings has increased. In addition to the numerous large-scale buildings visible in the 1966 aerial photograph, an increase in the number of smaller-volume buildings was also observed (Figure 6).



**Figure 6.** The changes in building fabric between Pervititch Insurance Maps (1922-1945) and 2024 maps.

It can be observed that the ratio of basic buildings to special buildings<sup>2</sup> has changed as a result of the construction of Atatürk Boulevard in the study area. A comparison of the Pervititch Insurance Maps with a 1966 aerial photograph reveals that the construction of Atatürk Boulevard has resulted in an expansion of the number of special buildings in the study area. The Pervititch Insurance Maps indicate a dispersed pattern of special buildings, whereas the 1966 aerial photograph shows that special buildings are located in close proximity to Atatürk Boulevard. A comparison of the 1966 aerial photograph with the Pervititch Insurance Maps demonstrates that the number of basic buildings in the Zeyrek Quarter in the direction of Atatürk Boulevard is greater than the number of special buildings. A comparison of the data from the present (2024) with that from the previous period shows that the quantity of special buildings has risen in every region of the study area (Figure 7).



**Figure 7.** The change in the ratio of simple buildings to special buildings between palimpsests.

<sup>2</sup> Basic building is defined as the building type that only fulfills the function of shelter. On the other hand, special building refers to the type of building other than residential buildings.

### 3.3. Subdivision

A comparison was made between the Pervititch Insurance Maps (1922-1945) and the 2024 maps to analyse the impact of Atatürk Boulevard on subdivisions. It was found that the subdivisions depicted on the Pervititch Insurance Maps have been merged to create large-scale subdivisions along the periphery of Atatürk Boulevard (Figure 8). The restructuring routes result in the destruction or fragmentation of subdivisions located along the axis of the route. This fragmentation of subdivisions results in a transition from rectangular subdivisions to a trapezoidal form. During the construction of Atatürk Boulevard, as in other examples of restructuring routes, rectangular subdivisions were fragmented, resulting in the production of trapezoidal subdivisions. This production of new forms of subdivision leads to angular changes in the urban fabric. The angular change in subdivision form facilitates the production of new building types and contributes to the diversity of street silhouettes.



**Figure 8.** The change in the ratio of parcels between Pervititch Insurance Maps (1922-1945) and 2024 maps.

### 4. Discussion

It is crucial to conceptualize Atatürk Boulevard as a restructuring route, whereby the past images of the urban space are interpreted through the lens of urban collective memory. This approach is instrumental in understanding the transformations experienced in the urban fabric and provides a valuable framework for future interventions.

The analyses conducted to read the morphological changes in the street fabric have shown that the organic fabric in the study area has deteriorated with the opening of Atatürk Boulevard and the grid-planned street fabric has increased. This situation demonstrates that Atatürk Boulevard exemplifies the process of restructuring routes, whereby the existing urban fabric is disrupted and a new identity is established. The analysis of the morphological changes in the building fabric in the study area revealed that the low-rise and old buildings were destroyed and replaced by multi-storey and rectangular buildings following the opening of Atatürk Boulevard. Additionally, the construction of Atatürk Boulevard has had an impact on the equilibrium between the basic and special buildings within the study area. The unexpected increase in the number of special buildings and the fact that these building types are located especially on the periphery of the boulevard can be explained by the fact that Atatürk

Boulevard has increased the economic value of the study area with its restructuring route character. Furthermore, the construction of Atatürk Boulevard, the alteration of the existing subdivision system and the introduction of varying perspectives on the urban fabric serve as a significant illustration of the phenomenon whereby restructuring routes engender a transformation in identity through the exertion of traumatic effects.

As with other instances of restructuring routes, Atatürk Boulevard has a positive impact on the surrounding area in terms of economic value, increasing the number of special buildings on new building blocks. Moreover, the boulevard contributes towards cultural growth through its construction, which is supported by the state as part of modernisation policies. These factors illustrate the constructive aspects of restructuring routes. Conversely, it exemplifies the adverse consequences of restructuring routes, namely the alteration and destruction of numerous urban artefacts as a consequence of their formation along the designated axis.

One of the most significant constraints of this study is the unavailability of the orthophoto image dated 1946, which depicts the period directly following the inauguration of Atatürk Boulevard. The use of orthophotos allows for a visual representation of an area in a specific historical period, thereby facilitating a more detailed examination of the changes and impacts in the area following the opening of the boulevard. However, the lack of access to this specific image precludes a comprehensive analysis of the impact of the boulevard's opening on the region. As a result, the study is unable to fully assess the impact of the boulevard on the region. Nevertheless, the study has its merits. Firstly, the analyses conducted using available data and sources provide a robust foundation for understanding the historical and spatial impacts of the boulevard. Besides, the methodological approaches and data collection techniques employed in the study ensure a high level of accuracy and reliability in evaluating the overall impact of the boulevard on the region. In this context, the findings and conclusions provide valuable insights into the regional development and transformation processes of Atatürk Boulevard.

## 5. Conclusion

Every alteration to the urban landscape creates a new layer of the city. The transformation of this stratification hierarchy results in a shift in the collective memory of the urban environment. The restructuring routes serve as an example of palimpsesting, with their traumatic effects on the urban fabric. This study draws on the concept of the palimpsest as posited by De Quincey and Baudelaire to examine the impact of Strappa's proposed restructuring routes on the urban fabric. The study develops a typomorphological analysis model to illustrate the interaction between restructuring routes and palimpsests. The proposed analysis model adopts Strappa's taxonomy, which draws upon the Italian urban morphological tradition and refers to the street-building-subdivision parameters identified in Conzen's Town-Plan Analysis. The study employs these parameters to examine the traumatic impact of morphological alterations to the urban fabric resulting from restructuring routes in a multifaceted manner.

The study established a baseline by superposing five discrete maps, which collectively represent the palimpsests with the reference to Doğan Kuban's 'The Historical Structure of Istanbul' (1969). The superposed maps facilitated an examination of the morphological changes that had occurred in the study area. A review of case studies from around the world on the impact of restructuring routes on urban fabrics has revealed that Istanbul's Atatürk Boulevard exemplifies the characteristics of a restructuring route. The introduction of a new historical stratum is evident, as the boulevard's construction has resulted in the complete deterioration of the previously organic urban fabric. This has led to the creation of a new physical structure that represents a significant transformation in the area's identity.

In the context of future design interventions, it is essential to identify potential routes that could be restructured. As the study demonstrates, through the analysis of urban artifacts such as street fabric, building fabric and subdivision, further information can be obtained regarding these routes and the land use patterns of the study areas. From this perspective, complex and multi-layered palimpsests offer the possibility of conducting a land use assessment that encompasses both past and present aspects of the existing physical environment. The analysis of these palimpsests for design interventions provides a means of exploring potential opportunities arising from the combination of the old and the new, particularly in areas where urban collective memories have been disrupted by restructuring route axes.

It is therefore crucial to gain an understanding of the restructuring routes in order to create a sustainable and meaningful environment for future generations. Also, the analysis of restructuring routes is a valuable tool for interpreting the urban landscape. It is crucial to emphasize that this documentation demonstrates the necessity for any modifications to be implemented with sensitivity in order to ensure the transfer of the urban landscape to future generations.

### Acknowledgements

Not related.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Conflicts of Interest

The authors declare no conflicts of interest.

### Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

### Institutional Review Board Statement

Not applicable.

### CRedit Author Statement:

Güllü Bozdoğan: Conceptualization, Format Analysis, Investigation, Methodology, Project Administration, Writing. Tan Kamil Gürer: Conceptualization, Investigation, Methodology, Project Administration, Writing-review and editing. All authors have read and agreed to the published version of the manuscript.

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**How to cite this article:**

Bozdoğan, G., & Gürer, T. K. (2024). The Morphological Impact of Restructuring Routes: Atatürk Boulevard's Palimpsest Phenomenon. *Journal of Contemporary Urban Affairs*, 8(2), 324–341.

<https://doi.org/10.25034/ijcua.2024.v8n2-3>



Original scientific paper

# Tactical Urbanism and Economic Inclusivity: Evaluating the Impact of Spacena Project in a Marginalized Urban Area

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## ARTICLE INFO:

### Article History:

Received: 3 June 2024

Revised: 28 August 2024

Accepted: 4 September 2024

Available online: 5 September 2024

### Keywords:

Tactical Urbanism,  
People with Disabilities (PWD),  
Inclusive Urban Spaces,  
Economic Empowerment,  
Marginalized Areas.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Addressing economic and social inequalities in urban settings, particularly those that affect marginalized groups, is becoming more challenging. In less privileged urban areas, women entrepreneurs face restricted opportunities, specifically in limited retail activities in urban spaces. This study examines the effects of implementing a tactical urbanism solution known as "Retailscape," as represented by Spacena, to address the existing socio-economic disparity. Spacena is an urban furniture piece designed to respect and accommodate PWD, serving as a platform for showcasing locally made products. Employing qualitative methods, including focus groups, interviews, and observations, the research assesses Spacena's economic and social impact. Key themes identified through coding reveal a strong desire for inclusive spaces, economic empowerment, and enhanced social integration. Findings indicate that Spacena is perceived as an opportunity for economic advancement, income generation, and social interaction among residents. However, concerns about project sustainability and regulatory challenges persist. This study demonstrates that tactical urbanism can effectively address economic disparities and foster social cohesion in marginalized communities, suggesting that similar small-scale interventions could have broad, positive implications for sustainable urban design. The findings highlight how Spacena's low-cost, scalable design and its positive impact on community inclusivity can serve as a model for replicating similar urban interventions in areas with comparable economic and social challenges.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 342–363.

<https://doi.org/10.25034/ijcua.2024.v8n2-4>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

-Spacena enhances economic empowerment for women entrepreneurs in marginalized urban areas, providing a sustainable platform for income generation.  
-The project promotes social cohesion by fostering inclusive interactions among diverse community members, including people with disabilities (PWD).  
-The study introduces a novel methodological framework using cloud analysis for qualitative data, offering insights into community-driven urban interventions.

### Contribution to the field statement:

This study provides critical insights into the transformative potential of tactical urbanism by demonstrating how Spacena fosters economic empowerment and social cohesion among marginalized groups. It bridges a gap in existing research by highlighting the role of community-driven initiatives in inclusive urban design and offers a replicable model for urban regeneration, particularly in economically disadvantaged areas.

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### How to cite this article:

Alhadyan, S., AlRahahleh, M., & Khwaileh, M. (2024). Tactical Urbanism and Economic Inclusivity: Evaluating the Impact of Spacena Project in a Marginalized Urban Area. *Journal of Contemporary Urban Affairs*, 8(2), 342–363.

<https://doi.org/10.25034/ijcua.2024.v8n2-4>



## 1. Introduction

Confronting the growing economic and social disparities in urban areas has become increasingly demanding due to rapid urbanization, limited resources, and systemic inequalities (Chmielewska & Horváthová, 2016). The high cost of urban living disproportionately impacts low- and middle-income families, exacerbating socio-economic disparities (Niessen, et al., 2018; Bailey, 2017). This gap further intensifies with the influx of refugees, which raises demand for housing, healthcare, education, and open spaces, increasing economic challenges (Aytug, 2023; UN-Habitat, 2022).

According to Forbes, there are about 2,755 billionaires worldwide as of 2021. The World Bank, on the other hand, estimated that more than 700 million people worldwide were living on less than \$1.90 per day (Lynch, et al., 1998; Illingworth, 2022). Global economic disparity refers to the unequal distribution of money and opportunities among various social groups (OECD, 2014). Many individuals remain stuck in poverty with no chance to move up the social scale (Thirlwall, 1974; Soja, 2010), particularly in less fortunate urban areas experiencing high rates of discrimination, large numbers of marginalized groups, intense urban pressure, and the presence of People With Disabilities (PWD) (Pandey & Nathwani, 1996; Baldwin & Johnson, 2006). Economic challenges in these areas can accelerate project closures due to a lack of financial activity, difficulty in obtaining affordable workplaces, competition in commercial sectors, male dominance in business, and limited trade options (Harris, Franz, & O'Hara, 2023).

With a focus on gender variances, women entrepreneurs in less privileged urban areas face restricted opportunities, specifically in retail activities, due to social and economic discrimination (Abuhussein & Koburtay, 2021). Even educated urban women, with access to managerial knowledge and skills, encounter barriers to establishing small businesses (Rizvi, et al., 2023). These enduring socio-economic disparities underscore the necessity for inclusive cities that provide access to opportunities, services, and decision-making processes regardless of financial situation, gender, age, ethnicity, or physical abilities (Talen, 2018; Kajjita & Kang'ethe, 2024). Inclusive urban policies aim to ensure that everyone can access the resources and opportunities they need to thrive (Fainstein, 2010; UN-Habitat, 2016).

However, the practical implementation of inclusive urban policies can be complex and slow-moving. This is where tactical urbanism comes into play (Silva, 2016). Tactical urbanism, defined as short-term actions for long-term change through low-cost, scalable interventions, offers a dynamic and immediate approach to addressing these issues (El-Messeidy, 2019). Tactical urbanism strongly emphasizes rapid, inexpensive, and scalable interventions that enhance urban areas, meet pressing community needs, and spark long-term urban regeneration (Mike, Anthony, & Andres, 2015). These initiatives can be spearheaded by governments, nonprofits, community organizations, or residents (Burton & Mitchell, 2006).

Tactical urbanism initiatives have the potential to accelerate urban regeneration processes and provide economic benefits to disadvantaged populations by promoting entrepreneurship, supporting local businesses, and creating employment and training opportunities (Meerow, Pajouhesh, & Miller, 2019). Projects focusing on women, particularly in specific seasons for particular products and services, can demonstrate these economic impacts and benefit society (Rossitti, Oppio, Torrieri, & Dell'Ovo, 2023). Despite the growing interest in tactical urbanism interventions, there is a notable absence of research on their economic implications and effectiveness in fostering urban regeneration and economic empowerment, especially for marginalized groups like women and PWD (Nello-Deakin, 2022). This gap in the literature highlights the need for studies that evaluate the broader impacts of such initiatives. To bridge this gap, the research focuses on Al Hashmi Al Janoubi, a neighbourhood in Amman designated for special assistance due to its significant refugee concentration. Al Hashmi Al Janoubi, located in the Al Madeenah District of the Capital Amman, has 14,100 people; 11.2 percent of them are refugees (UN-Habitat, 2022; Zalloom, 2022). To create more inclusive public spaces, particularly Queen Noor Park in the neighbourhood, creative and environmentally friendly design solutions are



crucial. This is especially vital for women and individuals with disabilities, who face numerous obstacles in accessing and using public spaces due to safety concerns, lack of accessible features, and gender-neutral design.

The tactical urbanism project "Spacena" in Queen Noor Park was chosen as it exemplifies the potential of such interventions to address urban inequality and foster inclusive urban economic development. Spacena is an innovative urban furniture piece designed to respect and accommodate people with disabilities, serving as a platform for showcasing locally made products. By employing methodical procedures in urban planning and social interaction, and leveraging creative creativity and experimentation, Spacena aims to find solutions to problems with public spaces. This project not only provides immediate economic and social benefits to the community but also serves as a replicable model for similar urban spaces. It demonstrates that small-scale, community-driven interventions can lead to substantial positive changes in the lives of marginalized individuals and contribute to sustainable, inclusive urban design.

The aims of this study are:

1. To examine how tactical urbanism initiatives like Spacena contribute to economic empowerment, social cohesion, and inclusive urban design; and secondly,
2. To explore the challenges and opportunities associated with implementing such interventions in less privileged urban areas.

The research questions guiding this investigation include:

1. How can tactical urbanism projects address economic disparities and promote financial empowerment among women?
2. What impacts does Spacena play in fostering social cohesion and promoting urban livelihood in public spaces in less privileged areas?

The study's significance lies in demonstrating how practical, low-cost interventions can make substantial impacts on marginalized communities, offering a replicable model for urban regeneration. Urban planners, policymakers, and community activists can find the research relevant as it highlights effective strategies for fostering inclusivity and economic empowerment in underprivileged areas. Additionally, scholars and practitioners interested in the intersection of urban design and social equity can benefit from the study's exploration of how tactical urbanism can address real-world challenges faced by women and people with disabilities. The paper's findings not only contribute to the existing body of knowledge but also offer actionable recommendations for improving urban spaces to better serve diverse populations.

## 2. Research Framework

Urban planning has evolved to address environmental, economic, and social phenomena, shifting focus from expansion to the regeneration of existing cities with attention to reuse, reversibility, and temporariness of interventions. The research highlights the transition from temporary tactical urbanism interventions to permanent transformations and the integration of inclusivity, entrepreneurship, and sustainability in public space design.

The diagram in Figure 1. begins with the general goal of utilizing tactical urbanism to achieve economic empowerment by implementing Spacena in an urban space. Spacena was designed with principles of participatory urbanism, addressing site-specific gaps, ensuring long-lasting impacts, and incorporating inclusive design elements. The project transitioned these principles into a practical fabrication process, encountering challenges such as budget constraints, stakeholder collaboration, and obtaining municipality approvals. Once established in Queen Noor Park, Spacena was operated by women entrepreneurs selling their homemade products to park visitors. Throughout this stage, interviews and observations were conducted to analyze the impact of Spacena, utilizing coding techniques to understand its effects on urban livelihood and social cohesion.

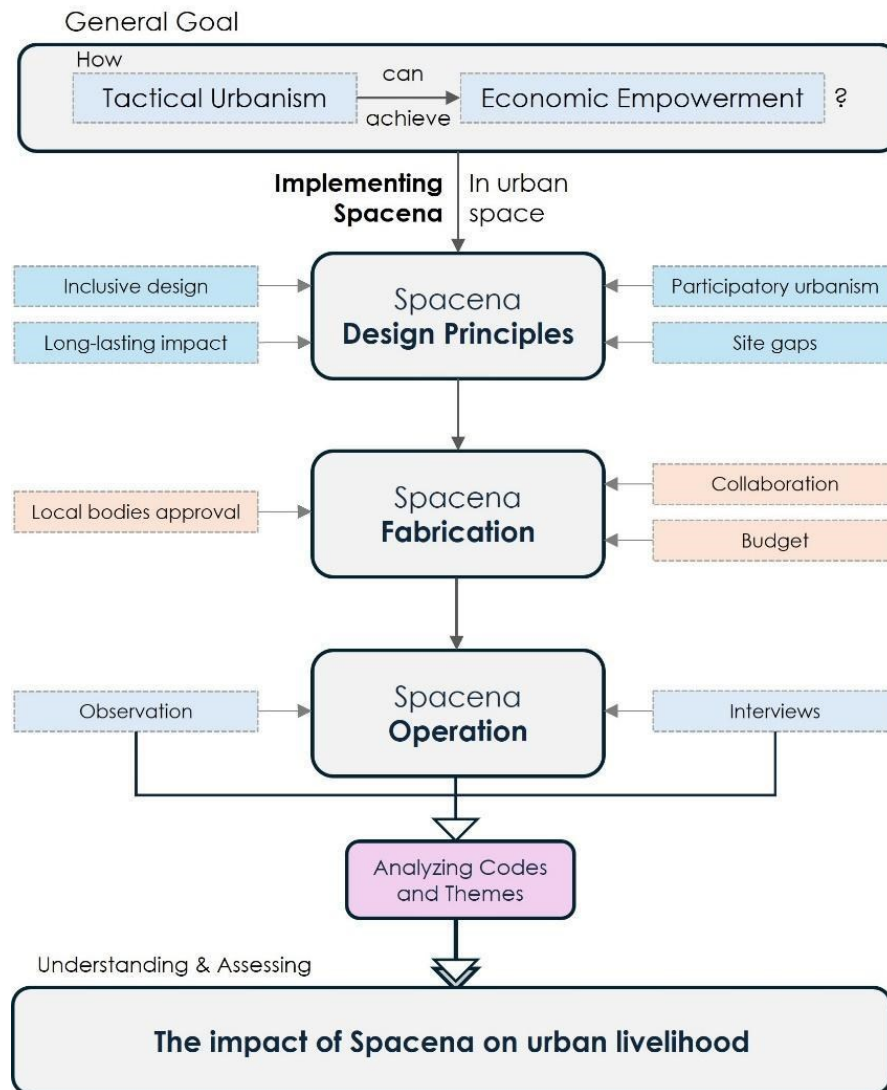


Figure 1. Research framework.

The Spacena project is a “retailscape” as a tactical urbanism solution in the research area Al Hashmi Al Janoubi neighbourhood in Capital Amman's Al Madeenah District, an urban gathering place for residents and visitors to socialize, shop, and rest; especially for women and children. It takes only the area (4.0\*4.0 m), which can be found anywhere in urban areas.

### 2.1. Study Area

Amman provides improved access to rights and services, making it a crucial hub for the integration of refugees. With about 1,080,716 Palestinian, 193,361 Syrian, 121,000 Iraqi, and 27,000 Yemeni refugees, the city is home to a sizable refugee community. Although a quarter of these refugees live in camps, most are housed in densely populated, unofficial dwellings in the city's east and centre (Hawkins, Assad, & Sullivan, 2019; Hamed-Troyansky, 2017). Many refugees find Amman appealing because of its freedom of movement, sense of dignity, well-established community networks, better housing, accessibility to services, and employment opportunities—despite the difficulties of living in an urban setting. Amman becomes a destination where refugees can come to find stability and start over (Hawkins, Assad, & Sullivan, 2019). The Greater Amman Municipality (GAM)'s refugee density research determined which neighborhoods had the highest concentration of refugees based on data from the 2015 census. Five neighborhoods—Jabal Al Nuzha, Al Hashmi Al Janoubi, Al Qweismeh,

Al Yadoudeh, and Al Amira Alia—were chosen for additional assessment. In order to provide targeted support in the most vulnerable locations, these neighborhoods were assessed (UN-Habitat, 2022; Zalloom, 2022). Figure 2. Al Madeena District and Al Hashmi Al Janoubi Neighbourhood (UN-Habitat, 2022).



**Figure 2.** Al Hashmi Al Janoubi Neighbourhood (UN-Habitat, 2022).

In many parts of the world, the issue of inclusion and accessibility in public spaces is a major concern, as Amman, Jordan city is considered one of them. According to Amman's spatial profile created by UN Habitat's program, the Al Hashmi Al Janoubi neighbourhood within the AlMadeenah District was chosen based on the results of the refugee density analysis. It showed that it has the highest refugee presence in comparison to the other neighbourhoods within the district (UN-Habitat, 2022).

This neighbourhood is in need to creative and environmentally friendly design solutions; especially for women and PWD, since they encounter several obstacles when trying to access and utilize public areas due to safety hazards, & accessibility (UN-Habitat, 2022). With 14,100 residents overall and an area of 430,000 m<sup>2</sup>, the Al Hashmi Al Janoubi neighbourhood has a population density of 32,118 people per km<sup>2</sup>. Al Hashmi Al Janoubi's population is made up of 11.2 percent refugees, of which 2.4 percent are Palestinians, 8.4 percent are Syrians, and 0.4 percent are Iraqis (UN-Habitat, 2022). It is important to note that the percentage of Palestinians includes those who are not citizens of Jordan, even though there are more Palestinians in this neighbourhood, they are citizens of Jordan. Its infrastructure networks are overburdened, and facilities for women, children, and individuals with impairments are particularly important and accessible. The area has to be made more aesthetically pleasing for its people, as the spatial analysis also showed (UN-Habitat, 2022).

## **2.2. Spacena Design Principles**

To implement Spacena as a specific case of Retailscape, emphasizing its design principles and objectives, the research is using the following conceptual framework:



***Anticipating Site Gaps and Aligning with Participatory Urbanism:*** A crucial aspect of Spacena's conceptual framework lies in its proactive approach to identifying and addressing site-specific gaps within the urban landscape. The meticulous process involves a comprehensive analysis of the immediate surroundings, with a keen focus on recognizing potential deficiencies. For instance, the project acknowledges the need for enhanced commercial spaces, prompting the strategic proposal of a well-needed function – the selling counter. This process is close to fitting a missing puzzle piece into the urban picture.

Moreover, the identification of these site gaps isn't a mere theoretical exercise; it is grounded in the lived experiences and demands of the local community. By acknowledging the tangible needs of residents, Spacena aims to fill a void, creating a functional space that resonates with the genuine requirements of its users. This meticulous approach goes beyond the conventional understanding of urban planning, transforming Spacena from a theoretical concept into a practical solution that actively contributes to enhancing the urban environment. Through this site-specific analysis and responsive proposal, Spacena becomes a dynamic intervention, finely tuned to the specific needs and aspirations of its community.

***Sustainable Transition: From Tactical to Permanent:*** The conceptual underpinning of Spacena delineates a trajectory from transient tactical urbanism interventions to a transformative permanence. This evolution is not merely a functional shift but a deliberate embedding of sustainability principles. Spacena's seamless transition from a temporary gathering locale to a fixture within the urban fabric speaks to the enduring impact of foresighted urban interventions. The integration of sustainability principles, inclusive of environmental and socio-economic facets, transforms Spacena beyond a mere commercial enclave into a sustainable urban furniture piece. The confluence of inclusivity and entrepreneurship inscribed in its design ensures that it becomes a resilient nucleus for perpetual economic and social activities, substantiating its contribution to the sustainable advancement of the community.

In conceiving Spacena, our foremost consideration is to transform inclusivity into a tangible and functional reality. The meticulous design process incorporates specific features addressing the needs of PWD.

***Inclusive Design for Women Empowerment:*** Spacena, as an exemplar of tactical urbanism, stands at the intersection of inclusivity and community empowerment. Its compact dimensions and welcoming atmosphere not only accommodate the diverse needs of residents, including women and children, but also prioritize the economic empowerment of women with special needs. Through careful spatial design, Spacena becomes more than just a retail space; it emerges as a symbol of inclusive urban planning. Its user-friendly layouts ensure that it is accessible to all, fostering an environment where women entrepreneurs, particularly those with disabilities, can confidently engage with customers and fellow vendors. This inclusive design goes beyond physical accessibility; it extends to creating a social space where diverse community members can interact and thrive.

At the heart of Spacena is a commitment to empowering women entrepreneurs through thoughtful community integration. Leveraging the skills cultivated at community support centres, particularly the International Rescue Committee (IRC). Spacena becomes a conduit for translating theoretical knowledge into practical opportunities. This strategic alignment transforms Spacena from a static structure into a dynamic force for economic empowerment. Community engagement is not an afterthought but a foundational principle. Through focused group discussions, observations, and interviews with local residents and park visitors, we systematically ensure that Spacena is not a unilateral imposition but a reflection of genuine community needs. This iterative process ensures that Spacena becomes more than a physical space; it evolves into a community asset co-shaped by those it aims to uplift.

### 2.3. Spacena Fabrication

Bringing Spacena to life in Amman, Jordan comes with its unique challenges and opportunities. The local municipality, Greater Amman Municipality (GAM), plays a substantial role, but getting the project approved might take some time due to ongoing design discussions. The project has six months to analyze, design, and put everything in place, dealing smartly with a budget of 7,000 EUR. Exploring future partnerships with local NGOs could mean more support and a chance to make Spacena a lasting part of the community. It's like putting together a puzzle, figuring out the best way to balance rules, budgets, and collaborations to make Spacena work for Amman.

The fabrication process of Spacena emphasizes sustainability and accessibility, aligning with its mission to empower local communities. It prioritizes user-centered design, incorporating specific features. The counter's height, set precisely at 75 cm, ensures it's accessible to a broad spectrum of users. A generous turning radius of 1.5 meters accommodates diverse mobility requirements. Shelves are strategically positioned, ranging from 0.6 m to 1.2 m, offering easy access for everyone. Ground fixation serves as a tactile guide for individuals with visual impairments, As shown in Figure 3. a: The Project 3d model, b: Preparing the site for implementing the project, c: Transfer the project on-site, d: The Project site in the Queen Noor Park.



**Figure 3.** a: The Project 3d model, b: Preparing the site for implementing the project, c: Transfer the project on-site, d: The Project site in the Queen Noor Park.

The choice of materials is intentional – a combination of recyclable steel and wood not only aligns with sustainability goals but also contributes to an aesthetically welcoming atmosphere. Set within the vibrant context of Queen Nour Park in Amman, Jordan, Spacena's ground-fixed implementation harmonizes seamlessly with the local environment, ensuring it becomes an integral part of the community fabric. Through collaborative efforts with local craftsmen and manufacturers, Spacena is assembled with meticulous attention to detail, reflecting the diverse needs and preferences of the community.



**Figure 4.** Implementation of the project on the site.

The output of Spacena is represented, as shown in Figure 4. Implementation of the project on the site., a transformative urban intervention, providing a vibrant gathering space for residents and visitors alike. Its multi-functional design enables it to serve as a hub for social interaction, local entrepreneurship, and community engagement. The thoughtful integration of amenities, such as flexible usage policies, ensures operational sustainability and accessibility. Spacena's impact extends beyond physical infrastructure, fostering economic empowerment and social cohesion within the neighbourhood.

### 3. Material and Methods

The following techniques are used in qualitative research: focus groups, open-ended interviews, participant observation, discourse analysis, case studies, etc. (Lune & Berg, 2017). A variety of fieldwork techniques can be used with qualitative approaches, such as "participant observation, formal and informal interviewing, document collection, filming, recording, and so on." (Maanen, 2011). A qualitative approach was employed for this research. Focus group, semi-structured interviews, and observations were used to examine the extent to which the Spacena project influences the economic opportunities for women entrepreneurs in the targeted less privileged urban area.

Focus groups, semi-structured interviews, and observation are selected due to their capacity to deliver rich qualitative data while maintaining flexibility and a balance between the breadth and depth of information. They work especially well for understanding complicated phenomena, gathering the subtleties of participant experiences and viewpoints, and doing exploratory research.

The greatest way to observe park visitors' socio-spatial behaviours is through observation, which is important since it helps to identify and target the target group more accurately before designing.

Regarding the focus groups, they were conducted in collaboration with UN-Habitat-Jordan and involved a select group of concerned citizens from the Southern Hashemi neighbourhood who were invited to share their opinions, ideas, and goals. By offering crucial background information and needs-based design data, the focus groups enhanced the design process. In addition to what was covered in the focus groups, semi-structured interviews are a good approach to getting specific details about the thoughts and experiences of the participants clearly and concisely. Therefore, these three methods were chosen to work together during the design stages to reach satisfactory results. The process for collecting data via observation focus groups, semi-structured interviews, and data analysis is explained in full in Figure 5. Conceptual methodology shows.

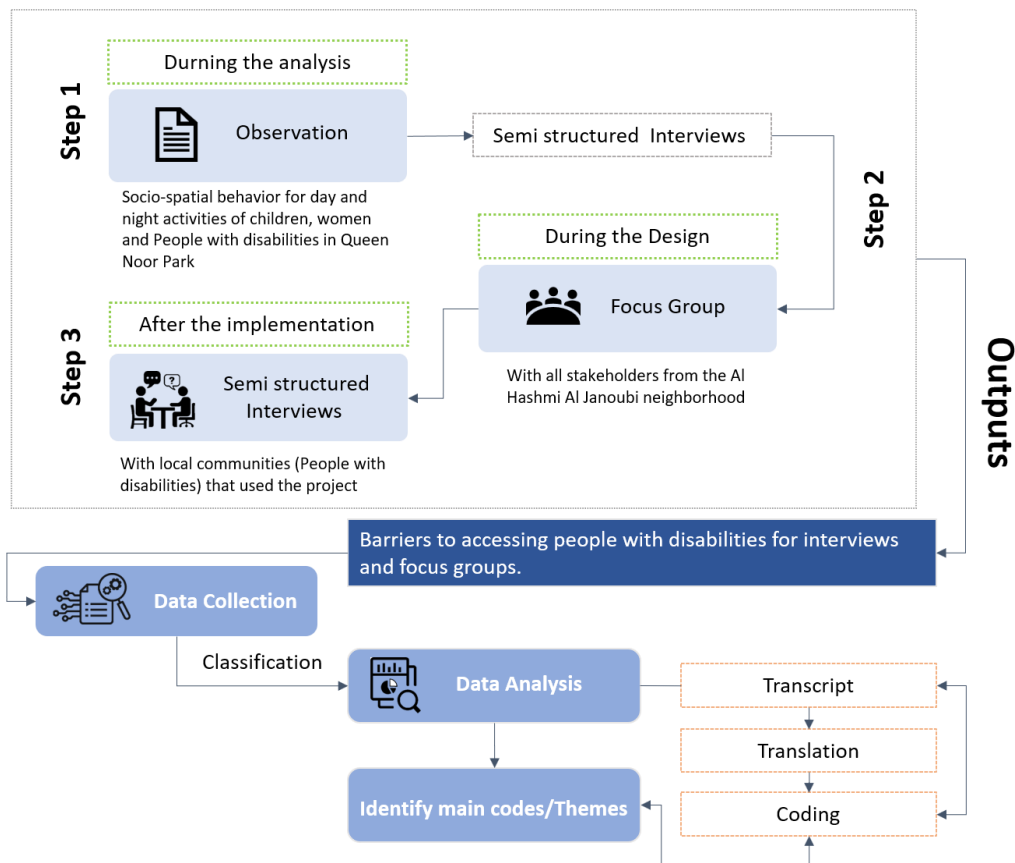


Figure 5. Conceptual Methodology.

### 3.1. Data Collection

*Observation during the site analysis:* Over a week, we observed the sociospatial behaviours of women, children, and individuals with impairments in Queen Noor Park, recording observations at predetermined intervals. We mapped important symbols, took pictures, videos, and written notes to record recurrent behavioural patterns. This was completed before the project design and during the site analysis phase.



*Focus groups in during the design:* As part of the Creative Forward Fund with UN-Habitat Jordan, Takween hosted an interactive design session on August 30, 2023, at the GAM Central Amman Library, which is next to the Al Hashmi Al Janoubi Neighborhood. Representatives from GAM and thirty-three participants from a variety of backgrounds attended the session.

Purposive sampling was used to choose participants to guarantee a varied representation of the neighbourhood's population. The hiring process sought to include: To make sure the session takes into account the needs and viewpoints of all community members, the following groups were specifically targeted: women, youth, the elderly, refugees, and people with disabilities.

*Al Hashmi Al Janoubi locals:* By concentrating on locals, it was ensured that the information acquired was pertinent to the neighbourhood's unique setting. Interaction with Nonprofits and Local Institutions: Access to potential participants was enabled by gatekeepers from non-governmental organizations and local community institutions, which helped us contact a wide range of the population. By using this strategy, the focus groups were guaranteed to be representative of the variety of the community, encompassing a wide range of experiences and needs.

Purposive and snowball sampling were used to find participants for the semi-structured interviews that were used to evaluate the Specna project in Queen Noor Park.

Semi-structured interviews after the implementation: Purposive Sampling: To ensure that the input from the people we gathered would be pertinent and informative, we deliberately looked for people who would probably be directly impacted by the initiative. Snowball sampling: We were able to reach a wider network throughout the community by having initial participants recommend others who met our criteria.

*Gatekeepers:* Women's organizations and young, old, and disabled people's organizations helped find and recruit participants so that we had a diverse group. To provide a representative and diverse sample, we conducted in-person Arabic interviews in Queen Noor Park with 13 participants, 9 of whom were female and 4 of whom were male, ages 18 to 55. As shown in Table 1. Participant characteristics of Semi-structured interviews., including gender, age, number of persons with disabilities, level of education, and field of work.



**Table 1:** Participant characteristics of Semi-structured interviews.

Participant characteristics of interviews		
Gender	Female	Male
	9 participants	4 participants
<b>Age</b>	<ul style="list-style-type: none"> <li>21-30</li> <li>31-40</li> <li>41-50</li> <li>51-60</li> </ul>	<ul style="list-style-type: none"> <li>21-30</li> <li>31-40</li> <li>41-50</li> <li>51-60</li> </ul>
<b>Number and type of disability</b>	<ul style="list-style-type: none"> <li>People with reduced mobility</li> <li>Visual impairment</li> </ul>	0 participants
<b>Education Level</b>	<ul style="list-style-type: none"> <li>Primary</li> <li>Secondary</li> <li>Diploma</li> <li>Bachelors</li> </ul>	<ul style="list-style-type: none"> <li>Primary</li> <li>Secondary</li> <li>Diploma</li> <li>Bachelors</li> </ul>
<b>Work Field</b>	<ul style="list-style-type: none"> <li>Home project</li> <li>Unemployed</li> <li>Engineer</li> <li>Teacher</li> <li>trainer in NGOs</li> </ul>	<ul style="list-style-type: none"> <li>Government employee</li> <li>driver</li> <li>Retailer</li> <li>coordinator in NGOs</li> </ul>



### 3.2. Data analysis

The data processing and analyzing process take place simultaneously. Qualitative data analysis is an iterative and reflexive process that involves a constant interaction between data collection and analysis, where during the data analysis process, orientation toward data collection for issues arising from the analysis (Suddaby, 2006; Akinyode & Khan, 2018).

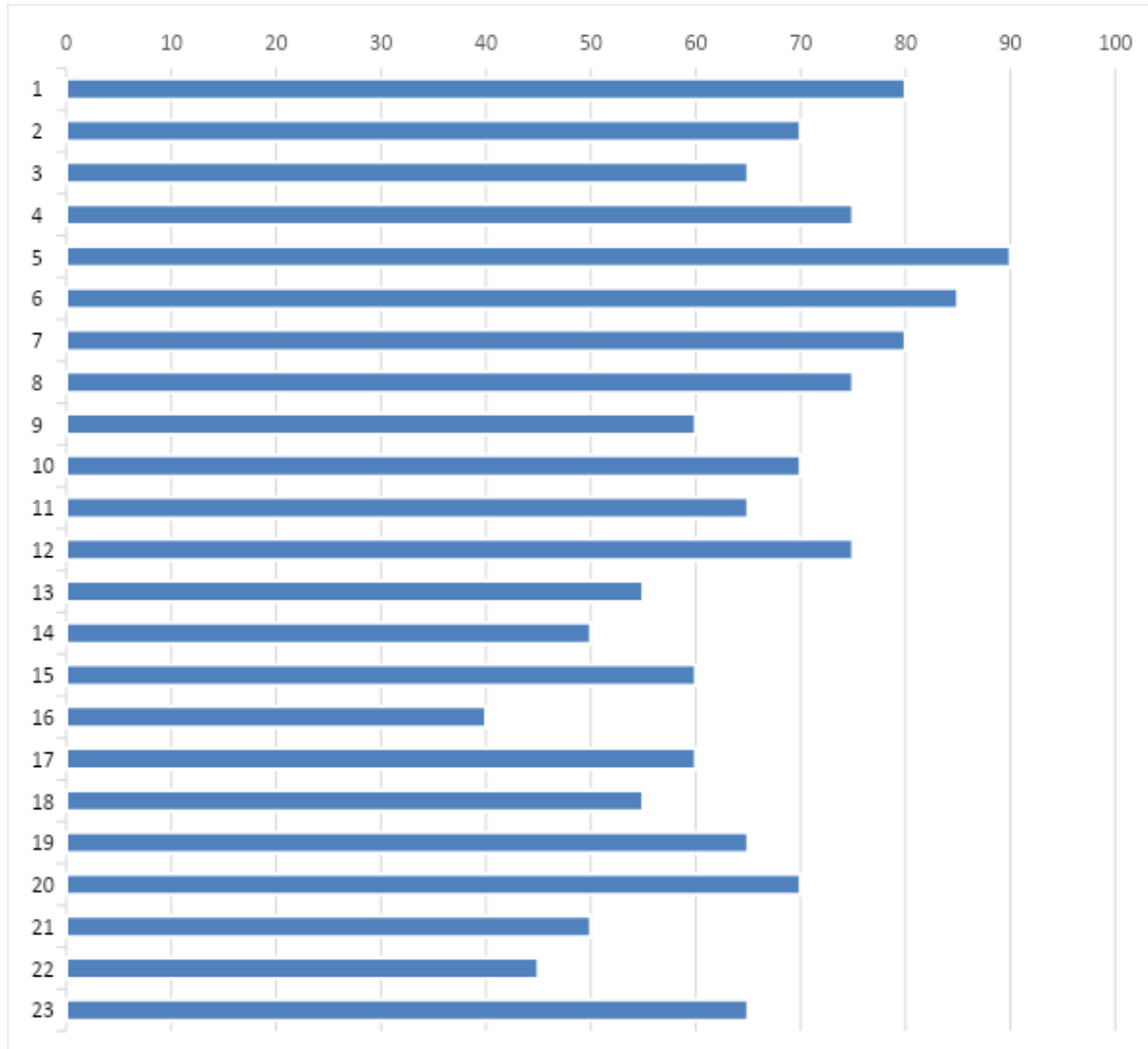
Data analysis involves transcribing simple audio recording data and translating focus group and interview transcripts from Arabic into English. The transcripts of all focus groups, interviews, observations, and notes are encoded in two stages using Excel: initial coding and focused coding methods.

Coding is a significant analysis method that categorizes data segments with a short name (code). These codes create and sort an understanding of what is going on in the participants' experiences (Maher, Hadfield, Hutchings, & de Eyto, 2018). This coding method makes it possible to view sections of text and information in new ways, and this analysis exposes emerging themes and patterns (Belotto, 2018).

Coded in two phases: the initial phase of data coding manually on Excel, open coding, for all transcript data. The second stage involved coding manually on Excel pages, in which the topics and themes within the previously defined categories were identified. Made a connection between the evolving data and patterns and the research questions and aims. In addition to making graphs to illustrate the results of data analysis.

### 4. Results

The synthesis of these themes offers valuable insights into the impact of Spacena on the community, addressing both positive outcomes and concerns from the community perspective shown in Figure 6. Outcomes and concerns from the community perspective. Spacena successfully strengthened community ties by providing essential amenities, catering to user preferences, and fostering economic empowerment, particularly among women and individuals with special needs. The analysis of coding from interviews, focus groups, and observations identified six key themes, including financial empowerment, promotion of social cohesion, timely response to community demands, addressing user preferences, project displacement concerns, and operating expenses.



**Figure 6.** Outcomes and concerns from the community perspective.

#### 4.1. Financial empowerment

Spacena served as a launchpad for entrepreneurship, enabling women to start or expand their businesses with low entry barriers. By providing a physical space to showcase their products and interact with customers, Spacena facilitated income generation and business growth for aspiring entrepreneurs. During the participatory focus group session, every participant conveyed their interest in the project, as one of the women stated "The project is fully aligned with our needs. I manufacture home products and require a well-appointed space to showcase them".

The results indicated that Spacena's role went beyond immediate income generation to capacity building and long-term economic impact. One said, "*Now I feel that I can bigger my project and show my products live instead of social media streams*". By nurturing entrepreneurial skills and providing ongoing support, Spacena contributed to sustainable livelihoods and economic resilience among women in the community.

From a different perspective, the IRC Community Center, situated within the park, plays a significant role in providing workshops, training sessions, and unique activities tailored towards economic empowerment, with a particular focus on women in the community. These initiatives are designed to equip women with the practical skills and knowledge necessary for entrepreneurship and economic independence. Here, Spacena serves as a tangible outlet for applying this acquired knowledge, effectively transforming theoretical concepts into viable business opportunities. The interview



conducted with IRC community centre employees verified that *“Spacena has transformed from a static structure into a dynamic force for economic empowerment. This alliance provides women with opportunities to earn money and access to financial resources. Rather than being an afterthought, community engagement is a core value”*. This partnership not only enables women to generate income but also facilitates access to financial resources. In return, it provides guidance on budgeting, pricing strategies, and financial management, empowering participants to make informed decisions and sustain their ventures.

#### **4.2. Promotion of social cohesion**

The study revealed that Spacena significantly strengthened community cohesion, particularly among women, including those with special needs who represent around 10 percent of the neighborhood. The project empowered women to engage actively with children and fellow residents in the garden, fostering stronger social networks. Women with disabilities quickly embraced the project, finding opportunities for communication and collaboration that enhanced their sense of belonging and participation in community activities. One woman said *“my son, (who is a PWD) is extremely thankful for this opportunity. Finally, we can achieve our dream!”* This comprehensive approach not only enhanced community ties but also economically empowered women, driving broader community participation. This sentiment reflects a genuine need for inclusive employment opportunities and highlights the project's importance in addressing diverse community needs and aspirations.

The results also underscored the role of Spacena in enhancing inclusivity and diversity, bringing together individuals of different ages and economic backgrounds around a shared interest in locally made products. This inclusive approach empowered women with special needs to overcome social barriers and participate more actively in community life. One community member noted how discussions about the project encouraged her sister, previously reluctant to leave the house, to visit the garden and engage with the diverse group of women involved. This shift illustrates the transformative impact of Spacena in breaking down barriers and fostering a more integrated and inclusive neighbourhood environment.

The impact also reached a different category. The results confirmed strengthened community ties during the installation and study stages of the project. A security man humorously remarked, *“Put it next to me so I can drink coffee on a daily basis, and in return, I take care of the project at night.”* This humorous exchange highlights the collaborative spirit and shared ownership of the project within the different community groups and shows how Spacena is a significant need for the whole community.

#### **4.3. Timely response to community demands**

The results demonstrated that Spacena effectively addressed the community's urgent need for nearby commercial facilities, especially within the park, catering to the specific needs of women and children. One woman emphasized that *“the project encouraged children to remain safely inside the park by providing essential items like juices and chocolates, reducing their exposure to risks on main streets”*. This efficient service provision not only supported women's work and income but also fostered a sense of internal satisfaction, motivating them to deliver services with care and dedication.

The meetings and focus groups drew enthusiastic participation from community stakeholders who were impressed by the project's impact relative to its implementation time. They praised the project and provided valuable suggestions for enhancing community engagement. Supporters of community initiatives expressed interest in creating direct employment opportunities through the project, which would strengthen community initiatives and deepen understanding of community needs. Furthermore, one institution expressed a desire to replicate the project in multiple locations and gardens due to its proven effectiveness in promoting community development.



#### 4.4. Addressing user preferences

The results highlight the impact of Spacena in addressing user preferences through a comprehensive analysis of the immediate surroundings and methodical observations over a week-long site assessment. This approach identified the pressing need for improved commercial space, leading to tailored amenities and services, including the strategic addition of a retail counter that was deemed essential by the community. Through this site-specific study and adaptive planning, Spacena emerged as a practical solution that precisely caters to the unique requirements and aspirations of its community, demonstrating the transformative potential of user-centred design in tactical urbanism.

An inspiring collaboration that closed the gap between experts and the community resulted from the participatory sessions with the local population and fostered a user-centred approach and a sense of ownership and pride in the intended Spacena development among the locals by encouraging active involvement and input. Residents engaged in open communication to share their opinions, goals, dreams, and personalized experiences, which enhanced the design process by providing important context based on their requirements. This resulted in increasing the satisfaction level of the users; especially PWD. One of the PWD said “oh! This space here is wide enough for the wheelchair!” she referred to the corridor space between the counter and the shelves in the back.

#### 4.5. Project displacement concern

Despite the positive impact of the project on the local community, they showed a significant concern regarding the project’s removal. One woman frankly questioned “*Is it going to stay? Are they going to remove it later on?*”. After many consecutive political, social and economic constraints, they started to question the very simple opportunity they could benefit from, as if they didn’t have the right to access it. The temporality concern also extended to “*until when we can use it to show our products before it goes?*”.

The temporality concern also extended to “until when we can use it to show our products before it goes?”. The sentiment of questioning the accessibility and longevity of the project suggests a fundamental desire for stability and sustainability. For entrepreneurs, in particular, the temporality concern extends beyond inconvenience; it directly impacts their ability to plan and invest in their businesses. The prospect of a temporary opportunity raises doubts about the viability of using Spacena as a platform to showcase their products and establish a lasting presence in the market. Stability in location is crucial for entrepreneurs seeking to take serious steps toward business establishment and project continuity, highlighting the need for assurances regarding the project's permanence and ongoing support.

Furthermore, community members perceive regulatory and administrative entities as barriers to their access to initiatives like Spacena, raising doubts about the reliability of formal support channels to their businesses. Instead of viewing these bodies as facilitators of progress, there is a prevailing sentiment of caution and skepticism, driven by past experiences of bureaucratic obstacles and unfulfilled promises. “*Leave it! You will have to deal with Amana (municipality) in the future*”; said whisperingly by a woman pulling her friend away.

#### 4.6. Operating expenses

Another concern raised by the residents is regarding financial planning and whether they will use Spacena as their main selling platform. For many start-ups, the location rent price plays a crucial element in managing their business budget. One questioned: “*Ohh! Are you going to take money from us?*” reflects apprehension about additional financial burdens, while another asked: “*Is it costly?*”, underscores the need for clarity on pricing structures.

Furthermore, the local entrepreneurs worried about the potential financial risks associated with renting the space, expressing concerns about being liable for rent even on slow sales days. The sentiment,



"What if we didn't sell on that day, are you going to make us pay for the rent?! This project is supposed to help us not break us!", highlights the community's desire for a supportive and sustainable economic platform.

After telling them that the project might be run by a local community support centre, meaning reduced or waived rental fees. Their concerns shifted towards the operational strategies like how many days per week one can use it and what type of products they are allowed to sell. This shift in focus towards operational strategies underscores the importance of transparent communication and clear guidelines to alleviate anxieties and empower entrepreneurs to leverage Spacena as a viable avenue for economic growth and community empowerment.

## 5. Discussion

The project achieved remarkable success, yet certain interactions posed challenges for individual users, particularly women with special needs. We analyzed the conducted codes and their frequency using cloud analysis, as Figure 7. Cloud Analysis shows. The results demonstrate a range of codes, with 69 percent indicating positive impacts and 31 percent reflecting negative sentiments.

The residents perceive Spacna as an "*Opportunity*". An opportunity to improve their economic and social conditions. This perception is rooted in its dual role as both an income generator and a socializing space. Locals view Spacena as a gateway to entrepreneurial opportunities, helping women in the community to start and sustain their businesses, thus boosting their financial independence and contributing to economic diversity. Additionally, the project has fostered a vibrant social environment where community members can interact, collaborate, and build stronger social ties. These findings align with existing literature on tactical urbanism, which emphasizes the potential for such projects to foster local economic development and community engagement (Mike, Anthony, & Andres, 2015; Lydon, 2015).

However, despite these positive impacts, concerns about the project's future persist. The risk of removal poses a significant threat to the gains made, as it could disrupt the established community benefits and undermine the emotional and financial investments of residents. Furthermore, issues related to budget management have emerged, with concerns about the adequacy of financial resources for ongoing operations and expansions. The community's apprehension about the complexities and costs associated with maintaining and potentially expanding Spacena highlights the need for stable funding and effective budget management strategies. Ensuring these aspects are addressed is crucial for preserving the project's success and extending its benefits to the community in the long term.



**Figure 7.** Cloud Analysis.

The results call for proactive measures. This fear of encountering institutional obstacles highlights the need for transparent communication and support from regulatory bodies. The effectiveness of Spacena is heavily reliant on institutional support and regulatory frameworks. However, the consistency and reliability of this support can vary significantly depending on the region and the specific regulatory environment. Inconsistent or inadequate institutional backing can pose substantial barriers to the project's expansion or replication. For example, bureaucratic delays, complex licensing requirements, and insufficient governmental resources can hinder the project's ability to scale or sustain its initiatives. Such challenges emphasize the need for more robust and supportive policy frameworks to ensure that projects like Spacena can thrive.

Based on this, it is crucial to implement policies that address key community concerns. First, subsidizing rental spaces within community projects can significantly reduce the financial burden on small businesses and women entrepreneurs, particularly those from marginalized communities. Simplifying and expediting the licensing and regulatory approval processes will help mitigate bureaucratic obstacles and encourage formal business participation. Establishing regular feedback sessions and community meetings ensures that the project can timely respond to community demands and tailor services to better address user preferences. Additionally, creating clear and accessible communication channels between the community and regulatory bodies can enhance transparency, build trust, and alleviate fears of project displacement.

Moreover, targeted programs that provide financial, educational, and mentorship support for women entrepreneurs can promote financial empowerment and help bridge economic disparities. Ensuring inclusivity in project design allows individuals of all abilities and backgrounds to participate, fostering social cohesion and maximizing community benefits. Developing long-term sustainability plans, including funding strategies, maintenance protocols, and community ownership models, will ensure the project's longevity and ongoing support for the community. By focusing on these strategic areas, policymakers can enhance the effectiveness and sustainability of community-driven projects.



## 6. Conclusions

The study's findings support the hypothesis that Spacena acts as a catalyst for economic empowerment, social cohesion, and community development in marginalized urban areas. Interviews and focus groups revealed significant financial empowerment among women entrepreneurs, who reported increased income and improved financial management skills. The project also enhanced social cohesion by providing a communal space that fostered interactions and support networks, particularly for women and individuals with special needs.

This study contributes to the existing literature by providing empirical evidence on the positive impact of tactical urbanism on marginalized communities. It highlights the challenges and opportunities for women entrepreneurs, emphasizing the importance of community-driven initiatives in urban planning. The findings underscore the value of integrating community input into project design, leading to successful outcomes. Additionally, the study offers policy recommendations to enhance project sustainability and introduces an innovative methodology using cloud analysis for data coding, setting a precedent for future research in similar contexts.

Spacena's impact appears to be multifaceted and significant, particularly in empowering women entrepreneurs and fostering community cohesion. The project has provided tangible economic opportunities for women, enabling them to manage finances, generate income, and engage socially within their neighbourhood. However, challenges remain, especially related to regulatory hurdles and concerns about project sustainability.

Overall, Spacena exemplifies the potential of tactical urbanism to create inclusive and transformative spaces within marginalized urban areas, offering valuable lessons for future community-driven initiatives. Spacena develops into more than simply a physical location; it also becomes a hub for women to start their businesses, generate income, and gain access to financial resources. In addition, Spacena becomes a communal asset that is collaboratively developed by the people it seeks to uplift.

The study's key findings reveal that Spacena has made a substantial impact in six crucial areas: First, it has significantly advanced financial empowerment by offering local entrepreneurs valuable opportunities and resources. Second, the project has fostered social cohesion, bringing together diverse community members and strengthening ties, particularly among women with special needs. Third, Spacena has responded effectively to community demands by providing timely, cost-efficient solutions and accessible commercial spaces. Fourth, it has adeptly addressed user preferences through responsive design and tailored amenities. Fifth, concerns about potential project displacement have been acknowledged, highlighting the need for strategies to ensure permanence. Lastly, the study underscores the importance of managing operating expenses, suggesting that streamlined regulatory processes and transparent communication are essential for long-term sustainability and trust.

The results underscore the critical need to address community concerns regarding the sustainability and permanence of projects like Spacena. Proactive measures are essential to ensure that these initiatives provide not only immediate benefits but also a stable foundation for long-term economic empowerment and community development. For example, integrating continuous feedback mechanisms and regular community meetings can help in refining operational strategies that align with local needs. The prevalent fear of institutional obstacles highlights the necessity for transparent communication, accountability, and tangible support from regulatory bodies. Establishing clear guidelines and simplifying bureaucratic processes can foster trust and enable sustainable development. Stakeholders and policymakers must engage in collaborative decision-making and tailored strategies, such as offering subsidized rental spaces and dedicated training programs, to create a supportive and inclusive environment for local businesses. These steps will ensure that the project not only meets immediate demands but also evolves as a resilient community asset.

Future research could explore the long-term impacts, through longitudinal studies, to assess how sustained community-driven initiatives affect women's entrepreneurship and broader economic



empowerment over time. Additionally, comparative studies across different urban settings could identify best practices and adaptable strategies for diverse socio-economic contexts. Further studies can also explore the potential for scaling such initiatives and integrating them into broader urban planning frameworks, contributing to the creation of inclusive and resilient urban environments.

### **Acknowledgements**

The authors are thankful to the financial and technical support from Takween, Jordanian Goethe Institute, and UN-Habitat as part of the Creative Forward Fund 2023. Their support helped in implementing, developing and operating the project in Amman city.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflicts of Interest**

The authors declare no conflict of interest.

### **Data availability statement**

The data that support the findings of this study are available from the corresponding author M.A. Shahed Alhadyan.

### **Institutional Review Board Statement**

Not applicable.

### **CRedit author statement:**

Conceptualization: S.H., M.R., M.K. Data curation: S.H., M.R., M.K. Formal analysis: S.H., M.R., M.K. Investigation: S.H., M.R., M.K. Methodology: S.H., M.R., M.K. Project administration: S.H., M.R., M.K. Writing—original draft: S.H., M.R., M.K. Writing—review and editing: S.H., M.R., M.K. All authors have read and agreed to the published version of the manuscript.

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**How to cite this article:**

Alhadyan, S., AlRahahleh, M., & Khwaileh, M. (2024). Tactical Urbanism and Economic Inclusivity: Evaluating the Impact of Spacena Project in a Marginalized Urban Area. *Journal of Contemporary Urban Affairs*, 8(2), 342–363. <https://doi.org/10.25034/ijcua.2024.v8n2-4>

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Original scientific paper

# Adapting Mobility Infrastructure to the Needs of a Liveable City: The Case of Beirut Street Markets

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## ARTICLE INFO:

### Article History:

Received: 14 June 2024  
Revised: 18 August 2024  
Accepted: 15 August 2024  
Available online: 5 September 2024

### Keywords:

Residential Neighborhood,  
Street Markets,  
Urban Public Space,  
Walkability,  
Liveable City.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Beirut's policies in the last decade or more contributed to the creation of a highly car-dependent city with almost 2 million vehicles dominating the streets and causing high traffic congestion. Yet, Beirut's informal street markets carry the potential for the enhancement of a liveable sustainable city, which previous studies have overlooked. To approach this problem, urban planners need to re-think and restructure the existing street network in Beirut to decrease the distances between the suburbs and the centre of the city. The aim of this research is to formulate a rational system that assigns markets and pedestrian areas to certain streets where cars can have no or limited access. This system adopts a parametric tool based on fuzzy logic which analyzes the current street network and filters out streets that fulfil certain criteria such as parking availability and proximity to public transportation, hence decreasing centrality in the city. This method is applied to both fixed and temporary food markets that are characterized by highly dynamic pedestrian movement. The final results show a series of maps of Beirut with different scenarios identifying streets that fulfil the defined criteria as potential street markets, which can be the blueprint for further analysis of street and transportation planning creating more liveable and sustainable places.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 364–384.

<https://doi.org/10.25034/ijcua.2024.v8n2-5>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- Increasing pedestrian areas in Beirut will enhance the overall livability of the city.
- Introducing street markets in selected urban areas will reduce traffic congestion in Beirut.
- Proximity to public transportation positively affects the success and footfall of urban street markets.
- Restructuring the street network to prioritize walkability will increase social inclusion and community well-being in Beirut.

### Contribution to the field statement:

This research sheds light on urban planning in Arab cities that are often overlooked, especially where public spaces are considered scarce resources. It also induces a philosophical framework of the capability approach that paves the way for studies on walkability in Arab cities.

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### How to cite this article:

Askar, Y., & Abdel-Ghani, T. (2024). Adapting Mobility Infrastructure to the Needs of a Liveable City: the Case of Beirut Street Markets. *Journal of Contemporary Urban Affairs*, 8(2), 364–384.  
<https://doi.org/10.25034/ijcua.2024.v8n2-5>



## 1. Introduction

### 1.1 Background and Context of Beirut's Urban Challenges

Beirut is Lebanon's densest city with very few unbuilt plots. Additionally, it is a car-oriented city, where transportation is exclusive to private automobiles, hence most of the public space in the city is dedicated to vehicles. This generates a great deal of car pressure on the public space, especially since there is no efficient public transport network in the city. This comes in complete contrast to the city's foundational potential for a walkable city regarding its mixed land-use patterns and compact urban form (Sevtsuk et al., 2024).

Throughout the history of urban development in Beirut, one can notice the urban fabric changes that led to the current urban challenges. The Danger Brothers Masterplan set in 1932 proposed three phases: The first was a multi-nodal development phase that linked Beirut with nearby cities such as Tripoli and Damascus, the second was establishing an East-West major axis and organizing a peripheral road, and that is to clear the old town that was stuck with traffic, and the third phase was defining several areas and separating them according to social classes (Yassin, 2012). By the 1940s, Michel Ecochard's proposal, which is considered to be the most representative of the state's effort, focused on the circulation system through a main road that connected North and South Lebanon, lateral roads that connect East and West Beirut, and terminal roads that penetrate the urban fabric linking to downtown (Barakat, 2004). Modernized planning continued in Beirut till the post-1991 Gulf War which caused major destruction in the city. Rafik Hariri's government attempted to reconstruct and reshape the image of the city, yet it came at the expense of other cities.

### 1.2 Problem Statement

Beirut, like other developing cities in the Middle East, became the centre of attraction for inhabitants causing rapid urbanization, environmental damage, and the concentration of urban transportation along the main highways. This led to, according to the IBI Group & TEAM International, an estimated 80.6% account for the dominance of vehicles in the streets, approximately 1.7 million vehicles (Hatoum & Barraj, 2023). A 2021 report by UN-Habitat on the city of Beirut stated that policies on the importation of used and new cars and the lack of alternative means of transport, in addition to inadequate infrastructure and high traffic congestion, all contributed to making Beirut a highly car-dependent city. This results in 70% of travel times experiencing delays. On another level, most of the urban blocks in Beirut are considered relatively small, creating more streets than needed, from which, some are insignificant to the mobility network in the city.

### 1.3 Research Questions

The current networking system illustrates a blurring of boundaries between formal and informal modes of transportation, with increased distances between the suburbs and the centre of the city (Mady, 2021). The street network tends to have a larger number of streets than usual and urban blocks are smaller than urban planners prefer them to be for more compactness and optimal use of land. Furthermore, the policy of centralized administration that the government has been adopting for past decades has added a lot of pressure on the city from non-residents as most of the legal/official documents, personal official paperwork, are requested and done personally in Beirut.

Hence, this article poses two important questions:

- How can the restructuring of street networks contribute to urban vitality and community well-being?
- How can such changes address broader societal challenges, such as social inclusion and adaptive responses to environmental and economic stresses?

These questions take us to the core problem of this paper, food accessibility and security. According to a study conducted by the UN regarding food security, in 2016, when Lebanon was relatively financially stable, around 16% of the country was within a margin of moderate food insecurity. Today,



this figure reached around 26%. One can draw a similar conclusion when observing the number of welfare aid requests the Government received during March and April 2020, which is around 300 000 requests according to the Ministry of Social Affairs, noting that only one family member is allowed to apply for such support systems, and all employees of the public sector are deprived of this social support. This crisis turned attention towards farmers and increased awareness of urban gardening. Despite the pro-activeness of Lebanese society, it is challenging for them to promote their products given that agricultural lands are at great distances from the city. This takes the reader to another problem which is the lack of sustainable transportation modes in Beirut. A study conducted by the World Bank in 2017 confirms this, the study elaborates how 80% of the Lebanese community prefers to use a private car when moving around Beirut, leaving 20% to buses and taxis (Anas et al., 2017).

#### **1.4 Significance of the Research**

Here, the authors seek to induce Beirut's urbanization problem of the current street networks, and through the application of a parametric model, analyze it as a form of public space that can be rethought and transformed from a car-oriented infrastructure to pedestrian spaces for optimal use of space in the dense city. These spaces could host functions the city needs today such as markets, which in this research are interpreted to have a greater impact on the surrounding environment. This aligns with the severe economic crises Lebanon is going through where people are losing their jobs and all types of goods are becoming unattainable. This crisis became more vivid following COVID-19 and the August 2020 explosion, where more than 70% of the population lost their jobs or saw their salaries reduced. Today, people need access to affordable goods and adopt a new way of trading, and for this, they need suitable spaces, most importantly free outdoor spaces in urban/dense areas.

#### **2. Literature Review**

The theoretical paradigm of liveability has been the subject of several writings as a result of the increased social, political, and economic challenges facing contemporary cities. Hajjaliakbari et al. (2022) put forward the term *obsolescent neighbourhoods* referring to deteriorated living conditions in places due to several reasons, among which is the lack of planned public spaces that can serve the local community. Tracing back to the writings on urban space, e.g. Jane Jacobs, Gordon Cullen, and Kevin Lynch, postmodern perception of urban space rejected modernists' negligence of the complexity of the city and their reductionist approach that "a city cannot be reduced to its quantitative dimensions without running the risk of killing its urban vitality" (Badami, 2022:2; Dovey & Pafka, 2016). This relationship between the user and the space is a morphological analysis that provides insights into the urban fabric. Morphology, a term used extensively to describe the conscious and unconscious patterns and compositions of the physical city (Maretto et al., 2023), has been integrated into different fields to address citizens' needs. The study of urban forms has become an integral part of a holistic approach to tackle the challenges of contemporary cities in its ability to integrate social and environmental perspectives.

For this matter, the literature review explores an intricate relationship between walkability and urban spaces. In the historical background sense, the field of urban design had little to consider regarding the quality of life and the environment of the inhabitants, prioritizing vehicles over pedestrians. Stakeholders can propose a variety of changes within the infrastructure of the city and introduce new policies that can protect cyclists and pedestrians to achieve sustainable urban planning decisions (Ros-McDonnell et al., 2024; Dragović et al., 2023). Hellberg et al. (2021) assert that the concept of walkability is not only associated with the inhabitants' attitudes and their usage of public space but also their choice of travelling short and safe distances which in turn stimulate non-motorized traffic over motorized ones. Previous renowned urban theorists such as Jan Gehl emphasize the importance of social activities in streets that can enhance walkable areas, hence developing the quality of urban space (Gehl, 1987; Hussein, 2018).



The effect of walkability on the quality of urban life can be promoted through the adoption of the compact city model (Mouratidis, 2017), which gives space to a wide range of activities and uses within the urban fabric. The compact city is known for its heterogeneous and multifunctional features that use few material resources, utilize less energy and a system that can work well with historic cities, such as Beirut, for better conservation of its old buildings, neighbourhoods, and old streets. In other words, walkable urban areas have an intrinsic socio-economic value. In a 2018 report released by the NSW Government, Landcom, established a toolkit for defining the economic and social values of societies and the different stakeholders involved in planning and development, whether public or private sectors (Cohen et al., 2018).

This approach can be situated within the scope of this paper by studying street markets as a vital element of planning. Street markets can be perceived as a form of tactical placemaking created through the organic behaviour of community members. Placemaking emphasizes the uniqueness of identity resulting from successful linkage, image, and sociality of the place (Nouri & Costa, 2017; Sukasta & Winandari, 2020). In the context of Beirut, placemaking is perceived as a tool for tackling socio-economic and geographical inequality. Hence, these renewal projects are mostly based on the notion that such places are occupied by marginalized communities, often looked at as the ‘other’ (Yatmo, 2008; Balarabe et al., 2019). Yet, has this image emerged out of the level of success of these markets?

### **2.1 Towards Successful Urban Markets: A Theoretical Framework**

Several studies have addressed the modern urban movement ‘New Urbanism’, sometimes referred to as ‘Neo-traditional design methodology’ that favours the pedestrian over the automobile (Al-Hagla, 2008). Its main core of work relies on creating a dynamic urban realm where several stakeholders, architects, urbanists, community members, and local and central governing bodies function together for the benefit of the whole. Street activities are one of the forms of urban dynamism that can enhance efficiency and vitality through everyday social interactions. This implies that streets can “operate as social places” (Rui & Othengrafen, 2023:9). This article highlights street markets as crucial focal points for urban economic and social life. Markets by definition are spaces where goods are offered for a reasonable price, usually cheaper than stores and supermarkets. Moreover, the goods in the case of markets of edible products are usually fresher since storage is not that common nor needed in most markets.

Situating markets within a theoretical stance introduces the reader to the capability approach developed by economist Amartya Sen (1999). The capability approach, often used in economics and social policy, focuses on enhancing individuals’ well-being through three approaches: 1) the various things that a person values doing, 2) the opportunities to achieve these doings, and 3) the ability of a person to act upon his/her own value. In the field of urban studies, researchers have defined urban capabilities as a set of capabilities that “depend on urban and environmental opportunities intended as combinations of contextual factors that can be modified with a public policy” (Blečić et al., 2015; Fancello et al., 2020:7). In this matter, there are certain elements that influence inhabitants’ choice to develop urban walkability in the city. The authors of this article highlight Beirut’s street network as the main element to explore the vitality of public markets being utilized to enhance walkability.

In light of the current challenging socio-economic conditions in Beirut, urban markets can offer a great deal of relief to the community. On one hand, Flea markets can help people sell products they don’t need to someone who does for affordable prices. Beirut is a suitable host to such markets as many people move temporarily to the city for education, job opportunities or to experience the city life. This fast-paced movement of residents can generate a need to sell or buy items frequently which flea markets can offer. On the other end, food markets can address the most serious issue threatening the city which is food safety. Food markets can intervene and offer themselves as a public platform for farmers to promote their products instead of supermarkets. Simultaneously, buyers will have the chance to shop from a variety of fresher products for more affordable prices. These markets can include

livestock, vegetables, fruits, and dairy products. The main aim is to provide a holistic vision for well-established markets that can encourage people's engagement, coming from different backgrounds (Agboola et al., 2018), with a diverse range of activities.

Public markets embody a great deal of benefits on the national and regional scales. Linking urban and rural economies is of course a goal in itself, but creating these one-to-one connections between rural farmers and urban residents can also have healthy impacts, such as promoting internal/rural tourism, where people have the curiosity to visit these places to purchase food produced from those areas. Several cities in the world such as Barcelona, Amsterdam, and Berlin, have famous markets that later became popular tourist destinations, which also fall within the umbrella of the benefits of the local economy.

### **3. Materials and Methods**

#### **3.1 Study Design and Setting**

When it comes to strategically placing elements in a city, a rational ordered logic should be established to allow them to function suitably within a certain context. This logic consists of a list of parameters based on data structures, which form together the criteria threshold. Once this phase is completed, streets can be converted to markets based on the study results. In this research, a parameter list is created through which a street network performance test is conducted, and later the criteria are divided into two categories, for the fixed markets and the temporary markets. The following briefly illustrates the structure:

##### **A. Testing the Street Network**

##### **B. Fixed Food market**

1. Streets long enough to host a market
2. Streets with proximity to parking space
3. Integrated public transportation network
4. Uninterrupted access from the food source
5. Land use of the existing structures and underground parking

##### **C. Temporary Food Markets/ Pedestrian Streets:**

1. Streets big enough to host a temporary market
2. Street far from existing green or public spaces
3. Street within a walkable range of parking lots
4. Proximity to sub-centres in the city

#### **3.2 Testing the Street Network**

This phase is mainly dedicated to testing the traffic and congestion on the streets. First, to be able to properly test the traffic system in Beirut, one can rely on intelligent traffic monitoring systems. Such data is usually available in municipalities, at the Ministry of Traffic and Transportation, and at specialized traffic and mobility firms. These systems can observe data related to streets, knots, roundabouts, and highways and highlight the ones that witness the heaviest traffic flow during the day. People tend to use the streets that represent the most convenient for them to reach their destinations within the city.

#### **3.3 Fixed Markets**

##### ***B1- Streets with a minimum length***

The maximum width of streets in Beirut is 12 meters, which indicates that the only way to expand the market is linearly, hence making the market longer. After observing the average street length in Beirut city street network, a well-defined range could be a set parameter, on one hand, to keep this number within the margin of the existing street width, and on the other hand to have enough stalls installed to keep the market functioning.

**B2- Streets with proximity to parking spaces**

The parking space can extend beyond its traditional function as a space for cars, yet it could also serve as an unloading space in the early mornings before the opening hours, as well as a loading space after hours and during waste collection.

**B3- Integrated public transportation network**

Accessibility is a crucial aspect that needs to be met. Although transit stops should be at the core focus of the criteria, in car-based and dense cities, the approach is more of what streets could offer rather than what is the best optimal place for a market. Connectivity to public transport is a factor of success in such environments.

**B4- Uninterrupted flow of goods from the source**

As an additional parameter, streets hosting food markets should have easy access to roads connecting to the rural agriculture areas without being a burden to the city. Car-dependent cities suffer from high traffic congestion, and street markets decrease pressure on the street network. Therefore, food trucks should avoid going into the city's internal grid network and limit their movement to the main highways to minimize the congestion they create as much as possible.

**B5- Land use of existing buildings and underground parking**

This kind of data platform could include all sorts of physical specifications i.e. which buildings are residential or office buildings, and what kind of plinth exists in the existing built structure in the city. Is it retail, and if so, what kind of retail, is it Horeca (Hotels, Restaurants, and Catering) related or not, exit and entrance of buildings as well as underground parking and whether they exist or not? For example, a fixed food market could not be located on a street where all buildings have underground parking. As a final step, a centrality study is made again to compare the best combinations of streets allowing the user to define which combination of closed streets would affect the city's spatial centrality.

**3.4 Temporary Markets****C1- Streets with certain lengths**

For Temporary markets, street length can be much more flexible. This comes as a consequence of the uncertainty temporary markets hold, in terms of frequency and retail intensity. Following the assessment of the street network and calculating the average street length, one can set a flexible threshold for these temporary markets, since they function as pedestrian-oriented streets when markets are not installed. For example, one can allocate multiple streets to be transformed to pedestrians and flea markets could occur simultaneously on different streets. This way a great public space network is established, out of which some streets are chosen to hold temporary markets following a certain schedule and even setting a rotation system targeting most neighbourhoods in the city.

**C2- Streets distant from existing public spaces**

When the chosen streets are not hosting temporary markets, they will act as pedestrian spaces which the city needs. Since this action plan is dedicated to dense cities with not enough parks and public spaces, it would be best to spread new ones to neighbourhoods where public spaces do not exist.

**C3- Streets with walkable distances from parking spaces**

While some dense cities remain car-dependent, accommodating people's choice of transportation is vital for increased vibrancy. Parking facilities should be available for market visitors as long as the general city policy is to remain car-welcoming.

**C4- Proximity to sub-centres in the city**

Although main cities act as a whole and usually have one main downtown or centre, cities such as Beirut have also developed vibrant sub-centres alongside downtown where mixed-use functions take place, and would often be people's daily or weekly destinations. Allocating markets and public spaces to these areas which are proximate to sub-centres in the city would be a convenient method to attract people to the market and to activate the public spaces when markets are inactive.



### 3.5 Parametric Implementation: Data Availability

All the theories and proposed parameters mentioned earlier could be implemented in a case where all kinds of data and resources are available. However, in the case of this research specifically and given its time frame, and particularly in the Lebanese context where most data is collected by the private sector and is not published, the approach for executing the research theory calls for some modifications. For instance, there is no actual data, map, or document listing the existing buildings, their land use, or whether the building has underground parking or not. Hence, to acquire this kind of data, a field survey can be done, in other terms a group of people can walk along all the city's streets and take notes about building size, stories, and basement availability, digitize it, and introduce it to the current database in the research. However, within the time frame and resources of the research, this is not actually possible, therefore the parameter concerned with underground parking, and buildings' land use will be left out of the simulation. Nonetheless, it could be added later on at any point once made available. Moreover, data concerning the parking spots all over the city was collected manually using a satellite image from Google Maps, hence all public underground parking is left out of the calculations.

Furthermore, the main basis of the study is the street network. This geometry is quite complex as it contains different layers such as tunnels, roads, and bridges which could overlap in one or many spots. Since a detailed scientific traffic study cannot be made at this point, one of the alternatives would be parametric tools which can give an impression about the potential of the street network based purely on the geometry. To be able to use this alternative method properly some simplifications to the street network's geometry must be made in order to reduce its complexity so that it is usable with parametric tools. Thus, this does not mean that the method cannot incorporate complex street networks, but within the time frame and resources of this research, a simple geometry is better fitting.

Finally, to start this rational process, the first step is to assess the current street network, which is again not available to the public. It is possible that some private traffic firms/engineers have run some studies and simulations. However, all related results are still to this day inaccessible nor published. Nevertheless, many other alternatives can be used to generate an estimation that might not be as accurate and realistic as a traffic study but could serve the purpose of this research to some extent.

### 3.6 Applied Methods

To avoid discarding this whole research because of lack of data specifically the street network performance part, the adopted alternative method will be geometrically testing the centrality of the street network. Street networks will be considered a simple abstract geometry with no precise relation to any spatial and realistic dimensions. Hence, the result would be the potential centrality of the street network.

To start, the current street network is simplified and turned into a plane geometry formed by connecting lines, each line is a representation of the connection between two points. In this exercise, a new segment must be defined at every intersection. Now once all this geometry is prepared the actual centrality test can be performed. Therefore, centrality is how elements are related and connected to each other. The main idea is to compute relationships between different elements, (in the case of street networks the elements are the nodes of these segments) while highlighting the different degrees of importance of these connections.

There are two different types of centrality:

- 1. Betweenness Centrality:** Calculates the shortest path from all nodes to all other nodes and highlights the nodes that are crossed the most. Therefore, this kind of centrality test points out the most important to the least important nodes in terms of connectivity using descending values.

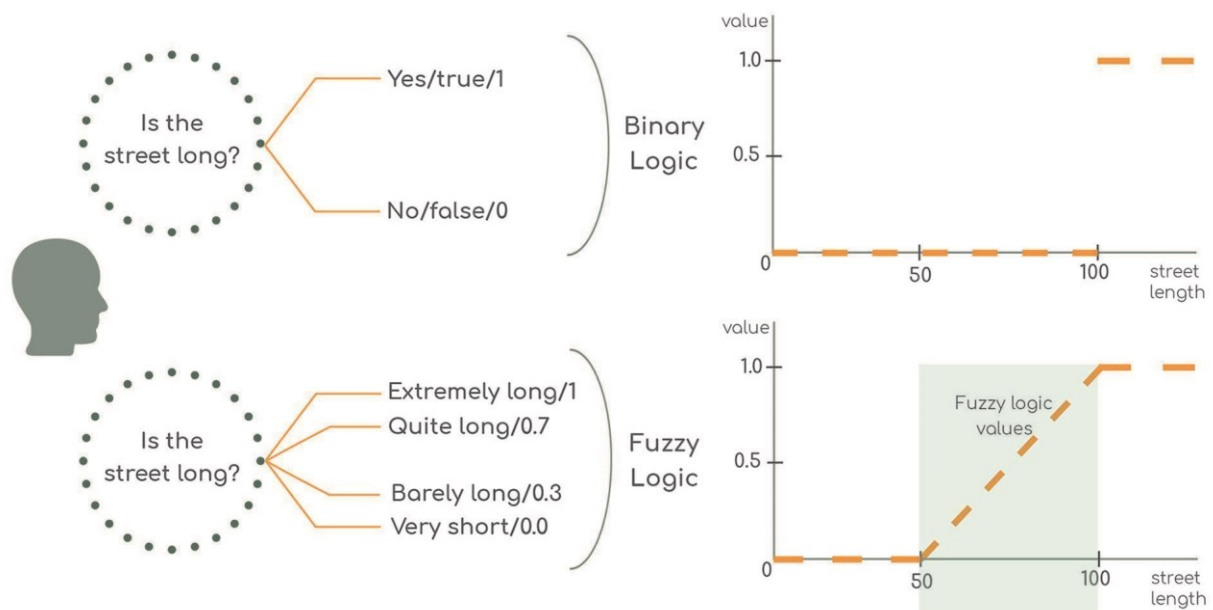
**2. Closeness Centrality:** Defines for each node the distance to all other nodes in the street network. The street with the highest and shortest connections to all other nodes is the street with the highest closeness centrality value.

In addition to these measurement concepts, two scales can be used, the global scale, where all the street network is considered, meaning from all streets to all streets (destinations and origins), or the local scale where only destinations within a radius based on a metrical value are considered.

### 3.3 Fuzzy Logic

First, a domain must be set, in this case, the street length. In binary logic, a street is either long or short, however in fuzzy logic, a membership defines whether the item belongs or not, and if it does, to what degree of membership, having 0 as not belonging and 1 as fully belonging. Between 0 and 1 is a list of belonging values. For instance, a street having a value of 0.7 belongs more to the domain, meaning it is longer than a street having 0.3 as a value, and so on.

Furthermore, this degree of membership follows a mathematical logic, hence, the calculation theory of the fuzzy logic. A crisp input is the start, for instance, a street length of 80 meters. At first, the fuzzifier transforms this into a fuzzy value following the rules that define what is long and what is not and the categories in between. If a street is below 50 it is definitely not long, if it is 100 meters and above it is definitely long, and if it is 75 it is long. Then, the logic calculates the new value based on the rules by fuzzifying the results in a way that 75 meters becomes 0.5 instead of 1, so in a way it is half true and not completely true, hence the half value. Eventually, after defuzzification, the output would be crisp again, just like traditional binary logic but instead of an ultimate 0 or 1, it presents a numerical value in between (Figure 1).



**Figure 1.** Fuzzy Logic.

### 4. Application

By using a parametric tool, this research can become more sustainable not only by creating a tool that fulfils this research purpose but also as a flexible tool for future use in different cities. As a result, any value or given data can be at any time modified, hence a new result based on the last modification. All parametric implementations are done using the software of Rhino and Grasshopper plug-in.



#### 4.1 Fixed Markets

Here all street values in terms of performance are bound between 0 and 1. Using only binary logic, streets having values less than 0.4 will undergo the upcoming tests and classifications to have a better overview of streets' suitability for each parameter.

##### ***B1- Streets with a minimum length***

Streets in Beirut are mostly narrow. Therefore, if transformed into street markets, the only possible market layout would be a linear one, hence the longer the street the more stalls are installed. In this case, streets that are less than 80 meters long are discarded, streets that are between 80 and 100 meters long are taken into consideration yet with a suitability value of less than 1, and streets that are 100 meters and longer have a full value of 1.

##### ***B2- Streets with proximity to parking space***

The internal narrow streets of Beirut make it difficult for food/waste trucks to circulate and manoeuvre, therefore they need a dedicated open space to load and unload. This is why proximity is significant and the short distance between the market and the parking space is important. Any street having a parking space further than 200 meters is discarded from the study.

##### ***B3- Integrated public transportation network***

In this simulation, the markets are assumed to be walkable from the stops, taking no more than a 10-minute walk which would be around 750 meters as a maximum.

##### ***B4- Uninterrupted flow of goods from the source***

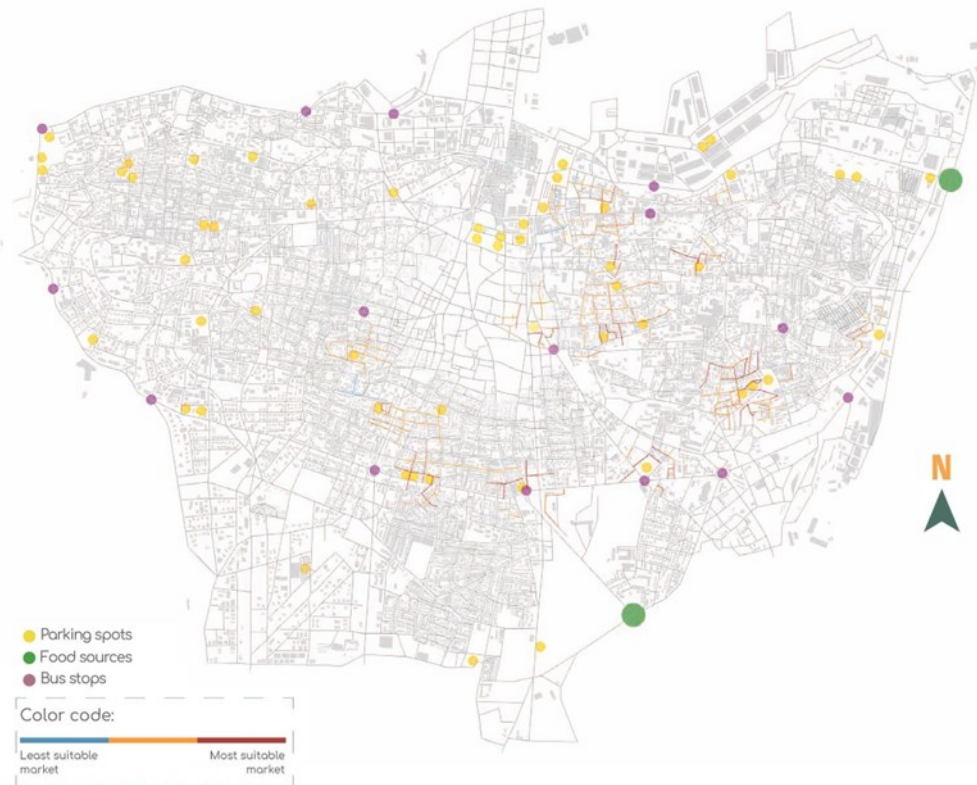
The author presumes that two markets are needed in Beirut, one in the East supplied with goods from Bekaa governorate and the Northern parts, while the other market receives supplies from Bekaa and the Southern regions. Food coming from the North and Bekaa would ideally go to a market situated between the two sources. Food trucks create congestion in cities, especially since they arrive early in the morning (rush hour), therefore these trucks should drive as little as possible in the city. In this case, a maximum route of 2.5 kilometers is allowed, from the midpoint of the route connecting food sources. Food supplied by the south has two means of getting to the city, which are central and heavy traffic highways. Thus, geometrically, the main food source would be considered as a midpoint of a route linking all three food sources (2 from south + 1 from Bekaa). Thus, again, all routes defined between 0 and a maximum of 2.5 kilometers are possible with decreasing suitability values.

##### ***4.1.1 Overlaying Results***

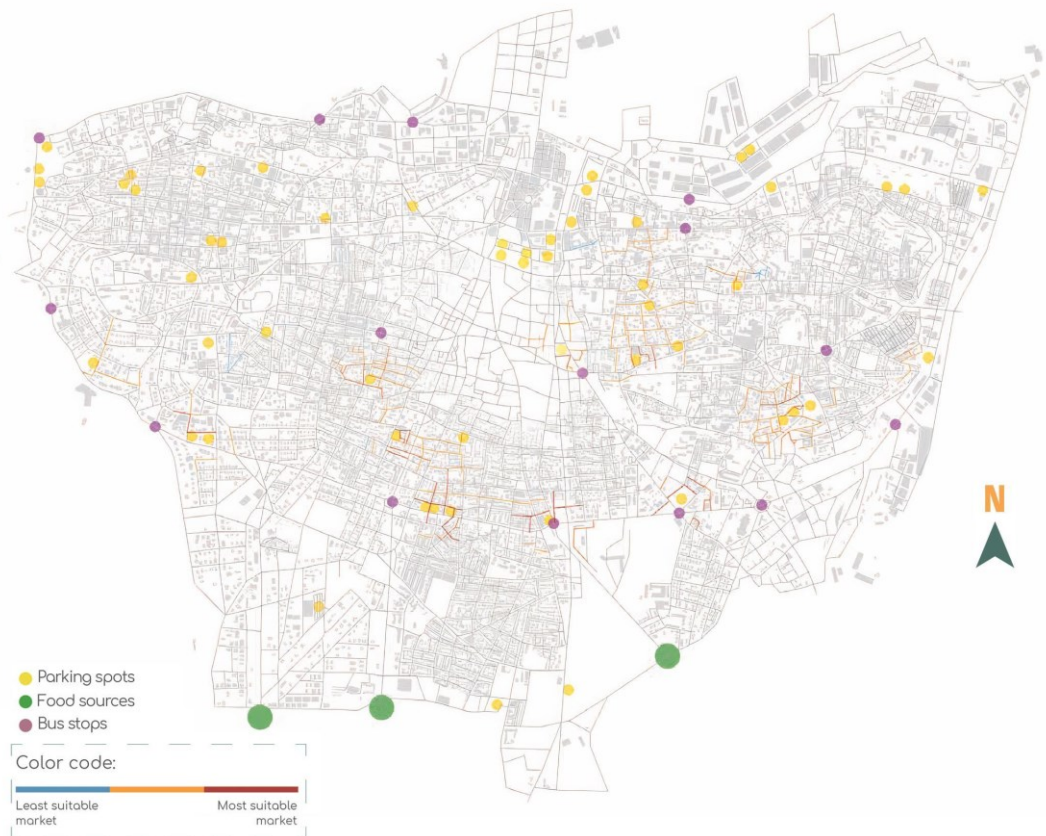
After generating street maps with their suitability scores, the aim is to have a final illustration mapping all the acceptable values based on the different parameters. The final goal is to have bus stops, parking spaces, street length, and accessibility to food, all listed in one map (Figures 2 & 3), and as a result, all the values from these parameters are mixed and transformed into one value.

Moreover, to explain this mathematically, every street having a value of zero in any of the previous parameters is not taken into consideration in the simulation, and only the streets with values above zero are kept in. Then all values of each street are added up and re-divided by the mass edition of parameters, which in this case, are divided by 4, ergo a new value for each street is assigned.

This mathematical equation takes place while taking into consideration all parameters having equal ratios to each other. In other words, all parameters are treated equally and have the same priority. Shall this change, the parameter is given a different value, and the number used to divide the sum of values is changed accordingly.



**Figure 2.** Combining Results for Markets in the East.



**Figure 3.** Combining Results for Markets in the West.

#### 4.1.2 Adaptable Tool

The generated tool assists users in strategically placing markets within a city based on data hypothesis, however, this can be modified at any instant for one or more parameters. In the case of placing a food market in a city where accessibility to food is a minor concern, while street length, parking, and bus stops are major concerns, the assigned ratio that was 1 in the previous simulation gets downsized to 0.1, meaning this parameter decreases 90% of its influence. Hence, the remaining parameters become dominant parameters leading to a different result. This is useful since cities are in constant development, and adaptation in the urban realm is inevitable. Nevertheless, in this research, all parameters are and will be treated equally, having the same score and value of 1.

Eventually, the final aim of this research is to strategically place two markets in Beirut city, and so far, multiple options have proven to fulfil all the required criteria. Nevertheless, the question remains of how to choose one market for each area of Beirut, knowing that there are multiple candidates. One way is to create a list of possible two street combinations (1 East and 1 West), remove them from the street network, test the effect they cause, and choose the option that affects the current performance of the street network the least (Figure 4). The possible options would be S1S1', S1S2', S1S3', S1S4', S1S5', S1S6', S1S7', and then S2S1', S2S2'... and so on. For simplicity and feasibility, this exercise will be tested only on 4 streets with the highest scores (2 from each list).



**Figure 4.** All Optimal Streets.

### 4.1.3 Comparing Closeness

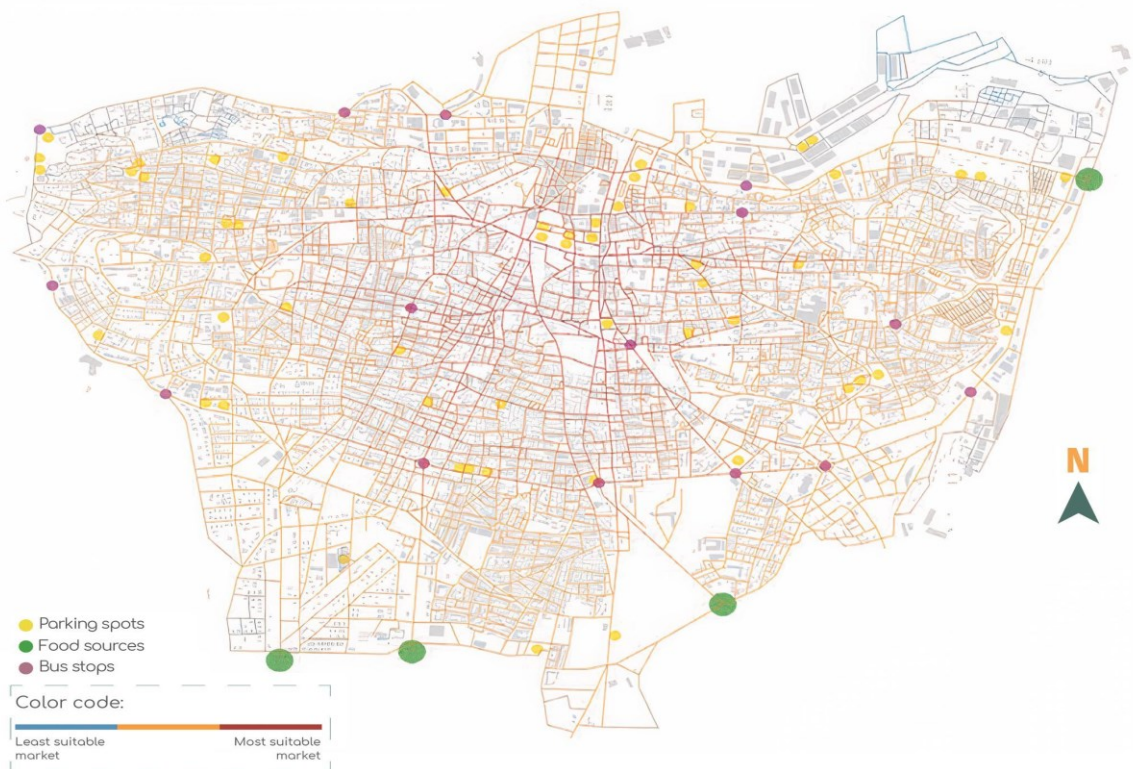
When performing a centrality test using parametric tools such as the present case, a map showing colourful segments would be one of the outcomes. This map comes as a graphical representation of centrality values, the higher the difference between values the greater the colour contrast would be on the coloured map.

When comparing the four scenarios, it is not possible to rely only on the graphical representations since it is not an accurate, nor a scientific method, while sometimes the difference might not be visible to the naked eye. Hence, a more sensitive method is put in place. The four possible outcomes are compared as follows:

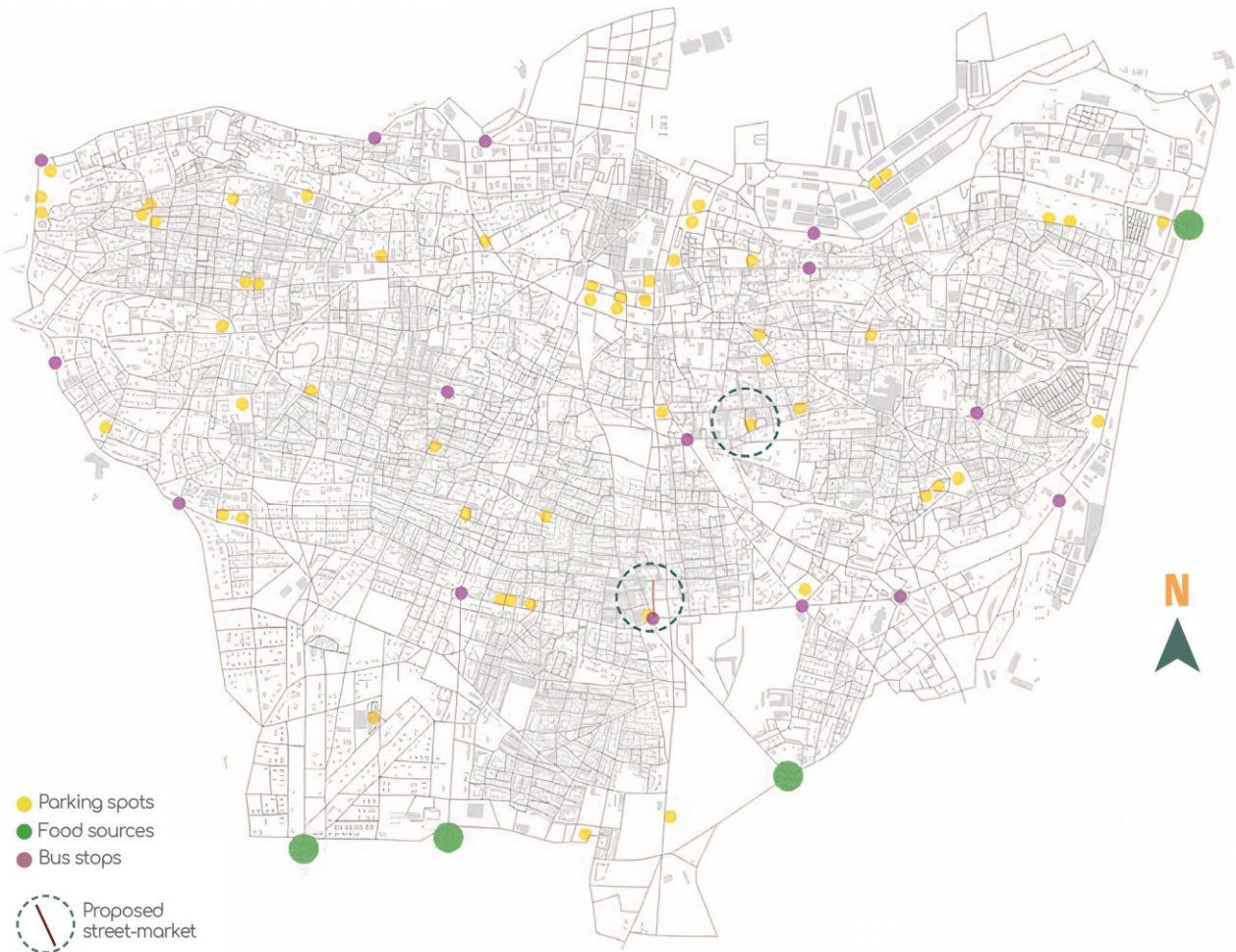
Each street value in the four scenarios is compared to the current street value, and the difference is kept as a variation value. Once all the variation values of all streets are collected, the values are added to reach one value. The same goes for the remaining three outputs and then the total variation values are compared to each other. The lowest value is the most suitable for this test if the aim is to not disturb the street network performance in terms of centrality as much as possible.

Around 6950 street segments were extracted, and each segment obtains a centrality value varying from 0 to 1, hence for each segment, the variation value is something between 0 and 1. The sum of all variation values for each scenario is the sum of all these variations defined as numerical values between 0 and 1. This is to give an impression of the importance and scale of the variation values in each scenario.

The combination of the two streets in red (Figures 5 & 6) has proven to affect least the current spatial centrality revealed by a global closeness centrality test. These two markets have quick access to bus stops and parking spaces while being long enough to host physically as many stalls as possible. They are also central in terms of food accessibility which will lead to an uninterrupted supply and waste exhaust. Therefore, theoretically, these two streets are the optimal location for setting up fixed markets.



**Figure 5.** Closeness Centrality.



**Figure 6.** Most Optimal Combination.

## 4.2 Temporary Markets

### *C1- Streets with minimum length*

Flea markets on street markets will preferably be installed in a linear layout, therefore streets above 80 meters should offer enough stalls. However, 100 meters and above is preferable and would be more spacious and give more space for people to showcase their goods leading to higher chances of success for the market.

### *C2- Proximity to parking lots*

A market with a walkable distance from a parking space would give a success boost to the market. The distance does not have to be short, yet it should be easily walkable.

### *C3- Integrated public transportation network*

A distance of 750 meters, which is equivalent to a 10-minute walk, is the furthest distance a person would have to walk from the bus stop to a market or public space. This ratio makes the market more attractive and stimulates the activation of public spaces as well.

### *C4- Distance from existing public spaces*

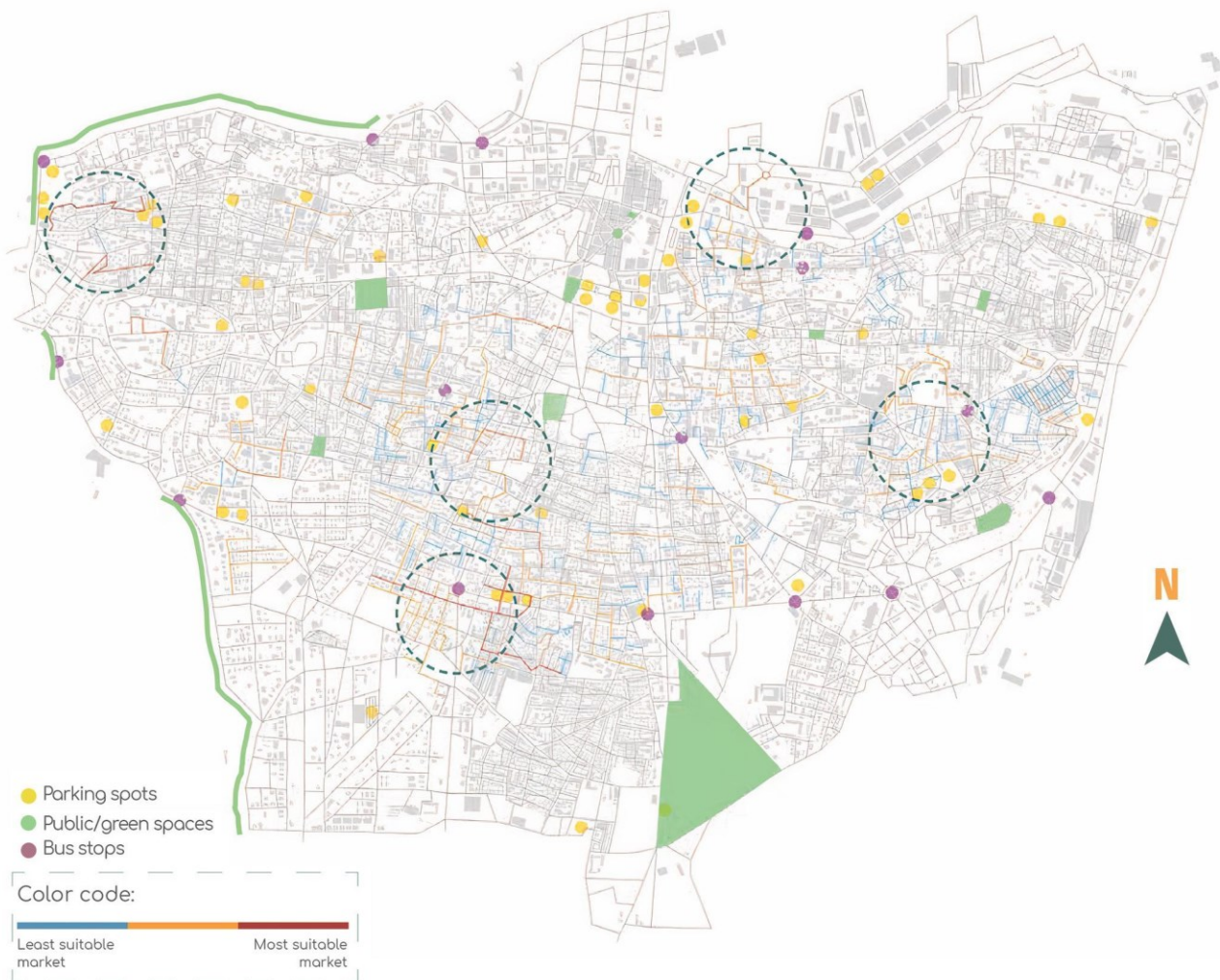
Since Beirut suffers from a lack of public spaces, it is essential to allocate public spaces at a fair distance from the existing ones. This would ensure spatial justice in the city, where the accessibility to public spaces should be granted to as many people as possible. The proposed public spaces are set in a way to be at least 300 meters far from existing ones, and preferably 500 meters and above.

### C5- Proximity to sub-centres

All potential markets are preferred to be within a distance not exceeding 600 meters from attractive spots in the city. Public spaces should be close to attractive places, considering the initial area is more or less active.

#### 4.2.1 Overlaying Results

Using the fuzzy logic concept to overlap and summarize all values streets have gained in previous parameters, a new set of values is generated as represented in the map below (Figure 7). However, similar to the fixed food market process, this representation offers results while treating all parameters equally and not prioritizing one parameter on the other. Although the red dark streets are located only in two main areas, other streets in lighter colours, are streets holding smaller values that could also be considered valid candidates since they fulfill all previous criteria. Any choice from this street list is theoretically a good choice for a temporary market and public space given the available data and selected parameters.

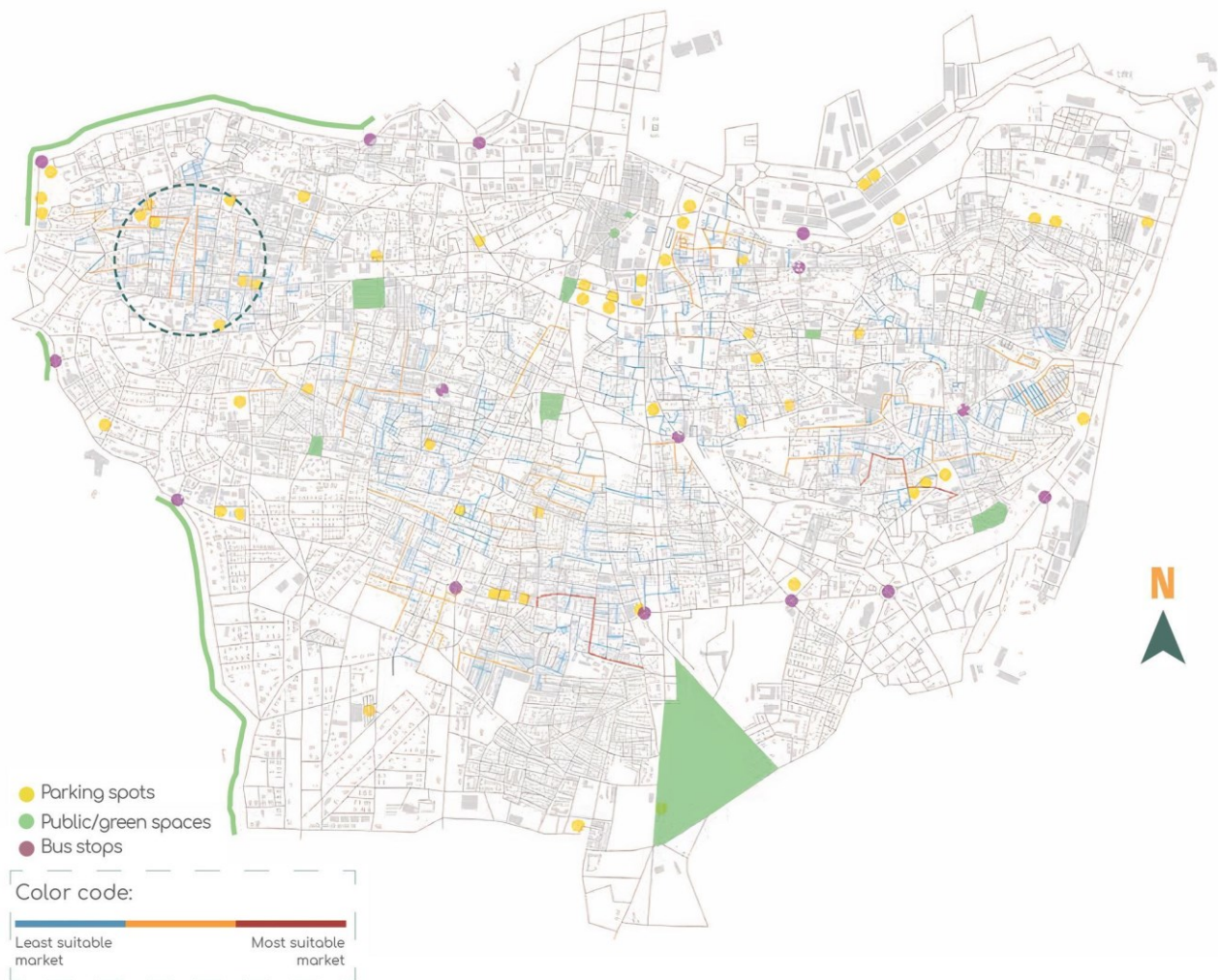


**Figure 7.** Most Suitable Streets for Conversion.

#### 4.2.2 Street Observation

These temporary markets will mostly hold light and dismountable structures which allow them to adapt to any existing street layout. However, since these markets are public spaces, the convenient way to describe these spaces would be pedestrian areas which could function as temporary markets. In the chosen street, parked cars on public domain streets should be relocated to the nearest parking area, while keeping cars in privately owned parking spaces as they do not interfere with the street performance.

The plinth here is significant since most buildings have plinths, these plinths will become more attractive once these areas are turned into proper public spaces, which will increase their revenues as well as property value. The streets will also be a great use for the residents, kids can safely play and use the streets, while people can enjoy walks and exercise recreational activities when markets are inactive. In a way, this network of temporary streets could act as a series of pocket public green spaces (Figure 8).



**Figure 8.** Changing Ratios.

### 5. Discussion & Outlook

When searching for a city or any area via Google Maps, if users have the default settings, the application reveals informative content beyond its basic purpose, a navigation tool. Google Maps highlights areas that attract people and cars and has to some extent a vibrant impression. How Google

Maps acquires this kind of information is not the main point in this research rather just seeing where people go in Beirut city regularly, and what areas are considered attractive. In the map below (Figure 9), Google Maps highlights vibrant areas in light yellow while regular areas are left light grey, and dark pink is for hospitals.



**Figure 9.** Layer of Centrality.

As a second step, it is essential to overlay these areas with the sub-centres that were found in the local closeness centrality test with a radius of 800 meters. The idea behind this exercise is to observe if the spatial central areas are used and if they match with the current attractive spots in the city. Following this observation, one can have an estimation of whether the used method aligns with reality, and if more sub-centres will emerge in the future of the city. Having more answers and a better understanding of the city can encourage decision-makers and stakeholders to rethink the future structure, its mobility plan, and its overall density potential.

The map shows in dark red the central street, as was previously illustrated in the local closeness centrality map, and the light orange patches highlight the current captivating spots in the city. At first sight, it is interesting to see that most of the orange patches align with the centrality test, while the three patches that do not overlap might have several reasons concerning the studied area during the simulation or the area could simply be vibrant while not being geometrically central. While most of the orange patches overlay with central streets, a lot of central streets are not considered interesting spots according to Google Maps, meaning that these streets have geometrically unattained potential.



Furthermore, this potential tackles many aspects of the city's performance, whether it is stations for public markets, future bus stops, or new green pocket areas.

### 5.1 Tool Optimization

After generating all kinds of informative and analytical maps in the different simulations, observing the results physically from a street scale, and finally drawing appropriate conclusions, it is vital to propose suggestions for future simulations to have a more optimized tool, hence optimized results. Since all simulation-based tools rely on data; the more available data is, the more accurate and correct the results will be.

#### *Fixed Food Markets:*

- 1) Data included are land use, architecture typology, and plinth availability. A good idea would be underground parking which does not appear on satellite maps and therefore could greatly change all results once integrated into the database.
- 2) Introducing street width as a parameter, and integrating a new simulation of the two street markets to be distant from each other.
- 3) Introducing closeness centrality in earlier phases to be able to locate how many markets are needed based on a certain walkable radius, in a city like Beirut maybe 3 or 4 are needed, and not just two.

#### *Temporary Markets:*

- 1) Integrate plinth land use here as well. This would be optimal for the local economy with a coherent combination of product-oriented flea markets and existing retail activity.
- 2) Integrate building typology to ensure a certain amount of people flow, allowing the public space to be active most times of the day.
- 3) Integrate street typologies (shared streets, pedestrian areas, scheduled service roads.) when the tool is taking a further step in placing the temporary markets.

Public space can be categorized into local use and regional use. The local might be integrated into the bigger proposed public spaces network and could perform as a whole in terms of biodiversity, green layer, and urban gardening. Regional public spaces can be combined for a bigger plan where Beirut has enough greenery and enough parks.

## 6. Conclusion

Markets have always been a significant element in the urban realm, yet when put in the Lebanese context they become one of the only possible solutions to the country's current crisis. A sustainable action plan is urgently needed, whether it is food markets that can deliver affordable and fresh food from farmers directly to consumers without passing by very few wholesale traders who are making major profits just by being an intermediate channel, whereas when adopting markets, farmers could make more profits which can be reinvested in their business to improve it and enlarge it in terms of quality and quantity. Or, through flea markets that give a second life to previously imported unused products which will no longer be available in Lebanese communities in the future.

The challenge remains in strategically positioning these markets. For the fixed markets, two are needed, one supplying from Bekaa and the north, while the other from the south and Bekaa. Moreover, following the final generated gradient map of market suitability, having fulfilled all required criteria with different values, two streets that can hold fixed food markets are found, and then an open space network is established, a network that can hold temporary markets on weekly basis, each week located in a different area.

Meanwhile, the Central and North-Western part of the city has to be reconsidered when establishing markets and public spaces. At the moment, people living there head to the seaside boulevard since it's the available public space there but it is not the ideal local public space as it is used more as a national/tourist destination. Whereas they should have public spaces around their neighbourhoods to



create communal connections and meet neighbours. These residents have only expensive stores and supermarkets to shop from, whereas markets could now be a great escape for them.

Going back to the main research question about how can underused mobility infrastructure host vibrant spaces of social cohesion and security, the answer relies on understanding how the street network performs, defining all the necessary and related elements of the urban realm, from logistics to accessibility, to attraction motivators, to people's behaviour and security, introducing them all to a rational functioning processing system, and then rethink the outputs for further optimization.

Markets have proven their role in cities all over the world, yet when introduced in the Lebanese context it is useful to customize such intervention. As a result, generating a list of streets is the main focus of this research. However, missing and unavailable data proved to be a great obstacle to a similar project. Therefore, one important key to success for any future intervention in the urban context would be the data collection/availability. In addition to the data-driven process, and the spatial dimension of similar projects, one must work on a social point of view for good integration of such spaces.

This is quite significant for a functioning market as it needs to be socially acceptable for people to go to and purchase used items. At the moment, this means purchasing is limited to only the poor and the low social class, yet for a better inclusive market, flea markets should be able to target all kinds of social classes. This can only be done after some awareness campaign and cultural acceptance.

### **Acknowledgements**

This research was made possible by the support of the College of Architecture and Urban Planning (CAUP) at Tongji University in Shanghai.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflicts of Interest**

The authors declare no conflicts of interest.

### **Data availability statement**

The authors confirm that the data supporting the findings of this study are available upon request.

### **CRedit author statement:**

Conceptualization: Y.A. & T.A., Formal Analysis: Y.A., Investigation: Y.A. & T.A., Methodology: Y.A., Resources: Y.A., Software: Y.A., Supervision: T.A., Visualization: Y.A. & T.A., Writing original draft: Y.A. & T.A., Writing, reviewing, and editing: T.A. All Authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Askar, Y., & Abdel-Ghani, T. (2024). Adapting Mobility Infrastructure to the Needs of a Liveable City: the Case of Beirut Street Markets. *Journal of Contemporary Urban Affairs*, 8(2), 364–384. <https://doi.org/10.25034/jcua.2024.v8n2-5>

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Original scientific paper

# Urban Regeneration Strategies for Enhancing Livability: A Case Study of the Chaktai Commercial Area, Chattogram, Bangladesh

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## ARTICLE INFO:

### Article History:

Received: 14 May 2024  
Revised: 20 August 2024  
Accepted: 29 August 2024  
Available online: 5 September 2024

### Keywords:

Urban Regeneration,  
Urban Commercial Area,  
Open Space,  
Livability,  
Chattogram.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Bangladesh has been experiencing rapid urbanization and economic growth, motivating people to move towards the cities. Consequently, commercial areas of the cities are becoming highly occupied. The issue of overpopulation leads to congestion and shortage of open spaces, both reserved and publicly accessible, in such areas of the cities, affecting the physical and mental health of the users of these areas. To understand this situation, Chattogram in particular, the Chaktai commercial area is identified as the case study area for further investigation and research. This study will examine the present scenario of this densely built commercial area through an empirical analysis and field survey, focusing on collecting data related to major land-use types, street characteristics, major activities, traffic analysis, and environmental conditions. Additionally, an observational approach will be employed, along with one-to-one interviews and Focus Group Discussions (FGD), to gather user feedback on the space. By examining urban regeneration strategies for Asadganj, this study offers guidelines to improve conditions for its users including residents, business holders, and workers, to enhance the area's quality of life.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 385–403.

<https://doi.org/10.25034/ijcua.2024.v8n2-6>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- This work aims to offer practical insights to future academics and planners on improving the environmental performance and sustainability of high-density settlements.
- The findings of the research hold the potential for guiding future development in undergrowing areas. The results can also inform urban regeneration strategies for similar facilities in Bangladesh, enabling development that preserves and enhances resources, leading to improved living conditions.

### Contribution to the field statement:

By examining urban regeneration strategies for Asadganj, a part of the Chaktai commercial area of Chattogram, Bangladesh, this study offers guidelines to improve conditions for its users including residents, business holders and workers, aiming to enhance the area's quality of life by analyzing the existing conditions of the study area.

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### How to cite this article:

Haque, S. B., Roy, M., & Tanha, Z. A. (2024). Urban Regeneration Strategies for Enhancing Livability: A Case Study of the Chaktai Commercial Area, Chattogram, Bangladesh. *Journal of Contemporary Urban Affairs*, 8(2), 385–403.

<https://doi.org/10.25034/ijcua.2024.v8n2-6>



## 1. Introduction

Developing country's cities are characterized by high population densities, high levels of industrial production and resources, and sophisticated social and technological infrastructure. Beneath its statutory concentration, there is a thriving informal economy. In addition to the largely unregulated spatial expansion, ineffective governance that leads to inefficient and depleted public services and utilities, unregulated and uneven land and property markets, and a lack of adequate housing supply, these factors also contribute to an increase in the number of informal settlements, which has a negative ecological impact on the environment. However, each one of the cities is composite in nature and its dynamics. The constantly evolving urban system is an illustration of various forces at work, including social, economic, and environmental factors that alter the shape of cities over time and in response to needs. Urban regeneration places these dynamics into perspective to revamp the urban system to mitigate current and future demand (Reazul et al., 2012). Thus, it is possible to argue that all or some of those factors that propel the urban system result in urban regeneration. The primary dynamic forces behind the growth of developing cities are typically economic and social drives to adapt the urban framework in response to increasing urbanization and population demand.

Rather than heavy industries or the formal tertiary service sectors of those post-industrial cities, the commercial, medium-sized industrial, and informal sectors are the primary sources of economic activity in developing nations. These unofficial economic sectors alter the current urban pattern and serve as a pull factor for internal rural-urban migration in developing nations. As a result, urban regeneration of the ancient city neighbourhoods occurs as a proactive planning strategy to handle the influx of people and the expanding economic need. But it also takes a toll on the open space of a city. As known, environmental, social, and economic stress indicators are becoming more evident in most Bangladeshi cities, particularly in the Chattogram region. Phenomena associated with the compact city's process of growth of its built environment. Over an area of 70 square kilometers 4.1 million people live. The city, which serves as the business centre for the major port of Bangladesh, is rapidly urbanizing, which has caused the loss of some of the open spaces of the city as development in the area picks up. Between 1989 and 2001, open lands decreased by 76% as a result of land use shifts from vacant spaces, agricultural lands, and ponds to urbanized regions (Chisty, 2014). Then from 2001 to 2013 a subsequent reduction was recorded, this time a decrease of these spaces took place by another 72% (Chisty, 2014). As the population of the city is increasing at an alarming rate, open spaces are getting transformed into human settlements resulting in highly congested urban areas with no breathing space for its residents at all.

At the same time, a city's location plays a significant part in distinguishing it from other cities from both a social and economic standpoint. Urban regeneration will therefore probably be distinctive to a particular area and feature of the metropolis (Roberts, 2000). Chaktai commercial area has been famous as a major seat-off trade and commerce controlling business all around the country since the beginning of Chattogram. Asadganj is one of the prominent commercial zones in Chaktai where the country's largest fish market is available. Besides the wholesale fish market, this area is also known for its dry fish market, and wholesale markets of rice, lentils, spices, and fruits as well. In addition, some notable industries can be seen, for example, the garment industry. The Chaktai commercial area is the city's primary economic centre, controlling the whole retail and wholesale market and contributing significantly to the overall GDP. Unfortunately, this part of town has historically developed in an unforeseen way that has resulted in a mixed commercial and residential zone related to those commercial occupants. All the previous residential buildings are turning into mixed-use categories with shops and storehouses on the lower-level floors. Hence, the area has become extremely congested with migrated people from the other parts of Chattogram city. Because of this increasing population, the importance of cultivating a livable urban environment has evolved into an utmost necessity. Till



today, no steps have been taken to utilize the existing open space. As a result, these areas are transforming into illegal settlements and waste disposal sites. However, by implementing appropriate regeneration strategies to restructure these spaces and providing recommendations to revitalize the canal & riverfront area to improvise open spaces in such high-density settlements.

The Chaktai commercial area, one of the city's main economic centres, must be more adaptable to keep up with the city's economic expansion. As a result, the Chattogram Development Authority has made it a top priority in its master plan to reorganize the entire commercial area as part of the urban regeneration process. By doing so, it will improve the area for its users and potentially increase its capacity to manage commercial activities to meet the city's growing economic demands. This research aims to analyze the existing conditions of the most important part of this selected urban commercial area, Asadganj to be named and provide some potential guidelines to integrate publicly accessible green parks and upgrading the existing canal front and river walks to create a more liveable built environment, which consists of spaces for social interaction and recreation along with intended commercial activities.

## 2. Literature Review

### 2.1 Urban Regeneration

It might be difficult to define "urban regeneration" and to determine what kinds of initiatives and policies fall under this particular term. While there are some minor but not insignificant differences in meaning between the terms, "urban renewal," "urban revitalization," and "urban renaissance," they are generally synonymous and have been used to refer to any significant intervention that improves run-down urban areas. The notion that urban areas require regeneration is based on a specific comprehension of the factors contributing to industrial cities' economic and social deterioration as well as the best ways to address such factors through policy. Fundamental to this understanding is the idea that social and environmental issues that accompany a locality's economic decline could be better addressed as issues specific to that locality rather than as issues that just so happened to arise there. (Magalhães, 2015) Urban regeneration is a crucial tool for city planning and an integrated process that should consider the rapidly evolving trends in urban health, fast-moving climate change, digital transformation, shifting cultural conceptions and goods, and growing spatial inequality. These current difficulties should also be viewed as chances to fund, advance, and improve urban regeneration projects. Sustainable and encompassing Urban regeneration advocates for a paradigm shift in the way people live in cities. It must put Environmental Social Governance (ESG) at the centre of all policies and activities and consider social, economic, physical, and environmental factors (UN-HABITAT, 2021).

**Table 1:** Factors of Urban Regeneration (Developed by the Authors):

<b>Urban Regeneration</b>	Physical Factors
	Economic Factors
	Social Factors
	Environmental Factors

### 2.2 Liveability

The foundation of human survival and advancement is human settlements. Large cities are sites of concentrated human activity due to their dense population, and as such, they are also the places where people consume the greatest amounts of food, water, energy, and other goods (Sadri, 2020). Places for living, working, learning, health, culture, and entertainment are among the things they offer. (Ma et al., 2016) People's general health and well-being are greatly impacted by the quality of human settlements.

Several issues, including natural disasters, contaminated environments, heavy traffic, and expensive housing, have become significant concerns that negatively impact people's living conditions, especially those who live in urban areas, as a result of recent economic growth and rapid urbanization. Urban environmental quality has therefore received a lot of attention from the academic community, governments, and the common people. The assessment and quantification of urban environmental standards are commonly achieved through the utilization of the term Liveability, as well as associated concepts such as quality of life and overall well-being. Similar to communities, most researchers have reported liveability as a concept that is difficult to define and measure (Balsas, 2004). Liveability is the degree to which a place fosters well-being, health, and quality of life. Liveability affects residents' quality of life. Furthermore, with an emphasis on the community and its surroundings, liveability ensures place-making and sustainable development (Leh et al., 2020).

Livable cities are, in general, aesthetically pleasing, cost-effective, safe, and harmonious. They are environmentally friendly, offer excellent accessibility, and have great amenities. (Australian Cities Report, 2011).

### 2.2.1 Dimensions and Indicators of Liveability

By analyzing the liveability characteristics into quantifiable components, the determination of the dimensions gives the content for indicator development. The most crucial aspects of the surroundings in which people live and work ought to be described by these indicators taken as a whole (Leby & Hashim, 2010).

**Table 2:** An overview of the dimensions and indicators of liveability (Adopted from Leby & Hashim, 2010):

Liveability dimension	Theme
<b>Social dimension (social connections)</b>	-Behavior of neighbours (nuisance) community. -existence and interpersonal relationships. -Ambiance.
<b>Physical dimension (Physical aspect of the dwelling environment)</b>	-Quality of the environment. -Open areas. -Preserving the constructed environment.
<b>Functional dimension (Services and amenities)</b>	-The accessibility of amenities and their closeness. -Job prospects.
<b>Safety dimension (perception of safety and criminality)</b>	-Number of accidents and the number of crimes. -A sense of security.

### 2.2.2 Worldwide Approaches to Encouraging Liveability

The Economist Intelligence Unit's liveability rating measures the potential impediments that may affect an individual's way of life in 140 cities globally. EIU scored over thirty elements in five categories—stability, healthcare, culture and environment, education, and infrastructure—with a high score of 100 percent to determine each city's degree of liveability. For the precedent study, This paper favours countries with comparable circumstances to Bangladesh, specifically Singapore City and New Town Kolkata.

**Table 3:** A Summary of the Liveability Principles Used in Various Asian Countries.

Singapore City	New Town Kolkata
Design a city that is efficient, green, and clean enough to compete with other cities worldwide.	Plan for a city to meet the challenge of rapid urbanization.
Large-scale expenditures in housing and transportation infrastructure	New Business District to enhance and augment the metropolis' level of operations.
Commitment to parks and green areas, enhances the city's appearance while providing recreational possibilities and environmental benefits including	To support the growth and development of non-polluting, inoffensive, and non-hazardous industries, land is being made available for such purposes. This

reduced air pollution and cooler metropolitan temperatures.	initiative will not only stimulate economic activity but also promote sustainable practices that prioritize environmental protection and the well-being of communities.
Considerable focus on architecture and urban planning, producing a stunning cityscape that honours its heritage and culture.	Activities that can be undertaken include urban afforestation, public space beautification, pocket woods, avenue plantations, nature-friendly parks, rooftop farming, kitchen gardens, vertical gardens, and floriculture/tall tree nurseries.
In addition to physical infrastructure, pay attention to economic growth and employment creation.	New locations for regional-level centre establishment

(Source: The Daily Star. n.d., GREN CITY MISSION of GoWB, and developed by the Authors)

### 2.3 Liveable Urban Open Space

The public realm is the playground where society reimagines itself, and public space serves as its playground. Urban open space encompasses both privately and publicly owned land that is characterized by openness and serves as a venue for outdoor recreation, ranging from small play areas to expansive hunting grounds. The community's health is influenced by open space since it provides ventilation in urban areas. Moreover, open space has interrelated social, economic, and environmental aspects, much like sustainable urban development (Adebara et. al, 2022). Without such spaces, the urban and suburban landscapes would consist solely of monolithic structures, devoid of any chance for casual encounters or communal exchange among people. A needs-based evaluation that considers demographics, recreation preferences, population density, and the number of people living there is part of an open space standard. (City of Sydney, 2016). Formal national standards for open space planning were developed over the 20th century, most notably in the United States and Britain. The National Recreation Association (now National Recreation and Parks Association, NRPA) in the USA dates back to the early twentieth century, and its standard of 10 acres of open space per 1000 population (40 square meters per capita) is based on data from the National Playing Fields Association (NPFA), now Fields in Trust (FIT), which was established in the 1920s. (City of Sydney, 2016).

#### 2.3.1 Pocket-sized urban parks as an Escape from the chaos

Due to the tiny pockets on vests that denote their lowered proportions, pocket parks are also referred to as vest pocket parks. (Rosso et al., 2022). In comparison to neighbourhoods with unimproved vacant lots, distressed neighbourhoods with converted vacant lots into small parks and community green spaces are linked to lower rates of health complaints, better mental health, increased exercise, decreased crime, and improved perceived safety, according to research from the University of Pennsylvania's Perelman School of Medicine. Additional advantages of pocket parks include:

- Supporting the general ecology of the surrounding area
- Assisting in the preservation and protection of local wildlife, landscapes, and cultural heritage
- Reducing pollution, traffic, and resource consumption, including oil
- Empowering locals to make decisions that impact their community
- Fostering a sense of safety and connection in communities
- Revitalizing run-down areas
- Strengthening ties between local authorities and communities (National Recreation and Park Association, 2012).

#### 2.3.2 River and canal front as a public space

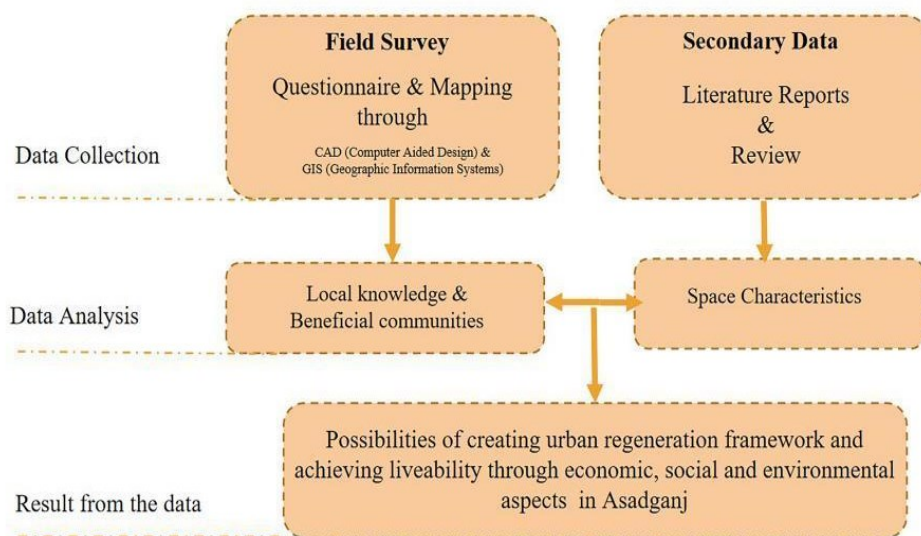
The canal bank near the Chaktai commercial area in Chattogram, a developing city, can function as a place for public interaction amongst the locals and as a working commercial area. (Haque & Hoque, 2018). The following categories encompass the fundamental functional functions of waterfront areas: (Wittmann, 2008): transportation (by car, train, foot, and bicycle), social (connected to public amenities), recreational, industrial use, and as supplementary purposes, there are intersection-specific social functions.

### 3. Research Methodology

Both primary and secondary data are used in this study. To achieve the goals, the study first analyzed the Asadganj Commercial Area in Chaktai, Chattogram, and identified the elements that make urban regeneration necessary. An initial reconnaissance survey was conducted to understand the current state of the research area.

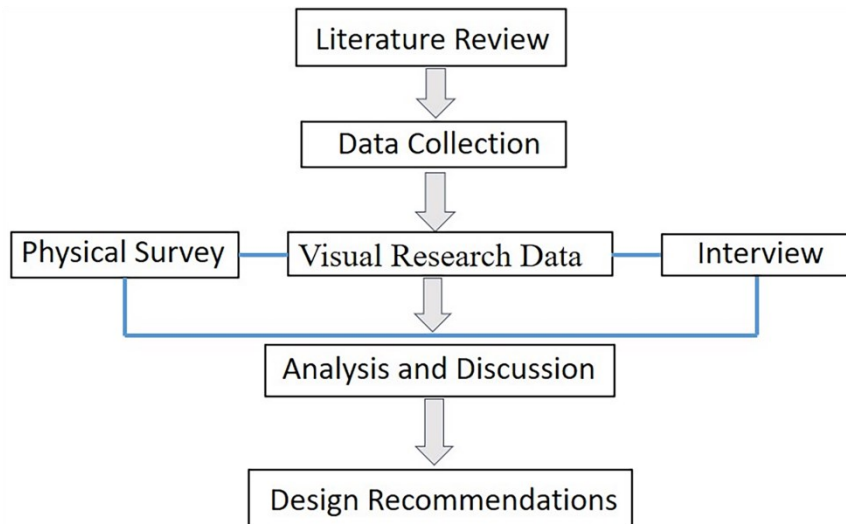
A detailed field survey was conducted to gather information on land use, open spaces, and street parameters. This survey involved systematically observing and recording the characteristics of the area. Site observations were complemented with photographs to document various social activities conducted by the users. A combination of individual interviews and Focus Group Discussions (FGDs) was used to gather feedback from the users of the space. In total, 50 respondents were randomly selected from the area to participate in these interviews and discussions. The Non-Participatory Observation (NPO) approach, which involves observing without interacting with the subjects, was employed during these interviews to minimize researcher influence and gather unbiased feedback. The field survey and site observations provide firsthand insights into the current conditions and social dynamics of the Chaktai commercial area. The use of NPO in interviews and FGDs helps in collecting genuine user feedback without researcher bias.

Secondary resources such as Geographic Information Systems (GIS) maps were obtained from the Chittagong Development Authority (CDA). These maps provided detailed information on land uses, the neighbourhood layout, and the local road system. The data extracted from these maps were essential for understanding the spatial context of Asadganj.



**Figure 1.** A conceptual model representing the overall methodological process.

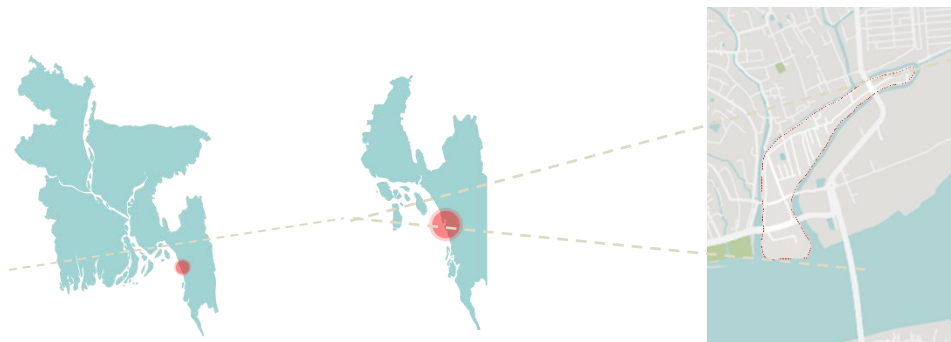
The findings from these quantitative, qualitative, and spatial analyses were integrated to provide a comprehensive understanding of the Asadganj Commercial Area. Once this was accomplished, an extensive literature review was conducted to determine what responsive actions had been taken in other nations across the globe in comparable situations. To identify similarities with the setting of a commercial centre like Chaktai, a variety of case studies on urban regeneration were carefully examined. The study examined the circumstances surrounding the implementation of the urban regeneration scheme in specific locations, as well as the response methods employed within the scheme's framework. Based on the findings and following the dimensions of liveability (Leby & Hashim, 2010), the study finally provides some guidelines and strategies to escalate the existing situation of the Asadganj commercial area.



**Figure 2.** Research Methodology Flow-Chart Study Area.

### 3.1 Study Area

The study tries to find a specific area of the Chaktai commercial community which is one of the largest and oldest commercial hubs in Chattogram. It serves the needs of agricultural goods including rice, spices, dry fish, and lentils for Chattogram City as well as for the rest of the country. The Shah Amanat Bridge, which is the connection of Chattogram's Northern and Southern regions, is located just next to it. The river Karnaphuli that flows through this region is where the Chaktai and Rajakhali Khals come to an end. Chandgaon thana is on the north, Karnafuli thana on the east, and Kotwali thana on the west (Ashraf & Chowdhury, 2009).



**Figure 3.** Location of Asadganj commercial area (Source: Chattogram City Corporation, taken in 2023).

Karnaphuli Bridge Roads surround the study area's east, Asadganj Road borders its west, Islam Foyez Road, Abu Zafar Road, and Osman Ali Lane border its north, and the Karnaphuli River borders its south. The study area is 64 acres in size.

#### 3.1.1 Primary Land Use Types in Asadganj

The majority of families reside in pucca or semi-pucca houses in nearly two to five-story buildings that are used for both residential and commercial purposes in this neighbourhood. A few buildings are used for commercial purposes, mostly warehouses or shops. Among the built-up area, the pucca structure occupies 70.36%, the semi-pucca 18.64 % and the rest 11% is katcha structure. Most of the buildings are mixed-use. Amenities are found such as mosques, schools, Bihar, Fire Service units, public toilets, etc. Overall, the Built and Unbuilt space percentage of Asadganj area is respectively 73% and 27%.

**Table 4:** Land use percentage of Asadganj Area, Chaktai (Data from Survey, 2022).

TYPE OF USE	PERCENTAGE OF THE STUDY AREA
Residential	21.75%
Commercial	45.62%
Mixed Use	28.60%
Amenities	4.03%

### 3.1.2 Street characteristics

Most social interaction and local activity occur on the main streets and in some inner areas; the other inner spaces are inactive and devoid of activity. Inner street activities include socializing, cricket matches, playing billiards, car/bicycle/cycle/cart parking, workshop extension, storage area, sometimes domestic chores extension, raising pet animals, and children's informal play (marbles, chalk darts, etc). Main street activities include different kinds of vendors mainly, grocery shop extension, celebrations on weddings or religious/political activities, local meetings, etc. The lack of street activities to encourage varied encounters hinders the ability of streets to serve as social integrators. Even though the route has been made pedestrian-only, permitting pedestrian activity to continue in other public areas does not promote the continuity and intensity of street activities.

### 3.1.3 User Characteristics

Asadganj commercial area in Chaktai, Chattogram, is a bustling hub with a diverse demography primarily composed of traders, wholesalers, and retailers (Source: BBS 2011). The area's population includes a mix of residents and migrant workers who contribute to the vibrant economic activities. Professionally, Asadganj is characterized by a concentration of individuals involved in various aspects of commerce, such as importers, exporters, and suppliers, particularly dealing in goods like spices, textiles, and industrial equipment. The user types in this commercial district range from business owners and employees to customers and visitors. Local shop owners, business investors, and service providers such as transporters and logistics personnel form the core professional groups, while daily shoppers and occasional visitors make up the user base. This dynamic interaction between various user types and professionals underscores the area's significance as a commercial powerhouse in Chattogram.

### 3.1.4 Time frame of activities on the site

(Time 7:00 p.m.-11:00 a.m.): Shah Amanat Node remains busy this time because the buses start their journey towards Coxbazar, which was issued as an illegal bus stop. Asadganj Road remains busy during this time because the trucks arrive with the goods for the wholesale markets of this area.

(Time 11:00 p.m.-5:00 a.m.): Wholesale markets in Asadganj commercial area and Asadganj road stay open during this time. Mariners Drive Road remains busy during this time as the trucks and pick-up vans carry goods to the wholesale markets of the Asadganj Commercial area. (Time 5:00 p.m.-7:00 a.m.): River banks stay active. Fishnet makers start doing their jobs.

### 3.1.5 Traffic density

The neighbourhood is penetrated by vehicles, obstructing pedestrian walkways, which raises concerns about traffic safety, particularly because children don't seem to notice when a car is coming because they don't react to automobile warnings. The trucks heading to the nearby storehouses are a significant safety concern as well. These vehicles completely restrict the flow of traffic and pose a risk to children's safety.

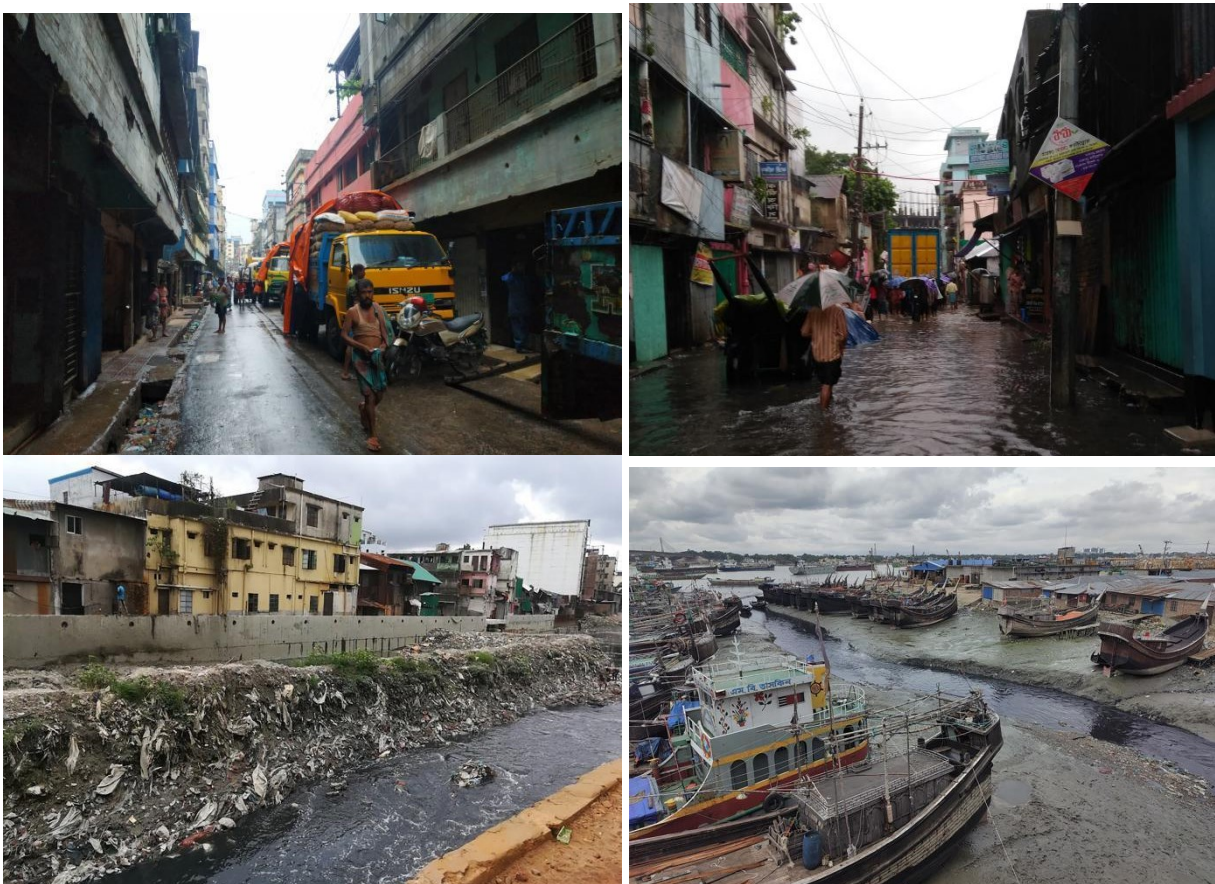


**Figure 4.** Nodes & Paths of Asadganj Area depicting (a) Mariner's Drive Road -Notun Bridge Node and (b) Notun Bridge Node-Mariner's Drive Road.

#### 4. Observation and Findings

##### 4.1 Physical aspect

The main access road, namely Chaktai Road to the Asadganj commercial area is from Shaheed Boshiruzzaman Square, which is directly connected to all the major roads that lead to Shah Amanat Bridge. This primary road is 42 ft in width with 5 ft wide drainage provision on both sides and a 20ft wide vehicular path. Two secondary roads approximately 16 ft wide lead to the intended area from the primary road. As the intersection of these two roads is full of commercial storehouses, the roads remain busy all day long with heavy vehicles for loading-unloading purposes; the inhabitants find it extremely difficult to commute.



**Figure 5.** (a) Road conditions during the wet season, (b) Road conditions during the wet season, (c) Condition of Chaktai Canal (d) Condition of Chaktai Canal (Source: Authors, 2023).



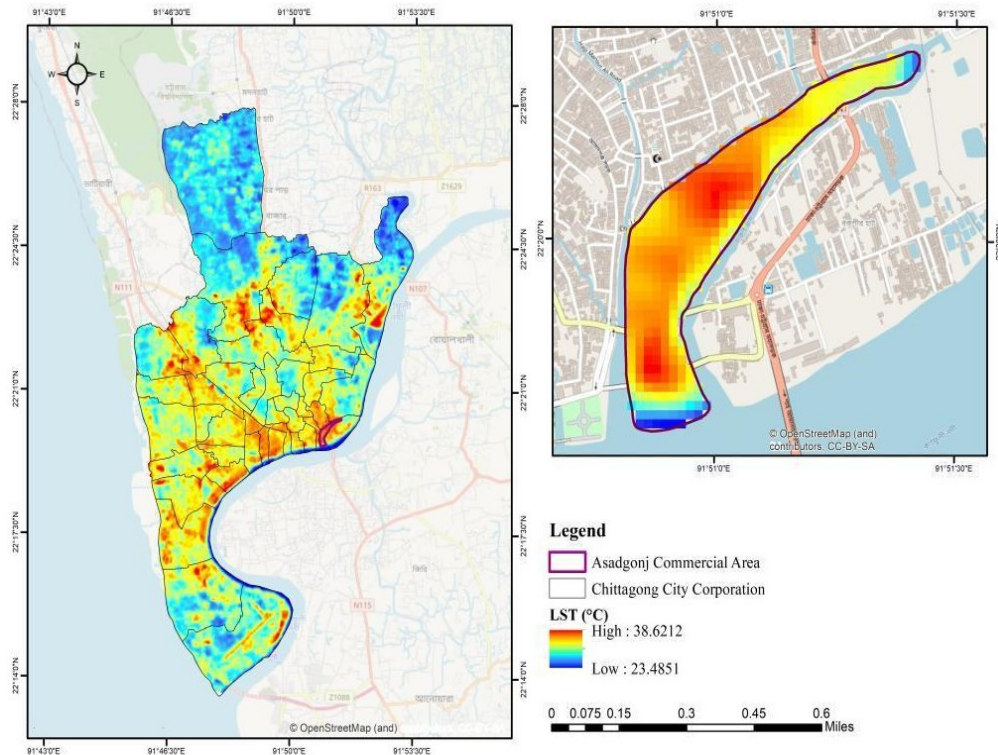
There is no defined walkable space for pedestrian movement. Street vendors fill up a lot of space on the main road during the day, which congests the entire area. Additionally, the bridges over the canals lack a suitable pedestrian facility and are too narrow for vehicle traffic. During the monsoon seasons, the roads get clogged due to the appalling drainage system which makes the situation worse. Whether the road was 20 feet or 60 feet wide, the drain width oddly stayed constant at 2 to 3 feet, creating an unsanitary living environment.

#### **4.2 Environmental Aspect**

One of Chittagong City's primary drainage channels and a major centre for waterway transit, the Chaktai Canal is roughly 6.9 kilometres long and partially man-made. This roughly seven-kilometre canal, which runs from Bahaddarhat to Chaktai, was once used for routing large ships and vessels loaded with perishable agricultural goods (onions, garlic, rice, lentils, sugar, tea, and spices), hardware, poultry feed, and other items. However, in addition to widespread encroachment, the canal is now choked and clogged with trash. Owing to the sediment load from soil erosion, illegal bankside encroachment, and the dumping of household and municipal solid waste, Chaktai has lost its natural form and ability to drain water. (Haque & Hoque, 2018). Due to the unpleasant odour, it is difficult to live and walk along the canal front because of the canal's contaminated water.

The Chaktai Canal, the city's main drainage system for eliminating precipitation and regular sewage outflow, was formerly considered the city's lifeline. However, over time, it became clogged with dirt, encroachments, and solid waste, which caused overflowing rainwater to flood both sides of the canal from Bahadderhat to Chaktai Commercial Areas. Additionally, the illegal disposal of waste and the dumping of dirt, household waste, and toxic commercial waste on the canal's side roads negatively impacted the working environment for residents, business owners, and workers. Primary drains are often natural canals with several parts. Because of this, water accumulates in different areas of the city even with drizzles.

There are hardly any greeneries that can be seen in the Asadganj commercial area due to the highly dense built environment. Lack of vegetation is one of the major factors causing the urban heat island effect in this area. A Land Surface Temperature map has been developed to better understand the current temperature range by using Geographic Information System (GIS) techniques for the study. Land surface temperature is the measurement of how hot the land is to the touch. LST found in the study area ranged from 23.48 °C to 38.62 °C for the year 2023 summer. The warmest temperatures are red, while the coldest temperatures are dark blue and light blue. Moderate temperatures are depicted in shades of yellow and orange.



**Figure 6.** Land Surface Temperature of Asadganj (Chaktai) commercial area (Roy et al., 2024).

### 4.3 Economic Aspect

The loading and unloading of goods take much longer than usual due to a narrow and crowded road infrastructure. Often the roads get congested by heavy vehicles, for example, trucks, pick-up vans, carriages, etc. It takes a lot of manpower to move goods off the vans since sometimes the traffic is so severe that it is difficult to make it to the station. Moreover, most of the storehouses are located on the ground floor or in a semi-basement. When it rains heavily during the monsoon, the roads get clogged because of the haphazard drainage system, and water seeps into the warehouses damaging goods.

Asadganj area is currently so crowded that better urban services are nearly impractical to offer. There is only one fire station for the Notun-Bridge area. It is challenging to offer fire protection in case of crises since the roads are too narrow and frequently remain congested by large vehicles.

These situations are leading to economic decay day by day.

### 4.4 Social Aspect

Inadequate public and community access to appropriate open space is one of the main concerns of Asadganj's urban residents. The absence of public spaces hampers economic activity, pollutes the environment, and reduces social stability and security. There is a presence of few open spaces.

However, these spaces are used by vendors illegally and some of these have become dumping zones due to lack of proper utilization. As a result, there is no such provision for children to play or for recreation. Usually, children are seen to play in the middle of the roads which is dangerous. When there is less provision for children to play, it can have negative impacts on their social, mental, and cognitive development. In a nutshell, the daily users of this area have no breathing space to get rid of their daily monotonous activities which are affecting their well-being and development. The below discussion on people's perceptions might give some insights into understanding the scope for development in Asadganj.

**4.4.1 Public perception of the development of the Asadganj commercial area:**

A survey was used to determine how eager people were for this area to be improved. Their visits and daily use serve as a reminder of their requirements and recommendations for improving the standard of these areas. Efforts were undertaken to obtain input from the local administration, Asadganj area inhabitants, and business owners. Fifty respondents in total were chosen at random from the local community. The information gathered from the questionnaire replies is given below, allowing for the identification of public demand.

**Table 5:** User Response from Questionnaire Survey, 2023.

<p><b>Public’s present expenditure during their leisure hours</b></p>	<table border="1"> <thead> <tr> <th>Category</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Rooftop</td> <td>9%</td> </tr> <tr> <td>Nearby park (Abhaymitra...)</td> <td>26%</td> </tr> <tr> <td>Nearby Vacant land</td> <td>19%</td> </tr> <tr> <td>Canal front</td> <td>8%</td> </tr> <tr> <td>Streets</td> <td>38%</td> </tr> </tbody> </table>	Category	Percentage	Rooftop	9%	Nearby park (Abhaymitra...)	26%	Nearby Vacant land	19%	Canal front	8%	Streets	38%						
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From the questionnaire survey, we can understand that the need for such open spaces can be categorized with demand. It is also recommended that when planning and developing public resources like green infrastructure, the perspectives and feedback of residents should be solicited and integrated into the process. (Dipeolu et al., 2022).

## 5. Recommendations for Urban Regeneration in Asadganj commercial area

Developing a congested commercial like Asadganj needs to address its present flaws and drawbacks while capitalizing on its potential strengths. Here are some recommendations for transforming and revitalizing such areas.

### 5.1 Environmental recommendations

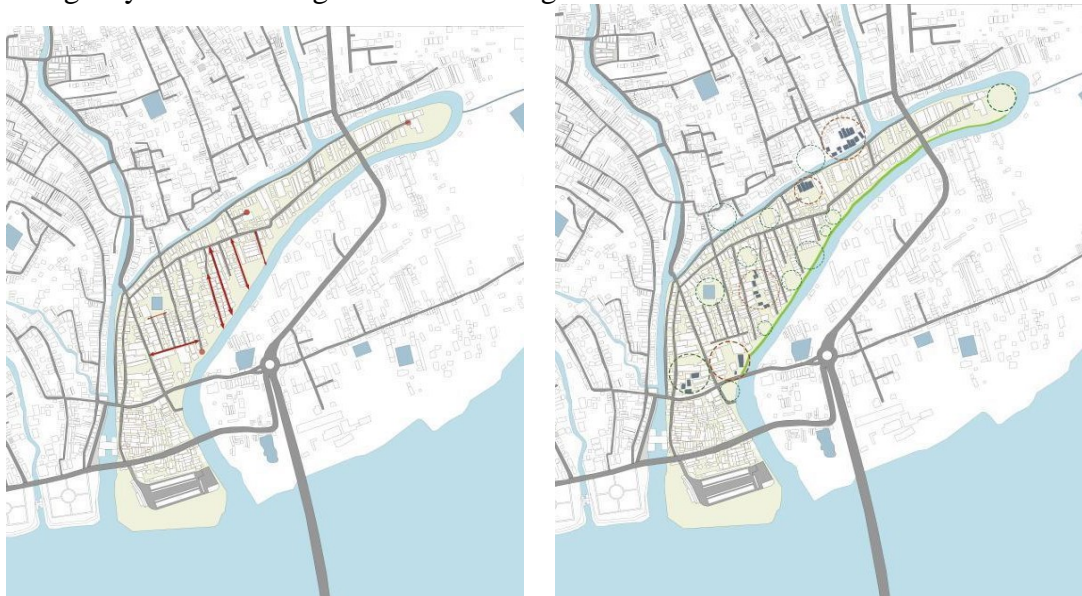
Taking green measures into action to lessen the impact on the environment and promote sustainability. Below approaches are listed below to carry out the process.

- To alleviate the urban heat island effect, strategically select tree species according to the context.
- Replacing existing outdoor concrete surfaces with permeable green surfaces.
- Designing a green belt alongside the canal front.
- Planting shrubs and hedge rows next to walkways. The plantation of large trees is categorized according to the site's context and weather.
- Establishing wildlife corridors to safeguard the movement of reptiles and ensure their safety.
- Cultivating water hyacinths along the canal edge on a specified scale to naturally purify the water.

### 5.2 Economic recommendations:

To successfully organize the area, clear zoning laws and urban planning techniques have to be taken into practice by

- Connecting the existing vehicular roads
- Designing a new pedestrian promenade
- Developing sewage system
- Including areas for community meetings with local business options, like food courts, tea shops, and street vendors
- Allocating proper loading and unloading spaces within the commercial area.
- Implementing well-designed fishing boat landing facilities at the canal ghat to seamlessly support and enhance the operations of the fishery business.
- Providing a cycle track alongside the canal edge.



**Figure 7.** (a) Provision of increasing road connectivity (b) Creating provision for urban public space (Source: Authors).

### 5.3 Socio-cultural recommendations

By providing subsidies to entice companies and property owners to make improvements to their spaces and by encouraging collaborations between community groups, private developers, and local governments to finance and oversee revitalization initiatives; socio-cultural practice can be improved. The below measures can be taken into account.

- Repurposing neglected areas such as vacant lots and the surroundings of the existing water bodies into public parks.
- Eradicating informal settlements to make provision for public open spaces.
- Creating pathways to ensure effortless and convenient public accessibility.
- Providing adequate lighting facilities and railing alongside the canal edge for safety and security.
- Establishing vibrant public areas for cultural and religious festivities, such as amphitheatres designed for public gatherings.
- Defining separate play spaces and parks for children.

### 6. Discussion

The survey findings have pointed out significant needs and opportunities for transforming Asadganj into a more vibrant, livable, and economically thriving commercial area. To address economic deterioration and lessen its negative impacts on society, comprehensive measures that promote sustainable economic growth, increase productivity, encourage innovation, improve infrastructure, and advance social welfare are frequently needed.

The Asadganj commercial area faces a confusing circulation system where pedestrian movement mixes with vehicle traffic. This issue can be addressed by establishing designated loading and unloading dockyards at the canal ghat and improving connections between existing vehicular roads. The proposed circulation aims to optimize transportation and elevate safety measures. To ensure safe roadways, vehicle restrictions based on weight and size within the market area must also be imposed through varied time zoning. Furthermore, proposing a pedestrian promenade will enable a better commuting experience for daily users.

In general, urban residents should have access to public green spaces measuring at least 0.5 to 1 hectares within 300 meters, or roughly a 5-minute walk, from their places of residence, according to the WHO. (Urban green spaces, WHO 2017). Including urban public parks in the Asadganj commercial area can have a profound and positive impact on the community. Not only it will enhance the physical environment but also it will nurture a sense of well-being, community, and sustainability. Every city dweller has an equal right to make use of green space and to lead a healthy lifestyle. By giving everyone equal access to use and benefit from community green spaces—such as protection from noise and air pollution—maintaining these spaces also helps residents enjoy psychological and environmental benefits, such as resting, stress relief, and other health benefits. (TOK et al., 2019) According to the World Health Organization (WHO), urban green spaces can reduce the health risks associated with living in densely populated cities by enhancing the quality of the air and water, reducing noise pollution, and minimizing the effects of extreme events.

These areas also support physical exercise, social connection, and community cohesion by offering chances for relaxation and stress reduction, as well as by promoting physical activity. (Urban green spaces, WHO 2017). Access to natural outdoor settings appears to encourage physical exercise, social cohesiveness, and enhanced psychological well-being, according to available data. (Gascon, Zijlema, Vert, White, & Nieuwenhuijsen, 2017; Nieuwenhuijsen, Khreis, Triguero-Mas, Gascon, & Dadvand, 2017).

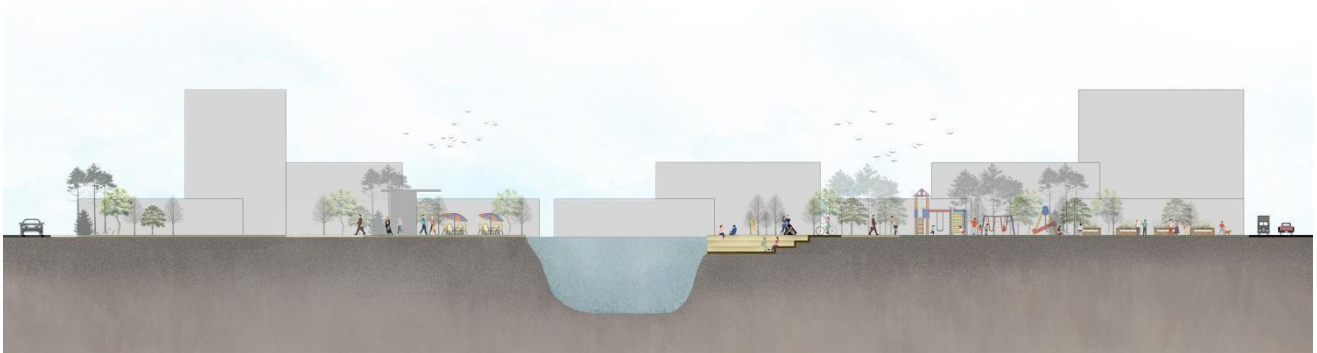
Additionally, every ward in a city, town, or union is required by the Bangladesh National Building Code to provide Ward Open Space to satisfy the active and passive recreational demands of the ward population. These open spaces should ideally be at least 10,000 m<sup>2</sup> (1 hectare) wherever possible. (Bangladesh National Building Code (BNBC, 2020). Therefore, approximately 10 to 12 potential

spaces in this area have been identified to accommodate playing fields, gardens, seating spaces, and informal play spaces for people of all ages. Particularly, neglected sites such as unused spaces and existing water bodies have been considered for conversion into public parks to revitalize their potential and prevent them from becoming dumping grounds.



**Figure 8.** Three-dimensional illustration of public parks (Source: The authors).

Moreover, the presence of urban open spaces will encourage social interactions, cultivating a feeling of community and belonging. It is recommended that People are more likely to benefit from their outdoor activities and use of green infrastructure facilities when they participate in these activities with others rather than alone. (Dipeolu et al., 2019). These places can also be used to celebrate various cultural activities which will enhance cultural value among the community. Because culture serves as a constant filter, it influences how people view and appreciate different situations even when they live in the same places. (Setten et al., 2012; Stephenson, 2008).



**Figure 9.** Section of a neighbourhood park (Source: The authors).

Urban green spaces are crucial for reducing air pollution, noise pollution, and the heat island effect—some of the worst problems that come with living in an urban environment. As a result, the suggested changes will have a big influence on Asadganj's overall environmental improvement. Offering shade and lowering the temperature during humid and hot weather, will assist in lessening the impact of the urban heat island. Integration of permeable green surfaces will serve a crucial function in managing stormwater, particularly during the monsoon season when water accumulation on roads is frequent on Asadganj's roads. Tree plantations in this area should be categorized according to the site's context and weather.

By implementing these strategies in a coordinated manner, haphazard commercial areas can be transformed into vibrant, sustainable, and inclusive neighbourhoods that support economic growth and improve the quality of life for residents and businesses alike. Furthermore, the entire population may benefit from nature-based interventions, particularly the area's lower socioeconomic level groups



(World Health Organization, 2017). Given that socioeconomically challenged populations typically have worse health than their richer counterparts, this is especially crucial. (Ball, 2015).

Significant amounts of capital are required for infrastructure construction, business support, and property purchase in regeneration projects. The scope and efficacy of reform initiatives may be limited by a lack of public financing or private investment. The regulatory frameworks in haphazard locations are sometimes unclear or antiquated, improvement attempts might be delayed or derailed by legal challenges and bureaucratic obstacles. Residents, businesses, and stakeholders may not be acquainted with the idea of change or any kind of revamp due to livelihood loss, cultural disruption, or relocation. Addressing disparities like escalating issues with poverty, healthcare, education, unemployment, and social services requires integrated approaches that go beyond regeneration on a physical level. Without sustained support and resources, long-term expected results may not be achieved. To overcome these limitations and bring about significant change, successful reform initiatives in chaotic commercial zones frequently depend on collaborations between local communities, non-profit organizations, government agencies, and stakeholders in the private sector.

## 7. Conclusions

To conclude, this study highlights the significant interconnections between urban morphology and economic sustainability, demonstrating how well-designed urban environments contribute to both social cohesion and economic resilience. By examining various urban forms and their impacts on social behaviors, we have identified patterns that foster more inclusive and interactive communities, which in turn enhance economic opportunities and reduce social inequalities. The findings indicate that compact, mixed-use developments are particularly effective in optimizing land use and infrastructure, thereby reducing costs associated with urban sprawl while promoting vibrant local economies.

Moreover, the research underscores the economic benefits of sustainable urban planning practices. By adopting strategies such as walkability, mixed-use zoning, and integrated public transport, cities can reduce reliance on private vehicles, lower energy consumption, and minimize greenhouse gas emissions. These measures not only contribute to environmental sustainability but also offer substantial economic savings by reducing the costs of transportation, infrastructure, and public health. Additionally, such urban forms attract investment, boost local businesses, and enhance property values, creating a positive economic feedback loop that benefits both residents and the broader urban economy.

In summary, the study provides a comprehensive understanding of how sustainable urban design can catalyze economic growth while fostering social equity and environmental stewardship. The research findings support the notion that cities aiming to enhance their economic performance should consider the integration of compact, sustainable urban forms as a strategic priority. Future research could build on these insights by exploring the specific economic impacts of various urban design elements in different socio-cultural contexts, further solidifying the role of urban morphology in achieving a balanced and sustainable urban future.

## Acknowledgment

This research did not receive any specific grant from funding agencies in the public, commercial, or non-for-profit sectors.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflicts of Interest

The authors declare no conflicts of interest.



### Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

### CRedit author statement:

Sarah Binte Haque (Author 1): Conceptualization, Methodology, Project Administration, Supervision, Writing - Review & Editing. As the project lead, she oversaw the research team and guided the study's overall direction. She played a central role in conceptualizing the research, developing the methodology, and ensuring the smooth progression of the project. Additionally, she was responsible for critically revising the manuscript and finalizing the study's conclusions.

Moumita Roy (Author 2) and Zereen Afroz Tanha (Author 3): Data Curation, Investigation, Formal Analysis, Visualization, Writing - Original Draft, Writing - Review & Editing. Authors 2 and 3 were pivotal in the empirical aspects of the research, primarily responsible for data collection through surveys and interviews, and for gathering and curating the dataset. They led the data analysis, provided in-depth interpretation, and contributed substantially to writing, visualizing, and editing the manuscript. Their work was instrumental in deriving the study's findings and shaping its outcomes. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Haque, S. B., Roy, M., & Tanha, Z. A. (2024). Urban Regeneration Strategies for Enhancing Livability: A Case Study of the Chaktai Commercial Area, Chattogram, Bangladesh. *Journal of Contemporary Urban Affairs*, 8(2), 385–403. <https://doi.org/10.25034/ijcua.2024.v8n2-6>

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Original scientific paper

# Comparative Spatio-Temporal Dynamics of Urban Sprawl in Algerian Cities Skikda and Tébessa (1985-2024) Using GIS and Landsat Imagery

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## ARTICLE INFO:

### Article History:

Received: 13 March 2024  
Revised: 20 August 2024  
Accepted: 1 September 2024  
Available online: 5 September 2024

### Keywords:

Urban Sprawl,  
Land Use Change,  
Spatio-Temporal Dynamics,  
Skikda,  
GIS,  
Tebessa.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*This study analyzes urban sprawl in the Algerian cities of Skikda and Tébessa from 1985 to 2024, utilizing supervised classification of Landsat satellite imagery and GIS analysis. Skikda, a coastal city, experienced a 68% increase in built-up areas due to industrial growth and coastal geography, whereas Tébessa, an inland city, saw a 45% increase, with growth moderated by its topography and economic structure. The findings illustrate how socio-economic factors, land-use policies, and geographical characteristics influence urban expansion patterns. Skikda's rapid, scattered growth contrasts with Tébessa's controlled expansion. This study highlights the need for customized urban planning strategies that consider local contexts to manage urban sprawl effectively. By comparing the dynamics of coastal and inland cities, the research provides valuable insights for sustainable urban development in medium-sized Algerian cities, offering a framework for similar studies nationwide.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 404–420.

<https://doi.org/10.25034/ijcua.2024.v8n2-7>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- Population density and land use changes are key indicators of urban sprawl
- This study examines the spatial and temporal trends of urban growth in Skikda and Tébessa from 1985 to 2024.
- Skikda experienced more rapid and extensive urban sprawl compared to Tébessa.
- Factors influencing urban sprawl include socio-economic drivers, planning and policy impact, and topographical features.

### Contribution to the field statement:

This study contributes to urban planning research by providing a novel comparative analysis of urban sprawl patterns in two medium-sized Algerian cities - one coastal and one inland - over a 40-year period, revealing distinct growth trajectories shaped by local socio-economic, policy, and topographical factors, and demonstrating the need for tailored, context-specific urban management strategies.

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### How to cite this article:

Ibtissem, L., Lamia, L., Lazhar, G., & Youcef, L. (2024). Comparative Spatio-temporal Dynamics of Urban Sprawl in Algerian Cities Skikda and Tébessa (1985-2024) Using Gis and Landsat Imagery. *Journal of Contemporary Urban Affairs*, 8(2), 404–420.

<https://doi.org/10.25034/ijcua.2024.v8n2-7>



## 1. Introduction

The early decades of the twenty-first century marked a significant milestone in global urbanization, characterized by an unprecedented rate of urban growth. During this period, nearly half of the world's population resided in urban areas, reflecting a rapid increase in urbanization (Birch & Wachter, 2011; Kookana et al., 2020). This accelerating urbanization has resulted in complex transformations in land use and land cover across different geographical scales, contributing to phenomena such as urban sprawl (Asabere et al., 2020; Nuissl & Siedentop, 2021; Sharma et al., 2024). Urban sprawl, often characterized by uncontrolled city expansion, low-density development, dispersed housing, car dependency, and extensive land use, has been a central theme in planning literature and discussions (Hu & Yang, 2018; Fuladlu, 2019; Siyavuş & Aydın, 2022). It commonly occurs in a radial pattern around city centers or along major transportation corridors (He et al., 2019; Oyesiji, 2023). While extensive research has explored urban sprawl in large cities, there remains a significant gap in understanding its patterns and dynamics in medium-sized cities (Jain & Sharma, 2019; Chetty, 2022), especially in developing nations where urbanization is occurring at a faster pace than in developed countries (Getu & Bhat, 2021; Auwalu & Bello, 2023).

Algeria exemplifies these trends. The United Nations (2019) and the World Bank (2015) report that Algeria's urbanization rate increased from 31.4% in 1966 to 73.7% by 2020. The phenomenon of urban sprawl in Algeria began in the 1970s, driven primarily by rural-to-urban migration and a rapid population increase following independence (DECHAICHA, 2020; Abdelhakim, 2023). This growth has resulted in the proliferation of small and medium-sized towns and unregulated urban expansion (CNES, 2002; ONS, 2011). The impacts of urban sprawl vary widely across different regions, with each city experiencing distinct challenges based on its unique geographical and socio-economic context (Salvati, 2016). Previous studies on urban sprawl in Algeria have primarily focused on large cities like Algiers, Constantine, and Oran, leaving a substantial gap in knowledge about medium-sized cities (Nemouchi, 2023).

Moreover, comparative research examining the patterns and spatio-temporal dynamics of urban sprawl across diverse urban regions of Algeria, particularly in terms of varying climatic and geographical characteristics, remains scarce. This research gap limits our understanding of how urban expansion occurs in these often-overlooked medium-sized cities and how it should be managed.

This study addresses this gap by examining the spatial and temporal trends of urban growth in two Algerian cities, Skikda and Tébessa, from 1985 to 2024. We hypothesize that these cities, with their contrasting characteristics, exhibit significantly different urban sprawl patterns shaped by varying socio-economic drivers, land-use policies, and natural topographic factors.

Skikda and Tébessa were selected for this comparative analysis due to their unique characteristics. Skikda, a significant coastal city on the Mediterranean coast with a population of nearly 210,000 (2008 census), serves as a crucial port with an economy primarily based on the petrochemical industry, port operations, and tourism (Hadeff & Hadeff, 2022). In contrast, Tébessa, an inland city located in northeastern Algeria near the Tunisian border, has a population of approximately 190,000 (2008 census) and an economy traditionally centered on phosphate mining and agriculture (Hadjela & Menacer, 2023). The differing geographical and socio-economic contexts of these cities provide a valuable opportunity to analyze and compare urban sprawl patterns in various regions of Algeria, essential for developing urban planning strategies tailored to each context for sustainable development. This study seeks to answer the following research questions:

1. How do the spatio-temporal dynamics of urban sprawl differ between Skikda and Tébessa from 1985 to 2024?
2. What are the primary drivers influencing the variations in urban sprawl patterns observed in Skikda and Tébessa over the study period?

The research methodology involves a comprehensive analysis using Landsat satellite imagery from 1985, 2005, and 2024, applying supervised classification techniques and Geographic Information System (GIS) analysis to accurately delineate and measure urban sprawl's spatial expansion patterns.

This methodology enables a detailed assessment and comparison of urban sprawl patterns in Skikda and Tébessa, considering factors such as expansion rate, growth direction, and land use changes. Socio-economic data, policy documents, and historical information are also analyzed to provide a comprehensive understanding of the observed patterns.

The study aims to:

1. Classify and map the spatial extent and temporal changes in urban sprawl in Skikda and Tébessa across three periods (1985, 2005, and 2024) using satellite imagery and GIS techniques.
2. Assess and compare the rates of built-up area expansion between the two cities over the nearly 40-year study period.
3. Evaluate how topographical, policy, economic, and demographic factors interact to shape divergent urbanization patterns.
4. Discuss the sustainability implications of unmanaged expansion, such as loss of farmland, congestion, infrastructure deficits, and ecosystem disruption.
5. Suggest tailored policy responses and growth management strategies for secondary cities, building on context-specific drivers and impacts.

To the best of our knowledge, this is the first comprehensive study comparing two medium-sized cities—one coastal and one inland—in Algeria. It provides valuable insights into strategically planning sustainable development in growing urban areas. By employing a comparative approach, we can better understand how coastal and inland environments uniquely affect urban sprawl, contributing to developing more customized and efficient urban planning strategies for similar cities nationwide.

The paper is organized into five sections. The first section presents the current situation, outlines the research problem, and defines the study's scope and approach. The second section details the materials and methods used in the analysis. The third section examines and interprets the results, establishing the cognitive and data foundation for the study. The fourth section summarizes the study's key contributions, and the final section discusses the findings, limitations, and suggestions for future research.

## 2. Material and Methods

### 2.1 Case studies

Two distinct Algerian cities, Skikda (a coastal city and economic center) and Tébessa (an intermediate and border city) were chosen to study the forms of urban expansion and spatiotemporal dynamic evolutions between 1985 and 2024.

Figure 1 illustrates the location of the two case studies in Algeria. Skikda (37°52'00" North, 7°54'00" East), situated on the Mediterranean coast in north-eastern Algeria, covers 55.4 km<sup>2</sup> and is the country's most efficient manufacturing center. Tébessa (35°40'06" North, 8°12'12" East), located in the far east of Algeria, has a surface area of 184 km<sup>2</sup>. It is a border town with Tunisia and the desert, serving as a crossing point between the interior and exterior of the country and between the Tell and the Sahara. The selection of these cities is based on various geographical, economic, and socio-political criteria, allowing for analysis of urban dynamics in diverse contexts. Skikda, with its varied industries and active port infrastructure, exemplifies urban expansion dynamics influenced by economic activities and maritime trade. In contrast, Tébessa, despite its strategic location at the crossroads of major traffic routes, has a weaker economic base and lags in social development. Studying Tébessa provides insight into urban dynamics in a context of limited development, illustrating how economic constraints and social challenges influence urban expansion. These case studies demonstrate how different factors affect urban development and can serve as references for other cities with similar characteristics.

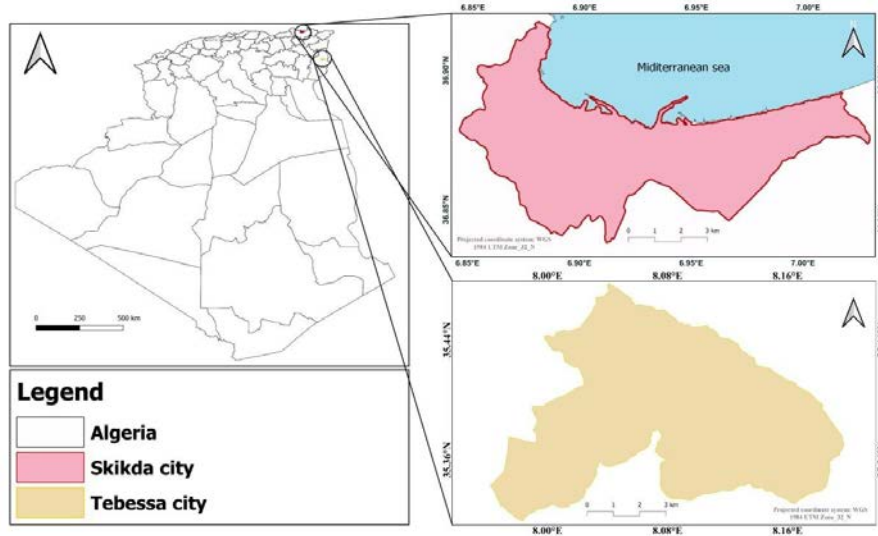


Figure 1: Location map.

### 2.3 Methodological Framework

Remote sensing and GIS-based Land Use/Land Cover Change (LULC) detection methods are often employed due to their cost-effectiveness and high Temporal Resolution (Abdelkebir et al., 2023; Leulmi et al., 2023; Wu et al., 2023). The main objective of this study was to examine the effect of land use/land cover change on urban sprawl using LULC spatial analysis in a GIS environment. The methodological framework consisted of two parts. The first step was to predict the spatial-temporal patterns of land use (LULC) for the two case studies (the city of Skikda and the city of Tébessa) using a quantitative supervised classification method and RS remote sensing data at a spatial resolution of 30 for the three time periods of 1985, 2005 and 2024. The second part involved comparing the extent of urban land use change for the two case studies over the study period (1985-2024) for representing urban expansion, in which the influential factors of natural topography and demographic change are highlighted. A flow chart describing the study approach is shown in Figure 2.

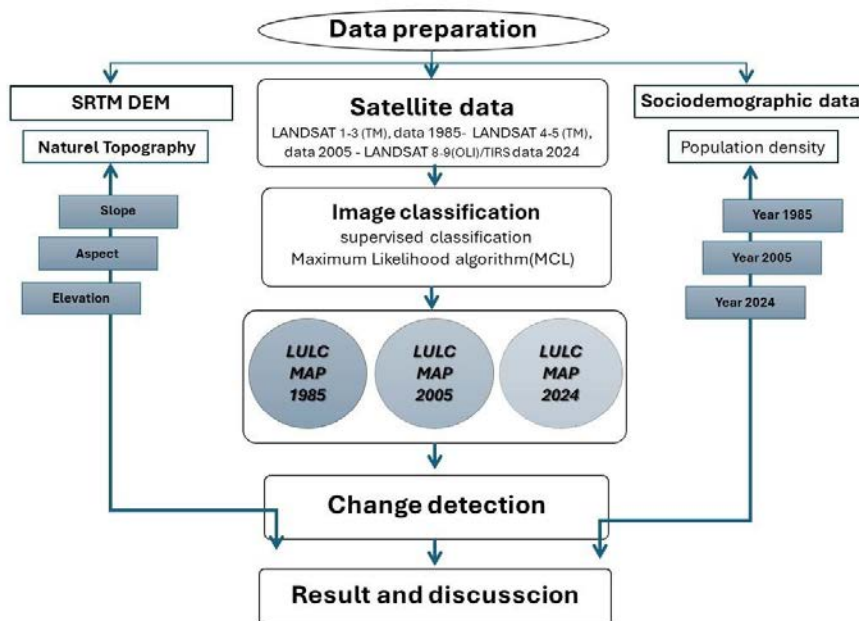


Figure 2: Structure of the study.



### 2.4 Data Acquisition and Pre-processing

This study used a range of data (Table 1). The baseline information was remote sensing data from the USGS Earth Explorer website (<https://earthexplorer.usgs.gov/>). The data were analyzed using Landsat 1-3 TM (1985), Landsat 4-5 TM (2005), and Landsat 8-9 OLI/TIRS (2024) satellite images to obtain land use information (Idowu & Zhou, 2021). Table 2 provides information on the satellite images. Other auxiliary data related to natural topography (elevation, slope, and aspect) were used in the study, obtained from the Shuttle Radar Topographic Mission (SRTM) 1 arc-second digital elevation model (DEM) in raster format on the official United States Geological Survey (USGS) web portal: <https://www.usgs.gov/>. In addition, population census data was collected from government reports for the years 1985, 2005, and 2024 to compare population change and land use/cover change in the two urban areas. All data was resampled to a spatial resolution of 30 meters. The data management steps were carried out using the (internationally recognized) actions integrated into the Quantum GIS open-source software (QGIS 3.18).

**Table 1:** Data used in the study.

Data used	Resolution scale	Format	Acquisition date	Source	Usage
Shuttle Radar Topography Mission (SRTM) – DEM	30 × 30 m	Raster/Spatial resolution (30 m)	2024	<a href="http://www.usgs.gov/">www.usgs.gov /</a>	Calculation of elevation, slope, and aspect.
LANDSAT: ▪ Landsat 1-3 (TM) ▪ Landsat 4-5 (TM) ▪ LANDSAT 8-9(OLI)	30 × 30 m	Satellite image	2024	<a href="https://earthexplorer.usgs.gov/">https://earthexplorer.usgs.gov/</a>	LULC simulation
Administrative boundary	Commune /Ville	Shapefile (Polygon)	2024	DUCH	Administrative divisions.
Census	1985-2024	Text District	- 2024	Office of Statistics (ONS)	Density of population

**Table 2:** The main characteristics of the Landsat satellite data.

site	Scene ID	Satellite Sensor	& WRS (Path/Row)	Spatial Resolution (m)	Acquisition date	Producer
Skikda City	LM04_L1TP_193034_19851109_20210917_02_T2	Landsat TM	1-3 137/43	30 × 30	1985-11-09	USGS
	LT05_L2SP_193034_20051108_20200901_02_T1	Landsat 5TM	4- 137/43	30 × 30	2005-11-08	USGS
	LC08_L2SP_193034_20240214_20240223_02_T1	Landsat OLI/TIRS	8-9 137/43	30 × 30	2024-02-14	USGS
Tebessa City	LT05_L1TP_192035_19851110_20200918_02_T1	Landsat 3TM	1- 137/43	30 × 30	1985-11-10	USGS
	LT05_L1TP_192036_20050930_20200901_02_T1	Landsat 5TM	4- 137/43	30 × 30	2005-09-30	USGS
	LC09_L1TP_192035_20240213_20240213_02_T1	Landsat OLI/TIRS	8-9 137/43	30 × 30	2024-02-13	USGS



### 2.5 Image classification

Quantitative supervised classification by maximum likelihood was used in this study, allowing the grouping of LULCs detected from satellite images ((Idowu & Zhou, 2021; Xu et al., 2021). The UTM WGS 1984 Zone\_32\_N projection system was used for image processing. Pixels were trained according to their colour tone based on land use classes (built-up land, green space, and other lands), collected from ground truth value observation via Google Earth and field observation. Land use/land cover was categorized using the Maximum Likelihood Classification (MLC) algorithm. The assessment calculated the extent of changes in each land use and land cover category (LULC) over the designated study periods. The entire classification process was implemented in Q-GIS software (version 3.18). In accordance with the study's objective, the study area was classified into three classes, as shown in Table 3.

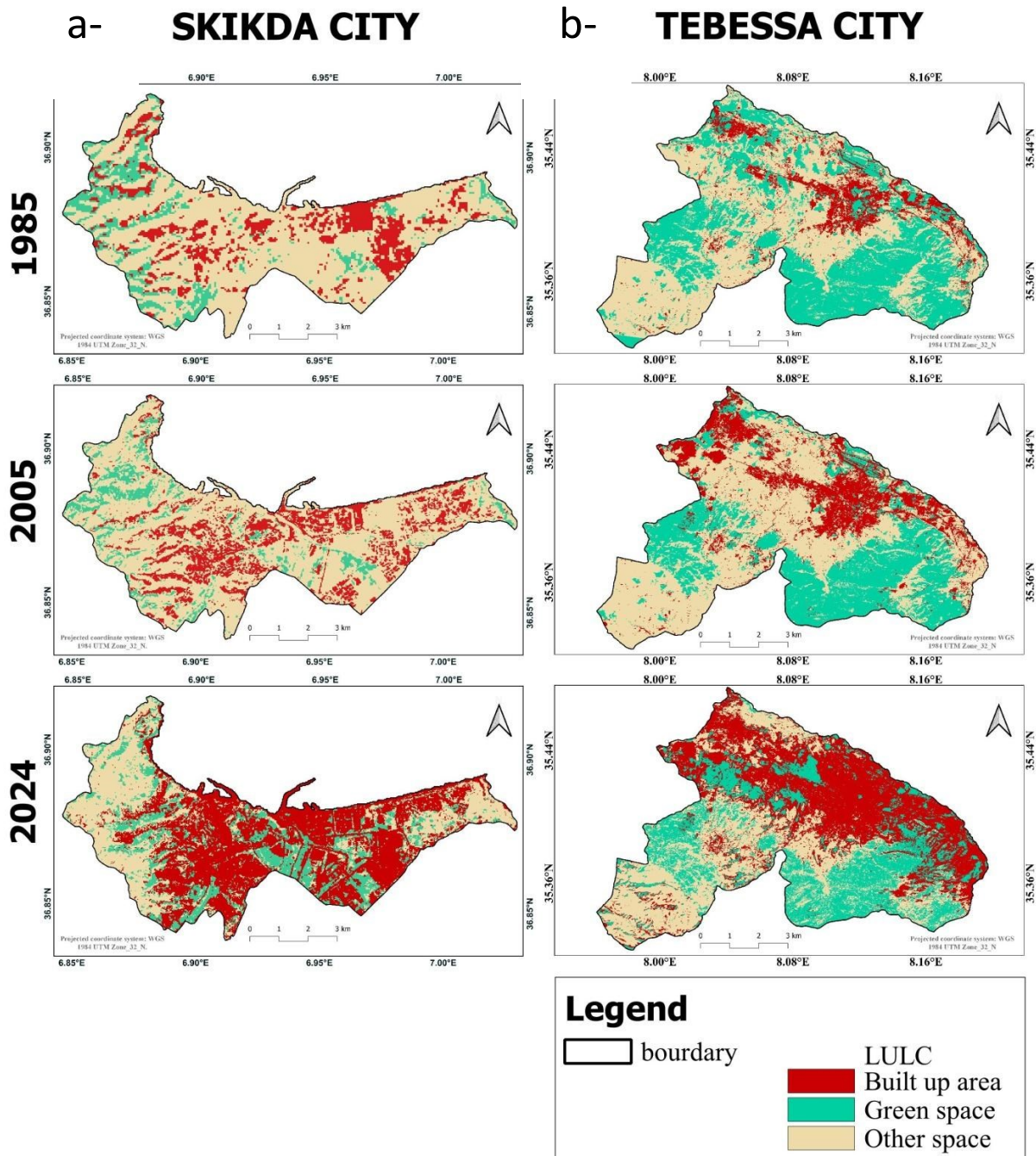
**Table 3:** Description of land use/cover classes.

Type LULC	Description	References
<b>Built up area</b>	Urban areas (buildings and concrete structures, gray infrastructure).	(Ahmadpour & Shahraki, 2019)
<b>Green space</b>	Agricultural lands, plantations, pastures, forests, etc.	(Aswal et al., 2018; Manikandan, 2019; J. Wu et al., 2023)
<b>Other</b>	Water bodies and uncultivated lands; lands with barren rocks and sandy sections.	(Ahmadpour & Shahraki, 2019; Lawrence F. & Mildred E., 2020)

## 3. Results

### 3.1 Urban sprawl and spatial pattern from 1985 to 2024

To better understand urban development and its spatiotemporal pattern in the two cities (Skikda and Tebessa), Landsat images from 1985, 2005, and 2024 have been classified into built-up, green spaces, and others. This has resulted in three thematic maps, illustrated in Figure 3 below.



**Figure 3:** Urban sprawl patterns in Skikda and Tebessa.

### 3.2 Land use and land cover change analysis

The results indicate that the two studied urban agglomerations underwent substantial urban expansion from 1985 to 2024. On one hand, in Skikda City, the built-up area progressively expanded from the port towards the south-west direction between 1985 and 2005, while slightly decreasing in the eastern region. However, from 2005 to 2024, a significant growth in built-up areas was observed in all directions, encroaching upon other land and green spaces.

The graphs (Fig. 4; a) below depict the urban sprawl trend in Skikda by illustrating changes in built-up areas, green spaces, and other land cover categories from 1985 to 2024. Built-up areas exhibited a significant increase, rising from 14% in 1985 to 37% in 2005 and a projected 47% in 2024, indicating continuous urbanization. Conversely, while green spaces initially expanded from 23% in 1985 to 42% in 2005, they are projected to decrease to 39% by 2024, potentially due to the encroachment of urban

development. The "Others" category, comprising land covers beyond built-up and green areas, decreased from 35% in 2005 to a projected 22% in 2024, suggesting land use conversions to accommodate urban growth. Overall, the data illustrates Skikda's urban sprawl pattern, characterized by the expansion of built-up areas at the expense of green spaces and other land cover types.

On the other hand, from 1985 to 2005 in Tebessa city, the built-up area continued to expand in a northerly and westerly direction, but within a planned and organized framework through the urban development plan (PDAU), which aimed for regular space consumption. This growth was accompanied by the expansion of illegal fabrics to the south, southeast, and north and the deployment of activities, equipment, and housing. This period is marked by the discontinued occupation of urban space from 2005 to the present; the built-up area has been characterized by the expansion of peripheral regions, with successive urbanization processes towards the west along major roads (RN10). The graph (Fig. 4;b) below depicts that in 1985, the built-up area was relatively small at 15%, while green space was 25%, and others accounted for 60%. By 2005, the built-up area had increased significantly to 60%, indicating substantial urban sprawl and development, while green space had decreased to 18%, likely due to the expansion of built-up areas, and others remained at 60%. For 2024, the projections show a potential decrease in built-up area to 28%, suggesting more controlled urban growth. Additionally, green space is projected to increase slightly to 22%, possibly due to urban planning efforts to preserve or create more green spaces, while the Others category is projected to increase to 50%, which could indicate either urban renewal efforts or the conversion of some built-up areas back to other land uses. Overall, the data suggests that Tebessa experienced significant urban sprawl between 1985 and 2005. Still, the projections for 2024 indicate a potential shift towards more controlled urban growth, with a decrease in built-up areas and an increase in green spaces and other land uses.

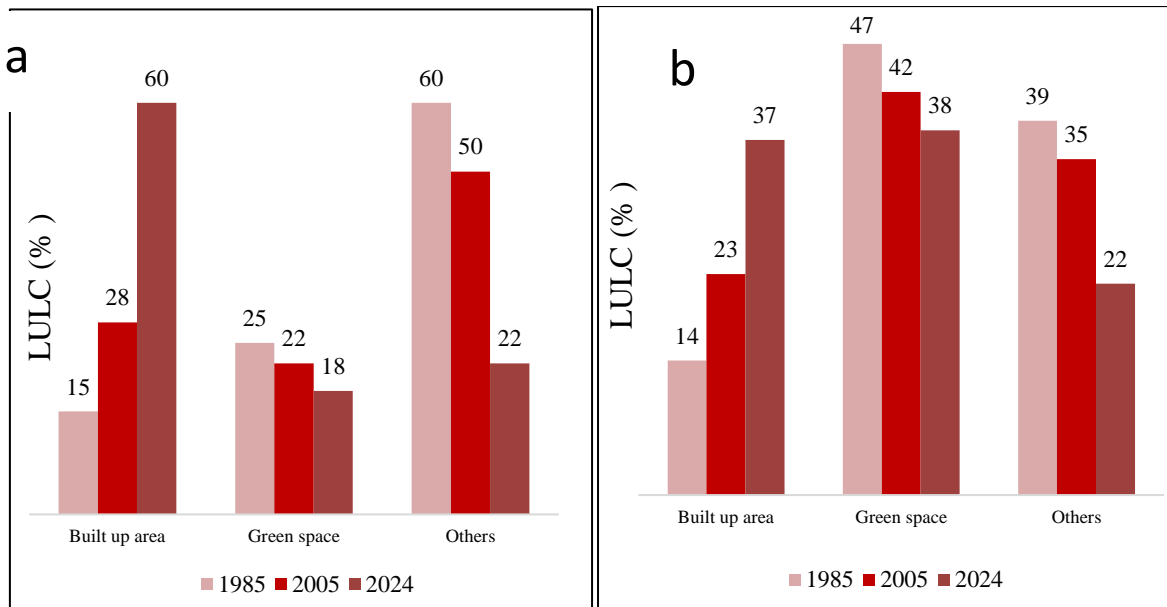


Figure 4: LULC percentage.

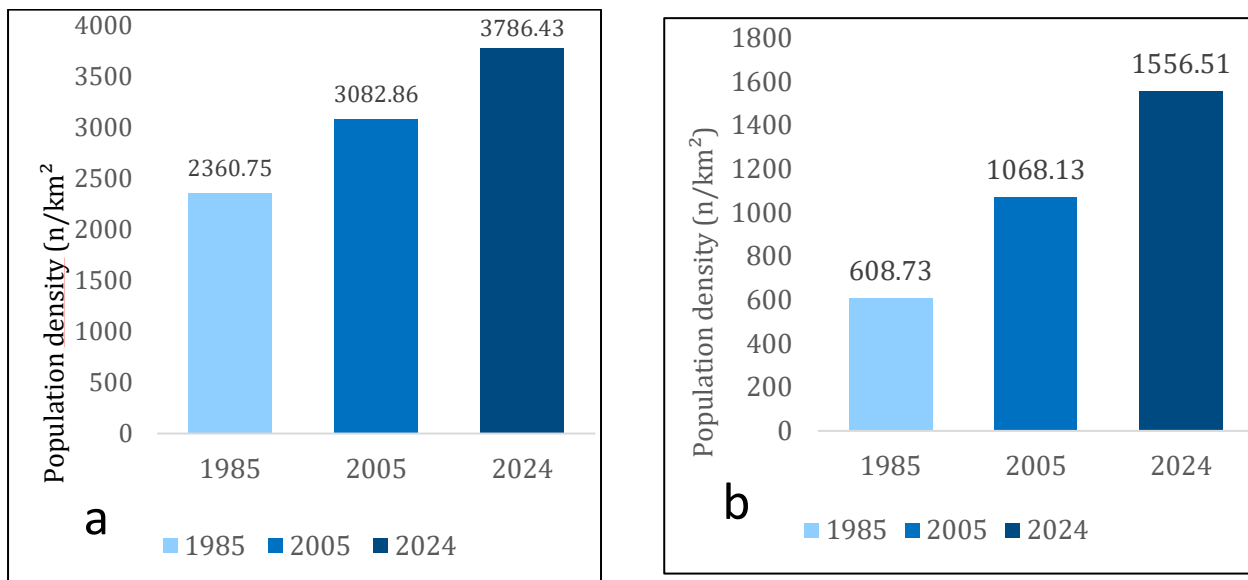
Overall, these graphs highlight urban sprawl trends in both cities, with built-up areas expanding at the expense of green spaces and other land cover types, whereas the rate of increase in built-up areas appears to be higher in Skikda.

### 3.3 Demography and Urban Expansion

Demographic data obtained from the National Statistics Office (ONS) were used to construct the graphs in Figure 5, which illustrate changes in population density in Skikda (graph a) and Tébéssa (graph b) for the years 1985, 2005, and the projected figures for 2024. These graphs provide insights into the patterns of urban sprawl in the two cities.

In Tébessa, the population density increased from 608.73 inhabitants per square kilometer in 1985 to 1068.13 inhabitants per square kilometer in 2005, with a further projected increase to 1556.51 inhabitants per square kilometer by 2024. Conversely, Skikda showed consistently higher population density throughout the same periods, starting at 2360.75 inhabitants per square kilometer in 1985, rising to 3082.86 inhabitants per square kilometer in 2005, and is expected to reach 3786.43 inhabitants per square kilometer by 2024.

The consistently higher population density in Skikda compared to Tébessa suggests a more rapid and extensive pattern of urban sprawl, assuming comparable economic and developmental conditions. As the population grows, the demand for housing, infrastructure, and urban services also increases, leading to the conversion of more land into urban use and contributing to the observed sprawl patterns. The substantial projected increases in population density for both cities by 2024 indicate that urban sprawl is likely to continue. This may result in the expansion of built-up areas into previously undeveloped or rural zones, involving the transformation of green spaces, agricultural lands, or other land cover types to accommodate the growing population and the accompanying urban development.



**Figure 5.** Population Density: a -Skikda, b- Tébessa.

A variety of factors beyond population density, such as urban planning policies, economic activities, transportation infrastructure, and environmental considerations, influence Urban sprawl patterns. In both Tébessa and Skikda, effective urban planning and sustainable development strategies are crucial to managing urban growth while preserving green spaces, protecting natural resources, and ensuring a balanced and livable urban environment.

#### 4. Discussion

Urban sprawl in Algeria, as described by DECHAICHA (2020), began in the 1970s and is specifically characterized by the dispersed expansion of metropolitan centers. This phenomenon was driven by two primary factors: a rapid population increase in the years immediately following independence and significant rural-to-urban migration (Abdelhakim, 2023). As a result, CNES (2002) and ONS (2011) report that Algeria experienced swift and inadequately regulated urban growth, particularly within small and medium-sized municipalities. This expansion has substantially influenced the country's urban system and population distribution.

#### 4.1. Differences between urban sprawl in Skikda and Tébessa

This study highlights distinct trends in urban expansion in the medium-sized Algerian cities of Skikda and Tébessa over the past four decades. The findings demonstrate a significant increase in urbanization in both cities, with Skikda exhibiting a more rapid and extensive growth rate—its built-up area expanded by 68% from 1985 to 2024, outpacing Tébessa's 45% growth. The analysis also showed significant changes in land use, with built-up areas expanding at the expense of green spaces and other types of land cover. These findings align with previous studies on urbanization patterns in Algeria's small and medium-sized cities. For instance, Mostari et al. (2021) documented a notable increase in urbanization in Mostaghanem, a coastal city where urbanized areas grew from 2,604 hectares in 1985 to 5,049 hectares in 2015.

Similarly, Gherbi & Toumi (2024) reported that the inland city of Khenchela experienced rapid population growth and high migration rates from 2008 to 2022, resulting in severe urban challenges such as housing shortages, unplanned expansion into agricultural lands, and the depletion of buildable land. Additionally, Skikda demonstrated a higher population density growth due to migration flows compared to Tébessa, suggesting a potentially more pronounced urban sprawl. These findings are consistent with Côte (1994), who emphasized the role of population growth and rural-to-urban migration in driving urban sprawl in Algeria.

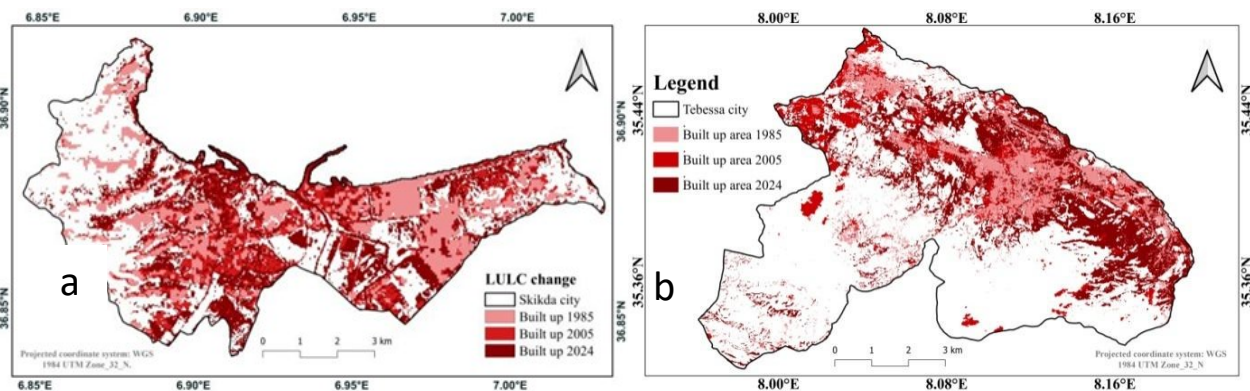


Figure 6. Built-up area: a- Skikda ,b - Tébessa.

#### 4. 2. Land use/land cover change drivers:

The expansion patterns in both cities showed significant spatial and temporal disparities. Two distinct sprawl models have been identified, possibly shaped by these drivers (Abdelhakim, 2023):

##### 4.2.1. Socio-economic factors

Skikda's advantageous coastal location has attracted substantial investments in petrochemicals and shipping, leading to rapid economic growth and urban expansion. A pivotal moment in Skikda's development occurred in 1971 with the establishment of an industrial zone, transforming the city from an agricultural area into a diversified industrial center (Hadeff & Hadeff, 2022). This transformation enhanced Skikda's prominence at the state level, especially after the administrative reorganization in 1974. Consequently, the city underwent significant changes in its economic structure, shifting from a focus on agriculture and tourism to becoming a hub for the industrial and service sectors.

In contrast, Tébessa, situated within the "Steppe and Saharan Atlas Zone," initially faced challenges such as a low population density, limited agricultural output, a lack of industrial activity, inadequate infrastructure, and minimal urban development (Hadjela & Menacer, 2023). The city's economic foundation was primarily built on mining, while development efforts were directed towards housing, urban planning, administrative services, education, public health, public works, and water management. Agriculture, industry, and tourism were considered secondary priorities (Gherzouli & Labii, 2020). Due to these divergent economic orientations, Skikda's urbanization has progressed at a faster rate than that of Tébessa.

#### 4.2. 2. *Planning and Policy Impact*

The impact of urban planning and policy on the growth of Skikda and Tébessa reveals a complex and often counterproductive dynamic. Rather than curbing expansion, urban policies and regulations have often unintentionally facilitated it (Saidi et al., 2023). Urban planning tools derived from Law n° 90-29 have been inadequate in managing the rapid growth of both cities, often accompanying rather than controlling urban sprawl. This inadequacy can be partly attributed to delays in the preparation and approval of these planning instruments (Aggoune, 2024).

In Tébessa, urban development benefited from planning tools such as the Master Plan for Urban Development (PDAU) and Land Use Plan (POS), housing programs, improved infrastructure, and the establishment of peri-urban zones with industrial areas, an airport, and dispersed new housing zones (ZHUN). However, the "Black Decade" led to unplanned urbanization, prompting a shift towards horizontal expansion marked by both collective and individual housing in new neighborhoods, including projects like the "Doukkane" urban center with 11,000 planned housing units and ongoing developments like Boulhaf Dyr.

Skikda, which became an administrative division in 1974, focused its urban planning policies on expanding southward and developing a 1,400-hectare industrial zone. This led to the formation of informal settlements in areas such as Bouabaz and Salah Boulkeroua, alongside expansions in the eastern and western directions. Planning efforts also included territorial divisions and various housing initiatives, such as the L'Espérance, 700-unit, and 500-unit developments, as well as new habitat zones (ZHUN), AADL, and participatory housing projects in locations like Boulkeroua and Merdj Eddib, all contributing to a comprehensive urban strategy for Skikda.

Despite the numerous policies and planning instruments, both cities have experienced uncontrolled urban sprawl and the substantial consumption of scarce, non-renewable land. This underscores the need for more effective laws and urban planning tools to manage urban growth (Nemouchi, 2023).

#### 4.2. 3. *Topographical Influence*

Topographical factors, such as elevation and slope, have significantly influenced the direction of urban growth in both cities. In Skikda, geographical features, including the Mediterranean Sea to the north and mountain ranges to the east and west, along with a petrochemical zone in the east, have constrained the city's expansion. These natural barriers have limited the city's growth, directing it toward the southern regions, where it increasingly encroaches on agricultural land. Recent assessments indicate that Skikda requires an annual increase of over 30 hectares of land to accommodate its growing population, often at the expense of valuable agricultural land on its southern periphery.

In Tébessa, the varied terrain, characterized by plains and mountains—where mountainous terrain accounts for over 50% of the total area—has significantly influenced the city's development patterns.

The city's geographical constraints have led to two main types of growth:

**Structuring lines:** Natural or artificial linear features, such as valleys, ridges, roadways, or rivers, that provide logical routes for urban expansion.

**Restricted plains and flat areas:** Limited flat regions have become highly desirable for development due to their suitability for construction and ease of accessibility.

These topographical influences have shaped the distinctive urban growth trajectories observed in both cities.

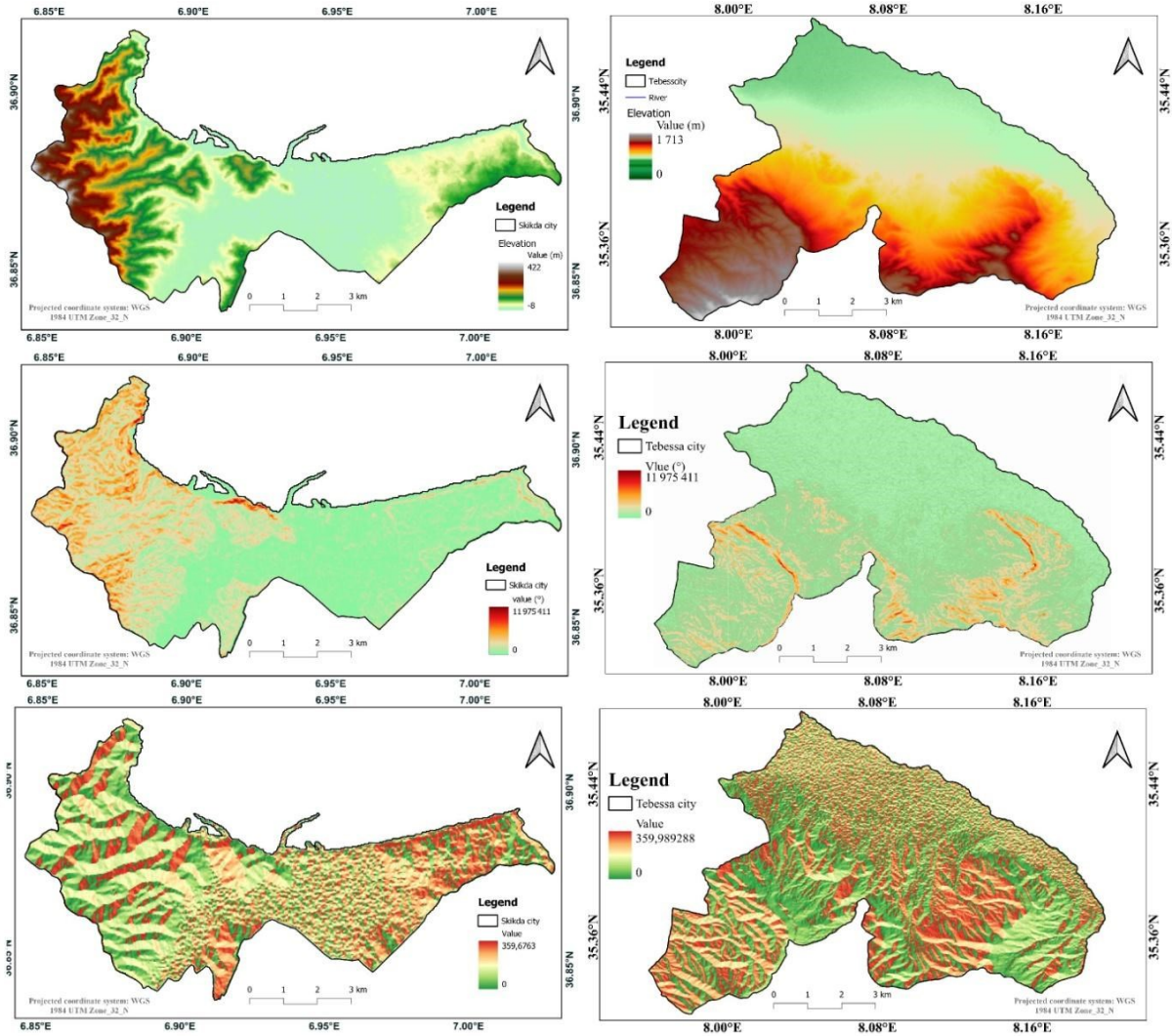


Figure 7. natural topography: elevation, slope, aspect; a- Skikda, b-Tebessa.

Table 4: description of the natural topography of the two cities.

Feature	Skikda	Tebessa
<b>Elevation</b>	Range: 0 to 592 meters, Higher elevations in the west, Lower elevations in the east (coastal area)	Range: 0 to 1,713 meters, Higher elevations surrounding the city, Lower elevations in central and northern parts
<b>Slope</b>	Steeper gradients in the western mountainous area, Gentler slopes towards the east, relatively flat areas in central and eastern parts	- Complex pattern of steep and gentle slopes throughout, Significant areas of steep terrain surrounding the city center
<b>Aspect</b>	- Varied pattern of slope directions, Predominance of east and southeast-facing slopes in the western mountainous area, less pronounced aspect variation in the flatter eastern part	- Intricate pattern of slope directions, a Mix of slope aspects throughout the city area, Indicates more complex, hilly, or undulating terrain
<b>Overall Topography</b>	Clear east-west topographic gradient, Mountains in the west, Flatter areas towards the coast in the east	More complex and varied topography: Higher overall elevations, Surrounded by mountainous terrain, more rugged landscape throughout

These findings align with theories of differential urbanization (Geyer & Kontuly, 1993), which posit that city at different stages of development exhibit varying patterns of growth. Skikda's rapid, scattered growth resembles the early stages of this model, while Tébessa's more controlled expansion aligns with the later stages.

The results have substantial ramifications for urban planning and policy in Algeria. The significant growth of urban areas, especially in Skikda, highlights the necessity for improved land use management strategies to protect natural areas and promote sustainable urban growth. By 2024, the possibility of reversing the current urban sprawl tendencies in Tébessa indicates that specific strategies can successfully control the city's expansion.

An important advantage of this study is its comparative methodology, which enables a detailed comprehension of urban expansion patterns in various metropolitan settings in Algeria. Utilizing data spanning from 1985 to 2024 offers a broad perspective on patterns in urban development. In addition, the combination of remote sensing data and demographic information provides a comprehensive examination of urban sprawl.

However, this study has limitations. The reliance on Landsat imagery may have led to some inaccuracies in land cover classification, particularly in distinguishing between different types of built-up areas. Furthermore, the projections for 2024 are based on historical trends and may not fully account for recent policy changes or economic shifts. Despite these limitations, our study contributes valuable insights into the urban sprawl dynamics of medium-sized Algerian cities, an area previously understudied.

Future research should focus on:

1. Conducting more detailed analyses of the types of urban development (e.g., residential, industrial, commercial) to better understand the nature of urban sprawl in these cities.
2. Examining the environmental and social impacts of the observed urban sprawl patterns, particularly in terms of ecosystem services and quality of life.
3. Exploring the effectiveness of different urban planning strategies in managing urban sprawl in medium-sized Algerian cities.

This study reveals distinct patterns of urban sprawl in Skikda and Tébessa, highlighting the importance of considering local contexts in urban development strategies. The findings underscore the need for tailored, sustainable urban planning approaches to manage urban growth effectively in medium-sized Algerian cities.

## 5. Conclusion

Consistent with the general trend of rapid urbanization in developing nations, urban sprawl has become an ongoing issue in Algeria. As populations congregate in cities, they grow outward, frequently in an unsustainable way. This is particularly relevant in medium-sized cities, which have grown substantially yet have been less researched than big cities. Against this backdrop, our study's comparative analysis of urban sprawl patterns in Skikda and Tébessa from 1985 to 2024 supports our hypothesis that varied socio-economic drivers, land-use policies, and topographic factors influence significantly different urbanization trajectories. The findings reveal Skikda's rapid, scattered growth (68% increase in the built-up area) driven by coastal industrial development, contrasting with Tébessa's more controlled expansion (45% increase) shaped by its inland location and distinct economic priorities. These results contribute to the understudied field of medium-sized city dynamics in Algeria, challenging one-size-fits-all urban planning approaches and highlighting the critical role of local context in shaping urban growth. The broader implications for urban policy in Algeria include the need for differentiated management strategies based on city type, strengthened planning instruments, and balanced approaches to economic development and sustainability. However, limitations such as potential inaccuracies in land cover classification, projections based on historical trends, limited socio-economic factor exploration, and the focus on only two cities impact the study's generalizability. Based



on these findings, we recommend implementing tailored growth management strategies, prioritizing green space preservation through stricter zoning, encouraging compact development, and integrating climate change considerations into urban planning. Future research should address detailed analyses of urban development types, the environmental and social impacts of sprawl, the effectiveness of various planning strategies, the role of informal settlements, and the expansion of the study to a larger sample of cities across Algeria. By pursuing these directions, future studies can build upon our work to develop more comprehensive and effective urban planning strategies for sustainable development in Algeria and similar contexts, thereby addressing the critical challenges of rapid urbanization in developing countries.

### **Acknowledgment**

I would like to express my sincere gratitude to all the individuals who participated in the interviews during my fieldwork. Their insights and experiences have been invaluable to this study. I am especially grateful to Gherzouli Lazhar and Lazri Youcef for their invaluable advice and guidance throughout the research process. Their expertise and support have greatly contributed to the development of this work.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

### **Conflicts of Interest**

The authors declare no conflicts of interest.

### **Data availability statement**

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary material.

### **CRedit author statement:**

Conceptualization: Ibtissem Lounis. Data curation: leulmi lamia Formal analysis: Ibtissem Lounis Funding acquisition: No funding Investigation Methodology: leulmi lamia Project administration: Ibtissem Lounis Writing—original draft: Ibtissem Lounis Writing—review and editing: Ibtissem Lounis. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Ibtissem, L., Lamia, L., Lazhar, G., & Youcef, L. (2024). Comparative Spatio-temporal Dynamics of Urban Sprawl in Algerian Cities Skikda and Tébessa (1985-2024) Using Gis and Landsat Imagery. *Journal of Contemporary Urban Affairs*, 8(2), 404–420. <https://doi.org/10.25034/jcua.2024.v8n2-7>

Original scientific paper

# Mapping the Discourse: Scientometric Analysis of Affordable Housing Research Trends

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## ARTICLE INFO:

### Article History:

Received: 14 June 2024

Revised: 18 August 2024

Accepted: 15 August 2024

Available online: 5 September 2024

### Keywords:

Affordable Housing,  
Scientometric Analysis,  
Housing Research Trends,  
Bibliometric,  
Urban Studies.

## ABSTRACT



*Affordable housing is not merely about cost but encompasses quality, safety, and accessibility. The shortage of affordable housing perpetuates cycles of poverty, negatively impacting well-being. Utilizing scientometric techniques—co-authorship analysis, citation network analysis, and keyword co-occurrence analysis—on Scopus data from 1999 to 2024, and employing the VOSviewer tool, the aim of this study is to provide a comprehensive understanding of housing affordability by integrating both monetary and non-monetary factors and identifies 1) the co-authorship, co-occurrence, and countries' collaboration, and 2) the most cited article in the field. The results reveal key contributors in affordable housing research, highlight influential works, and map publishing trends. The outcomes show that nine different groups exist and actively collaborate worldwide. Waddell's work, with 873 citations, is the most cited, followed by Monahan with 421 citations. The analysis highlights significant thematic clusters, such as the integration of technological advancements, health considerations, and policy changes in affordable housing research. The study underscores the critical role of social and environmental sciences in addressing housing equity and community well-being. By mapping the current research landscape and forecasting future trajectories, this study provides critical insights for guiding future research, policy development, and societal progress in affordable housing.*

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 421–435.

<https://doi.org/10.25034/ijcua.2024.v8n2-8>

[www.ijcua.com](http://www.ijcua.com)

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## Highlights:

-Through citation network analysis, the study uncovered the most cited works, illustrating foundational studies and their impact on subsequent research. This provides a clear picture of how knowledge has been built over time.  
-The study revealed patterns of international collaboration, showcasing the interconnectedness of global research efforts in addressing affordable housing challenges.

## Contribution to the field statement:

The originality of this study lies in its comprehensive and systematic approach to mapping the landscape of affordable housing research using robust scientometric techniques. The study's methodological rigor and multidisciplinary perspective provide a holistic understanding of the research landscape, emphasizing the integration of technological advancements, health considerations, and policy changes.

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### How to cite this article:

Sohaimi, N. S., Hanafiah, N. A. H., Manaf, A. A., & Zivalı, T. (2024). Mapping the Discourse: Scientometric Analysis of Affordable Housing Research Trends. *Journal of Contemporary Urban Affairs*, 8(2), 421–435. <https://doi.org/10.25034/ijcua.2024.v8n2-8>



## 1. Introduction

In recent decades, affordable housing has arisen as a crucial global concern, with serious social, economic, and environmental consequences. This study builds on key studies that define housing affordability by the relationship between housing costs and income. Earlier works emphasize the need to consider both monetary and non-monetary factors, such as quality, safety, accessibility, and sustainability of housing. Traditional methods have been critiqued for overlooking broader aspects of household well-being. Recent analyses have mapped global research, identifying key areas and gaps. This study expands on these foundations by exploring the integration of sustainability, the impact of new construction technologies and the effectiveness of financial mechanisms for a comprehensive understanding of housing affordability.

Affordable housing is a multidimensional notion with several characteristics, including housing affordability, accessibility, quality, and security. At its core, affordable housing refers to housing options that are affordable to low- and middle-income households, which are often defined as those whose housing expenditures do not exceed a particular percentage of their income. The most widely accepted definition of housing affordability is the association between housing cost and income (Abd Aziz, Hanif, & Singaravello, 2011; Jewkes & Delgadillo, 2010). Some authors contended that affordability is constantly linked to monetary principles (Mulliner & Maliene, 2015). Stone (2004) claimed affordability extends beyond monetary principle, while also asserting that referring to affordability solely as monetary principle is a superficial definition. According to him, affordability is the link between social and economic situations, without regard for basic human necessities. Sohaimi et al., (2018) also argued that housing affordability solely based on housing costs, as is commonly done in traditional methods like the price-to-income ratio (PIR), may neglect crucial aspects concerning household well-being and sustainability. Therefore, it is imperative to define housing affordability comprehensively, incorporating both monetary and non-monetary factors, including sustainability (Sohaimi et al., 2023).

In this vein, affordable housing is a multidimensional concept that includes affordability, accessibility, quality and security. At its core, affordable housing refers to options that are financially accessible to low- and middle-income households, typically defined as those whose housing costs do not exceed a specific percentage of their income. However, a comprehensive definition must incorporate both monetary and non-monetary factors. Monetarily, affordable housing means that households can cover housing costs—rent or mortgage, utilities, and maintenance—without compromising their ability to meet other essential needs like food, healthcare, education and transportation. Non-monetary factors include the quality and safety of the housing, its accessibility to essential services and its environmental sustainability. Therefore, affordable housing should enable all households to meet their basic needs, maintain a decent standard of living, and thrive in a sustainable and supportive environment (Lazuardi et al., 2022). This holistic approach ensures that housing solutions are inclusive, equitable, and conducive to the overall well-being.

The increase in housing affordability research over the last decade indicates a greater global acknowledgement of the issue's importance. As Linneman and Megbolugbe (1992) remarked, there are numerous dialogues about housing affordability, suggesting its importance in a variety of socioeconomic circumstances. However, in order to fully comprehend the trends, patterns and dynamics within this sector, bibliometric analysis is required as it serves as a valuable tool for depicting the intricate landscape of global housing affordability research. By scrutinising publication outputs from various regions, countries and academic disciplines, researchers can pinpoint geographical hubs of research activity, as well as areas where research is sparse or in its infancy. This comprehensive mapping endeavour facilitates a holistic grasp of housing affordability challenges, encompassing a myriad of socio-economic circumstances and viewpoints. Harnessing bibliometric analysis is not just advantageous but essential for thoroughly exploring the trends within housing affordability studies. By furnishing a systematic, data-driven approach to comprehending the scholarly landscape, bibliometrics empowers researchers, policymakers and practitioners to make well-informed decisions,



foster innovation and effectively tackle housing affordability challenges on a global scale. Through this analytical framework, stakeholders can identify research gaps, discern emerging patterns and devise evidence-based strategies to address housing affordability issues in diverse contexts, ultimately fostering equitable and sustainable housing outcomes worldwide. Despite extensive research on housing affordability, significant gaps remain in understanding the integration of sustainability with affordability, the impact of emerging construction technologies and the effectiveness of various financial mechanisms. Additionally, there is limited empirical evidence on the long-term impacts of social policies, best practices for community involvement and geographical disparities in research. Current definitions of housing affordability often neglect non-monetary factors and there is a need for more holistic approaches. Furthermore, research on the implementation and outcomes of affordable housing policies is scarce. Addressing these gaps is crucial for developing effective, sustainable and inclusive housing solutions globally.

## 2. Literature Review

The current affordable housing crisis is an urgent issue in many countries throughout the world. Numerous regions are experiencing a shortage of affordable housing units, particularly for low- and middle-income individuals (Calabrese et al., 2021). High construction costs, limited land availability and tight zoning rules are some of the causes leading to the supply limitation (Enwin & Ikiriko, 2023). This supply scarcity is caused by high building prices, restricted land availability and tight zoning rules. In many markets, home prices and rents have grown faster than wages, making housing less affordable to a growing population. This trend has put affordable housing out of reach for many families, especially in urban areas that have robust job markets. Securing adequate finance for affordable housing production and preservation is an ongoing challenge (Wang & Jacoby, 2023). Government schemes and private sources frequently provide insufficient financing to meet the growing need. The affordable housing crisis is a complex issue that requires extra funding, legislative reforms and collaboration between the public, private and non-profit sectors. Continued research and experimentation are required to find successful solutions that will increase the supply of low-cost housing while simultaneously enhancing access to adequate housing for all. Expanding the supply of affordable housing necessitates a diverse strategy to address the underlying causes of the crisis, and one possible answer is through the use of novel construction technologies and procedures. Modular construction, for example, can cut building costs and time, making it an attractive alternative for low-income housing projects. Additionally, increasing the density of housing complexes through zoning change can help with land scarcity difficulties. Cities can make more effective use of available space by allowing higher buildings and more units per plot of land (Calabrese et al., 2021; Olayiwola, & Ajala, 2022).

Financial mechanisms play an important role in addressing the affordable housing scarcity. Public-private partnerships (PPPs) can increase private sector investment while utilising public resources and incentives to build affordable housing units. Governments can offer tax breaks, subsidies and low-interest loans to developers who agree to produce affordable housing. Furthermore, the creation of housing trust funds at the local and national levels can provide long-term support for affordable housing programmes (Enwin & Ikiriko, 2023). Social policies and tenant safeguards are both critical in ensuring affordable housing is available to those in need. Rent control and housing vouchers greatly assist low-income families in finding affordable accommodation in high-cost locations. Efforts to ensure affordable housing units remain inexpensive in the long run through deed restrictions and affordability covenants could help reduce displacement and guarantee the supply of affordable housing for future generations (Wang & Jacoby, 2023). Community involvement and support are essential for the success of affordable housing projects. Engaging local communities in the planning and development process can result in more sustainable and acceptable housing options. Community land trusts, for example, can manage land to benefit the community while keeping housing affordable. Furthermore, nonprofit organisations can play an important role in building, managing and lobbying



for affordable housing (Calabrese et al., 2021). Finally, addressing the affordable housing challenge necessitates a dedication to research and innovation. Continuous review of current programmes and policies can help discover best practices and areas for improvement. Pilot projects and case studies can provide vital insights into what works and what does not, allowing policymakers to make sound decisions. Collaboration between academia, government organisations and the corporate sector can spark new ideas and accelerate affordable housing creation (Enwin & Ikiriko, 2023).

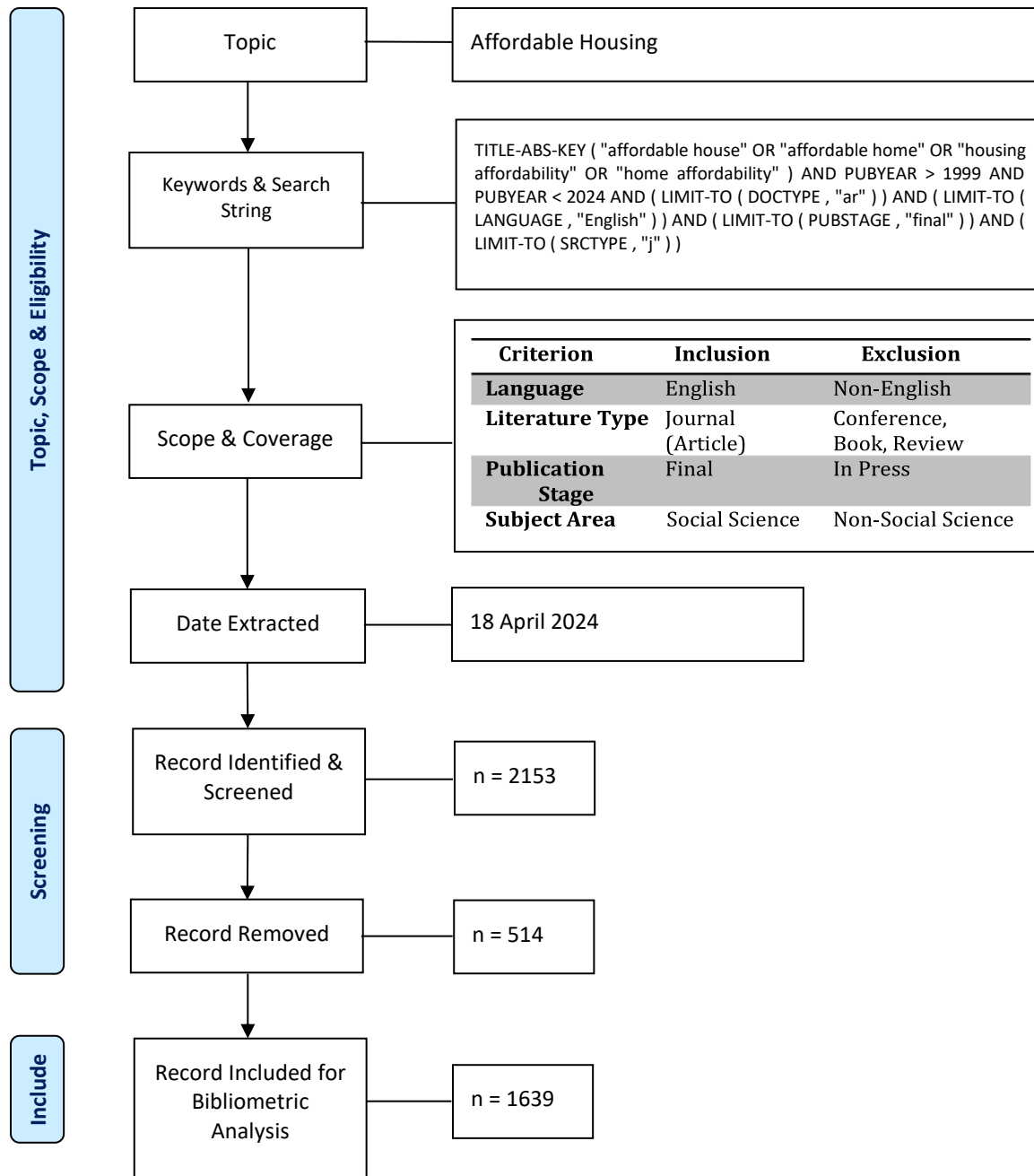
Overall, the affordable housing crisis is a complicated and diverse problem that necessitates a thorough and coordinated strategy. It is possible to establish and maintain affordable housing for everyone by addressing construction costs, land availability, zoning rules, funding sources, social protections and community involvement. Continued research and innovation are critical for establishing successful solutions and ensuring that everyone has access to adequate, affordable housing.

### 3. Materials and Methods

Bibliographic data in scientific publications is organised, coordinated and examined using bibliometrics (Alves et al., 2021; Assyakur et al., 2022). It includes specific descriptive data such as publishing journals, publication year, and principal author categorisation, in addition to more advanced techniques such as document co-citation analysis (Wu & Wu, 2017). A thorough literature review demands an iterative process that includes finding relevant keywords, doing a literature search and carefully assessing the results to provide a comprehensive bibliography and credible conclusions (Fahimnia et al., 2015). Consequently, this study concentrated on scholarly articles because these papers offer important insights into the theoretical ideas that have guided the field's evolution. To verify data reliability, the data was obtained using the Scopus database (Al-Khoury et al., 2022), and to ensure that only high-quality publications were included, books and lecture notes were omitted from the study, and only papers published in rigorously peer-reviewed academic journals were included. Notably, Elsevier's highly rated Scopus database made it easier to assemble papers from 1999 to December 2024 for further study.

#### 3.1 Data Search Strategy

This study utilised a screening technique to determine suitable search phrases for article retrieval. It required querying the Scopus database, which yielded 2153 articles. The process for selecting articles in this study was meticulous to ensure the inclusion of high-quality and relevant sources. Only journal articles were used, as they typically undergo rigorous peer review and provide reliable, up-to-date research findings. Other sources such as books, book chapters and lecture notes were excluded from the analysis. This exclusion was deliberate to maintain a consistent level of scholarly rigor and to focus on research that has been critically evaluated by experts in the field. By prioritising peer-reviewed journal articles, the study aimed to derive the most accurate and comprehensive insights into housing affordability, ensuring that the conclusions drawn are based on the most credible and validated evidence available. To ensure reproducibility, the data handling, cleaning and pre-processing steps included gathering journal articles from Scopus (1999-2024) and importing them into VOSviewer. Duplicate entries and incomplete records were removed, and keywords, author names, and affiliations were standardised. Furthermore, due to several limitations, the researchers were unable to access the Web of Science database. As a result, the Scopus database was utilized comprehensively for this study. This decision was made to ensure data reliability and to provide a broad and detailed analysis, despite the constraints in accessing multiple databases. The use of Scopus allowed the researchers to gather extensive bibliographic data and perform robust analyses to address the research objectives effectively. Next, the search phrases were adjusted to highlight "affordable house" or "affordable home" or "housing affordability" or "home affordability" as the study's focus. This modification yielded 1639 results, which were then scrutinised by the researcher to specifically include research papers written in English while omitting article reviews. Figure 1 depicts a search strategy flow diagram.



**Figure 1.** Flow Diagram of the Search Strategy (Adapted from Zakaria et al., 2021; Moher et al., 2009).

### 3.2 Data Analysis

In the realm of scientometric analysis, several advanced tools offer unique capabilities for visualizing and analysing bibliometric data. (Semi) open-source tools (e.g. CiteSpace, Gephi, VOSviewer) excels emerging trends and pivotal points in scientific literature through citation analysis and co-citation networks, making it a powerful tool for historical and evolutionary research mapping (Zıvalı Turhan & Ayataç, 2021). The data for this scientometric study was gathered from the Scopus database between 2010 and 2023. It contained information in PlainText format on publication year, author, title, journal, keywords and citations. The VOSviewer software version 1.6.19 was employed to analyse the data

using the mapping and clustering techniques. VOSviewer was chosen for this study due to its powerful visualization and analysis capabilities for bibliometric networks. It effectively handles large datasets and provides clear, interactive maps, making it easier to identify research trends, clusters and relationships. VOSviewer was preferred over other tools because of its user-friendly interface, superior visualisation options and compatibility with major bibliometric databases like Scopus. This ensures a comprehensive and detailed presentation of the data, facilitating a deeper understanding of global research trends in housing affordability. VOSviewer is used to create and analyse visual maps of bibliometric data, such as co-authorship networks, keyword co-occurrence and citation relationships, helping to identify research trends, clusters and connections within the data.

This software is an alternative to the Multidimensional Scaling (MDS) approach, which was put forth by Van Eck & Waltman (2010). These two approaches share the similar goal, which is to accurately reflect relatedness and similarity by distancing apart and arranging items in a low-dimensional space (Appio et al., 2014). VOSviewer is a useful tool for normalising co-occurrence frequencies by producing similarity metrics like cosine and Jaccard indexes (Van Eck & Waltman, 2010). It computes the association strength ( $AS_{ij}$ ) to normalise co-occurrence frequencies and improve the accuracy of the representation of associations between items as illustrated below:

$$AS_{ij} = \frac{C_{ij}}{\omega_i \omega_j}$$

The association strength metric, developed by Van Eck & Waltman (2010), measures the degree of association between items  $i$  and  $j$ , by comparing observed and expected co-occurrences while assuming statistical independence between  $i$  and  $j$ . By reducing the weighted sum of squared distances between item pairs, VOSviewer arranges objects on a map. Furthermore, the LinLog/modularity normalisation technique was applied in accordance with Appio et al. (2014) recommendations. Patterns formed by mathematical correlations were uncovered using VOSviewer's visualisation techniques on the dataset. This makes it easier to perform various studies, such as keyword co-occurrence, citation analysis and co-citation analysis. After lowering the weighted sum of the squared distances between each pair of objects, VOSviewer arranges the elements to form a map. Appio et al. (2014) advocated using LinLog/modularity normalisation. Many analyses were performed on the dataset utilising VOSviewer's visualisation tools, such as co-citation analysis, co-occurrence analysis, keyword co-occurrence analysis and mathematical correlation patterns. Keyword co-occurrence analysis can be used to track the progress of a study area over time as it is good at discovering frequently discussed topics across multiple disciplines (Li et al., 2016).

As consequently, VOSviewer uses this index to organise the items into a map by reducing the weighted sum of the squared distances between each pair of objects. Appio et al. (2014) advocated for the adoption of LinLog/modularity normalisation. Furthermore, analyses such as co-citation analysis, co-occurrence analysis and keyword co-occurrence analysis were carried out on the dataset using VOSviewer's visualisation capabilities, as well as mathematical relationship patterns. Keyword co-occurrence analysis is beneficial for discovering themes that are commonly discussed in diverse academic domains, as well as for investigating how a research area has evolved over time (Li et al., 2016). This enables researchers to analyse the historical significance of a discipline's major area of study. Meanwhile, citation analysis can aid in identifying key research issues, trends and methodologies. This makes it easier to examine a discipline's core area of study for historical relevance and identify key research issues, strategies and methodologies.

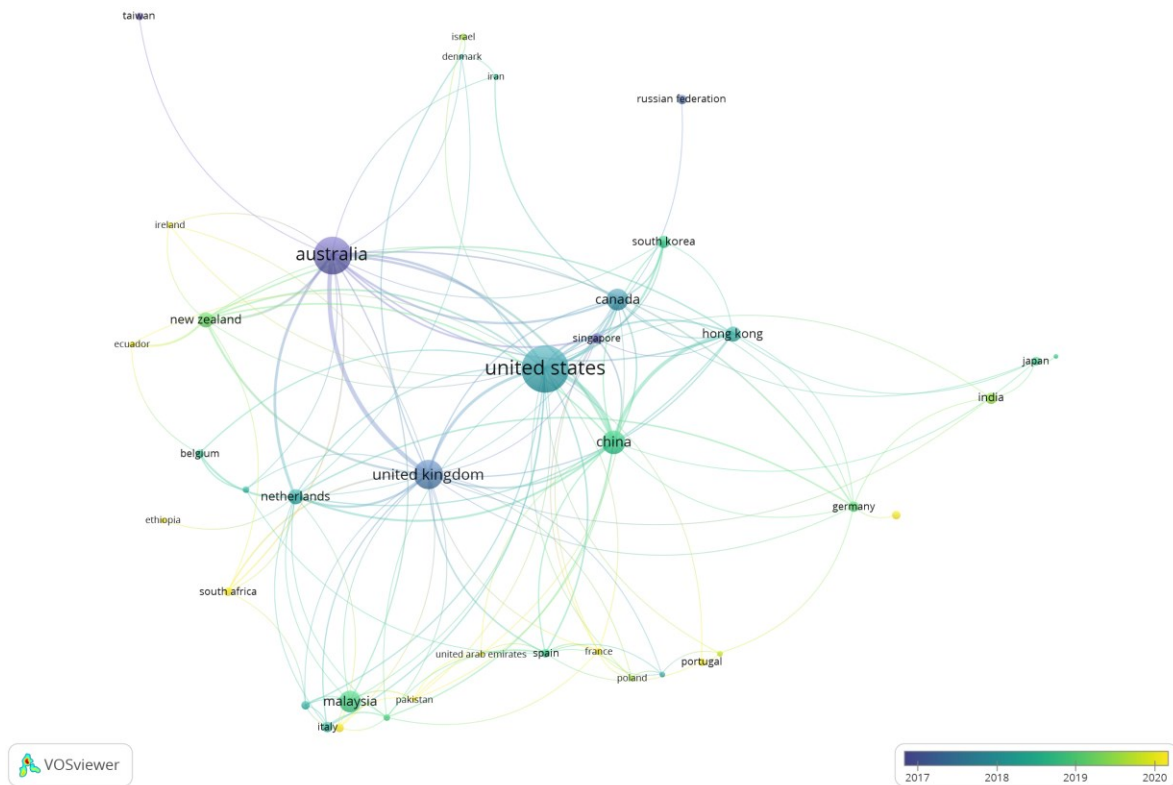
## 4. Results

### 4.1 Co-Authorship Analysis by Countries

Figure 2 shows the network visualisation of co-authorship by countries. There are nine clusters within this network that show nine different groups that actively collaborate among them. Countries with

similar colours share the same cluster while circles symbolise countries. In terms of the size of nodes, it represents the number of documents per country. For example, the United States has the largest circle, hence it has the most published articles. The thickness of the line shows the strength of collaboration. As an illustration, the thick line connecting the United States and Canada demonstrates a close collaboration between scholars in those two countries. This type of a bibliometric map can be used to analyse patterns in international collaboration among scholars. For example, the map reveals that the United States has significant collaborative links with a number of other countries, including Canada, the United Kingdom, Germany and France. This indicates that scholars in the United States are actively involved in international research projects.

However, the illustration in Figure 2 only shows co-authorship, which is just one indicator of collaboration. Other types of collaboration, such as data sharing or cooperative research projects are not included. Besides, the visualisation only shows data from the countries that are depicted. This implies that it may not provide an accurate depiction of global collaboration trends. In general, this bibliometric map provides a useful overview of international research collaboration. It can be used to discover trends, analyse changes over time, and compare collaboration patterns between different fields of research.



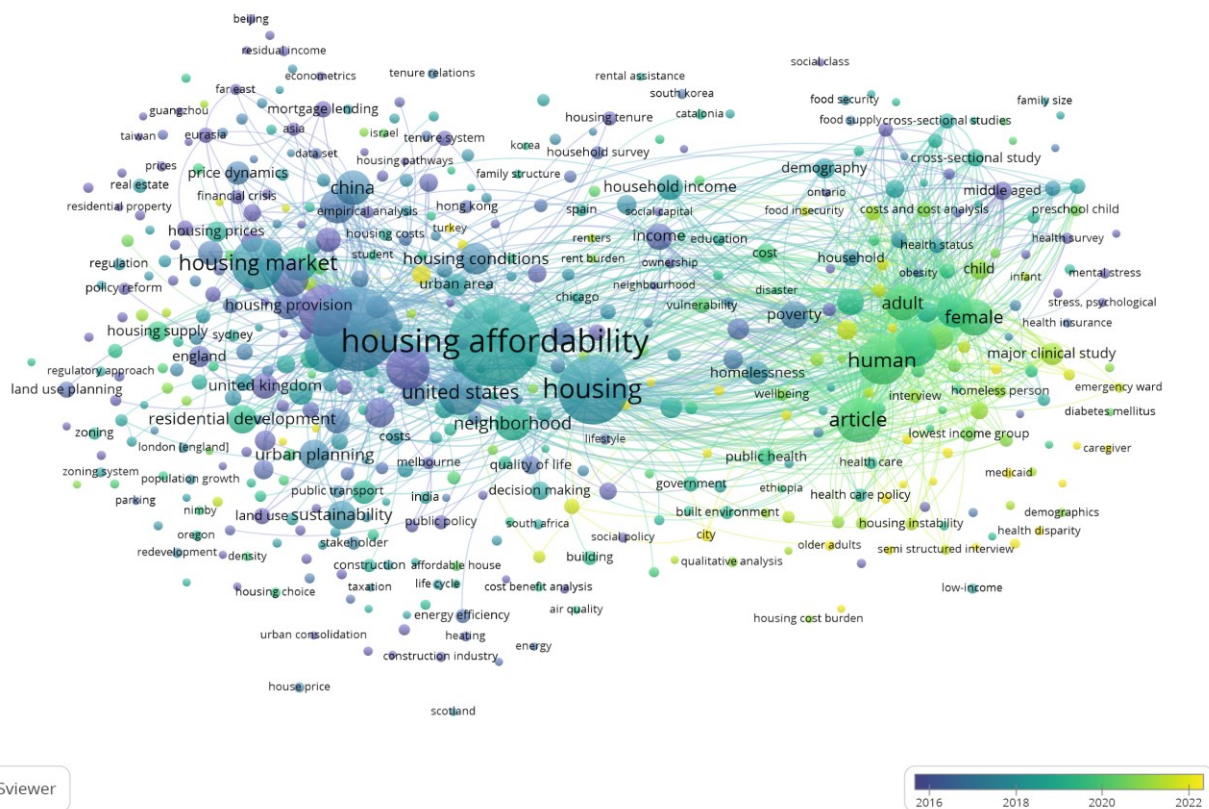
**Figure 2.** Network Visualisation of Co-authorship Analysis by Countries.

#### 4.2 Co-occurrence and Keywords

The illustration presents a comprehensive co-occurrence network analysis of keywords related to housing affordability (Figure 3). This network visually represents how frequently keywords appear together throughout the dataset. The size of each circle indicates the frequency of the keyword, with larger circles like "housing affordability" showing the most common terms. Lines between the circles reflect co-occurrence relationships, with thicker lines indicating stronger connections between keywords. Different colours are used to distinguish groups of keywords, likely representing distinct research themes within the field of housing affordability. For example, a blue cluster containing

keywords such as "residential mobility," "residential satisfaction" and "location affordability" seem to focus on the social and geographic dimensions of affordability. This thematic clustering helps to identify various areas of research and their interconnections.

Core themes in the research are established by large and central keywords like "housing" and "affordability." These terms form the foundation of the network and highlight well-established areas of study. Additionally, connections between keywords like "housing prices" and "interest rates" indicate traditional research topics. In contrast, the presence of keywords like "short-term rentals" and "sharing economy" suggests emerging trends and new areas of interest within the field. The network analysis not only identifies dominant themes and emerging trends, but also reveals potential research gaps. The prominence of certain keywords and their connections can guide researchers to areas that may require further investigation or interdisciplinary collaboration. Furthermore, the analysis may highlight regional research priorities or areas facing unique challenges, providing valuable insights for geographically targeted studies. Overall, this co-occurrence network analysis serves as a tool for researchers to navigate the current landscape of housing affordability research. It enables them to strategically position their contributions, identify collaboration opportunities and address gaps in the existing literature, ultimately advancing the field in meaningful ways.



**Figure 3.** Network Visualisation of Co-authorship Analysis by Keywords.

### 4.3 Citation and Documents

Figure 4 demonstrates the relationship between scholarly documents based on citations. The VOSviewer software also displays a chronology at the bottom of each image. This demonstrates that research covered by the network was published between 2001 and 2020. This analysis is a version of bibliometrics and is frequently used to estimate the scholarly impact of publications. As mentioned above, circles symbolise documents and the size of the circle represents the number of times the document has been cited in other scholarly works. In the centre, for example, is a huge circle labelled

with a slew of author names, most likely reflecting a widely cited paper on housing affordability. In the centre, there is a large circle with several author names, likely representing a seminal work by Waddell (2002). This work appears to be the most cited within the dataset, suggesting it as a foundational text in the field.

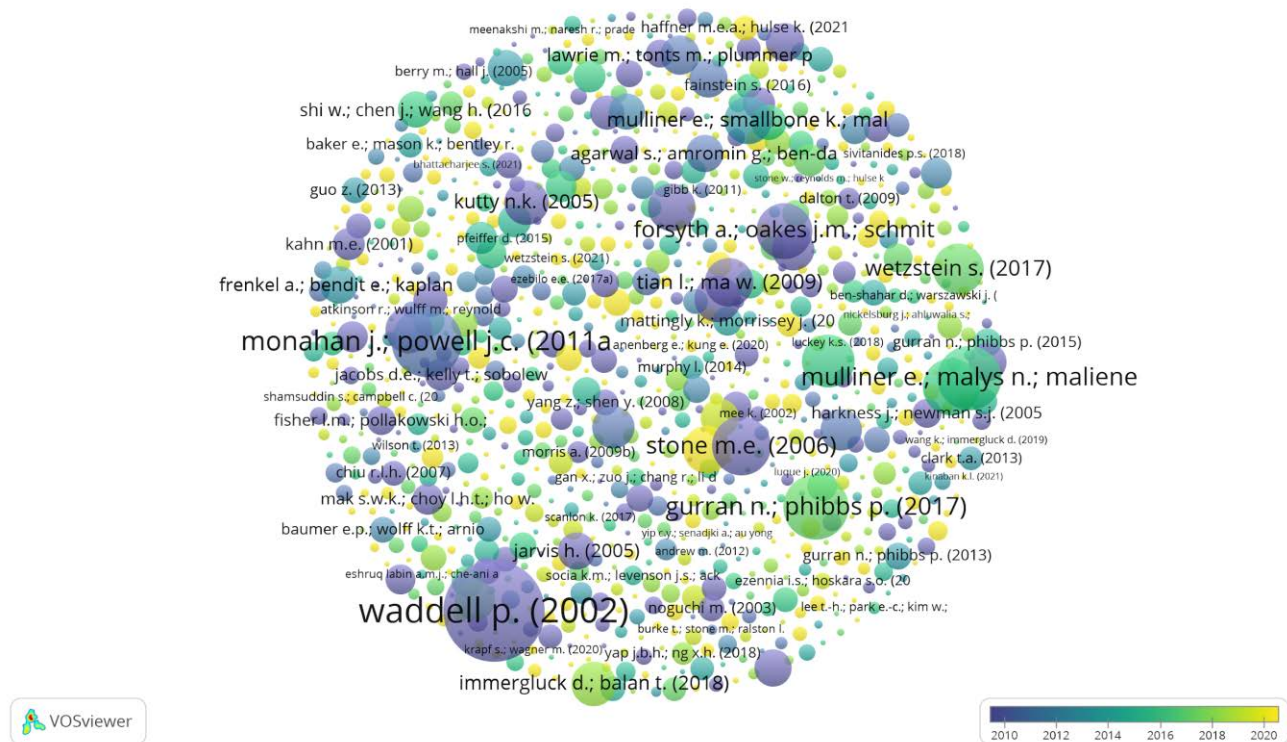


Figure 4. Network Visualisation of Citation and Documents.

The data presented in Table 1 highlights numerous prominent academic works on housing affordability, displaying distinct thematic focuses and their impact on the scholarly community. The data is similar to that in Figure 4, except it contains more detailed information. One of the most cited works is Waddell's (2002) article, which models urban development for land use, transportation and environmental planning, demonstrating the critical role of simulation and modelling in urban planning with 873 citations. Another significant contribution is Monahan & Powell's (2011) study, cited 421 times, which delves into the embodied carbon and energy analysis of modern construction methods, emphasising the importance of sustainability in housing construction. Gurrán & Phibbs' (2017) written work on Airbnb, which has been mentioned 360 times, specifically addresses tourism's impact on property markets. This study investigates the issues that urban planners confront as a result of the increase in short-term rentals. Similarly, home affordability is examined from several perspectives, including Mulliner et al.'s (2016) comparative analysis of Multi-Criteria Decision-Making (MCDM) methodologies (348 citations) and Stone's (2006) support for the residual income approach (301 citations). The data also underscore the significance of geographic and policy contexts in housing affordability. Zhang (2016), with 235 citations, discusses global urbanisation trends, while Wetzstein (2017), cited 221 times, addresses the global urban housing affordability crisis. Tian & Ma (2009) provide insights into China's government intervention in land supply, showing the importance of policy-driven urban development, with 203 citations. Forsyth et al. (2007) investigated whether home density affects physical activity and received 272 citations. This demonstrates the interdisciplinary nature of urban planning research, which combines public health with urban design. Finally, Fields & Uffer (2016) critically explore the financialisation of housing in their comparative examination of New



York City and Berlin, and the study has received 279 citations. This study sheds insight on how financial markets affect rental housing, highlighting the larger economic factors at work in metropolitan housing markets. These studies highlight the complexities of housing affordability and urban growth, emphasising the need for interdisciplinary research, novel techniques and successful policy interventions. These publications' high citation counts reflect their major impact on the academic discourse and ability to inform practical solutions to these important global concerns.

**Table 1:** Publication by the authors.

Authors	Title	Year	Source Title	Cited By
Waddell P.	Urbansim: Modelling urban development for land use, transportation, and environmental planning	002	Journal of the American Planning Association	873
Monahan J.; Powell J.C.	An embodied carbon and energy analysis of modern methods of construction in housing: A case study using a life cycle assessment framework	011	Energy and Buildings	421
Gurran N.; Phibbs P.	When Tourists Move In: How Should Urban Planners Respond to Airbnb?	017	Journal of the American Planning Association	360
Mulliner E.; Malys N.; Maliene V.	Comparative analysis of MCDM methods for the assessment of sustainable housing affordability	016	Omega (United Kingdom)	348
Stone M.E.	What is housing affordability? The case for the residual income approach	006	Housing Policy Debate	301
Fields D.; Uffer S.	The financialization of rental housing: A comparative analysis of New York City and Berlin	016	Urban Studies	279
Forsyth A.; Oakes J.M.; Schmitz K.H.; Hearst M.	Does residential density increase walking and other physical activity?	007	Urban Studies	272
Zhang X.Q.	The trends, promises and challenges of urbanisation in the world	016	Habitat International	235
Wetzstein S.	The global urban housing affordability crisis	017	Urban Studies	221
Tian L.; Ma W.	Government intervention in city development of China: A tool of land supply	009	Land Use Policy	203

**5. Discussion**

The comprehensive bibliometric analysis conducted in this study provides valuable insights that both confirm existing knowledge and contribute new perspectives to the discourse on affordable housing. By mapping the breadth and diversity of research in this field, the study highlights several key themes and trends that align with and extend current understandings. Existing literature emphasizes that housing affordability encompasses more than just financial cost, incorporating aspects such as accessibility, quality and security (Abd Aziz, Hanif, & Singaravello, 2011; Jewkes & Delgadillo, 2010). This study confirms these findings by identifying affordability as a multi-dimensional concept,



reinforcing the need for a holistic approach to addressing housing issues. Additionally, previous studies have highlighted the significant role of government policies and regulations in shaping housing affordability (Wang & Jacoby, 2023). The current analysis supports this view, demonstrating the critical impact of policy-driven initiatives and the influence of local and global policy frameworks on affordable housing outcomes. The literature extensively discusses the importance of financial mechanisms such as public-private partnerships (PPPs), tax incentives and housing trust funds in addressing housing scarcity (Enwin & Ikiriko, 2023). This study corroborates these findings, underscoring the necessity of robust financial strategies to enhance the supply of affordable housing. Moreover, the study introduces novel perspectives on the potential of innovative construction technologies, such as modular construction, to reduce building costs and time. These findings suggest new avenues for research and practical implementation, offering potential solutions to the affordable housing crisis that have not been extensively explored in previous literature.

The bibliometric analysis identifies geographical hubs of research activity and areas with sparse research, pointing to a need for more geographically diverse studies. Additionally, the emphasis on interdisciplinary research highlights the necessity of integrating public health, urban planning, economic policies and social equality to propose comprehensive solutions to housing affordability challenges. Furthermore, while the importance of community involvement is acknowledged in the literature, this study brings new insights into best practices for engaging communities in affordable housing projects. The findings suggest that successful community engagement can lead to more sustainable and acceptable housing solutions, emphasizing the role of local participation in addressing housing issues. This study's findings contribute significantly to the existing body of knowledge on affordable housing by confirming the multi-dimensional nature of affordability, the critical role of policy and financial mechanisms and the importance of sustainability. Additionally, the study offers new insights into emerging construction technologies, highlights geographical and disciplinary research gaps, and underscores the value of community involvement. By integrating these findings with existing literature, this study enhances our understanding of affordable housing challenges and provides a foundation for developing more effective, sustainable and inclusive housing strategies worldwide. Continued research and interdisciplinary collaboration are essential to address the complex and evolving nature of affordable housing and to ensure that all individuals have access to safe, decent, and affordable homes.

Based on the findings and supported by previous research, the following specific, actionable recommendations are proposed for policymakers and practitioners to address housing affordability. Policymakers should adopt the residual income method in national and local housing affordability assessments to provide a comprehensive understanding of housing costs relative to essential living expenses. Developing region-specific benchmarks for essential living expenses, including food, transportation, healthcare and education, is crucial and should be regularly updated in collaboration with statistical agencies and research institutions. Creating targeted subsidy programs that use the residual income method can help identify and assist households most in need, ensuring subsidies cover the gap between actual housing costs and what households can afford after essential expenses. Revising zoning and land use policies to encourage high-density developments and mixed-use projects can reduce land costs and increase affordable housing availability. Promoting innovative construction techniques, such as modular and prefabricated housing, through government incentives can reduce construction costs and expedite the delivery of affordable housing units. Strengthening public-private partnerships (PPPs) can leverage resources and expertise to finance and build affordable housing projects, combining public funding with private investment. Enhancing financial education and support services can help households manage their budgets and understand the importance of residual income, empowering them to make informed housing and financial decisions. Establishing a robust monitoring and evaluation framework to assess the effectiveness of housing affordability programs based on the residual income method can ensure that programs meet their goals and identify areas for improvement. Involving local communities in the planning and development of affordable housing



projects through public consultations and participatory planning processes can ensure solutions are responsive to community needs and gain local support. Finally, investing in ongoing research and data collection to refine the residual income method and better understand its implications for different household types is essential. Collecting and analysing data on housing affordability can inform policy decisions and track progress over time. By implementing these specific recommendations, policymakers and practitioners can create a more effective and comprehensive approach to addressing housing affordability, ensuring all households have access to safe, decent and affordable housing.

## 6. Conclusion

This study significantly contributes to the field of housing affordability research by integrating both monetary and non-monetary factors into a comprehensive definition of affordable housing. It highlights the importance of considering sustainability, quality, safety and accessibility alongside traditional financial metrics. Furthermore, the study uses VOSviewer to provide a detailed bibliometric analysis, mapping global research trends and collaboration networks, and identifying key research gaps. Future research should focus on further exploring the integration of sustainability with housing affordability. It is imperative to conduct comprehensive studies that investigate the long-term effects of innovative construction technologies and novel financial mechanisms on both affordability and sustainability. In this manner, studies should examine how these emerging technologies can be leveraged to reduce costs while enhancing environmental performance. Additionally, research should investigate the effectiveness of social policies and best practices for community involvement in housing projects. There is also a need for more geographically diverse studies to understand regional disparities and to develop tailored solutions for different contexts. Finally, interdisciplinary research combining public health, urban planning, economic policies and social equality will be essential to address the complex nature of housing affordability comprehensively.

## Acknowledgement

This research is supported by the Ministry of Higher Education (MoHE) of Malaysia through the Fundamental Research Grant Scheme (FRGS/1/2022/SS10/UUM/02/5).

## Funding

This research is supported by the Ministry of Higher Education (MoHE) of Malaysia through the Fundamental Research Grant Scheme (FRGS/1/2022/SS10/UUM/02/5).

## Conflicts of Interest

The authors declare no conflicts of interest.

## Data availability statement

Not related.

## CRedit author statement:

Conceptualization: S.N.S, N.A.H.H, A.A.M, T.Z. Data curation: S.N.S. Format Analysis: S.N.S, N.A.H.H, A.A.M, T.Z. Funding acquisition: S.N.S. Investigation: S.N.S, N.A.H.H, A.A.M, T.Z. Methodology: S.N.S, Project Administration: S.N.S, Writing -original draft: S.N.S Writing-review and editing: S.N.S, N.A.H.H, A.A.M, T.Z. All authors have read and agreed to the published version of the manuscript.

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### How to cite this article:

Sohaimi, N. S., Hanafiah, N. A. H., Manaf, A. A., & Zıvalı, T. (2024). Mapping the Discourse: Scientometric Analysis of Affordable Housing Research Trends. *Journal of Contemporary Urban Affairs*, 8(2), 421–435. <https://doi.org/10.25034/ijcua.2024.v8n2-8>



Original scientific paper

# Socio-Economic Impact of the Mass Rapid Transit (MRT) System in Dhaka: A Case Study of Mirpur Stations

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## ARTICLE INFO:

### Article History:

Received: 23 June 2024

Revised: 15 August 2024

Accepted: 1 September 2024

Available online: 5 September 2024

### Keywords:

Mass Rapid Transit (MRT), Socio-Economic Impact, Dhaka Urban Development, Transit-Oriented Development (TOD), Sustainable Urban Transportation.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Mass Rapid Transport (MRT) has become pivotal in sustainable urban transportation, especially in densely populated cities like Dhaka, the capital of Bangladesh. Dhaka is implementing its first MRT system, which includes 17 stations, with three located in Mirpur. Mirpur, a significant area due to its diverse economic activity and population, is an important case study for understanding the effects of the MRT system. The study area spans 58.66 square kilometers and has a population of 632,664, representing a zone with unplanned mixed uses and a spontaneously developed favorable job-housing ratio conducive to transit-oriented development (TOD). Challenges such as last-mile connectivity and capacity limitations could impede the MRT's socio-economic potential. Moreover, the current land use and urban planning framework are not adequately prepared to support future TOD. This research highlights the necessity of proactive legislative changes and infrastructural improvements to optimize the success of Mirpur's MRT stations. Despite being in service for only a year and facing a lack of real-life data, this study focuses on Mirpur MRT stations to explore the socio-economic impacts of MRT systems, aiming to enhance knowledge in urban transportation and development.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 436–459.

<https://doi.org/10.25034/ijcua.2024.v8n2-9>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- MRT-6 aims to introduce a new mass transport mobility option as part of the future TOD policy.
- Examination of the MRT-6 route and station surroundings to assess socioeconomic impact.
- Implementation of MRT-6 has been ongoing for one year, with limited practical data available for conclusive study.
- Continued Research on MRT station success is necessary.
- Proactive Legislative Changes and infrastructural enhancements are crucial, as highlighted by this research.

### Contribution to the field statement:

This study advances the field of urban transportation by evaluating the socio-economic impacts of the MRT-6 system in Dhaka. It fills a critical gap in understanding MRT's effects on unplanned urban areas, proposing legislative and infrastructural improvements for optimal transit-oriented development (TOD), thereby enhancing sustainable urban growth and policy formulation.

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### How to cite this article:

Raj, S. I., Mohino, I., & Khatun, F. (2024). Socio-economic Impact of Mass Rapid Transit (Mrt) System. *Journal of Contemporary Urban Affairs*, 8(2), 436–459. <https://doi.org/10.25034/ijcua.2024.v8n2-9>



## 1. Introduction

### 1.1 Background and Context

Dhaka, the capital of Bangladesh, is among the world's most populous and densely populated cities, with over 10.2 million residents (BBS, 2022). The city has experienced rapid urbanization in recent years, marked by a population growth rate of 3.26% (WPR, 2024). Additionally, Dhaka attracts 3-4 million migrants annually from different parts of the country due to better job opportunities and higher wages (Karim, 2015). In 2018, Dhaka was ranked ninth in urban agglomeration among the top 67 cities globally, and it is projected to rank fourth by 2030 (The Economist Intelligence Unit, 2018). In a global urban risk assessment, Dhaka ranked second in four categories: Critical Infrastructure, Environment, Socio-Institutional, and Economic (TBS, 2023). The city's rapid urbanization has resulted in numerous challenges, including a lack of affordable housing, urban poverty, inadequate healthcare, limited empowerment of women, poor public transportation, illiteracy, slums, institutional corruption, social inequities, and insufficient green spaces (Barai, 2020). These issues are further compounded by severe traffic congestion due to a transportation system heavily reliant on road-based vehicles such as cars, buses, mini-buses, auto-rickshaws, cycle-rickshaws, and human haulers, all contributing to increased safety concerns and traffic accidents (Raj & Naem, 2022). Traffic congestion significantly impacts environmental pollution, particularly air quality, due to emissions of carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) from congested traffic (Arefin, Mallik, & Islam, 2017). The economic loss associated with traffic congestion for a commuter is estimated at \$4 per day (Haider & Papri, 2021). Implementing a Transit-Oriented Development (TOD) strategy is essential for achieving sustainable urban development and meeting the Sustainable Development Goals (SDGs) by 2030 (Raj & Naem, 2022). The Strategic Transport Plan (STP) for Dhaka (2004-2024), developed by Louis Berger Inc. and BCL, introduced the concept of TOD by proposing an MRT system in Dhaka. The Japan International Cooperation Agency (JICA) conducted the Dhaka Urban Transportation Network Development Study (DHUTS) Phase 1 in collaboration with the Dhaka Transport Coordination Authority (DTCA), which emphasized an elevated metro rail system as a priority project to address the city's growing transportation challenges. The proposed MRT system is designed based on future urban socio-economic indicators rather than existing economic activity levels to address these issues (RAJUK, 2015). The Dhaka Structure Plan (2016-2035) recommended developing a mass transport system to ensure balanced urban development rather than focusing solely on traffic management within the existing urban areas.

A World Bank report proposed three elevated MRT and three Bus Rapid Transit (BRT) systems, with routes including MRT-1, 5, 6, and BRT-1, 2, 3 (DMTCL, 2020). MRT-6, which is partially operational, currently includes 16 stations on an elevated route connecting Uttara North and Motijheel. The MRT lines are expected to handle 10% of total traffic, with BRT-1 expected to be completed by 2035 (RAJUK, 2015).

### 1.2 Problem Statement

Dhaka, home to over 10.2 million people, faces enormous pressure on its infrastructure and public services due to rapid urban growth. The city is plagued by challenges such as housing shortages, increased poverty, inadequate healthcare, insufficient public transport, and severe traffic congestion. These problems are exacerbated by the reliance on diverse road transport modes and the lack of coordination among various transport agencies, leading to significant environmental pollution, economic losses, and social disruptions.

To address these challenges, government initiatives and research funded by the World Bank and JICA have emphasized the implementation of Transit-Oriented Development (TOD) through strategic transport plans. These plans include developing multiple MRT systems to alleviate transportation issues and promote sustainable urban growth. Despite the operationalization of MRT-6 for one year, existing studies and implementations have inadequately explored the socio-economic impacts of MRT-6 and the integration of station influence zones into surrounding urban plans. This creates an urgent



need for a comprehensive evaluation of the MRT-6 system to assess its impact on urban development and to develop effective strategies for TOD adoption.

### 1.3 Research Gap

- **Inadequate Consideration of Socio-Economic Factors:** Current studies on MRT systems primarily focus on trip characteristics based on future projections. There is a lack of comprehensive analysis that includes the socio-economic impacts of MRT stations and their influence zones, which is crucial for evaluating the MRT-6 system's impact on urban development.
- **Limited Focus on Land Use Planning:** While strategic plans propose developing transport routes to facilitate balanced urban growth, there is insufficient research on the redevelopment and densification of land uses around MRT stations. This gap restricts the potential of the MRT-6 system to promote TOD and sustainable urban expansion.
- **Scarcity of Empirical Studies on Environmental and Economic Impact:** Despite the pressing issues of traffic congestion and environmental pollution in Dhaka, there are few empirical studies that assess the effectiveness of the MRT-6 system in addressing these challenges. Comprehensive research is needed to evaluate the environmental benefits and economic savings associated with MRT-6 implementation.

This study aims to address these research gaps by thoroughly examining the MRT-6 system's impact on Dhaka's urban development. It uses three station areas as a pilot study to develop strategies for TOD adoption, contributing to the city's sustainable growth and long-term urban development goals.

### 1.4 Objectives of the research

Public transportation is a vital solution to traffic congestion and other urban transportation challenges. Advanced, reliable, and well-organized transit systems enhance mobility and ensure safe access to employment, community services, healthcare, education, and recreational activities. As an essential public good, public transportation must provide adequate mobility for all, including vulnerable groups such as the elderly, disabled, and economically disadvantaged, which is crucial in urban planning (Jaafar Sidek et al., 2020). Given Dhaka's continued growth, effective public transit is becoming increasingly important. The Government of Bangladesh (GOB) has made substantial investments to improve the Dhaka Metropolitan Area's (DMA) transportation system, including the construction of MRT-6, the country's first metro system, at a cost of \$2,910 million USD. The adoption of a TOD strategy is another critical policy measure that will enhance the success of this initiative. It is therefore essential to recognize the potential of the transit system and the TOD strategy to justify these substantial investments in public transportation.

The objectives of this research are:

- To identify the socio-economic factors and their impacts on the study area.
- To understand the need for proactive legislative changes and infrastructural improvements to maximize the success of the MRT stations in Mirpur.
- To evaluate the role of Transit-Oriented Development (TOD) in enhancing the effectiveness and sustainability of the MRT-6 system.

These objectives aim to provide insights into the sustainable development and efficient functioning of the MRT-6 system, ensuring it meets the diverse needs of Dhaka's growing population while promoting strategic urban planning through TOD.

## 2. Research Methodology

### 2.1 Study Design

This research employed a mixed-method approach to examine the impact of TOD and the development of MRT station surroundings. The study utilized both quantitative and qualitative techniques along with primary data collection. Preliminary data were collected through random online and physical

surveys. The stations were physically observed to understand existing infrastructure and social, economic, and development activities. This mixed-method approach provides a comprehensive view of the benefits of the TOD- system in the Mirpur area, capturing socio-economic variations. After the data collection process, the data were processed to classify accordingly. Data processing involves converting data from one format to another. In contrast, data analysis consisted of examining, categorizing, tabulating, or otherwise recombining the evidence to address the initial propositions of the study. Data based on area observation were graphically presented with GIS maps, tables, and graphs to depict the comprehensive socio-economic impact of land use in the study area.

### 2.2 Participants

The study focused on three MRT stations in the Mirpur area. 208 Participants' data were collected using protocols from Google Forms and questionnaire surveys. The Google form was circulated among social media groups of young and aged people, students, and professionals. Physical questionnaire surveys were conducted near concerned station areas. The participants included diverse individuals engaged in various social, economic, and development activities around the MRT stations. This selection aimed to capture the socio-economic variation of MRT-6 users.

Conceptual Research Methodology Framework

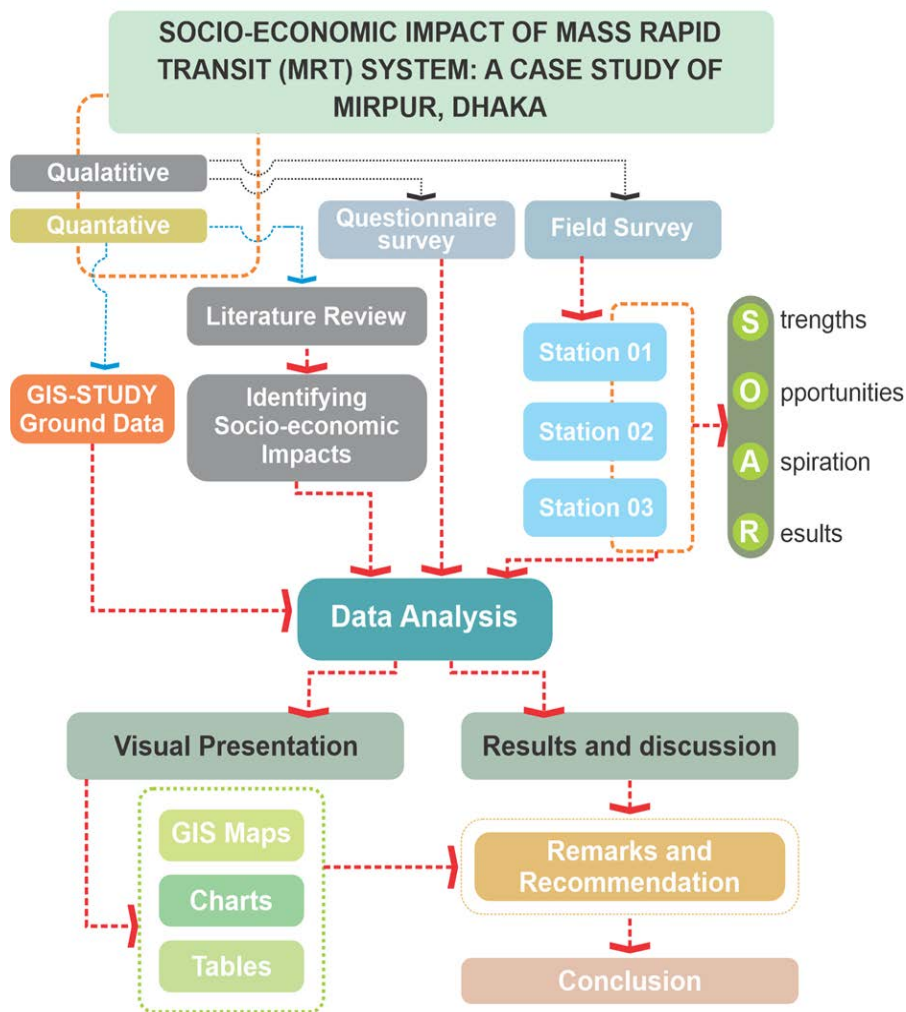


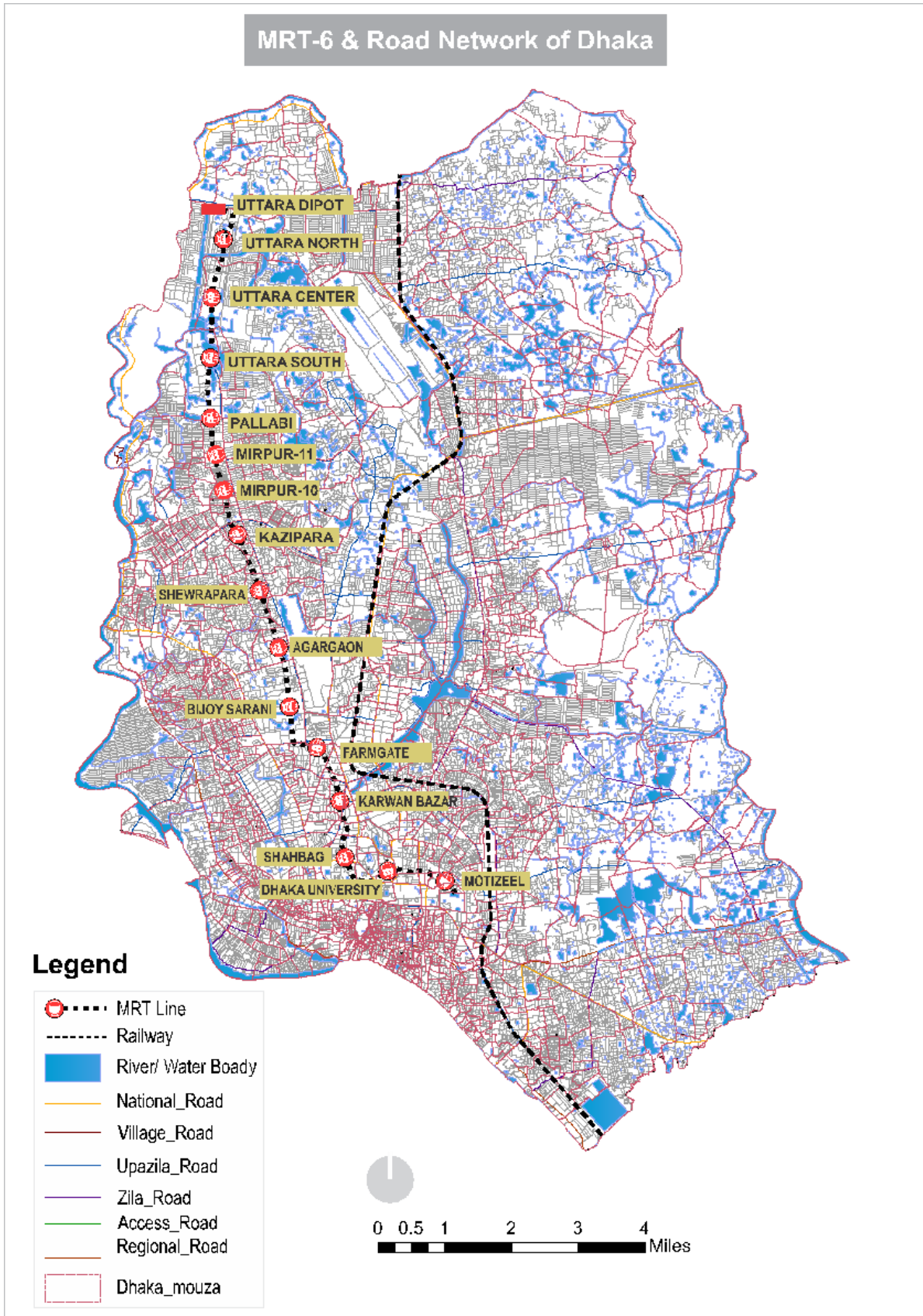
Figure 1. Conceptual Frame work of Research Methodology.



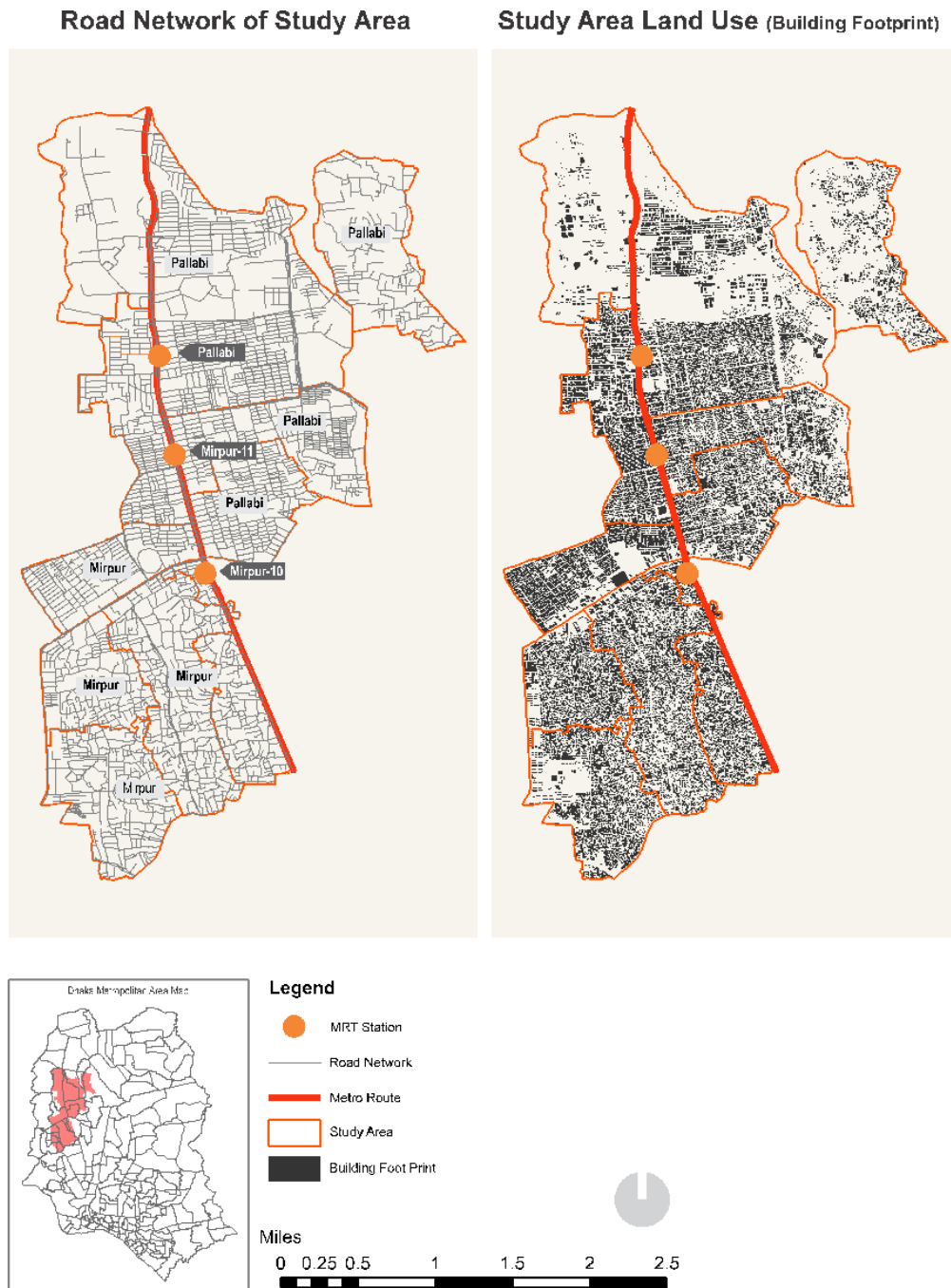
### 3. The study area

Mirpur is one of Dhaka's 21 administrative divisions. Most households living there are middle-class and impoverished; the residential and hygienic conditions are standard for any densely populated urban region. There are multiple wards (small areas under local government) on the site; partially included are Wards 11, 12, 13, 7, and 14. This area was developed to house primarily Muslim rehabilitated populations under the 1959 master plan. However, this master plan was rendered outdated during the colonial era, and Mirpur began to set a new pattern of urbanization, reinventing the scope of mixed-use development. Together with residential structures, there are several business and industrial communities (Afrin, Zerin, Sharmin, Kazi, & Morshed, 2012). A significant portion of homes are semi-pucca. There are rainfall runoff systems and markings on every pucca road. However, most internal roadways lack designated walking areas. Among the three MRT stations, Mirpur 11 and Mirpur 10 are more densely populated than Pallabi, and Mirpur 10 station is the busiest. Mirpur 10 has the intersection of four streets connecting other parts of Mirpur. Pallabi MRT station started operation on January 25, 2023. Mirpur 11 MRT station started operation on March 15, 2023, and Mirpur 10 MRT station became operational on March 1, 2023.

Nevertheless, most interior roads lack designated walkways; they are narrow, with occasionally damaged sections and illegal encroachments of roadside shops, thus hindering the metro station's walking connectivity with neighbours. Every Mirpur ward has several urban amenities, including colleges, schools, hospitals, speciality hospitals, markets, stadiums in the vicinity, open glossary markets, street markets, parks, workplaces, businesses, and unofficial economic activity areas (hawkers). The garment industry dominates the area's economy, and numerous unofficial businesses may be seen on the sides of the roads (Sharmeen & Houston, 2019).



**Figure 2.** Road Network system of Dhaka City and Super imposed MRT-6 route (grade separated-elevated route, adopted from OS map).



**Figure 3.** Study area road network and land use- showing the MRT-6 three Stations of Mirpur. (developed from OS map and field study).

#### 4. Theoretical background

##### 4.1 Transit-oriented development

Three decades ago, Petter Calthorpe and Peter Calthorpe introduced the concept of "Transit-Oriented Developments" (TOD) in the book "The New American Metropolis, Ecology, Community, and New American Dream." In this work, the authors emphasized the significance of smart density, walkability, public space, place-making, human-scale design, and mixed-use development, aiming to elucidate the crucial elements for creating sustainable and affordable communities with an enhanced quality of life (Jamme, Rodriguez, Bahl, & Banerjee, 2019). Aligned with the ideas of Calthorpe and other proponents of New Urbanism, they envisioned economically viable and environmentally responsible communities, contending that the integration of rail transit could play a central role in realizing such a

transformative urban lifestyle (P. Calthorpe, 1993).

TOD has recently gained increased attention for promoting smart urban growth (Renne, Voorhees, Bloustein, & Jenks, 2005). In many developing countries, the reliance on road-based public transportation systems persists because of the initial high costs and dependence on external donors for investment. The urban mobility landscape in these growing cities needs to be improved by inadequately designed urban networks (Chatman, 2013) and a decline in the quality of public transport services (Pojani & Stead, 2017). Research suggests that, in the long run, TOD can emerge as a successful development strategy for developing countries, potentially offering even more significant benefits than in more affluent nations (R. B. Cervero, 2013). However, TOD requires a well-designed transport network integrated with considerations such as land use diversity, density, affordability, and accessibility to residence and job opportunities.

The primary goal of TOD is to generate revenues where benefits will exceed costs on both local and regional scales (Singh, Zuidgeest, Flacke, & van Maarseveen, 2012). The economic vitality and long-term development of communities depend heavily on the effectiveness of transit networks in rural, urban, and suburban districts. Transit systems ought to serve everyone's needs and aid in commuting to work, school, the doctor, and visiting friends and family. These two domains come together in transit-oriented development (TOD), which results in substantial change. A dense, walker-friendly, mixed-use area near a transit hub draws people and enhances thriving, connected community partnerships that support the construction of affordable and low-cost housing close to transit can be fostered with the aid of public transportation. When implemented effectively, TOD creates more egalitarian communities. According to Stan Wall, Managing Partner for HRA Advisors, Washington D.C., TOD helps to develop a sense of place, a sense of ownership, and a secured future, acknowledging and realizing who are the real beneficiary of a transit investment or a TOD investment. (FTA, 2024).

TOD is an urban planning strategy that integrates transport transit and land use seamlessly. This approach, widely advocated, revolves around creating a built environment with relatively high density and a mix of urban functions around transit stations (P. Calthorpe, 1993; Duany & Elizabeth, 1994). TOD is a planning tool that harmonizes land use and transit systems, fostering vibrant, sustainable, pedestrian-friendly city areas with high-density and diverse land use activities.

In the United States, metropolitan areas grapple with dispersed growth patterns or sprawl development, and TOD has been embraced to address the associated environmental and social impacts (Porter, 1997). Research highlights the significant effect of TOD in reducing private automobiles, increasing transit ridership, and fostering a stronger sense of community in neighborhoods (Cervero, 1996; Newman & Kenworthy, 1999).

In the context of European cities, where the use of automobiles is relatively low, and there is a more extended history of integrating transit and land use, TOD is employed to encourage urban renewal in city centers (e.g., the ABC location policy in the Netherlands) as well ascended to facilitate the reconfiguration of the cities' outskirts (Bertolini & Spit, 2005).

In the context of Asia, Japan has been at the forefront, experimenting with policies that, to a significant extent, serve as early models for the Transit-Oriented Development (TOD) concept (Delpirou, Doulet, & Delaunay, 2016). In Asian cities, TOD is overlaid on an existing culture of transport-land use integrated planning (Delpirou, Doulet, & Delaunay, 2016). This achievement intensifies urban development and relocates metropolitan functions, primarily addressing traffic problems.



**Figure 4.** Conceptual TOD diagram-Dhaka (JICA, 2018).

Figure 4 summarizes the TOD operating process. The diagram illustrates the various conditions for a successful TOD are strongly interdependent. Maximizing the short- and long-term benefits of MRT demands the simultaneous achievement of the three goals: sustainable urban development, efficient urban transportation, and equitable socio-economic development (JICA, 2018).

#### 4.1 Mass rapid transit

Mass rapid transit refers to the public transportation services that combine individual trips into common trunk links or a significant amount of collectivization. It includes those modes that rely on a particular fixed track or an exclusive road track that may be used by many users separately. Bus lanes and other types of bus priority in mixed traffic are generally segregated or mostly separated busways (Ahmad & Hasan, 2019). As a component of the entire system, the kind and importance of secondary access and egress points to the trunk facility are considered. In developing cities, the primary need for mass transit is to transfer many people quickly. This requires cheap transportation costs (therefore low fares) and quickness in operation in the absence of significant subsidies. Because safeguarding its impacts depends on speed, this assessment will refer to mass rapid transit (MRT).

#### 4.2 Types of public transit

There are four general types of public transit. For this study, these are defined as follows:

- 4.1.1 Busways:** are at-grade unless otherwise indicated, with horizontal protection from other traffic and frequent priority over other traffic at signalized crossings.
- 4.1.2 Light Rail Transit (LRT):** refers to at-grade railing with comparable horizontal protection unless otherwise indicated. Generally, LRT contains one or two functional compartments. Light rail lies between the Train and tram. Light rail travels longer distances than trams but takes more travel time than trains and stops at more stands. Light rail is more suitable for regional routes than long distances (General Affairs, 2024).
- 4.1.3 Metros:** are entirely segregated and typically located underground or elevated. Rapid service delivery depends on segregation, and carrying a considerable mass ridership is made possible by technology.
- 4.1.4 Suburban Rail:** These services are fully segregated by controlled level crossings and are often at grade within a more extensive rail network (Majid & Singh, 2018).

#### 4.2 Need for mass rapid transit in Dhaka

Dhaka is a lively city; the increasing population, expanding urban area, enhancing economic activities, and promoting motorization have made life more prosperous. However, this attractive urbanization introduces many challenges, such as chronic traffic congestion, air and noise pollution, longer

commuting time, and scarcity of affordable housing, which will accelerate unless adequate urban strategies and effective frameworks exist.

According to RSTP, it was declared that MRT 1, 5, and 6 will affect both transportation and land use planning, and it is essential to integrate urban planning with transportation. In other words, the urban railway can suppress urban sprawl in Dhaka, promote appropriate development initiatives along the metropolitan railway, and establish an urban structure for TOD (Kumar Roy & Labony, 2019). In addition, urban railway users can avoid heavy traffic congestion with improved accessibility to the central areas of Dhaka. Moreover, it will bring environmental sustainability by alleviating air pollution and promoting economic growth through increased opportunities.

Numerous amenities on the MRT improve accessibility, safety, and comfort. The universal design includes features that increase accessibility for all users, such as elevators, escalators, and warning tile blocks. Automatic gates and platform screen doors (PSDs) will guarantee further security and comfort. According to the projection of Dhaka Structure Plan 2016-35, traffic volume will reach 60 million passenger trips. The limited road space and high traffic flow indicate the need for a long-term solution that can be achieved through the mass transit system. The government must develop MRT and BRT systems to manage increased traffic volume in the upcoming years (RAJUK, 2015).

**Table 1:** Modal share with consideration to MRT (in thousands).

Item		Car	Bus	Rickshaw	Others	Rail & Water	Walk	MRT	Total
No MRT	2013	2016	10708	12724	38	66	5803		31355
	2015	2518	12894	13145	49	87	6184		34877
	2025	5520	20739	15338	94	164	7784		49639
	2035	9737	24782	16360	120	203	8572		59774
With MRT services	2013	2016	10708	12724	38	66	5803		31355
	2015	2518	12894	13145	49	87	6184		34877
	2025	5054	19387	14549	90	159	7665	2735	49639
	2035	8772	21745	14698	113	195	8356	5895	59774

In Table 1, mass transit systems are built to efficiently transport vast numbers of people, which is crucial during peak travel times. Currently, Dhaka's public transportation system relies solely on low-capacity, road-based transit. This will change with the introduction of an MRT system structured according to the hierarchy of public transportation systems. To address future transportation demand, the Mass Rapid Transit (MRT) and Bus Rapid Transit (BRT) Systems should be implemented. Priority is given to public transportation systems with higher capacity (RAJUK, 2015).

**5. Socio-economic impact of mass rapid transit**

Developed countries like the United States, Canada, Germany, and France obtained rapid mass transit to achieve environmental goals and flourish in the economic sector (Walmsley, Perrett, & Laboratory, 1992). To make cities congestion-free, faster, and more reliable for the public necessitates effective transportation planning. The general purpose is to decrease the dependency on motorized vehicles. Conversely, developing countries implement costly TOD projects to control growing transportation needs, which may not reduce traffic congestion (Alam, 2010). TOD-based transport solutions enhance the overall quality of urban life, and both businesses and employees are attracted to the region, supporting additional growth and development in developing countries. Thus, agglomeration benefits are typically capitalized into land values and rents at locations where access to public transportation services is concentrated (Weisbrod & Reno, 2009).

With a lot of benefits from TOD, Banister and Thurstan Goodwin argue that TOD's impact can be measured on the economy at three distinct levels (Banister & Thurstain-Goodwin, 2011).

- Output and productivity changes;

- At the meso level, the impact related to agglomerative economics and labour market
- At the micro-level, the effect is determined by land and property market effects.

(Banister & Thurstain-Goodwin, 2011).

### **5.1 Identified socio-economic impacts of mass rapid transport:**

This research identified and concentrated on the social and economic impacts of mass rapid transit, and based on these three MRT stations, the surroundings are surveyed accordingly.

#### **5.1.1 SOCIAL IMPACTS**

##### **5.1.1.1 Accessibility and Mobility**

Accessibility means the description of the proximity to the desired destinations and the facilitation offered by the transport system, including public transport and preferably non-motorized transport to reach them. Mobility is the ability to travel to the desired destination and the necessary movement. Application of the TOD concept is expected to increase accessibility and mobility while reducing congestion and environmental pollution, ensuring the efficient use of energy in the transportation sector (Kristianto, Ismiyati, & Setiadji, 2020). Thus, as a mass public transport mode, MRT influences accessibility and provides mobility to an area. This study shows that 41% of participants feel that the MRT –system will reduce their time on the road and ease accessibility.

##### **5.1.1.2 Availability and Affordability**

Availability and Affordability refer to transport facilities such as buses or rail-based systems that enable basic mobility activities. The affordability ensures that the fare cost shall not exceed a certain percentage of household income. Measuring the Affordability of individual or household transport systems is essential to formulating any strategic transport policy, and it assists in formulating comfortable commuting strategies for low-income and mobility-constrained people (UN.ESCAP, 2018). The study shows that 33% of people agree that the system is affordable, and 36% somehow agree with the benefit; thus, a significant percentage realize that MRT-6 will be the most convenient mode of transport.

##### **5.1.1.3 Quality and Reliability**

Reliability and quality are paramount considerations for daily commuters. A dependable public transport service strictly adheres to schedules, ensuring vehicles run punctually while providing accurate information on routes, fare structures, and transport mode frequencies. Conversely, quality is assured by delivering comfort and cleanliness, maintaining courteous behaviour among service operators, and prioritizing safety.

##### **5.1.1.4 Safety and Security**

The safety of passengers is one of the most essential aspects of a successful transport mode, which refers to the prevention and protection from the exposed dangers to passengers in transport. The way to the station and waiting shall also be safe for all passengers. Commuters shall not experience theft, harassment, or harmful comments that provoke uneasiness or demotivate passengers from travelling with public transport.

##### **5.1.1.5 Health**

Health is another critical aspect, including passengers and other road users or persons living alongside the tracks or streets. Health should be protected from being jeopardized. The appropriate authorities must control air pollution, dust, noise, etc. Information about the lines, fares, routes, conditions for children, elderly, disabled, timetables, and transport system owners must be easily accessible in the language passengers speak. The station area must be adequately marked with eligible signage indicating the location of the information and eventual operational changes.

##### **5.1.1.6 Public Involvement**

The public, including passengers, shall have adequate authority to influence the planning policies and operation of public transport. Public transport authorities shall provide an exact place for messages or proper contact channels. Personnel attending to the answer and working with public relations are required.

#### **5.1.1.7 Time-Saving**

Metro is a crucial component of TOD-supported public transit systems, where travel times are expected to be short and efficient. Time should be saved by using the service, not vice versa. Public transport should serve where people need to go and be economically significant for the passengers (Zamparini & Reggiani, 2007).

#### **5.1.1.8 Economic benefit**

The use of efficient Metro Rail as public transport, income earning, or other can be reached by increasing access to different forms of resources.

#### **5.1.1.9 Economic Impact**

Travel and vehicle ownership savings are realized by public transportation users and those opting out of personal cars. This leads to shifts in consumer spending. Concurrently, drivers of automobiles experience reduced traffic congestion, translating into direct travel cost savings for households and businesses. Additional benefits include lowered business operating costs tied to worker wages and increased reliability due to diminished traffic. Furthermore, expanded access to a broader pool of skilled workers, facilitated by fewer traffic jams and extended transit service areas, enhances business productivity. The indirect effects of business expansion on suppliers and worker wages further fuel regional business growth. The cumulative impact of cost reductions and improved productivity may influence a country's international competitiveness. (Weisbrod & Reno, 2009).

#### **5.1.1.10 Job Housing Ratio**

Depending on how evenly the distribution of jobs and housing is distributed among the residents, there is a notable variation in the average commute distance and duration. The average commuter in Dhaka's housing-rich areas takes 8.17 minutes (2.92 km) longer than the employment-rich regions. Communities that are balanced economically and environmentally would be created by housing options within an affordable commute of their place of employment. To ensure a suitable balance between housing and jobs, cities must continue to grow and residents' travel habits within them (Rahman & Ashik, 2020).

## **6. Results and discussion**

### **6.1 Study area analysis (Field observation)**

The Mirpur area is predominantly residential in Dhaka. Roadside mixed-use developments are visible. Once there, many small garment industries flourished in this area because of the supply of cheap labour from nearby neighbourhoods. However, the scenario has changed in the last decade. The job scope of garment industries is replaced with small furniture manufacturing workshops, vehicle repair workshops, small manufacturing industries, and retail shops. Most of the streets at Mirpur and the adjacent area are comprehensive, and alternative connectivity has been created with well-bitumen-carpeted road networks. In addition, a linked flyover and a new MRT system are developed to ensure ease of traffic and speedy connectivity. However, Mirpur's significant challenges are the lack of a well-designed footpath network, the illegal encroachment of Hawkers, and road-adjacent economic activities.



**Figure 5:** Study Area Images- a. Mirpur 10 MRT station, Busy street with public transport; b. People are queuing for the ticket. c. People boarding on the Train; d. Mirpur 11- MRT station. e. Packed Train on peak hour; f. Pallabi MRT Station.

## 7. Data analysis from field survey

### 7.1 Determining job-housing ratio

The concept of Job-household balance is derived from initiatives of the self-contained community by Howard, Purdom, and Munford (Giuliano, 1991). Giuliano defines Job-housing balance as "the distribution of employment relative to the distribution of Workers in a given geographic area."

Job-housing balance can reduce travel demand and increase the quality of the place, which is visible through the adoption of cities' development and transport authorities in developed countries (Wu, Zhang, & Yang, 2015). Job housing balance is one of the preconditions for the effective implementation of the TOD policy (Rahman & Ashik, 2020).

**Table 2:** Recommended Jobs-housing balance ratios.

Study	Measurement	Recommended Ratio
(R. Cervero, 1989)	Jobs to household ratio Ceiling ratio	Ceiling ratio 1.5 (multiple workers) at a city level
(Frank & Pivo, 1994)	Jobs to household ratio	0.8:1–1.2:1 for census tracts
(Peng, 1997)	Jobs to household ratio	1.2:1–2.8:1 for TAZs covered by a 5-mile radius of a central TAZ
(Armstrong & Sears, 2001)	Jobs to household ratio	1:1–1:1.29 Commute shed within 14 miles radius of job centers
(Cervero R. , Jobs housing balance as public policy, 1991)	Jobs to housing unit ratio	1.4:1–1.6 for Medium-sized community

The job-housing balance has been calculated as a ratio of the number of jobs and households in this study area. The equation to calculate the ratio:  $JHR = J_i/H_i$

Where  $J_i$  = number of jobs (employed population) of neighbourhood  $i$

$H_i$  = number of Households in the neighbourhood

**Table 3:** Job-Housing Calculation Chart (Relevant et al., (BBS et al., 2011).

Job-housing calculation chart									
Thana	The base year is 2013			Present 2022			Projected 2030		
	Household	TPE	Job-Housing	Household	TPE	Job-Housing	Household	TPE	Job-Housing
Mirpur	117450	116700	0.99	152253.57	146254.98	0.96	191760.04	178754.58	0.93
Pallabi	143332	151381	1.06	185805.10	189719.16	1.02	234017.46	231877.01	0.99

The table shows household data, total employed population (TPE), and job-housing ratios for the Mirpur and Pollabi area for three years: the base year 2013, the current year 2022, and the estimated for 2030. These data indicate that the number of employed people and households in Mirpur and Pollabi has grown. Still, the job-housing ratio has shrunk, meaning that the number of jobs in Mirpur has not kept up with the growth in employed people and households, which could result in problems like increased unemployment or people having to commute to other places for work.

Suppose there is a decline in the employment-to-housing ratio despite an increase in the number of families and employed people. In that case, it might cause problems such as more unemployment rates and more commuting. The Mass Rapid Transit (MRT) system may provide a workable option by providing mass people in and out of the area for various purposes.

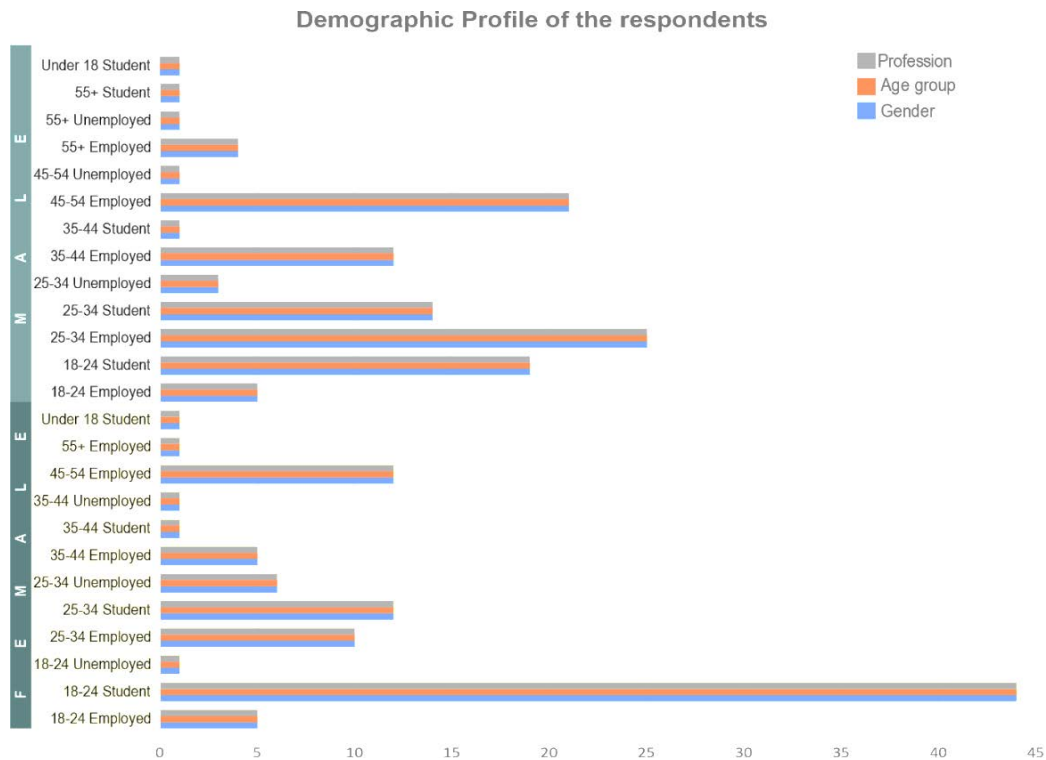
### 8. Field survey – SOAR analysis

**Table 4:** SOAR analysis of MRT stations.

MRT-ST	Strengths	Opportunities	Aspirations	Results
PALLABI	<ul style="list-style-type: none"> <li>▪ Good Location</li> <li>▪ Moderate Traffic</li> <li>▪ Street Side Economic Activities</li> <li>▪ Residential</li> </ul>	<ul style="list-style-type: none"> <li>Good Land Mark</li> <li>Scope of Commercial Development</li> <li>Good quality road</li> <li>New MRT Station</li> </ul>	<ul style="list-style-type: none"> <li>MRT station</li> <li>Scope to increase Economic activities</li> <li>Increased accessibility</li> </ul>	<ul style="list-style-type: none"> <li>▪ MRT will generate traffic and, thus, the scope of economic activity</li> <li>▪ Retail shops</li> <li>▪ New Urban Spaces-Theater</li> <li>▪ Rise in property price</li> </ul>
MIRPUR-11	<ul style="list-style-type: none"> <li>▪ Good Neighborhood</li> <li>▪ Vibrant Surroundings</li> <li>▪ Good Road Network</li> <li>▪ Street Side Mixed Use Development</li> </ul>	<ul style="list-style-type: none"> <li>Good Land Mark</li> <li>Road Side Commercial activities</li> <li>Less Traffic Congestion</li> <li>New MRT Station</li> </ul>	<ul style="list-style-type: none"> <li>MRT station</li> <li>Scope to increase Economic activities</li> <li>Increased accessibility</li> </ul>	<ul style="list-style-type: none"> <li>▪ MRT will generate traffic and, thus, the scope of economic activity</li> <li>▪ Retail shops</li> <li>▪ New Academic Facilities</li> <li>▪ Business offices</li> <li>▪ Low traffic on the road</li> <li>▪ Rise in Property price</li> </ul>
MIRPUR-10	<ul style="list-style-type: none"> <li>▪ Good Neighborhood</li> <li>▪ Road Transport Junction</li> <li>▪ Good Road Network</li> <li>▪ Heavy Economic Activities</li> <li>▪ Street Side Mixed-Use Development</li> </ul>	<ul style="list-style-type: none"> <li>Good Land Mark</li> <li>Road Side Commercial activities</li> <li>Less Traffic Congestion</li> <li>New MRT Station</li> </ul>	<ul style="list-style-type: none"> <li>MRT station</li> <li>Scope to increase Economic activities</li> <li>Increased accessibility</li> </ul>	<ul style="list-style-type: none"> <li>▪ Might experience huge traffic</li> <li>▪ Excessive economic activity</li> <li>▪ Street Vendor</li> <li>▪ Unsafe Padeterian movement</li> </ul>

A questionnaire survey was conducted to understand the impact of metro service on the Mirpur area. Total number of respondents was 208, The demographic profile of the respondents is given below: Among the total respondents, 51.4% were male, 48.1% were female, and the rest did not prefer to answer. A large number of female respondents are between 18 and 24 and are students by profession. On the contrary, most male respondents were employed and aged between 25 and 44. A minimal number of respondents were under 18. And no respondents were over the age of 55. (Figure 6 is the reference Chart).

According to the survey, most people choose buses and rickshaws for frequent travel. Besides, automobiles and CNG are popular travel modes in Mirpur. A small number of people use motorbikes and cycles. Motorbike-ride sharing is also widespread among people. People are spending more money while travelling by bus and rickshaw. From the graph, MRT is still the least popular travel mode in the area. (Figure 6 is the reference Chart).



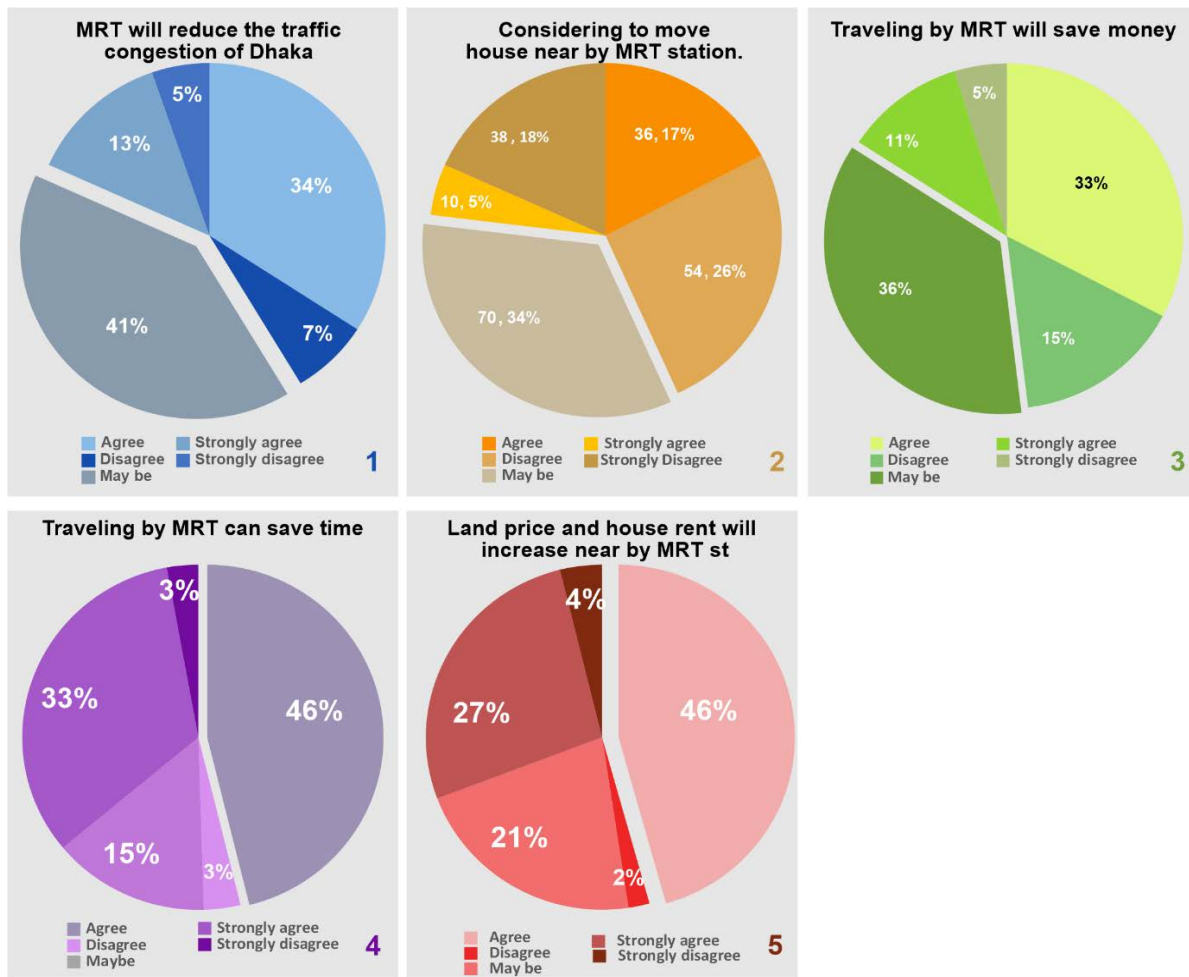
**Figure 6.** Demographic Profile of the Responded.

The study draws attention to the wide range of housing options and demographics of those residing close to the metro station. By comprehending the housing patterns of inhabitants and tackling related issues, it is possible to enhance the station's accessibility and promote a livelier and more involved community. Figure 6: The chart indicates that a noticeable number of people live in rented houses that are very far (relative to the MRT influence zone) from the metro station in the Mirpur area. In the long run, eventually, while the benefit of MRT will be exposed to the neighbour, a significant number of households may shift to near the MRT station for their accessibility, convenience, and comfort.

Survey data shows another important scenario: around 40.4% of the respondents live very far from the station influence area, and 37.5% live far from the station area. This means they are not actively participating in local community initiatives facilitated by metro stations. However, if these people start using metro services, traffic around the station area will increase and positively impact local businesses, thus contributing to the local economy.

This investigation explores respondents' differing perspectives about how the new MRT system might affect housing, the economy, and transportation systems. A survey on 208 people within at least a mile radius of the study area of concerned MRT stations would directly impact was used to gather data.

In the pie chart-1, 39% of the respondents believe introducing a new MRT system would effectively reduce traffic congestion in the Mirpur region. However, 41% of respondents were unsure about the impact. Only 5% of respondents strongly agreed about the ability of MRT to decrease traffic problems. The rest expressed doubts about the positive effects of traffic congestion. The field observation also verifies the respondent's notions regarding traffic management. However, it is understandable that the MRT service is in its infant stage. While all supporting services will be in place, traffic congestion should decrease and ease the traveller's waiting time on the street. The positive notion of the people is also expected to encourage them to use the MRT service at their convenience.



**Figure 7.** Pie Charts- showing survey data

The second pie chart assesses respondents' thoughts regarding possibly moving their home closer to an MRT station. A questionnaire Survey was used to collect data from 208 people who lived more than one mile away from the locations of the current MRT stations. Here, 34% of respondents are unsure about it. 44% disagreed, and the rest agreed to move near the MRT station.

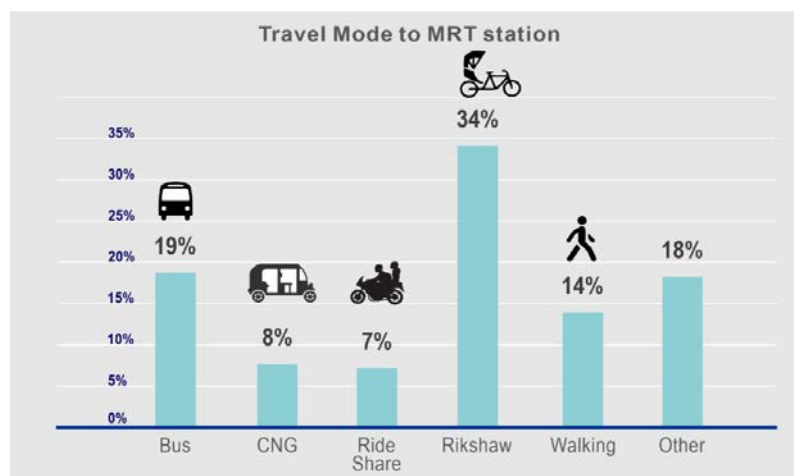
Regarding the possible cost-saving advantages of utilizing the MRT system for travel, respondents' opinions are split, as seen by the third analysis. While a significant portion, a total of 56%, acknowledge the possibility of reduced travel expenses. 20% of the responses are not in favor of acknowledging the cost-saving benefits of utilizing the MRT system for commuting. Disagreement might relate to the additional cost the traveler is spending to reach the MRT station. The rest are still confused about it.

This fourth chart assesses respondents' perceptions of the possible time-saving benefit of using an MRT system to commute. According to the analysis, respondents mostly agreed on the potential time-saving advantages of using the MRT system for transportation. The percentage is 79%. 15% of respondents are unsure, and only 6% disagree or strongly disagree that the MRT system will save them time during travel.

The Fifth graphic illustrates respondents' differing opinions about how a Mass Rapid Transit (MRT) system might affect the cost of real estate. Although a sizable fraction (73%) recognizes that there may be a price-hike in property values close to MRT stations, a sizable minority continue to express worries about the magnitude of the impact and economic uncertainty. Of those surveyed, 21% were unsure, and 6% disagreed or strongly disagreed that the MRT system would affect land and home values. Field observation shows that 10%-15% of real estate has increased since the work of the MRT system started.

The analysis aims to comprehend the most common ways people get to the MRT station. The data indicates that people use a variety of forms of transportation to get to the MRT station. It will be essential to comprehend demographic preferences and deal with related issues to improve accessibility and support environmentally friendly transportation options. Survey data from 208 respondents was analyzed and plotted 71% of respondents reached the station by rickshaw. 29 % of the respondents reported walking as their primary mode of getting to the MRT station. 39% of respondents utilize public buses. Around 16% of respondents are using ride-sharing to reach the station. 38% of respondents reported using other modes to reach the station. And 19% of respondents accounted for using CNG. So, we can address the parking challenges as many people use vehicles rather than walk to the MRT station.

In the Mirpur area, according to the respondents, people living very far and far from the metro station have a low crime rate, so much importance to living in their current location. So, there is a chance that by reducing the crime rate around the metro station, the area can create a sense of safety, which will bring more people to live and work around the station.



**Figure 8.** Travel Mode to reach MRT station (in percentage)

## 9. Recommendation

Dhaka, the vibrant capital of Bangladesh, has consistently faced the challenges of crowded streets, air pollution, and lack of systematic urban development. Dhaka is considered one of the most challenging cities globally to traverse (Afrin, 2023). Addressing this issue, the introduction of MRT6 stands as a noteworthy advancement that holds the potential to reshape the city's transportation dynamics. However, including MRT-6 as a Transit-Oriented Development (TOD) component in the Dhaka Detailed Area Plan 2022-35 is a significant step in changing Dhaka's transport horizon. Relying solely on MRT-6 without advancing other TOD elements could lead to overly optimistic anticipation of its impact on Dhaka's traffic conditions and economic, social, and environmental spheres. Following are recommendations based on the survey data analysis and literature reviews.

### 9.1 Infrastructure Investment

'MRT construction is a large capital investment, which becomes a heavy burden to the railway operator in financing and repayment by fare-box revenue. Europe and the United States generally cover the whole construction cost with public funds, which is a better approach. This will support financially viable railway businesses. A project like MRT is expensive and might require a special budget allocation in the national fiscal budget' (JICA, 2010)

Most developing countries built such projects with the help of donor agencies like the World Bank, JICA, or donor countries. A stable supply of funds is required to construct the METRO line and develop surrounding road networks, footpaths, parking routes, infrastructure, and facilities to attract

economic development and create a scope of mixed-used development.

### **9.2 Integration with Current Transport Systems:**

A well-integrated transport system contributes to the attractiveness of public transport, thus reducing the number of automobiles on the street (Mrníková, Poliak, Šimurková, Hernandez, & Reuter, 2017). Establishing an excellent integrated street network with the MRT stations is essential. Safe and evenly levelled footpaths are a priority requirement to create walkable access to the MRT station. Surveys showed that the studied MRT stations lack connectivity through safe and quality footpaths and parking facilities. People use Buses, Rikshaws, or Ride share to reach the MRT station, causing additional travel costs. People may be encouraged to use MRT as their primary form of transportation by putting in place a single ticketing or transfer system.

### **9.3 Accessibility and Inclusivity:**

The mobility concept will undergo massive changes in the upcoming years based on how it will be articulated with the transport of people and goods, always considering universality and accessibility (Silva, Verde, Paiva, Barreto, & Pereira, 2023). Railways and stations should be designed to support the accessibility of elderly and physically challenged people. To meet the various demands of commuters, this should include tactile pathways, elevators, escalators, ramps, and priority sitting places. Appropriate visual and native language signs should be billed as required.

### **9.4 Environmental Sustainability:**

One of the anticipated benefits of MRT is that it will reduce dependency on automobiles. Every day, 532 new vehicles hit the Dhaka Metropolitan Area (Ullah, 2022). Eco-friendly technologies in MRT trains and infrastructure should be encouraged. The engineering design of MRT should incorporate energy-efficient technologies. The scope of the use of renewable energy should be there. The traffic volume and peak-hour integration must determine the frequency and the service. Initiatives must be taken to encourage people to switch from driving cars to using public transit to protect the environment. Educational TVC, social media, easy ticketing service, and promotional initiatives should be designed.

### **9.5 Safety Precautions:**

Stringent safety procedures and well-thought-out action plans must be developed to safeguard passenger security. Separate female-only compartments should be encouraged. CCTV monitoring must be permanently installed, and the system should be visible to travelers. In-compartment emergency communication and use-instructions should be established. All the instructions and information should be displayed in the native language.

### **9.6 Public Education Efforts:**

Start efforts to inform the public about the advantages of MRT systems, such as fewer traffic jams, lower pollution levels, and faster travel times. Programs for community participation and various media outlets could be used for this.

### **9.7 Regulatory Framework:**

Clear rules and policies addressing rates, timetables, and maintenance requirements should be established to maintain a sustainable MRT system and its seamless operation.

### **9.8 Urban Planning and Development:**

Introducing MRT is Dhaka's most crucial component of more significant TOD planning. Implementing TOD in urban designs has become a common challenge for developing countries. Three types of urban sprawl affect the growth throughout the cities of developing countries: the low-density sprawl of higher-income regions that become auto-dominant, low-income sprawl that isolates the poor from

economic, social, and cultural opportunities, and high- the density sprawl of superblock, towers (P. A. Calthorpe, 2022). As an alternative to these challenges, cities must create walkable and transit-oriented communities offering many automobile options. Sustainable TOD needs mixed-used neighborhoods that can create places for a broad range of economic activities, ages, and household types (P. A. Calthorpe, 2022). The MRT system should coordinate with the expanding urban planning and requires a logical route rationalization. Encourage transit-oriented development (TOD) around MRT stations by combining land-use planning and transit development. A comprehensive strategy would be needed to develop and implement new policies, including public involvement, government actions, and partnerships with diverse stakeholders. Ultimately, with careful and research-based approaches that are unbiased to political influences, the new MRT system of Dhaka would become more accessible, sustainable, and efficient.

## 10. Conclusion

This study presents a comprehensive evaluation of the socio-economic impacts associated with the implementation of the Mass Rapid Transit (MRT) system in Mirpur, Dhaka. The findings highlight several key areas where the MRT system contributes positively to urban development and community well-being, while also identifying critical challenges that must be addressed to maximize the system's potential.

Firstly, the MRT system in Mirpur has demonstrated significant improvements in accessibility and mobility, offering efficient and reliable transport options for a diverse population. This has led to reduced travel times and increased connectivity between residential areas and commercial hubs, fostering economic growth and development. The analysis shows that 41% of participants believe the MRT system will reduce their time on the road and enhance accessibility, aligning with the objectives of transit-oriented development (TOD) principles.

Moreover, the MRT system has had a notable impact on land values and economic activities surrounding the stations. Property prices in the vicinity of MRT stations have experienced an upward trend, with an observed increase of 10-15% since the commencement of the MRT project. This trend indicates the potential for TOD to stimulate urban renewal and densification, contributing to sustainable city expansion. The study also reveals several challenges that need to be addressed to ensure the MRT system's long-term success. The lack of well-designed pedestrian pathways and last-mile connectivity remains a significant barrier to maximizing the system's socio-economic benefits. Illegal encroachments and insufficient infrastructure further hinder the full realization of the MRT's potential.

Furthermore, the job-housing ratio analysis indicates a disparity between employment opportunities and housing availability in the Mirpur area, necessitating targeted interventions to balance this equation and reduce commuting pressures. This calls for strategic urban planning that integrates land use with transit development, promoting mixed-use neighbourhoods and facilitating economic activities around MRT stations. To enhance the MRT system's effectiveness and sustainability, several recommendations have been put forward. These include investing in infrastructure improvements, integrating current transport systems, enhancing accessibility for all commuters, and adopting eco-friendly technologies to promote environmental sustainability. Public education efforts and a robust regulatory framework are also essential to ensure the MRT system's successful operation and maintenance.

In conclusion, the implementation of the MRT system in Mirpur offers valuable insights into the transformative potential of mass transit in rapidly urbanizing areas. By addressing the identified challenges and leveraging the system's socio-economic benefits, stakeholders can contribute to Dhaka's sustainable urban growth and achieve long-term development goals. This research highlights the importance of strategic planning and collaboration among government agencies, urban planners, and the community to create a more prosperous and interconnected urban future for Dhaka.

### Acknowledgements

We want to express our heartfelt gratitude to North South University, Bangladesh, and Polytechnic University of Madrid, Spain. Their unwavering support, resources, and invaluable contributions were instrumental in the successful completion of this work.

### Funding

This research received no specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Conflicts of Interest

The authors declare no conflicts of interest related to this research.

### Data availability statement

The data supporting this study's findings are available from the corresponding author upon reasonable request.

### Institutional Review Board Statement

Not applicable.

### CRedit author statement:

Conceptualization: Shahriar Iqbal Raj; Methodology: Shahriar Iqbal Raj, Dr. Inmaculada Mohino Sanz; Software: Shahriar Iqbal Raj, Farjana Khatun; Validation: Farjana Khatun; Formal Analysis: Shahriar Iqbal Raj; Investigation: Farjana Khatun; Resources: Shahriar Iqbal Raj; Data Curation: Shahriar Iqbal Raj, Farjana Khatun; Writing - Original Draft: Shahriar Iqbal Raj; Writing - Review & Editing: Shahriar Iqbal Raj, Farjana Khatun; Visualization: Shahriar Iqbal Raj. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Raj, S. I., Mohino, I., & Khatun, F. (2024). Socio-economic Impact of Mass Rapid Transit (Mrt) System. *Journal of Contemporary Urban Affairs*, 8(2), 436–459. <https://doi.org/10.25034/jcua.2024.v8n2-9>



Original scientific paper

# How Socio-Economic and Cultural Factors Shape Privacy in Ibadan's Public Housing Estates

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## ARTICLE INFO:

### Article History:

Received: 13 May 2024

Revised: 20 August 2024

Accepted: 2 September 2024

Available online: 5 September 2024

### Keywords:

Privacy Regulation,  
Socio-Economic Factors,  
Cultural Characteristics,  
Public Housing Estates,  
Ibadan, Nigeria.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*This study investigates the socio-economic and cultural characteristics of residents in selected public housing estates in Ibadan, focusing on the privacy regulatory mechanisms they adopt. By employing a mixed-methods approach, the research involved administering questionnaires to 565 household heads and conducting in-depth interviews with eight key informants from neighbourhood associations. The findings indicate a significant majority (92.00%) of respondents have adopted privacy regulating mechanisms, with personal space and territorial behaviour being the most common. ANOVA results reveal a significant relationship between these mechanisms and the residents' socio-economic and cultural characteristics. Qualitative insights from key informants' interviews provided a nuanced understanding of residents' privacy needs, highlighting emotional and behavioural cues, as well as verbal and non-verbal data. The study concludes that privacy regulation in public housing varies across different estates and is influenced by nine socio-economic and cultural factors, offering guidance for sustainable housing design that considers contemporary urbanization's socio-economic impacts. These findings can inform architects and policymakers in creating housing designs that respect privacy and enhance the quality of life for residents.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 460–474.

<https://doi.org/10.25034/ijcua.2024.v8n2-10>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- The privacy mechanisms in Ibadan's public housing estates are shaped by socio-economic factors like income and education level.
- Cultural influences, including religion and family background, significantly affect privacy needs and regulation mechanisms.
- Architectural design features of public housing estates directly impact residents' privacy regulation strategies.
- The type of tenure system and housing structure influences the privacy adaptations made by residents.

### Contribution to the field statement:

The findings provided guidance for future sustainable housing design and advanced the understanding of the socio-economic impacts of contemporary urbanization. The study developed Privacy Regulating Mechanisms Indices (PRI) to guide the design of socially acceptable housing that respects the privacy needs of the residents in urban centres. The study also identified specific needs of the residents that should be integrated into estate development policies

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### How to cite this article:

Amao, F. L., Rahbarianyazd, R., & Odunjo, O. O. (2024). How Socio-economic and Cultural Factors Shape Privacy in Ibadan's Public Housing Estates. *Journal of Contemporary Urban Affairs*, 8(2), 460–474. <https://doi.org/10.25034/ijcua.2024.v8n2-10>



## 1. Introduction

### 1.1 Background and Context

Housing serves a multifaceted purpose beyond providing mere physical shelter. It addresses sociological needs by establishing a social environment for the household, the fundamental unit of society (Sultan-Sidi, 2010). It fulfils psychological needs by offering a sense of personal space and privacy (Hayduk, 1994; Altman, 2013). The architectural design of residential buildings significantly influences the level of privacy they afford. In essence, housing encompasses not only shelter but also communal services and neighbourhood facilities that are essential for sustainable living (Eni, 2015). Privacy signifies a fundamental human requirement, the deprivation of which can precipitate an exceedingly precarious situation (Zaiton, 2018). It assumes paramount significance as it is instrumental in fostering well-being; its absence renders individuals susceptible to physical and psychological afflictions (Akande, 2021). Research suggests a correlation between residential overcrowding and adverse physical and psychological outcomes (Solari and Mare, 2012). Privacy assumes a pivotal role in enhancing the quality of life, as the craving for personal space serves as an innate criterion for security and contentment (Overtoom, Elsinga, Ostra, and Bluysen, 2019). Respecting the privacy of individuals and groups stands as an essential characteristic across all human cultures and should be safeguarded from undue infringements (Rapoport, 2005; Wu, 2018). In a global context, privacy is a subject of paramount concern, with its contours shaped by cultural nuances that dictate what is deemed acceptable (Kara, 2019; Ahmadnejad, 2022). Privacy emerges as a multifaceted concept influenced by cultural, individual, and contextual variations. While universally cherished, the manifestations of privacy diverge across cultures and are guided by diverse operative frameworks, each culture delineating its boundaries and norms regarding privacy (Alkhateeb, 2015). The scrutiny of privacy assumes particular relevance within the sphere of public housing, acting as a tool to mitigate overcrowding, establish identity and territoriality, and sustain personal autonomy and self-evaluation, social conduct, and societal relationships (Amao and Ilesanmi, 2022).

### 1.2 Problem Statement and Research Gap

Research has underscored the impact of privacy in public housing on residents' living conditions (Tao, 2018). Notably, the extant literature relating to privacy in public housing, particularly within the context of Ibadan, remains scarce. Public housing has faced criticism for not taking into account residents' privacy needs and sensitivity to socio-cultural factors (Kennedy, Buys, and Miller, 2015; Tao, 2018). Privacy is an important socio-cultural factor that influences the design of houses (Rapoport, 2005). Different cultures have varying preferences for privacy (Attman and Chemers, 1984; Zaiton, 2018). Although the need for privacy is universal, the methods of regulating it differ greatly across cultures (Othman, Aird, and Buys, 2015). Privacy can be controlled in two main ways. The first is through behavioural means achieved by structuring events in time, such as using cues, roles, manners, and hierarchies (Abdul Rahim, 2018). Second is using environmental mechanisms like spatial segregation and the use of physical components such as partitioning walls, fences, curtains, and blinds (Zaiton, 2018).

The concept of privacy in the built environment can be assessed through residents' perceptions. Perception, defined as the process of understanding the environment through sensory information, varies among individuals and is influenced by their backgrounds and cultures (Ahmad and Zaiton, 2010; Othman et al., 2015; Omid, Farzad, Ehsan and Parisa, 2017. Amao and Ilesanmi, 2022). Understanding residents' perceptions of privacy is crucial for improving public housing design and policy (Zaiton, 2018). Residents manage their privacy needs through different mechanisms, with their regulation processes determining the level of privacy achieved. Privacy regulation involves residents striving for a balance between desired and achieved privacy. This regulation can be achieved through behavioural and environmental mechanisms such as territoriality and personal space (Altman, 1977; Zaiton, 2018). While there has been limited focus on privacy in public housing, studies tend to overlook the impact of design on behaviour with regard to individual and cultural differences. This phenomenon remains largely unexplored, particularly in public housing estates in Ibadan.



Ibadan, the capital of Oyo State, is an appropriate area for this study as it represents the development of cities in the developing world. Despite its cosmopolitan nature, the city's cultural characteristics strongly influence residents' lifestyles and residential experiences (Tomori, 2012). Additionally, the public housing estates in Ibadan have been in existence long enough to provide the expected quantitative and qualitative data. Given this background, the study employed a mixed-method approach to identify and examine the socio-economic and cultural characteristics of residents in selected public housing estates in Ibadan. The study also analyzed the residents' privacy regulating mechanisms and determined the relationship between residents' socio-economic and cultural characteristics and privacy regulating mechanisms. This study is important for architects and professionals involved in public housing design as it provides empirical data on residents, privacy, and the residents' privacy regulating mechanisms, which could be valuable for designing future housing units and neighbourhoods.

### 1.3 Objectives and Hypotheses

The specific objectives of this research are to:

- (a) identify and examine the socio-economic and cultural characteristics of residents in selected public housing estates in Ibadan;
- (b) examine the housing and neighbourhood characteristics in the study area;
- (c) analyse the residents' privacy regulating mechanisms; and
- (d) determined the relationship between residents' socio-economic and cultural characteristics and privacy regulating mechanisms.

### 1.4 Significance and Structure of the Paper

This paper investigates how socio-economic and cultural factors shape privacy in public housing estates in Ibadan, Nigeria. It employs a mixed-methods approach, combining qualitative and survey research methods to gather data from household heads and key informants. The study aims to examine the socio-economic and cultural characteristics of residents, analyze privacy-regulating mechanisms, and determine the relationship between these factors and privacy adaptations in selected public housing estates. The paper begins with an introduction that outlines the context, problem statement, and research gaps. The literature review explores relevant theories and previous studies on privacy needs and regulations. The research methodology details the study design, sampling methods, and data collection techniques. The findings are presented in the results and discussions section, highlighting significant variations in privacy mechanisms influenced by socio-economic and cultural factors. The conclusion provides insights for architects and policymakers on designing public housing that respects residents' privacy needs and offers recommendations for future research and policy development. Table 1 below indicates the Research Methodology Flow Chart adopted in the study.

**Table 1:** Structure of the Study.

Section	Content
<b>Introduction</b>	Background and Context, Problem Statement and Research Gap, Objectives and Hypotheses, Significance and Structure of the Paper
<b>Literature Review</b>	Privacy Needs Based on Socio-Economic and Cultural Factors, Behavioural and Environmental Privacy Mechanisms, Altman's Privacy-Regulation Theory, Contributions and Implications of the Theory
<b>Research Methodology</b>	Research Design, Study Population, Sampling Method, Sample Size, Data Collection Instruments, Data Validation, Data Processing, Choice of Statistical Techniques, Ethical Considerations
<b>Data Analysis Findings and Interpretation</b>	Socio-economic and Cultural Characteristics of Residents, Analysis of Residents' Privacy Regulating Mechanisms, Relationship Between Characteristics and Privacy Mechanisms
<b>Conclusion</b>	Summary, Conclusion, Recommendations for Future Research, Implications for Housing Design and Policy

Source: Author's Conceptualisation, 2024.



## 2. Literature Review

The research by Abdul-Rahim (2018) revealed that privacy needs can differ based on various personal and socio-economic characteristics. Alkhateeb (2015) noted that the concept of privacy is relative to individual family members and the community as a whole. She suggested that different personalities may have varying privacy needs. Her study found that individual personality and socio-economic differences regarding privacy are connected to factors such as gender, age, life stage, family situation, personal history, and personality traits like introversion or extroversion, as well as mental health. Income levels are also closely related to privacy, as evidenced by the fact that wealthier individuals are more likely to own larger homes (Tao, 2018). Therefore, it is common for a wealthy person to live in a luxurious house, while a less affluent individual may reside in a lower-quality dwelling made of inexpensive materials with limited space and fewer private areas. Housing affordability is a measure of the cost of a residence compared to what buyers can afford to spend on housing. The available amount for housing investment depends on various factors, including ongoing housing expenses, housing options, and standards. These standards can be determined by assessing the privacy of both the housing unit and the surrounding neighbourhood.

The concept of privacy varies significantly across different cultures, with some placing a higher emphasis on privacy than others. Rapoport (2000) proposed that cultural traits influence privacy needs, and cultural factors play a crucial role in shaping the perception of privacy. Alashoor *et al.* (2016) noted the existence of sub-cultural and micro-cultural variations in privacy attitudes. Hall (1969) categorised cultures into two distinct groups: contact and non-contact. His research highlighted significant spatial behavioural differences between Mediterranean (contact groups) and northern European (non-contact groups) societies. Mediterranean cultures tend to prefer closer interactive distances, while northern European societies lean toward more extensive interactive distances. Hall's work has considerably influenced subsequent research on the impact of culture on spatial behaviour and public personal space, with researchers endorsing his findings in their surveys (Sobh and Belk, 2011).

Cultural norms and practices collectively influence privacy needs (Alkhateeb, 2015; Somayeh *et al.*, 2022). Consequently, residential dwellings are designed to cater to family-oriented requirements and the preferences of the residents (Bekleyen and Dalkilic, 2011). These social norms evolve over time and shape social behaviour, thereby being transmitted to future generations. While each family may maintain its distinct set of rules, there are more correspondences than discrepancies in the social language constructed. Homeowners and their guests respect these social languages, which are embodied in the spatial and architectural layouts of residences (Negoita, 2012; Humphris, 2019). These standards are integral to the factors influencing privacy (Othman *et al.*, 2013). According to Altman (1977), Abdul Rahim (2015, 2018), Hosseini *et al.* (2015), and Zaiton (2018), residents employ behavioural and environmental mechanisms to achieve optimal privacy within their homes.

### 2.1. Behavioural Privacy Mechanisms

Individuals employ verbal and non-verbal mechanisms to express the distinction between their existing privacy and the desired level of privacy. Verbal mechanisms encompass language styles, vocabulary selection, voice dynamics, speech rates, and voice quality. Non-verbal or para-verbal mechanisms include the use of body gestures and facial expressions to regulate interactions. Cultural mechanisms, such as norms and customs, can either inhibit or promote privacy. For effective communication, verbal and non-verbal cues should complement each other to mitigate the risk of misunderstanding.

### 2.2. Environmental Privacy Mechanisms

Individuals employ environmental mechanisms to regulate privacy, which can be categorized into three primary types: clothing, personal space, and territories (Altman, 1977; Ali and Armin 2013). These measures are utilized to physically demarcate spaces or convey desired levels of privacy through indications, symbols, and other methods. Clothing serves a critical role in expressing identity and



societal position. Individuals across various age groups and professions select specific attire, uniforms, or accessories to communicate their status within their community and to signify their preferred level of privacy. Personal space, the area surrounding an individual, is an essential aspect of privacy.

Territory refers to a defined space that individuals or groups lay claim to and protect as an exclusive area, often employing barriers like fences, walls, signs, and other markers to manage interactions within a residential setting (Altman, 1977). Various environmental elements, such as walls, screens, territorial markers, bed placement, light partitions, and closed exterior doors, are effective means of attaining privacy in residential areas. Regulating privacy involves a multifaceted feedback system in which resources are utilized to align individual preferences with outcomes, to attain and sustain an optimal level of privacy.

### **2.3. Altman's Privacy-regulation Theory**

The theory of privacy regulation was developed by social psychologist Irwin Altman in 1975. This theory seeks to elucidate the fluctuating nature of human preference for solitude and social engagement. Traditionally, privacy has been defined as a condition of social withdrawal. Altman posits that the process of boundary regulation is both dialectic and dynamic, implying that privacy is not a static state but rather a selective control of access to the self or the social group. Altman's concept of "dialectic" pertains to the degree between openness and closeness to others, while the notion of "dynamics" underscores the variability of the desired privacy level in response to individual and cultural disparities, continuously shifting between states of openness and closeness over time, mirroring changing circumstances. The desired privacy level is subject to temporal and situational variability. The individual may seek seclusion at one point in time and social interaction at another.

Central to Altman's theory is the idea that privacy regulation aims to achieve an optimal level of privacy, where the individual endeavours to align the attained privacy level with the desired one. At the optimal level, individuals can experience desired solitude when seeking isolation or fulfil the need for social contact when desiring interaction. Deviations from the desired privacy level can yield contrary emotional responses. Excessive privacy leads to feelings of loneliness and isolation, while insufficient privacy can evoke sensations of irritation and claustrophobia.

Altman asserts that effective control over the degree of openness and closedness to others, reflective of personal desires and environmental cues, can enhance an individual's social functioning compared to those lacking such control. Effective privacy regulation necessitates the application of diverse behavioural mechanisms, encompassing verbal and non-verbal behaviours, and environmental mechanisms, such as territoriality and personal space. The coordination of these mechanisms allows individuals to effectively communicate their desired privacy level to others, thereby achieving the desired optimal level of privacy.

### **2.4. Properties of Privacy Regulation Theory**

Altman's (1975) privacy regulation theory describes privacy as a dynamic process of interpersonal boundaries. This means that privacy involves maintaining a flexible boundary between oneself and others and that this boundary changes based on internal and external factors to ensure proper functioning. Altman also distinguishes between desired and actual levels of privacy. The desired level is the amount of privacy needed to meet a person's needs and role requirements, while the actual level is what a person achieves. When the achieved privacy matches the desired privacy, optimal control of privacy is achieved.

### **2.5. Contribution and Implication of Altman's Privacy Regulation Theory**

Privacy regulation theory contributed a new perspective on human-environment interaction using spatial behaviour techniques to regulate social interaction. Altman proposed a new perspective to understand privacy in terms of multiple unit levels (individual vs. group; in-group and out-group; self vs. others; across time and condition etc.) and its operating mechanism (Petronio, 2002). It is a dynamic analysis of how people regulate social interaction. The theory challenged traditional beliefs that



“privacy” was a rather personal process. He proposed that it was intrinsically a social process. It was a psychological process involving people's interaction, their social world and their environment. It stimulated researchers to think about self-disclosure and privacy regulations. Moreover, privacy was culturally defined and the behaviour was influenced by its context. Altman's theory stimulated more research on privacy across different settings such as schools, hospitals and public housing. Additionally, incorporating theories related to culture, socio-economic status and space utilization could offer a nuanced understanding of how cultural capital influences privacy needs and behaviours. This theoretical discussion that situates the study within these broader discourses could not only contextualize the findings but also highlight the study's contribution to the interdisciplinary field of housing studies.

### 3. Material and Methods

The study adopted a combination of qualitative and survey research methods in its research methodology. This decision was made to allow the researcher to link overarching patterns from qualitative analysis to underlying processes and mechanisms, as well as to conduct a more detailed examination of the structural interaction through survey research. The research focused on household heads in four public housing estates managed by the Oyo State Government: Bodija Estate (466), Olubadan Estate (114), Owode Estate (280), and Ajoda New Town (270), with a sampling frame of 1130 household heads. These estates were chosen based on specific inclusion criteria, with Bashorun Estate and Akobo Estate, managed by the Oyo State Government, not meeting the necessary criteria as they were not built and designed by the state government.

To ensure a representative analysis, two sampling methods were utilized: Purposive and Systematic Random Sampling methods. The purposive sampling method was used to select the four public housing estates, which were designed, constructed, completed, and allocated by the Oyo State Government through the Oyo State Housing Corporation.

On the other hand, the systematic random sampling method was employed to select respondents (household heads) in the selected public housing estates - Bodija Estate, Owode Estate, Ajoda Estate, and Olubadan Estate. A sample size of 565 household heads, representing 50% of the sampling frame, was considered appropriate to provide an accurate representation of the total population. Respondents for questionnaire administration were selected by randomly choosing the first house and subsequently systematically selecting every 2nd house in the street until the desired sample size was achieved.

Key informants for in-depth interviews were chosen using the purposive sampling method. Eight key informants, comprising executives of landlord associations in the selected public housing estates, were selected.

**Table 2:** Summary of Sampling Frame and Sample Size in the Study Area.

Public Housing Estates	Sampling Frame	Sample Size
Bodija Estate	466	233
Owode Estate	280	140
Ajoda New Town	270	135
Olubadan Estate	114	57
Total	<b>1130</b>	<b>565</b>

**Source:** Author’s Field Work (2024).

The questionnaires were designed for the household heads of the housing units that were selected, while the observation schedule was meant for the expert's use. The questionnaire covered all aspects of the research objectives, including the socio-economic and cultural characteristics of residents and the privacy regulating mechanisms of the residents in the study area. The questionnaires included both closed and open-ended questions. The closed-ended questions aimed to obtain specific opinions, while the open-ended ones allowed the respondents to provide more detailed answers and explanations where necessary. For the closed-ended questions, a 5-point Likert scale (1-5) was used for data evaluation. The interview questions gave the researcher the advantage of capturing additional emotional and



behavioural cues, accurate screening, and gathering verbal and non-verbal data. Data processing and analysis were done using a computer and the Statistical Package for Social Sciences (SPSS) 16. The observation schedule was designed to document the observations made by the expert during the fieldwork (see Appendix 1, 2, and 3). The secondary data used was obtained from secondary sources.

The quantitative data analysis included descriptive analysis such as frequency distribution, percentages, and cross-tabulation, as well as inferential statistical analysis like analysis of variance and chi-square. Both descriptive and inferential statistical analyses were employed. The former was used to obtain frequencies and percentages, while the latter was used to develop the Privacy Regulating Mechanism Index (PRI). The Summation Weight Value (SWV) or Variable Score (VS) was used to measure responses from residents to gain a better understanding of their Privacy Regulating Mechanisms.

In the first approach, a 5-point Likert scale of Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree was respectively assigned a value of 1, 2, 3, 4, 5 for all the twenty-eight (28) questions used to measure Privacy Regulating Mechanisms. This means that the range of scores for each respondent for all 28 questions would be between 28 (28x1) and 140 (28x5).

In the second approach, the sum of individual respondents' scores on responses to the privacy variable was referred to as individuals' overall privacy regulating mechanism score (IRS), while the total scores given by all the respondents to each of the privacy regulating mechanism variables was the variable score (VS) or Summation of Weight Value (SWV). IRS was used to assess individuals' responses to privacy regulating mechanisms, while Summation of Weight Value (SWV) or Variable Score (VS) was used to evaluate the contribution of each of the 28 variables to overall responses to privacy regulating mechanisms.

The Summation of the Weight Value (SWV) for each privacy regulating variable was obtained by adding the product of responses for each variable and their respective weight value.

Mathematically, this is expressed in equation 3.1:

$$SWV = \sum_{i=1}^5 Xi Yi \dots\dots\dots Eqn.3.1$$

Where:

SWV= Summation of the Weight Value of each of the twenty-eight (28) questions

Xi = number of respondents choosing a particular rating i

Yi=the weight assigned a value (i=1, 2, 3, 4, 5)

For instance, to measure the level of agreement to which the residents of the selected public housing estates are attached to the types of privacy regulating variables, the formula to use is given in equation 3.2 below.

$$PRI = \frac{SWV}{\sum_{i=1}^5 i = Xi} \dots\dots\dots Eqn.3.2$$

Where PRI = Privacy Regulating Mechanism Index

$$X= \text{Mean Index} = \frac{SWV}{\sum_{i=1}^5 i = Xi / \text{No of Variables}} \dots\dots\dots Eqn.3.3$$

The SWV is divided by the number of respondents (565 household heads) to give the Privacy Regulating Mechanism Index (PRI).

This method was employed to measure the rating of the respondents on the level of agreement with privacy regulating mechanisms in the study area. It must be noted that the closer the PRI of a factor is to five (5) the higher the assumed privacy regulating mechanism. The Mean Index (X) used was also obtained by summing up the PRI and dividing it by the total number of variables. PRI was used in evaluating the contribution of each of the 28 variables to the overall privacy regulating mechanism and privacy regulating mechanism across the four estates. The total scores on each privacy regulating mechanism type by all the respondents are the privacy regulating mechanism scores (PRS), while the total possible Mean Index that can be given by all the respondents on each of the four privacy regulating mechanism types is the Aggregate Privacy Regulating Mechanism Index (APRI).To



compare the level of responses to each of the four privacy regulating mechanism types used in this study across the four estates, the Privacy Regulating Mechanism Index (PRI) was calculated by summing up the APRI and dividing it by the total number of variables (N). This is expressed mathematically as:  $PRI = APRI/N$

### 3.1. Ethical considerations

The research process involves several key elements, including obtaining participants' informed consent, ensuring their right to withdraw from the study, communicating research intentions, keeping participants informed about any resulting publications, maintaining anonymity, and most importantly, ensuring confidentiality between participants and the researcher. The Institute of Public Health at Obafemi Awolowo University has established a Research Ethics Code of Practice, which outlines the researcher's responsibilities towards both the research and the participants. Before conducting the interviews, approval was obtained from the School Research Ethics Committee, addressing any anticipated ethical issues. This included clarifying the research purpose and procedures, ensuring the safety of both the researcher and participants, obtaining participants' consent for data confidentiality, protecting their privacy, and ensuring that participants understand the nature and potential benefits of the research. To safeguard participant confidentiality, both the recordings and transcribed data are securely stored.

## 4. Results and Discussions

### 4.1. Socio-economic and Cultural characteristics of resident

A total number of 565 residents were sampled in the study area. Significant variations existed among the public housing estates concerning age, marital status, religion, occupational status, level of education, and type of tenure system, among others, as confirmed in the summary of ANOVA and Chi-Square test (Table 3). With such significant variation, it is expected that the residents' privacy regulating mechanisms would vary as well.

**Table 3:** Summary of ANOVA and Chi-Square of the Socio-economic and Cultural Characteristics of Residents across the Four Public Housing Estates.

Socio-economic Attributes	ANOVA F value	P value	Chi-Square $\chi^2$ value	P value	Remark
Gender			6.609	0.085	Not significant
Age	3.366	0.018			Significant
Marital status			29.017	0.004	Significant
Occupational status			42.540	0.000	Significant
Monthly income	2.117	0.097			Not significant
Level of education			43.206	0.000	Significant
Type of tenure system			65.634	0.000	Significant
Mode of ownership			97.829	0.000	Significant
Type of building			94.475	0.000	Significant
Length of Stay/Residency	5.208	0.001			Significant
Household size	0.665	0.574			Not significant
Number of male children	0.360	0.782			Not significant
Number of female children	1.229	0.298			Not significant
Sleeping arrangement of male and female children			2.364	0.500	Not significant
Reason for living in the estate			126.344	0.000	Significant
Family Background			9.131	0.028	Significant
Religion			25.918	0.000	Significant
Ethnicity			2.344	0.886	Not significant

## 4.2. Overall Privacy Regulating Mechanism

Table 4 reveals that 55.71% of respondents agreed and 36.29% strongly agreed with the use of privacy-regulating mechanisms. This represents, in summation, 92.00% of the respondents. It confirms the earlier finding that the majority of the residents' perceived privacy levels in the study are low. This may have influenced their responses to the privacy regulating mechanisms adopted in the estates.

**Table 4:** Overall Privacy Regulating Mechanisms: Author Field Work (2024).

Privacy Regulating Mechanisms Scores	Rating	Frequency	Percentage
28-59	Strongly Disagree	3	0.50
60-79	Disagree	35	6.25
80-99	Neutral	7	1.25
100-119	Agree	315	<b>55.71</b>
120-140	Strongly Agree	205	<b>36.29</b>
Total		565	100.00

The key informant interview findings also revealed that residents in the four estates used various methods to increase security and privacy. These methods included adding more blocks to existing fences, installing burglary-proof doors and windows, hanging curtains, and insulating their homes against noise. Residents also mentioned relocating bathrooms inside bedrooms and building additional bathrooms on the other side of their houses. This can be corroborated by statements of residents from the estates:

*“Bathroom was relocated inside the bedroom and construction of another bathroom in the other side of the house”*

*“We changed the kitchen and entrance doors”*

*“...immediately we got here we constructed the fences by ourselves then the windows were changed to tinted sliding windows, the doors we changed from wood to iron”*

This may be considered to be in tandem with the findings of Ahmad and Zaiton (2010), which indicated that residents of Malay Urban Dwellers in Selangor strongly agreed with their overall housing modification. Aduwo (2011) also suggested that residents in low-income public housing estates in Lagos also agreed with the housing modification.

## 4.3. Residents' Socio-economic and Cultural Characteristics and Privacy Regulating Mechanisms

The study presents the relationship between the socio-economic and cultural characteristics of residents and their privacy regulation mechanisms. Mean scores were calculated for nine characteristics including family background, length of stay, educational level, age, religion, marital status, type of building, type of tenure system, and occupation. The scores varied significantly across the four housing estates surveyed. The mean scores of these characteristics are shown in Appendix 4 about their privacy regulating mechanisms.

The mean index scores for family background, length of stay, educational level, and age were 1.79, 1.72, 1.69, and 1.81, respectively. These scores indicate that residents with different socio-economic and cultural backgrounds rated their perception of privacy as low and their privacy regulating mechanisms as high. Additionally, the mean indices for single-family and multi-family dwellings were 1.83 and 1.74, respectively. This suggests that single-family residents agreed more on privacy regulating mechanisms compared to multi-family residents. There were six common mechanisms with indices greater than 1.79 for both single-family and multi-family groups. These included the addition of bedrooms, insulation of walls against noise, relocation of windows, installation of odour extractors in the kitchen, planting of gardens in the neighbourhood, and creation of open spaces between houses. The analysis revealed that the majority of the residents were single-family households. As a result, single-family households showed a higher level of agreement on the regulating mechanisms compared to multi-family households, due to differences in family background, lifestyles, and personalities. The



mean index for residents who had lived in the area for less than ten years was 1.83, while those who had resided for 10-20, 21-30, and 31-40 years had mean indices of 1.82, 1.65, and 1.58 respectively. Residents who had lived for less than ten years highly agreed with the privacy regulating mechanisms, as indicated by twenty-two out of twenty-eight variables having mean scores above the group mean index of 1.72. In comparison, those who had lived for 10-20 years had eighteen variables above the mean index, residents living 21-30 years had four, and residents who had lived for 31-40 years had eight variables ranked above the group mean index.

Mechanisms highly ranked above the group mean index among residents who had lived for less than ten years included the addition of bedrooms (2.16), conversion of spaces to other uses (2.07), adjustment of the initial layout plan of the living room (2.03), separation of the bedroom from guest areas (1.90), blocking of unwanted accesses to the kitchen (1.78), and screening of the house against unwanted views (1.77), as well as insulation of walls against unwanted noise (2.23). This suggests that residents who had lived for less than ten years regulated their privacy more than long-term residents, who might have adapted to their privacy levels and required fewer regulating mechanisms.

This aligns with the response of a participant:

*“We demarcated the living room by putting a big curtain just to stop the visitors from seeing what was inside the bedroom when we freshly moved here”*

The mean indices for residents with different levels of education were as follows: 1.61 for those with no formal education, 1.46 for primary education, 1.86 for secondary education, and 1.82 for tertiary education. There were five regulating mechanisms with indices higher than the group mean index for the educational level group, which were common across the identified groups. These included the replacement of existing floor finish materials, installation of odour extractor in the kitchen, amendment of set-back for houses, planting of gardens, and creation of open spaces between houses.

Residents with secondary and tertiary qualifications showed higher agreement with the regulating mechanisms compared to those with primary and no formal education. This finding is consistent with Margulis (2003), who concluded that higher education levels of household heads correlated with higher agreement with regulating mechanisms.

The mean indices for youth, young adults, adults, and the aged were 1.85, 1.83, 1.81, and 1.76, respectively. This indicates that the level of agreement with regulating mechanisms was higher among youth and young adults compared to adults and the aged. As the age of residents increased, the level of agreement with regulating mechanisms decreased. Across different age categories, six regulating mechanisms had mean scores greater than the group mean index. These mechanisms included the addition of bedrooms, conversion of spaces to other uses, adjustment of the living room layout plan, insulation of walls against noise, relocation of window positions, and planting of neighbourhood gardens.

These findings are in tandem with the research of Tomah (2011), Shabani (2011), and Tao (2018), who established that age has a positive effect on privacy levels and the adopted regulating mechanisms. According to their research, older people tend to be more satisfied with lower privacy levels compared to young adults. It's evident from the above findings that youth and young adults showed higher agreement with the regulating mechanisms compared to adults and the aged in the estates.

The socio-economic and cultural characteristics of residents and their privacy regulating mechanisms are presented in Appendix 5. The variables examined were religion, marital status, and type of building. The findings revealed that the mean indices for the three identified religious groups (Christianity, Islam, and Traditional) were 1.81, 1.89, and 1.58. This suggests that residents of the Islamic faith were more likely to agree with the regulating mechanisms than others.

This finding is consistent with the perspective of Memarian (2011) that privacy holds a high priority in the Islamic religion, both in private (in-house) and public spaces (in the neighbourhood). Three regulating mechanisms were found to be commonly agreed upon across the three religious groups, as their mean scores were higher than the group mean index computed. These mechanisms included insulation of walls against unwanted noise, relocation of the position of doors, and planting of gardens in the neighbourhood. The group mean index for the religion group was calculated to be 1.76.



The mean indices computed for the different marital status groups were as follows: 1.92 for single, 1.81 for married, 1.79 for separated, 1.55 for divorced, and 1.95 for widow/widower. The overall mean index for the entire group was 1.80. Among single residents, the most important adjustment mechanism for the initial layout plan of the living room was rated at 2.62. For married and separated individuals, the addition of bedrooms and insulation of walls against unwanted noise were the most important mechanisms, rated at 2.19 and 4.00, respectively. Additionally, divorced residents highly agreed on the insulation of walls against unwanted noise and planting of the garden in their neighbourhood, with ratings of 2.29 each, while widow/widower residents indicated the relocation of position doors and windows as the most important mechanisms, both rated at 2.32. Among married residents, the addition of bedrooms was the most important mechanism, with a rating of 2.19. These findings align with previous studies that showed the need for more space among married residents, whether for themselves, their children, or visitors (Rosa, 2022). This suggests that married residents were the ones who added more rooms to their houses (Amao and Ilesanmi, 2022; Akinola et al., 2024).

In Appendix 6, the relationship between residents' tenure type and occupation, and their privacy regulating mechanisms is presented. There are four variables under the type of tenure system: rent, lease, self-ownership, and transfer/inheritance. Residents on rental and lease systems are referred to as tenants, while those on self-ownership and transfer/inheritance are known as landlords. The mean indices for rent, lease, self-ownership, and transfer/inheritance were 1.79, 2.25, 1.82, and 1.77 respectively. Residents on lease showed higher agreement with privacy regulating mechanisms compared to other categories, contradicting the notion that owner-occupiers are the ones who make better use of opportunities to make their residences more comfortable in meeting their privacy needs. The group mean index for the type of tenure system was 1.91. It was observed that three regulating mechanisms were highly rated across the four types of tenure systems: the conversion of spaces to other uses, adjustment of the initial layout plan of the living room, and insulation of walls against unwanted noise. It was confirmed that the regulating mechanisms adopted by tenants were quite different from those employed by landlords.

Findings on the relationship between types of occupation and privacy regulating mechanisms showed that self-employed residents mostly regulated their privacy, with a mean index of 2.00. This was followed by student/unemployed, private employee, civil servant, and retiree, with mean scores of 1.93, 1.90, 1.71, and 1.57 respectively. The group mean index was 1.82. Across the different occupational types, insulation of walls against unwanted noise as a mechanism was observed to have a mean index above the group mean index.

It has been established that residents' privacy regulating mechanisms varied across the four public housing estates, varying with socio-economic, cultural, and housing characteristics. It is concluded that these characteristics influenced residents' privacy regulating mechanisms. The findings supported existing theories and studies of privacy regulation. The key informant interview provided the researcher with an understanding of privacy regulating mechanisms from the residents' perspective, complementing the outcomes of the questionnaire.

## 5. Conclusions

It has been established that residents' socio-economic and cultural characteristics are the determinants of privacy regulatory mechanisms adopted in selected public housing estates. These regulations varied based on the specific characteristics of each housing estate. Interviews with key informants provided valuable insights into the residents' perspectives on privacy regulations, which complemented the findings of the questionnaire. The study also offers valuable information for the design of future public housing estates. It developed Privacy Regulating Mechanisms Indices (PRI) to guide the design of socially acceptable housing that respects the privacy needs of the residents. This information could help architects make design decisions that are responsive to the residents' preferences in contemporary urbanization.

The study recommends that the government involve residents in the development and implementation of policies that affect their lives, particularly during the design phase of public housing construction.



This is important because public housing has been criticized for not adequately addressing residents' privacy needs and socio-cultural sensitivity. Involving residents from the beginning could prevent the need for costly transformations and modifications later on.

The study also identified specific needs of the residents that should be integrated into estate development policies. For instance, future designs should consider the inadequate spaces identified, such as the need for additional bedrooms to accommodate large families. Public housing providers should ensure that the number of bedrooms meets the needs of residents with large families to bring rapid improvement to the study area.

Windows should be designed to provide both ventilation and privacy for residents. This can be achieved through the use of tinted glass, adjustable windows, and strategic positioning. It's best to avoid arranging housing units in rows or mirror-image patterns in the neighbourhood. Instead, consider arranging more units around open spaces rather than facing each other.

In the course of this study, we encountered limitations related to residents' unwillingness to share information about themselves and their households, as well as some residents' initial scepticism towards the researchers due to fear of government involvement. However, once residents understood that the study was for academic purposes only, they supported the research.

This study is limited to public housing estates designed, constructed, allocated, and managed by Oyo State Housing Corporation in Ibadan, Nigeria. The focus is on privacy-regulating mechanisms in selected public housing estates in Ibadan, with many other privacy-related issues in urban housing areas that could be explored. Possible areas for future research include:

1. Conducting similar studies in different urban centres with varied socio-economic and cultural backgrounds for comparative purposes.
2. Assessing the different methodological approaches and architectural designs of housing typologies in public housing estates.
3. Conducting comparative studies between public and private housing to identify similarities, differences, and the underlying factors.
4. Exploring additional personality characteristics such as introversion and extroversion

### **Acknowledgements**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflict of Interests**

There is no conflict of interest.

### **Data availability statement**

The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

### **CRedit author statement:**

Conceptualization: F.L., R.R., Data curation: F.L., R.R., Formal analysis: F.L., Funding acquisition: F. L. Investigation: F.L., R.R., Methodology: F.L., R.R., Project administration: F. L., Writing—original draft: F.L., Writing—review and editing: F.L., R.R.O.O. All authors have read and agreed to the published version of the manuscript.



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**How to cite this article:**

Amao, F. L., Rahbarianyazd, R., & Odunjo, O. O. (2024). How Socio-economic and Cultural Factors Shape Privacy in Ibadan's Public Housing Estates. *Journal of Contemporary Urban Affairs*, 8(2), 460–474. <https://doi.org/10.25034/jjcua.2024.v8n2-10>

**Appendices:**

**Appendix 1  
Questionnaire**

Ladoke Akintola University of Technology, Ogbomosho, Nigeria.  
Faculty Of Environmental Sciences  
Department Of Architecture

Residents' Socio-Economic and Cultural Characteristics as Determinants of Privacy Regulatory Mechanisms  
Adopted In Selected Public Housing Estates In Ibadan

Dear Respondent,

This questionnaire is designed to elicit responses on Privacy in Public Housing estates in Ibadan, Oyo State. It is mainly an instrument for gathering data for Research in Architecture. All information provided will be treated confidentially and used purely for academic purposes.

Thank you for providing responses to the questions

AMAO Funmilayo Lanrewaju

**INSTRUCTION:** Please tick (X) or fill as appropriate

**Name of Housing Estate**.....

**SECTION A: Socio-economic and Cultural Characteristics of Residents**

1. What is your gender? (1) Male ( ) (2) Female ( )
2. What age were you at your last birthday?.....
3. My marital status is (1) Married ( ) (2) Separated ( ) (3) Divorced ( ) (4) Widow/Widower ( ) (5) Single ( )
4. My religious background is (1) Christianity ( ) (2) Muslim ( ) (3) Traditional ( ) (4) Others.....
5. What is your ethnicity? (1) Hausa ( ) (2) Ibo ( ) (3) Yoruba ( ) (4) Others.....
6. What is your employment status? (1) Civil Servant ( ) (2) Private employee ( ) (3) Self-employed ( ) (4) Student or unemployed ( ) (5) Retiree ( )
7. What occupation do you do for living?.....
8. My average monthly income is (in Naira).....
9. What is the highest level of education you have completed?.....
10. My type of tenure status is (1) Rent ( ) (2) Lease ( ) (3) Self-Ownership ( ) (4) Transfer or Inheritance ( ) (5) Others.....
11. If Self- Ownership, how did you acquire the ownership? (1) From Government ( ) (2) From a Previous Owner ( ) (3) Inheritance ( ) (4) Others.....
12. What is the type of building you are occupying?.....
13. How long have you lived in this house?.....
14. What are the reasons for your decision to live here?.....
15. How many people, including yourself are there in your household?.....
16. How many children are there in your household? (1) Male Children ( ) (2) Female Children ( )
17. Do your male and female children sleep in the same room?.....
18. What is your family background? (1) Single-family ( ) (2) Multi-family ( ) (3) others.....

**SECTION B: RESIDENTS' PRIVACY REGULATING MECHANISMS**

Consider the following privacy regulating mechanisms and indicate how much you agree or disagree:

Rate their significance by tick (√)

S/ N	Privacy Regulating Mechanisms	SA 5	A 4	N 3	D 2	SD 1
1.	Addition of Bedrooms					
2.	Conversion of spaces to other uses.					
3.	Adjustment of the initial layout plan of the Living room					
4.	Separation of bedroom from guest areas					
5.	Blocking of unwanted accesses to the kitchen					
6.	Screening of your house against unwanted views					
7.	Insulation of walls against unwanted noise					
8.	Relocation of position of Doors					
9.	Relocation of position of windows					
10.	Change of windows to suitable types					
11.	Hanging of curtains on the windows					
12.	Blocking of doors for maximum privacy					
13.	Addition of burglary proof on entrance door					

- 
14. Installation of burglary proof on windows

---

  15. Addition of extra blocks on fence

---

  16. Screening plants on existing fence of the house

---

  17. Visual screening plants on balconies

---

  18. Replacement of existing floor finish materials

---

  19. Installation of odour extractor in the Kitchen

---

  20. I Scrutinize my activities on time

---

  21. Amendment of set-back for my house

---

  22. Planting of garden in my neighbourhood

---

  23. Creation of open spaces in-between houses

---

  24. I don't look into my neighbours' house

---

  25. I regulate my interactions with neighbours

---

  26. Language styles such as busy for my neighbours

---

  27. Body gesture to communicate to unwanted quest

---

  28. Facial expressions to dialogue with my neighbours
-

**Appendix 2**  
**Observation Schedule**

Name and Location of Housing Estate: -----

House Number: -----

1. Housing Typology
 

(i) Single-Family Bungalow [ ]	(iii)	Semi-detached Bungalow [ ]
(ii) Block of flats) [ ]	(iv)	Duplex [ ]
(v) Others.....		
2. Walling material of your house?
 

(i) Sun-dried burnt bricks [ ]	(iii)	Compressed Stabilized Laterite [ ]
(ii) Sancerre Cement Blocks [ ]	(iv)	Others.....
3. Wall finishing
 

(iii) Cement sand plastering [ ]	(iii)	Painted [ ]
(iv) Tiled [ ]	(iv)	Others.....
4. The type of windows used in the house
 

(i) Timber [ ]	(iv)	Glazed louvres [ ]
(ii) Glazed aluminium [ ]	(v)	Others.....
(iii) Casement [ ]		
5. The type doors used in the house
 

(v) Plywood flushed [ ]	(iv)	Panelled timber [ ]
(vi) Aluminium Glazed [ ]	(v)	Others.....
(vii) Panelled Steel [ ]		
6. Burglary proof on windows
 

a. Yes [ ]	(ii)	No [ ]
------------	------	--------
7. Burglary proof on external doors
 

a. Yes [ ]	(ii)	No [ ]
------------	------	--------
8. Type of floor finish
 

a. Cement screed [ ]	(iv)	PVC Tiles [ ]
b. Ceramic Tiles [ ]	(v)	Terrazzo [ ]
c. Marble [ ]	(vi)	Others.....
9. Ceiling Material(s)
 

a. Asbestos [ ]	(iv)	Plaster of Plaster (POP) [ ]
b. Acoustic ceiling [ ]	(v)	PVC strips [ ]
c. Polished timber [ ]		
10. Type of Roofing material
 

a. Galvanized iron [ ]	(iv)	Asbestos [ ]
b. Aluminium long span [ ]	(v)	Others, specify.....
c. Villa tiles [ ]		
d.		
11. The layout of the housing estate
 

a. Crowded [ ]	(iii)	Haphazard [ ]
b. Spacious [ ]	(iv)	Properly planned [ ]
12. Types of partition
 

a. Curtain [ ]	(iii)	Blinds [ ]
b. Wall [ ]		
13. Perimeter fencing
 

a. Non-existent [ ]	(iii)	Very low [ ]
b. Low [ ]	(iv)	Very high [ ]
14. Kiosks for retail shops
 

a. Non-existent [ ]	(ii)	Present [ ]
---------------------	------	-------------
15. Security post at entrance(s) to the estate



### Appendix 4

#### Family Background, Length of Stay, Educational level, Age, and Privacy Regulating Mechanisms

Mechanism	Family Background		Length of Stay (Years)				Educational Level				Age			
	Single-family	Multi-family	< 10	10-20	21-30	31-40	No formal	Primary	Secondary	Tertiary	Youth	Young Adult	Adult	Aged
Addition of bedrooms	2.16	2.11	2.16	2.19	1.67	1.80	1.33	1.00	1.91	2.20	2.09	2.23	2.14	1.82
Conversion of spaces to other Uses	2.06	1.75	2.07	1.90	1.50	1.80	1.33	1.00	2.19	1.99	2.02	2.09	1.91	1.84
Adjustment of initial layout plan of liv. Room	2.10	1.66	2.03	2.08	1.67	1.50	1.33	1.00	2.23	2.00	2.32	2.06	1.84	1.82
Separation of bedroom from guest areas	1.91	1.65	1.90	1.84	1.50	1.80	1.33	1.00	1.89	1.88	1.94	1.90	1.82	1.73
Blocking of unwanted accesses to kitchen	1.80	1.59	1.78	1.75	1.33	1.80	1.00	1.00	1.62	1.80	1.97	1.75	1.70	1.69
Screening of house against unwanted views	1.76	1.72	1.77	1.66	2.33	1.50	2.00	1.00	1.58	1.78	1.83	1.75	1.66	1.88
Insulation of walls against unwanted noise	2.17	2.38	2.23	2.17	2.67	1.20	2.00	1.00	2.13	2.23	2.30	2.42	1.82	2.08
Relocation of position of Doors	1.88	1.76	1.84	1.96	1.83	1.40	2.00	1.00	2.01	1.84	1.93	1.83	1.80	2.06
Relocation of position of Windows	1.93	1.83	1.88	2.06	1.67	1.40	2.00	1.00	2.28	1.86	1.93	1.93	1.88	1.90
Change of windows to suitable types	1.73	1.62	1.75	1.60	1.50	1.70	2.00	1.00	1.78	1.70	1.73	1.66	1.78	1.73
Hanging of curtains on the windows	1.58	1.45	1.59	1.46	1.67	1.70	2.00	1.00	1.53	1.57	1.54	1.50	1.64	1.65
Blocking of doors for maximum privacy	1.70	1.63	1.71	1.64	1.67	1.70	2.00	1.00	1.71	1.69	1.68	1.66	1.76	1.65
Addition of burglary proof entrance door	1.76	1.76	1.75	1.78	1.67	1.80	1.33	1.00	1.76	1.76	1.76	1.74	1.82	1.67
Installation of burglary proof windows	1.72	1.64	1.70	1.70	1.50	2.40	1.33	1.00	1.77	1.70	1.80	1.64	1.83	1.55
Addition of an extra block on Fence	1.75	1.75	1.79	1.69	1.33	1.30	1.33	1.00	1.84	1.74	1.86	1.77	1.69	1.61
Screening plants on existing fence of house	1.74	1.77	1.73	1.85	1.50	1.30	1.33	2.00	1.82	1.74	1.82	1.76	1.71	1.69
Visual screening plants on balcony	1.73	1.81	1.73	1.83	1.50	1.30	1.33	2.00	1.90	1.72	1.69	1.78	1.73	1.65
Replacement of existing floor finish materials	1.75	1.61	1.75	1.67	1.50	1.60	2.00	2.00	1.71	1.72	1.76	1.78	1.63	1.63
Installation of odour extractor in the kitchen	1.99	1.94	2.05	1.86	1.67	1.60	2.00	2.00	2.06	1.97	1.92	2.04	2.02	1.67
I do not look into my neighbour's house	1.65	1.52	1.65	1.59	1.33	1.60	2.00	2.00	1.87	1.58	1.59	1.58	1.76	1.55
I scrutinize my activities on Time	1.71	1.46	1.69	1.63	1.67	1.30	2.00	2.00	1.76	1.65	1.63	1.60	1.81	1.67
Amendment of set-back for my house	1.91	1.75	1.89	1.88	2.00	1.50	2.00	2.00	1.80	1.89	1.92	1.80	1.97	1.96
Planting of garden in the neighbourhood	1.87	2.00	1.91	1.93	1.67	1.20	2.00	2.00	2.03	1.87	1.90	1.88	1.93	1.86
Creation of open spaces in-between houses	1.83	1.84	1.83	1.89	1.50	1.50	2.00	2.00	1.75	1.84	1.92	1.91	1.64	1.78
I regulate my interactions with neighbours	1.71	1.57	1.71	1.68	1.33	1.50	1.33	2.00	1.65	1.70	1.69	1.68	1.71	1.65
Language styles such as busy neighbours	1.85	1.77	1.83	1.91	1.67	1.50	1.33	2.00	1.96	1.82	1.69	1.82	1.94	1.86
Body gesture to communicate unwanted guest	1.80	1.65	1.76	1.83	1.67	1.80	1.33	2.00	1.70	1.79	1.76	1.74	1.84	1.82
Facial expressions to dialogue with neighbours	1.82	1.78	1.80	1.85	1.67	1.80	1.33	2.00	1.76	1.83	1.76	1.79	1.89	1.82
<b>Mean Index</b>	<b>1.83</b>	<b>1.74</b>	<b>1.83</b>	<b>1.82</b>	<b>1.65</b>	<b>1.58</b>	<b>1.61</b>	<b>1.46</b>	<b>1.86</b>	<b>1.82</b>	<b>1.85</b>	<b>1.83</b>	<b>1.81</b>	<b>1.76</b>
<b>Group Mean Index</b>	<b>1.79</b>		<b>1.72</b>				<b>1.69</b>				<b>1.81</b>			

**Appendix 5**  
**Religion, Marital Status, Building Type, Privacy Regulating Mechanisms**

Mechanism	Religion			Marital Status					Type of Building					
	Christ	Islam	Trad	Single	Married	Separated	Divorced	Widow/ Widower	Duplex	Detached	Semi-detached	Flat	BQ	Brazilian
Addition of bedrooms	.19	.03	.43	.98	.19	.20	.43	.84	.00	.00	.00	.00	.00	.00
Conversion of spaces to other uses	.02	.99	.71	.09	.00	.80	.43	.05	.00	.00	.00	.00	.00	.00
Adjustment of initial layout plan of living room	.04	.98	.71	.62	.95	.80	.43	.11	.00	.00	.00	.00	.00	.00
Separation of bedroom from guest areas	.91	.72	.71	.03	.86	.40	.43	.84	.00	.00	.00	.00	.00	.00
Blocking of unwanted accesses to kitchen	.77	.73	.71	.07	.72	.00	.43	.05	.00	.00	.00	.00	.00	.00
Screening of house against unwanted views	.74	.81	.43	.88	.73	.40	.71	.95	.00	.00	.00	.00	.00	.00
Insulation of walls against unwanted noise	.23	.09	.29	.38	.16	.00	.29	.26	.00	.00	.00	.00	.00	.00
Relocation of position of doors	.80	.13	.00	.02	.83	.40	.00	.32	.00	.00	.00	.00	.00	.00
Relocation of position of windows	.82	.35	.57	.98	.90	.40	.57	.32	.00	.00	.00	.00	.00	.00
Change of windows to suitable types	.68	.84	.29	.74	.70	.00	.29	.00	.00	.00	.00	.00	.00	.00
Hanging of curtains on the windows	.58	.52	.29	.55	.55	.00	.29	.79	.00	.00	.00	.00	.00	.00
Blocking of doors for maximum privacy	.67	.79	.29	.90	.67	.60	.29	.68	.00	.00	.00	.00	.00	.00
Addition of burglary proof on entrance door	.76	.75	.29	.05	.73	.00	.29	.89	.00	.00	.00	.00	.00	.00
Installation of burglary proof on windows	.70	.74	.71	.90	.69	.60	.71	.68	.00	.00	.00	.00	.00	.00
Addition of extra block on fence	.78	.61	.71	.03	.71	.60	.71	.84	.00	.00	.00	.00	.00	.00
Screening plants on existing fence of house	.72	.87	.71	.90	.73	.40	.00	.84	.00	.00	.00	.00	.00	.00
Visual screening plants on balconies	.71	.89	.43	.69	.75	.00	.71	.74	.00	.00	.00	.00	.00	.00
Replacement of existing floor finish materials	.72	.77	.43	.84	.71	.40	.71	.74	.00	.00	.00	.00	.00	.00
Installation of odour extractor in the kitchen	.99	.99	.29	.90	.01	.00	.29	.95	.00	.00	.00	.00	.00	.00
I do not look into my neighbour's house	.59	.78	.71	.57	.62	.60	.43	.95	.00	.00	.00	.00	.00	.00
I scrutinize my activities on time	.63	.83	.71	.60	.69	.00	.43	.68	.00	.00	.00	.00	.00	.00
Amendment of set-back for my house	.82	.12	.71	.91	.87	.60	.71	.21	.00	.00	.00	.00	.00	.00
Planting of garden in the neighbourhood	.88	.94	.29	.98	.88	.00	.29	.21	.00	.00	.00	.00	.00	.00
Creation of open spaces in-between houses	.85	.74	.71	.14	.79	.20	.43	.89	.00	.00	.00	.00	.00	.00
I regulate my interactions with neighbour	.66	.85	.29	.67	.70	.40	.29	.68	.00	.00	.00	.00	.00	.00
Language styles such as busy for neighbours	.78	.11	.29	.72	.85	.00	.29	.00	.00	.00	.00	.00	.00	.00
Body gesture to communicate to unwanted guest	.75	.90	.29	.76	.78	.40	.29	.00	.00	.00	.00	.00	.00	.00
Facial expressions to dialogue with neighbor	.78	.99	.29	.78	.82	.00	.29	.00	.00	.00	.00	.00	.00	.00
<b>Mean Index</b>	<b>.81</b>	<b>.89</b>	<b>.58</b>	<b>.92</b>	<b>.81</b>	<b>.79</b>	<b>.55</b>	<b>.95</b>	<b>.84</b>	<b>.82</b>	<b>.74</b>	<b>.85</b>	<b>.74</b>	<b>.86</b>
<b>Group Mean Index</b>	<b>.76</b>			<b>.80</b>					<b>.81</b>					

Author Field Work (2024)

**Appendix 6**  
**Residents' Tenure Type, Occupation, and Privacy Regulating Mechanisms.**

Mechanism	Type of Tenure System					Occupation			
	Rent	Lease	Self-ownersh	Transfer/ Inheritance	Civil servant	Private employ	Self employed	Student/ unemploye	Retiree
Addition of bedrooms	.14	.37	.16	.67	.10	.75	.75	.75	.75
Conversion of spaces to other uses	.00	.84	.97	.93	.90	.53	.53	.53	.53
Adjustment of the initial layout plan of living room	.97	.53	.05	.93	.87	.53	.53	.53	.53
Separation of bedroom from guest areas	.79	.74	.90	.73	.74	.64	.64	.64	.64
Blocking of unwanted accesses to kitchen	.69	.11	.82	.80	.69	.53	.53	.53	.53
Screening of house against unwanted views	.65	.16	.84	.60	.64	.72	.72	.72	.72
Insulation of walls against unwanted noise	.01	.74	.36	.33	.02	.06	.06	.06	.06
Relocation of position of doors	.80	.53	.88	.93	.64	.92	.92	.92	.92
Relocation of the position of windows	.92	.42	.89	.60	.67	.81	.81	.81	.81
Change of windows to suitable types	.70	.32	.68	.53	.62	.64	.64	.64	.64
Hanging of curtains on the windows	.56	.89	.55	.47	.51	.47	.47	.47	.47
Blocking of doors for maximum privacy	.69	.58	.71	.40	.58	.44	.44	.44	.44
Addition of burglary proof on entrance door	.79	.89	.75	.20	.68	.50	.50	.50	.50
Installation of burglary proof on windows	.65	.79	.77	.60	.64	.33	.33	.33	.33
Addition of an extra block on fence	.71	.95	.71	.60	.58	.50	.50	.50	.50
Screening plants on existing fence of house	.67	.47	.79	.67	.63	.36	.36	.36	.36
Visual screening plants on balconies	.70	.21	.74	.00	.61	.44	.44	.44	.44
Replacement of existing floor finish materials	.70	.21	.70	.00	.59	.47	.47	.47	.47
Installation of odour extractor in the kitchen	.90	.53	.03	.00	.87	.64	.64	.64	.64
I do not look into my neighbour's house	.65	.79	.59	.73	.60	.31	.31	.31	.31
I scrutinize my activities on time	.72	.84	.60	.80	.60	.42	.42	.42	.42
Amendment of set-back for my house	.86	.37	.85	.20	.72	.72	.72	.72	.72
Planting of garden in the neighbourhood	.81	.26	.95	.93	.80	.78	.78	.78	.78
Creation of open spaces in-between houses	.73	.26	.90	.87	.79	.56	.56	.56	.56
I regulate my interactions with neighbours	.72	.79	.65	.67	.59	.28	.28	.28	.28
Language styles such as busy for neighbours	.89	.37	.74	.93	.71	.53	.53	.53	.53
Body gesture to communicate to unwanted guest	.79	.11	.74	.67	.71	.56	.56	.56	.56
Facial expressions to dialogue with neighbours	.87	.89	.75	.87	.74	.44	.44	.44	.44
<b>Mean Index</b>	<b>.79</b>	<b>.25</b>	<b>.82</b>	<b>.77</b>	<b>.71</b>	<b>.90</b>	<b>.00</b>	<b>.93</b>	<b>.57</b>
<b>Group Mean Index</b>			<b>.91</b>		<b>.82</b>				

Author Field Work (2024)



Original scientific paper

# District-based Rental Value Coefficients for Shopping Mall Development in Istanbul

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## ARTICLE INFO:

### Article History:

Received: 25 May 2024  
Revised: 30 August 2024  
Accepted: 1 September 2024  
Available online: 5 September 2024

### Keywords:

District-Based Analysis,  
Commercial Rental Value,  
Shopping Mall Development,  
Urban Real Estate Investment,  
Istanbul Retail Market.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*This study investigates the district-based rental value coefficients for shopping malls in Istanbul, a city with significant commercial real estate activities. The research focuses on identifying regional and district variations in rental income values, crucial for urban retail investment success. Data were collected from 101 active shopping malls across 39 districts and analyzed using arithmetic mean and proportional rate methods. The findings indicate that districts such as Bakırköy, Beşiktaş, and Kadıköy have the highest rental values, while Esenyurt, Arnavutköy, Sultanbeyli, and Sancaktepe rank lowest. These insights provide valuable guidance for investors during the feasibility phase of shopping mall projects, highlighting the importance of location in achieving financial success. The study emphasizes the role of socio-economic conditions and accessibility in rental value determination, offering a detailed analysis that contributes to the socio-economic dimension of urban studies. The results guide retail investors in utilizing district-based coefficients for more accurate feasibility assessments, ultimately supporting sustainable commercial real estate development and urban improvement.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 476–487.

<https://doi.org/10.25034/ijcua.2024.v8n2-11>

[www.ijcua.com](http://www.ijcua.com)

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### Highlights:

- Higher socio-economic status of districts increases the rental value coefficients of shopping malls.
- Improved accessibility and public transportation connectivity positively affect the rental income of shopping malls in Istanbul.
- The diversity and visibility of tenant stores are positively correlated with the rental values of shopping malls.
- Proximity to central business areas increases the commercial rental values of shopping malls in Istanbul.

### Contribution to the field statement:

This study contributes to the field of urban retail investment by providing valuable socio-economic insights and offering practical guidance to decision-makers during the feasibility stage of their investments.

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### How to cite this article:

Yoğurtçu, F. B., & Köksal, A. (2024). District-based Rental Value Coefficients for Shopping Mall Development in Istanbul. *Journal of Contemporary Urban Affairs*, 8(2), 476–487. <https://doi.org/10.25034/ijcua.2024.v8n2-11>



## 1. Introduction

Shopping malls, which are a type of commercial real estate, have evolved into new socialization hubs where urban communities share their commercial experiences, parallel to the development of metropolitan regions. Due to the decline in the quality of public infrastructure in traditional centers, urban functions have gradually shifted from conventional areas to new city centers (Derya Arslan & Ergener, 2023). This type of building affected the development of urban and territory forms (Manuel Pagés Madrigal, 2018). Moreover, these centers have impacted not just urban lifestyles but also influenced urban communities in terms of socioeconomic and cultural living conditions, as well as the security perceptions of households residing in nearby areas (Caymaz, 2019; Olla et al., 2023). This central urbanization has also changed the culture of retail. Consumers preferred to visit these centers more often. As a result, retail real estate investors are developing large-scale shopping center projects in urban city centers.

From a retail real estate investor's perspective, the development and management of these malls require careful consideration of market trends and consumer preferences. Besides, these investments have a significant effect on the evolving dynamics of urbanization, encompassing cultural, and socioeconomic conditions, and demographic shifts in the surrounding areas (Ho et al., 2016; Ke and Wang, 2016; Ananthakumar and Sinha, 2019). Moreover, these centers are risky ventures for investors due to their location feature, require large amounts of capital, and require a relatively long period on the return of their investment in an economic context. Since the primary objective of an entrepreneur is to achieve high returns from his/her investment in the long term, the commercial success of the shopping center is critically important. In this direction, the rental value of commercial units also plays a decisive role in the financial and socioeconomic success of these centers (Patat, 2018; Özegeli, 2016; Iskandar, 2017; Astarini & Utomo, 2023; Nebati et al., 2023).

According to the literature, there are many studies conducted on the factors that affect the rental income of shopping malls. These are location, center's pulling power, the purchasing power of nearby household's income level, total leasing rate and period of commercial units, competitiveness in the retail market, sales ratios, shopping externalities, shopping mall management's service quality (Benjamin et al., 1990; Sirmans C.F. and K. Guidry, 1993; Ingene and Ghosh, 1990; Okoruwa et al., 1994; Hardin III and Wolverton, 2000; Tay et al., 1999; Gatzlaff et al., 1994; Sirmans et al., 1996; Ghosh, 1986). Alongside these factors, tenant mix is also crucially important in rental values (Wu et al., 2023; Xu et al., 2022; Zhang et al., 2023; Leung et al., 2024). Retail investors need to develop a correct tenant mix to achieve commercial and financial success from their shopping mall investments. According to Gamal and Romadhon (2023) and Khairunnisa (2023), another significant impact on rental income is the visibility of stores. In their research, they portrayed a positive relationship between the visibility of retail and rental values. It is emphasized that as the visibility of the store increases, the rental value also maximizes. Among the visibility of stores, the diversity of products offered by brand stores also affects the rental value (Yuo & Tseng, 2021; Orr & Stewart, 2022). Rozilah Kasim et al. (2018), proposed that green building certification potentially leads to higher rental income for commercial real estate investors. However, studies conducted by Masebe et al. (2020), Che et al., (2023), and Liu et al., (2022) highlight the rising trend of e-commerce in the retail market following COVID-19. They argued that this trend decreased rental rates and lowered the leasable areas of retail space in shopping malls.

In line with all these studies, it is noteworthy that rental income is a significant factor in shopping mall development for both urban life quality and commercial real estate investment success within a two-dimensional approach. At this point, if investors fail to accurately predict the future rental values of commercial units at the feasibility stage of the venture, the investment may lose its future profitability in the economic context. Moreover, misallocation of capital expenditure may lead to unwanted situations such as bankruptcy or foreclosure in the long term (Miles et al., 2000). In terms of urbanization, if the investment fails, socialization areas for households living in the immediate vicinity may decrease, employment may slow down, and security problems may arise. Since these



difficulties bring financial and social issues, an optimal solution to determine rental incomes is needed at the feasibility stage. In this respect, a skilled strategy should be developed for both sustainable commercial real estate development and urbanism.

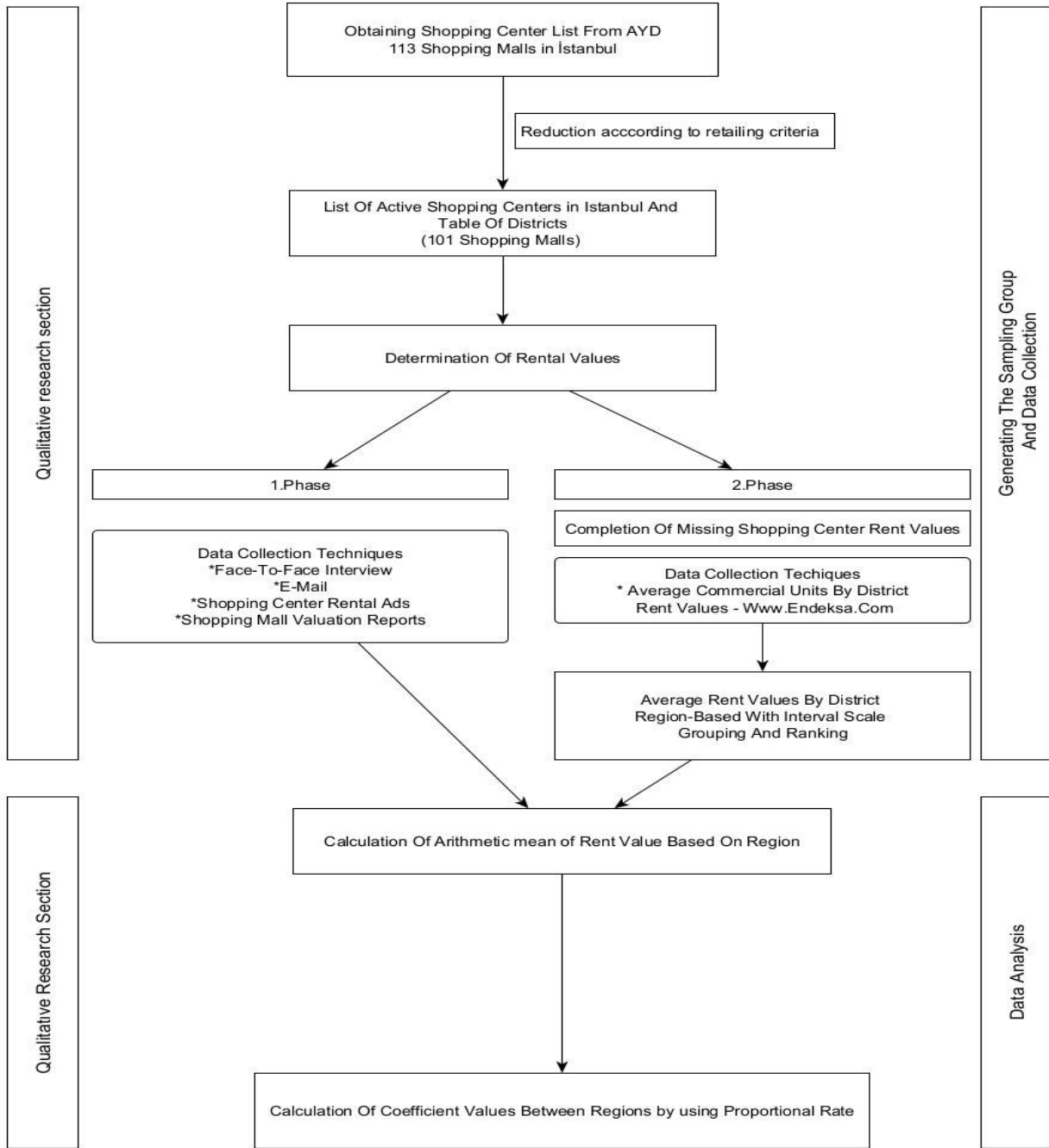
Literature review shows that limited research has been conducted on the commercial rental values focused on the city or district level. To fill this gap, this study aims to empirically investigate the district-based coefficient values of commercial rent income in commercial real estate investment. The scope of methodology consists of two parts; data collection and data analysis. During the data collection phase, face-to-face interviews, shopping valuation reports, and rent ads were used to obtain rental values, the missing data of the rental income were completed by the values on the [www.endeksa.com](http://www.endeksa.com) website.

To create the data set, firstly, all rental values from the website were ranked by using an interval scale and then classified based on regions and districts. After classification, the input data of shopping mall rental values has been added to the dataset regarding regions. When analyzing the data set, the arithmetic mean technique was used to calculate the average rental value of each region. To achieve the district-based coefficient value the proportional rate was used. The findings of this article contribute to the socio-economic dimension of urban studies by providing a detailed analysis of commercial rental values across various districts, which is crucial for understanding the economic situation of urban retail investments. Meanwhile, this research also guides investors to employ district-based rental coefficient values during the feasibility stage. So, the ventures make decisions based on tangible data.

This study is structured into five main sections, including the introduction. In the second section, the selected shopping malls for the dataset are described, and the methodology of the data analysis is detailed. The results derived from the analyses are interpreted in the third section. Implications and findings were discussed in the fourth section. The final section offers projections for future studies by summarizing the overall conclusions.

## 2. Materials and Methods

The research design consists of two main phases: data collection and data analysis as illustrated in Figure 1. While the first part shows the research studies conducted during the data collection phase, the second part demonstrates the analysis process of the dataset. At the end of these stages, region-based rental value coefficients were calculated in line with the research objective.



**Figure 1.** Research Framework.

### 2.1. Study Area

Istanbul province was selected for this study due to its prominence in Turkey's shopping mall industry. As of 2023, Turkey hosts a total of 446 shopping malls, with the majority located in Istanbul (30%) and Ankara (9%) (GYODER, 2023). Istanbul boasts the largest gross leasable area (GLA) for shopping malls in the country, totaling 5,213,721 square meters. This accounts for approximately 38% of Turkey's total GLA of 14,009,962 square meters, far exceeding Ankara's 1,655,941 square meters and the combined 7,140,310 square meters in other cities (GYODER, 2023).

However, since 2017, shopping centers across Turkey have faced economic challenges, leading to a decline in their functionality (Eva Real Estate, 2019). Istanbul, with its vast leasable area, was particularly affected, experiencing a 17% decrease in leasable space (Eva Real Estate, 2019). Furthermore, both in Istanbul and across Turkey, the growth rate of shopping mall investments has

decreased since 2017 (GYODER, 2023). This slowdown can be attributed to macroeconomic policies within the country and the global COVID-19 health crisis. These uncertainties have deterred both local and foreign investors from pursuing new shopping mall projects, especially in Istanbul.

As Turkey's most populous and dynamic metropolitan area, Istanbul comprises 39 districts, with 24 on the European side and 15 on the Asian side, and an official population of 15,655,924 in 2023 (TURKSTAT, 2024). This city is also at the center of economic growth and is envisioned as a global city, positioning itself among global cities (Sadri, 2017). Therefore, due to these reasons, Istanbul was selected as the case study area for this research.

## 2.2 Data Collection

This study tries to identify the commercial rental value pattern for different districts of Istanbul by putting forward coefficient values among districts. For this reason, 101 active shopping mall investments located across 39 districts in Istanbul were utilized for the analysis.

According to the Shopping Mall Investors Association (AYD), there are 131 shopping malls in Istanbul province by the year 2023. The study was initiated with this list where certain criteria were applied; inactive malls and the malls with certain retail characteristics (i.e. outlets) (a total of 30) were eliminated from the list. Several approaches were followed to obtain the commercial rental values. The first step was face-to-face interviews with the management team of malls where a handful of them accepted the invitation.

The second step was to review shopping mall valuation reports which are publicly available. The third attempt was to review rental advertisements for commercial units in shopping malls published by the Istanbul Chamber of Commerce and Industry website. As a result of these attempts, 40 shopping malls' actual monthly rental value data for 2023 were gathered. The Endeksa website ([www.endeksa.com](http://www.endeksa.com)) was used to complete the rest of the 61 shopping malls' data. Endeksa is a platform that utilizes big data analysis and machine learning methods to provide real estate value, location data analysis, and predictions. The purpose of this platform is to enable individuals to confidently complete real estate transactions by offering transparent, independent, and up-to-date real estate values. This platform's reliability stems from being founded by certified experts in real estate valuation, regular monthly updates of data, and data access is facilitated through a subscription-based membership system. However, these rental values do not reflect the actual monthly rental income of the shopping mall investments operating in that region. They only indicate the rental values of small and medium-sized commercial areas operating for commercial purposes in the relevant district. Therefore, the values obtained from this website were only used to ascertain the general ranking of districts from highest to lowest, and for classification as regions.

Monthly commercial unit rental value ranges, obtained from [www.endeksa.com](http://www.endeksa.com) website, based on districts of Istanbul are demonstrated in Table 1. This table shows the general ranking of commercial unit rental values based on regions.

**Table 1:** Commercial Unit Rental Value Ranges for Istanbul based on Districts in 2023.

Region Number	Commercial Unit Rental Value Range (\$ / m <sup>2</sup> )	Districts in Istanbul
1	8,1 \$ -9 \$	Bakırköy, Kadıköy, Beşiktaş
2	7,1 \$ -8 \$	Şişli, Sarıyer, Fatih
3	6,1 \$ -7 \$	Güngören, Bayrampaşa, Zeytinburnu, Beyoğlu, Eyüpsultan, Üsküdar
4	5,1 \$ -6 \$	Ataşehir, Pendik, Tuzla, Maltepe, Ümraniye, Kartal, Başakşehir, Avcılar, Beylikdüzü, Kağıthane, Büyükçekmece, Bahçelievler, Bağcılar, Gaziosmanpaşa, Küçükçekmece
5	4 \$ - 5 \$	Esenyurt, Sancaktepe, Arnavutköy, Sultanbeyli

When constructing the whole dataset with a total of 101 shopping mall samples for Istanbul, the rental incomes of 40 shopping centers were placed regarding relevant regions by using Table 1 with their original values obtained from the first phase of data collection. For the remaining 61 shopping malls, rent values determined on a district basis were used in Table 1.

### 2.3 Data Analysis

The dataset including a total of 101 shopping mall monthly rental value is based on empirical data obtained from various sources in the retail market. To achieve the coefficient values for each zone, the arithmetic mean and proportional rate methods were used during the data analysis process. These methods are simple, easy, and trustworthy to apply and also have validity for empirical studies (McDonald & Morris, 1984).

Initially, the commercial rental values in the whole dataset were calculated for each region. In this way, the lowest commercial rental value region was identified. Subsequently, the coefficient value of this zone was set as 1, and other regions' coefficients were calculated by using the proportional rate method. Clusters were created and determined as "Region 1-2-3-4-5" with similar district coefficient values.

### 3. Results

As stated in the introduction section of our study, calculating the rental income of commercial units in shopping mall investments has a significant impact in the context of the investment's success. However, many factors determine rental income. Foremost among these factors is the geographical region. Given that there is currently no database of this nature available for investors, this study aims to reveal shopping malls' district-based commercial rental coefficient values in Istanbul. As a result, district-based rental coefficient values of 101 shopping malls operating in Istanbul by the year 2023, were demonstrated in Table 2.

**Table 2:** District-based Commercial Rental Coefficient Values of Shopping Malls in Istanbul.

Region Number	Districts in Istanbul	Commercial Rental Values by Region	Coefficients Rate
<b>Region 1</b>	Bakırköy, Kadıköy, Beşiktaş	53,69 \$ /sqm	3,56 x
<b>Region 2</b>	Şişli,Sarıyer,Fatih	47,63 \$ /sqm	3,16 x
<b>Region 3</b>	Güngören, Bayrampaşa, Zeytinburnu, Beyoğlu, Eyüpsultan, Üsküdar	44,10 \$ /sqm	2,92 x
<b>Region 4</b>	Ataşehir, Pendik, Tuzla, Maltepe, Ümraniye, Kartal, Başakşehir, Avcılar, Beylikdüzü, Kağıthane, Büyükçekmece, Bahçelievler, Bağcılar, Gaziosmanpaşa, Küçükçekmece	35,42 \$ /sqm	2,35 x
<b>Region 5</b>	Esenyurt, Sancaktepe, Arnavutköy,Sultanbeyli	15,07 \$ /sqm	1,00 x

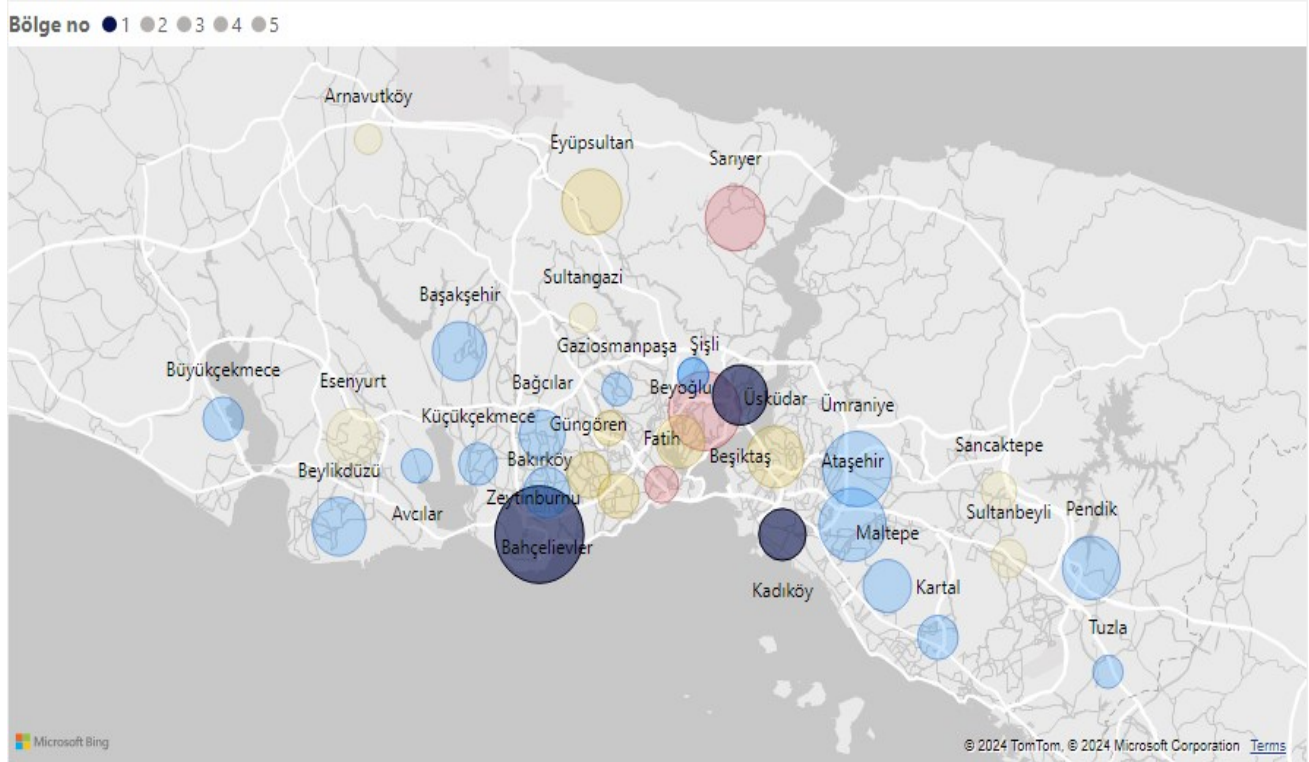
As shown in Table 2, the coefficient value of the shopping malls located in Kadıköy, Beşiktaş, and Bakırköy districts representing Region No.1's coefficient is 3.56. When these districts' values are compared to other regions, it is observed this zone has the highest value concerning rental income.

In terms of Region No 2, which contains Şişli, Sarıyer, and Fatih districts, commercial rental income coefficient values are calculated as 3.16. There is a fractional difference between the first and second regions.

The shopping malls placed in Güngören, Bayrampaşa, Zeytinburnu, Beyoğlu, Eyüpsultan, and Üsküdar districts are within the scope of Region No.3. Their rental income coefficient values of these districts are 2.92. Besides, the coefficient value for Region No.4 consisting of Ataşehir, Pendik, Tuzla, Maltepe, Ümraniye, Kartal, Başakşehir, Avcılar, Beylikdüzü, Kağıthane, Büyükçekmece, Bahçelievler, Bağcılar, Gaziosmanpaşa, Küçükçekmece are calculated as 2.3. Lastly, the rental value coefficients of the shopping centers operating in Sancaktepe, Esenyurt, Arnavutköy, and Sultanbeyli have the lowest value of 1.00.

Based on these coefficients, it can be assumed that monthly rental incomes of shopping malls in Istanbul for 2023 on a square basis in terms of regions are approximately 53.69 \$/sqm for Region 1, 47.63 \$/sqm for Region 2, 44.10 \$/sqm for Region 3, 35.42 \$/sqm, and finally 15.07 \$/sqm for Region 4. These values can be used for feasibility works for investments.

To guide commercial real estate investors on which districts in Istanbul have the highest commercial rental income potential, the findings of this research were visualized using the POWER BI application and displayed in Figure 2. In this map, the colors and the size of the circles represent the potential and strength of commercial rental income in different locations. This visualization helps investors understand which areas may offer greater rental income potential.



**Figure 2.** The commercial rental income level map for Istanbul province is based on districts.

#### 4. Discussion

This article was conducted to present the commercial rental coefficient values for 101 actively operating shopping malls located in various districts of Istanbul by the year 2023. The results indicated that the shopping centers located in Sancaktepe, Esenyurt, Arnavutköy, and Sultanbeyli (Region 5) have the lowest rental income based on their coefficient value, while the malls established in Kadıköy, Beşiktaş, and Bakırköy districts (Region 1) have the highest coefficient value. In recent years, infrastructure improvements initiated by the municipality improved the public to Region 1. However, Region 5 (Sancaktepe, Esenyurt, Arnavutköy, and Sultanbeyli) has limited public accessibility. It implies that consumers prefer to visit these centers of attraction frequently because they can easily

reach these locations by various means of transportation. So, it shows that if more consumers drop in on these malls, both the frequency of visit rate and rental income would be increased. Therefore, the easy access feature of a shopping mall is a significant factor in terms of retail investment success. This implication and the results of the study also validate the outcome of previous studies about the positive effects of easy access to the rental values conducted by Bodkin and Lord (1997), Bloch et al. (1994), Nebati and Ekmekçi (2019) and Ferman and İlhan (2019). However, according to the study's findings, the Beşiktaş district requires a special evaluation. The shopping centers with the highest rental value in Istanbul are located in this district on the Zincirlikuyu-Levent-Maslak line, which is the Central Business Area (CBD) of Istanbul. In this direction, the result that the rental values of the shopping centers, especially those operating in the Beşiktaş district are the highest is consistent with the results of the model established by Demircioglu (2010).

In terms of socio-economic status, Şişli, Sarıyer, Kadıköy, Beşiktaş, and Bakırköy districts which have the highest rental value coefficients are among Turkey's most developed districts at the highest level (Sege,2022), while Arnavutköy, Esenyurt, Sancaktepe, Sultangazi, and Sultanbeyli districts are relatively at a lower level. These districts are mostly situated in the peripheries of the sub-centers, especially on the eastern side of the city. Household incomes in this region are somewhat lower than in the other regions. Therefore, this indicates that socio-economic conditions, particularly household income, play a crucial role in understanding the economic landscape of urban retail investment success. This finding was also in line with the other studies conducted by Sirmans C.F. & K. Guidry (1993), Hardin III & Wolverson (2000), Demircioglu (2010), White J.R. & Gray K.D. (1996) and Des Rosiers et al. (2005). Ho et al. (2016) argued that there is a positive relationship between the income level of the households residing in the shopping center vicinity and commercial rental values. Besides that, this result also supports the emphasis by Olla et al. (2023) on the impact of shopping malls on the urban lifestyle, culture of retail, and socio-economic conditions.

On the other hand, Şişli and Sarıyer districts are also within the area defined as the Central Business area of Istanbul, similar to Beşiktaş district. Located between the Bosphorus bridges and ring road connections, these places provide advantages in terms of easy transportation. High-rise buildings built in this region have also increased the value of the region. Also, due to the high-income population living in these districts, the rental income of shopping centers operating in these locations within the city is relatively higher than the centers in other sub-regions which was emphasized by Demircioglu (2010). In this case, it is an expected result that the rental values of shopping centers operating in the districts in Region 2 will be higher than in Region 3, Region 4, and Region 5.

This study is limited to observing shopping malls in Istanbul and does not reflect the rental income of anchor shops or small-sized shops. The results only depict the overall ranking by districts and the monthly average rental values concentrated on regions. Within the scope of this study, the findings of the rent income cannot be generalized to all other types of commercial real estate and for other countries.

## 5. Conclusion

Accurate determination of commercial rental values during the feasibility phase of shopping mall investments is important in terms of ensuring financial success and increasing the quality of urban life. In this direction, investors should formulate a proficient strategy for achieving sustainable commercial real estate development and urban improvement. This research aimed to determine the commercial rent coefficient values of shopping centers based on districts. In line with the purpose, a data set was prepared using data from a total of 101 retail shopping malls that were actively operating in Istanbul in 2023 as the study area. District-based ranking and region-based classification methods were used to create the data set and the arithmetic mean and proportional rate techniques were used to analyze. The results obtained according to rental price coefficient values discussed in this article are briefly summarized below:

- The success of an investment in a shopping mall is often measured by high rental returns for investors. However, such ventures significantly impact the socio-economic status of

households living in the immediate vicinity. In this context, continued investment in shopping malls in urban centers could potentially increase employment rates and thereby household incomes, contributing positively to the local population.

- To implement a sustainable investment project, it is crucial to ensure easy access to the area where these investments are located. Therefore, investors and policymakers should collaborate closely. Policymakers can enhance public transportation systems by expanding coverage with new routes, increasing the capacity of existing routes for more efficient service, and improving user satisfaction by increasing the frequency of bus, tram, and metro services to reduce waiting times. Additionally, using environmentally friendly vehicles like electric buses can enhance the sustainability of the public transport system.
- Shopping mall management can also attract consumers by developing various marketing strategies such as promotions and discounts to draw them to these centers.

The findings of this article contribute to the socio-economic dimension of urban studies through a detailed analysis of commercial rental values across different districts. This analysis is crucial for understanding the economic landscape of retail investments in urban cities and also Istanbul province. Moreover, the research guides investors on utilizing district-based rental coefficient values during the feasibility stage.

In future studies, the sustainable commercial rental value prediction model can be revealed with more cases for Turkey to achieve financial and socioeconomic success in retail investments. Regarding the results, a survey can be conducted in the districts that have the lowest rental coefficient values to determine the expectations of households living in the immediate vicinity as consumers of shopping malls and to increase visit frequency to these centers.

### **Acknowledgements**

This research did not receive any specific grant from funding agencies in the public, commercial, or non-for-profit sectors.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflicts of Interest**

The author(s) declare(s) no conflicts of interest.

### **Data availability statement**

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

### **CRedit author statement:**

Fatma Bengü Yoğurtçu: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Visualization, Writing - Original Draft; Almula Köksal: Funding Acquisition, Supervision, Validation, Writing - Review & Editing, Formal Analysis, Methodology, Investigation, Project Administration. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Yoğurtçu, F. B., & Köksal, A. (2024). District-based Rental Value Coefficients for Shopping Mall Development in Istanbul. *Journal of Contemporary Urban Affairs*, 8(2), 476–487. <https://doi.org/10.25034/ijcua.2024.v8n2-11>



Original scientific paper

# Countering Urban Redundancy with a Multipronged Strategy: Lessons from Ashram Road, Ahmedabad

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## ARTICLE INFO:

### Article History:

Received: 15 June 2024  
Revised: 20 August 2024  
Accepted: 2 September 2024  
Available online: 5 September 2024

### Keywords:

Urban Decline,  
Core-Area,  
Real-Estate Approach,  
Urban Regeneration,  
Adaptability,  
Central Business District (CBD).

## ABSTRACT



*Urban redundancy, often observed in the core areas of cities, poses significant challenges to sustainable development and urban vitality. This study addresses urban redundancy by proposing a quantitative framework to both identify and mitigate its effects, using Ashram Road in Ahmedabad, India, as a case study. The research employs a Multi-Criteria Decision-Making Analysis (MCDMA) based on data collected through physical surveys and literature reviews. This analysis integrates approaches such as redevelopment, adaptive reuse, policy interventions, and economic strategies to counter redundancy effectively. The findings highlight that Ashram Road's core area, despite its historical and cultural significance, faces challenges like poor maintenance, high vacancy rates, and inadequate utilization of the available floor space index (FSI). The proposed framework aims to develop context-sensitive strategies that uphold the intrinsic value of core urban areas while promoting sustainable regeneration. The study demonstrates the need for a balanced approach that combines modern development with preservation, providing insights for urban policy-making that enhances the resilience and longevity of city cores.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 489–508.

<https://doi.org/10.25034/ijcua.2024.v8n2-12>

[www.ijcua.com](http://www.ijcua.com)

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Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

### Highlights:

- The implementation of the Multi-Criteria Decision-Making Analysis (MCDMA) framework reduces urban redundancy and optimizes resource use.
- A balanced approach that integrates modern development with historical preservation enhances the cultural and economic vitality of core urban areas.
- A plot-by-plot urban regeneration strategy increases the effectiveness of interventions and minimizes waste.
- The combination of redevelopment, adaptive reuse, and economic strategies improves urban resilience and ensures the longevity of central business districts.

### Contribution to the field statement:

The study offers a new entry point into urban renewal and regeneration. Existing literature is mainly focused on the nature and implications of regeneration or the stimuli for it. Relatively lesser scholarship exists on the decision-making process, and even lesser, on a plot-by-plot approach. The resultant gap is duly addressed through this research.

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### How to cite this article:

Acharya, M. (2024). Combating Urban Redundancy with a Multipronged Strategy: Lessons from Ashram Road, Ahmedabad. *Journal of Contemporary Urban Affairs*, 8(2), 489–508. <https://doi.org/10.25034/ijcua.2024.v8n2-12>



## 1. Introduction

Urbanization in contemporary cities is rapidly evolving, leading to significant challenges such as inadequate infrastructure, environmental degradation, social disparities, and resource constraints (Koko & Bello, 2023). In India, much of the developmental activity over recent decades has occurred in what are now the core areas of cities—geographical centers that serve as hubs of connectivity, residential, and commercial functions while embodying the city's identity and character. These core areas play a vital role in sustaining urban vitality and combating urban decline (Miranda, Silva, & Costa, 2020).

However, despite their strategic importance, core areas in many Indian cities are facing a decline in growth. Urban expansion primarily occurs in peripheral areas, resulting in shrinking city cores. This shift in focus toward the city's peripheries has led to a neglect of the core areas, which were once central to urban development and economic growth (Rogerson & Giddings, 2021). Census data from 2011 reveals this trend, showing population declines in the core areas of cities like Delhi (-9.91% in the central district), Mumbai (3.87% growth, which is less than one-fifth of the previous decade), Chennai (6.97% growth, half of the previous decade), and Kolkata (-1.83% in the municipal corporation area). These statistics indicate a significant demographic shift away from city cores, suggesting that these areas are struggling to adapt to contemporary needs.

This inability of the core areas to accommodate present-day requirements leads to the phenomenon of "urban redundancy." Urban redundancy refers to built and public spaces that become obsolete or unusable due to various factors, including the lack of adaptability of existing infrastructure, poor maintenance, physical deterioration, demographic shifts, and changes in the urban morphology or character. Beyond physical attributes, urban redundancy also extends into the cultural domain, where collective practices or traditions may lose relevance within a particular context.

Given the intrinsic interconnectedness of the core areas with the overall urban fabric, redundancy in these areas can adversely affect the entire city. Urban cores function as key economic centers, meeting the city's population needs (Randhawa & Kumar, 2020). Redundancy, therefore, poses a risk to valuable urban assets and resources, creating a disconnect between older core areas and newer developments such as transit-oriented development and transferable development rights. This disconnect can lead to decreased engagement between residents and the city, reducing its 'porosity'—the fluid exchange of people, goods, and ideas within urban spaces (Baba, Aktaş, Balioglu, & Kaba, 2023).

To counteract urban redundancy, there is a pressing need to optimize the utility of core areas while preserving their inherent value. The critical question that arises is whether these core urban areas can be reused, repaired, refurbished, and recycled to conserve their vitality, utility, and historical significance. Addressing urban redundancy necessitates a detailed decision-making process that considers the specific type and extent of redundancy in a given area. Strategic decisions in urban planning have lasting impacts on living conditions, environmental sustainability, and the overall organization of urban spaces (Burinskienė et al., 2017). This study proposes a multi-faceted framework, demonstrated through the case of Ashram Road in Ahmedabad, India, as a vital tool for guiding urban policy and planning. According to NITI Aayog's 2021 report, India's urban policy must "shift from blanket regulations to area-specific regulations to ensure the optimum use of urban land" (NITI Aayog, 2021). An approach tailored to the specific area, considering market conditions at each location, is economically prudent (Byahut, Patel, & Mehta, 2020). This framework aims to facilitate complex urban regeneration and renewal initiatives, encouraging thoughtful and context-sensitive interventions in urban areas.

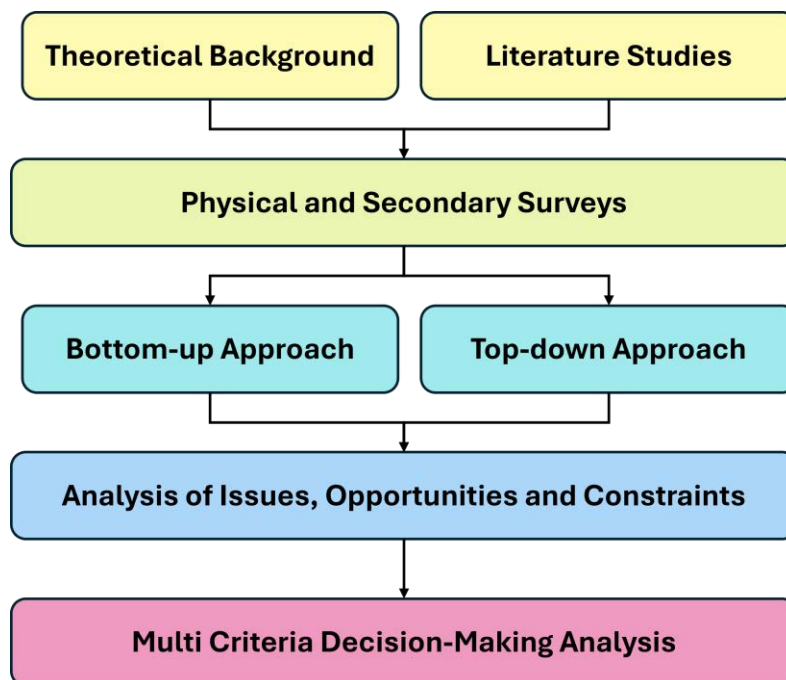
This research draws on existing theories about the lifecycle of a city to explore urban redundancy. Cities can be viewed as living organisms that evolve and change over time (Nassar, 2021). Two notable theories—the ones proposed by Lewis Mumford and Griffith Taylor—suggest that urban decay or decline is a natural stage in the lifecycle of a city. According to Mumford (1938), a city progresses through stages from its beginnings as an agricultural center ('Eopolis') to a mechanized, specialized hub ('Polis'), and finally to a vast, declining metropolis ('Necropolis') due to resource strain. Similarly, Taylor (1945) describes a city's evolution from a rudimentary settlement ('sub-infantile') to a complex urban environment that eventually experiences physical decay ('senile' stage).

Both Mumford and Taylor acknowledge urban decline as an inevitable phase, characterized by evident morphological changes and contextual shifts. This research delves deeper into these theoretical frameworks, focusing specifically on the core areas of cities. The study reviews several scholarly works

to understand urban decline and revitalization in the Indian context. For example, Ganapati (2014) examines the paradox of shrinking cities in India, noting population decline in urban cores alongside peripheral growth. Kumar and Kumar (2022) explore "bypass urbanization," where outdated policies and economic pressures exacerbate socio-spatial inequalities. Jariwala and Bhagat (2020) emphasize revitalization strategies that combine financial tools with historical preservation. Patel (1999) critiques Ashram Road's role as a Central Business District and suggests spatial interventions to rejuvenate the area.

The objectives of this study are to identify and classify the factors contributing to urban redundancy, understand the significance of core areas within the city, and mitigate the shortcomings in planning regulations for Central Business Districts (CBDs) to prevent redundancy. It also aims to analyze the spatial impacts of urban redundancy within core areas and CBDs, their interrelationships, and existing planning frameworks that address these issues.

Ashram Road in Ahmedabad was selected as the study site due to its historical and current significance as a core urban area. The research employs both bottom-up and top-down approaches, using physical surveys and visual documentation to assess the site's characteristics. A multi-criteria decision-making framework is developed to align site-specific attributes with appropriate urban regeneration strategies, providing a comprehensive response to urban redundancy.



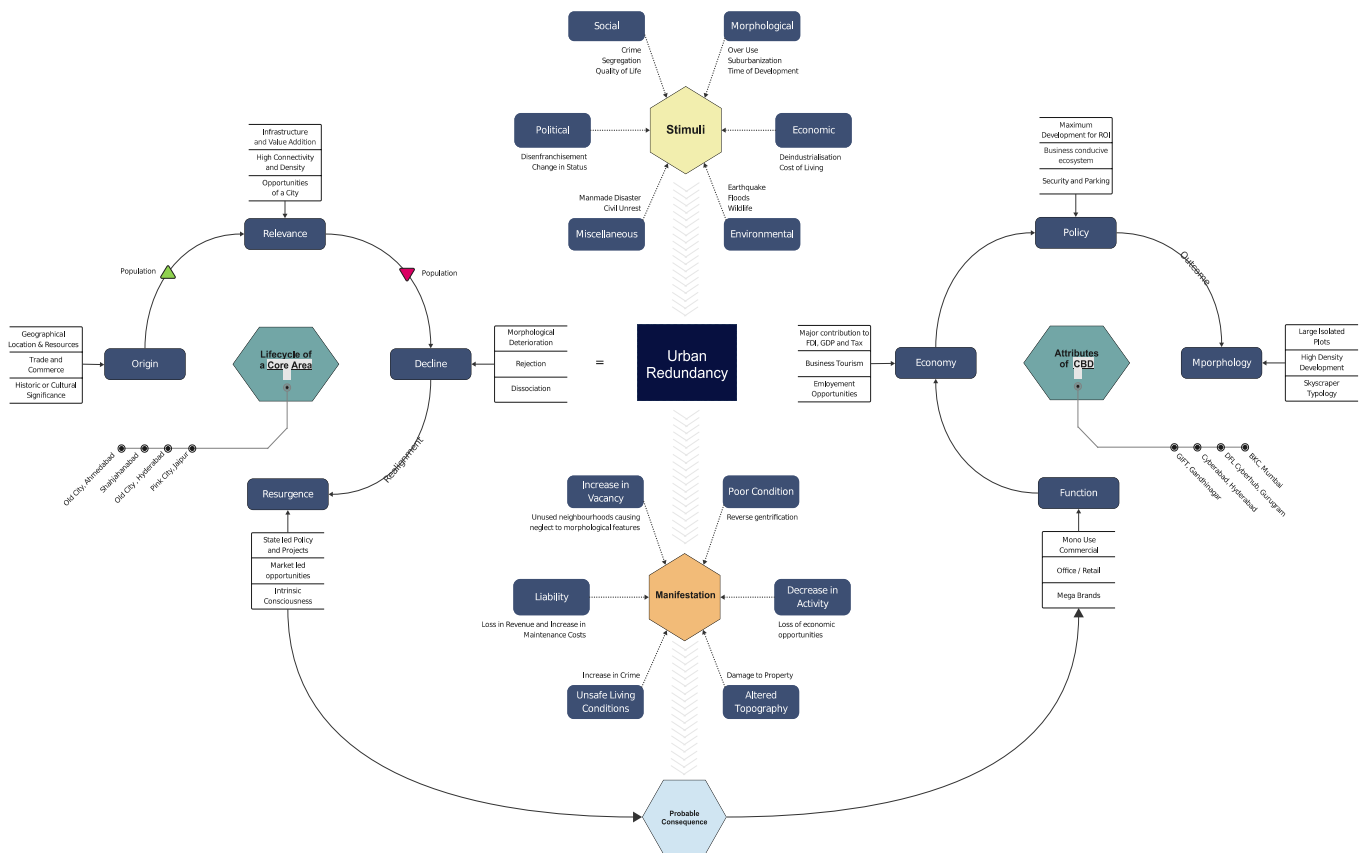
**Figure 1.** Diagram Depicting Chronology of Research Methodology.

## 1.2 Structure of The Study

A city originates from a core, which may be established due to many reasons. These include geographical stimuli, such as topography or proximity to a water body; a trade/commerce stimulus, such as a busy trade route; and historical or cultural stimuli, such as the birth of a kingdom or a community. As the city begins to develop, it invites a steady influx of population, creating dense settlements. A lot of commercial and residential infrastructure begins to take shape to accommodate the population growth. The core, with its well-distributed services and amenities, offers a lot of opportunities for business and recreation.

As the infrastructure of the core becomes overused, it gradually gives way to morphological deterioration. Peripheralization begins to occur, redistributing the existing population. This induces vacancy in the core area, and its morphology undergoes severe neglect and deterioration. It also becomes dissociated with newer development initiatives, ultimately growing redundant. Resurgence is achieved when the city core realigns itself with newer developments and policies and operates at full potential by increasing its capacity and replacing unproductive redundant areas with prime real estate and commercial hubs.

From a social perspective, redundancy may be caused when the pressure on existing resources increases, leading to a drop in the quality of life. Additionally, high-density occupation of a certain social class in the core may lead to segregation and increased crime. From an economic perspective, as demand supersedes supply, the cost of living in the city core may be too high for a majority of the population to afford. This manifests as a loss of economic opportunity. Economic conditions like deindustrialization, recession, etc. may force the population out of the city center. Redundancy may also be caused due to political conditions- a change in the government that introduces revised policies, or the disenfranchisement of a certain social group which subsequently shifts out of the core. The environmental reasons for redundancy are mostly, natural disasters such as earthquakes and floods. In such events, the natural topography and morphology may get temporarily or permanently altered. Redundancy may also be caused due to reasons such as man-made disasters, war, and civil or communal unrest, which may manifest as a safety threat or destruction of property. In such cases, the core may become a liability to the city, with a loss of revenue and a need for increased maintenance. Once a core area displays poor morphological conditions, vacant real estate, loss of activity and demography, and unsafe living conditions, there is a tendency to overcome this situation by stimulating a market-led commercial approach. A concentration of commercial functions in a core area translates to a CBD, which contributes majorly to the GDP and tax revenue for the city while also bolstering employment opportunities. The CBD, along with a prominent industrial base in the region, can potentially facilitate business tourism. The city must be able to establish a standardized regulatory framework and a conducive business ecosystem for the CBD to flourish. In return, the CBD can provide stature, character, and monetary benefits to the city. The result of these conditions will provide a unique morphology to the city that is characterized by high-rise, high-density development in large, isolated plots with a singular use.



**Figure 2.** Structure of the Study.

This study can help plugin to the design strategies for revitalizing urban centers, enhancing liveability, and ensuring the longevity of city cores.



## 2. Urban Evolution and Site Selection: The Case of Ahmedabad

Ahmedabad, in western India, is Gujarat's largest city. The Sabarmati River runs through its heart, with the Gandhi Ashram located on the western side. On the opposite bank, the Calico Museum of Textiles features an extensive collection of both antique and contemporary textiles. These institutions reflect Ahmedabad's distinct cultural character. Cultural heritage, with its physical, diverse, and intangible aspects, needs innovative approaches for preservation, renovation, and adaptation. (Akdağ & Sayar, 2020).

Additionally, the area under the Ahmedabad Urban Development Authority (AUDA) and the Ahmedabad Municipal Corporation (AMC) has constantly been increasing with Town Planning Schemes as a development tool (Bharti & Mehrotra, 2020). Ahmedabad has experienced remarkable urban growth through strategic planning and development, transforming into a vibrant and inclusive city that blends modern infrastructure with its rich tradition (Tognon, Narayanan, & Rossi, 2020). However, the census data for Ahmedabad reflects a population decline of 0.76% annually in core-area wards like Navrangpura, while peripheral areas of Bopal, Ghuma, and Sanand are increasing at 20.89%, 25.83%, and 19.58% respectively. Ashram Road is located in the heart of the city, in the Navrangpura ward. It marks the point where the city of Ahmedabad was established and later began expanding westward. The area consists of significant residential, institutional, and commercial developments, some dating back to the 19th century. It is the cultural and financial hub of the city, yet it lacks a multiplicity of activities. Although designated a CBD in 1954, it differs from CBDs globally in planning regulations like higher ground coverage, FSI, height, etc. The building stock from the 1970s-1980s is now deteriorating due to poor maintenance and loss of character. Population restructuring, decline in activity, and degenerating morphology all together qualify Ashram Road as an opportunity to study redundancy.

### 2.1. Characteristics of The Site

Ashram Road in Ahmedabad is strategically positioned between two significant areas: CG Road, a prominent commercial and retail hub, and the Walled City, the historical core of Ahmedabad. This area is aligned with one of the city's largest infrastructure initiatives, the Sabarmati Riverfront Development, a project aimed at revitalizing the riverbanks for public use, enhancing urban aesthetics, and improving environmental conditions. Additionally, Ashram Road forms a substantial segment of the north-south metro corridor, which is a critical component of the city's expanding public transportation network.

An analysis of the occupancy trends over time on Ashram Road reveals a complex narrative of urban development and transformation. Although the built environment in this area has seen considerable expansion since the 1950s, the majority of buildings still date back to the 19th century. These older structures, many of which have historical and cultural significance, far outnumber the developments introduced over the last two decades. Notable landmarks along Ashram Road include the Mill Owners' Association Building, designed by Le Corbusier in the 1950s during the height of Ahmedabad's textile industry boom, the Town Hall, one of the city's oldest public assembly halls, and Chinubhai Tower, a multifunctional commercial complex that overlooks the Sabarmati River.

The strategic location of Ashram Road has made it a repository of Ahmedabad's architectural heritage, blending historical buildings with more recent developments. However, this has also resulted in a patchwork of jurisdictional boundaries governed by multiple urban local bodies, complicating urban management and planning efforts. These boundaries include lands under the Ahmedabad Municipal Corporation (AMC), the Special Purpose Vehicle: Sabarmati Riverfront Development Corporation Ltd. (SRFDCL), and the Indian Railways.

The multifaceted governance structure and jurisdictional complexities have led to fragmented development policies and inconsistent land use regulations. This situation creates challenges in maintaining a cohesive urban fabric and optimizing the area's potential for commercial and cultural revitalization. Furthermore, the site's positioning along the Sabarmati River and its inclusion in the metro corridor provide unique opportunities for connectivity and redevelopment, aligning with city-wide efforts to promote sustainable urban growth and integration.

Ashram Road's diverse urban landscape—ranging from historical precincts to modern infrastructural projects—reflects both its enduring significance and the challenges it faces in adapting to contemporary urban needs. As a result, it serves as an ideal site for studying the phenomena of urban redundancy and



exploring strategies for urban regeneration that balance heritage conservation with modern development demands.

### 3. Material and Methods

Peripheralization in cities often amounts to population losses from core city areas. At the outset, individuals often recognize the need to relocate to suburban areas to fulfill their aspirations, such as enjoying a closer connection to nature, breathing fresher air, embracing a different lifestyle, distancing themselves from the city core, gaining more privacy, living in detached homes, and having larger green spaces (Fuladlu, 2019). The change in the core area is manifested in the form of morphological changes, activity decline, and population loss. These can be analyzed through an urban design lens. A site study that oscillates from architectural to urban scale reveals aspects such as building age and architectural value through a study of vacancy, building condition, and urban context.

Further, the core area reflects the identity of the city and its growth. For planning initiatives that adopt a top-down approach, the city core is critical to gauge the needs of the city, and its response to large-scale changes. When the core is planned as a Central Business District, it becomes even more necessary to analyze its propensity to adapt to the corresponding development control regulations. An urban planning study reveals the regulatory frameworks and policy-making bodies involved in the implementation process.

#### 3.1 The Urban Design (Part-To-Whole/Site Upwards) Lens

An analysis of the plot-by-plot morphological conditions of the site is the best entry point for this research because it reveals the degree of redundancy and the effect it has on the present condition of each plot. Planning-based studies for analyzing redundancy may suggest demographic decline, but urban design-based studies involving a physical analysis of built form and activity are necessary to rationalize this statistical data. For instance, low occupancy may be manifested through the ill-maintained or abandoned condition of a building, building age may be indicated through the state of degeneration, and context may reveal the heritage value of a building. Each of these parameters is necessary to firstly, define redundancy, and secondly, to classify it based on the causes of redundancy.

##### 3.1.1 Methods

A qualitative method was employed for a series of mapping and classification tasks. This included conducting condition mapping based on the façade appearance of buildings through a physical survey. Architectural Value mapping was performed by classifying each building according to the uniqueness of its architectural styles, utilizing both physical surveys and literature reviews. Land ownership mapping was conducted by categorizing plots as public or private through surveys. Similarly, land use mapping involved classifying plots into categories such as residential, commercial, defunct, institutional, and mixed-use through physical surveys. Intangible value mapping was carried out based on the historic significance of buildings as described by residents. Additionally, various town planning schemes within the study areas were determined. The built morphology of the study area was visualized using physical surveys and satellite imagery.

A quantitative method was employed for specific tasks. This included conducting vacancy mapping through physical surveys. Ground coverage mapping was carried out by assessing the percentage of built-up area in each plot using satellite imagery. Additionally, the Floor Space Index (FSI) was performed by determining the existing FSI utilized on each plot as prescribed by the urban local body.

A mixed method was employed for the following set of tasks. Jantri rate (circle rate) mapping was conducted by reviewing the Revenue Department's Annual Statement of Rates (ASR) for individual plots. The three-dimensional visualization of vacancy rate was achieved through a combination of physical and satellite imagery. Finally, multi-criteria decision-making analysis was performed by converting various qualitative methods into quantitative data.

### 3.1.2 Physical surveys

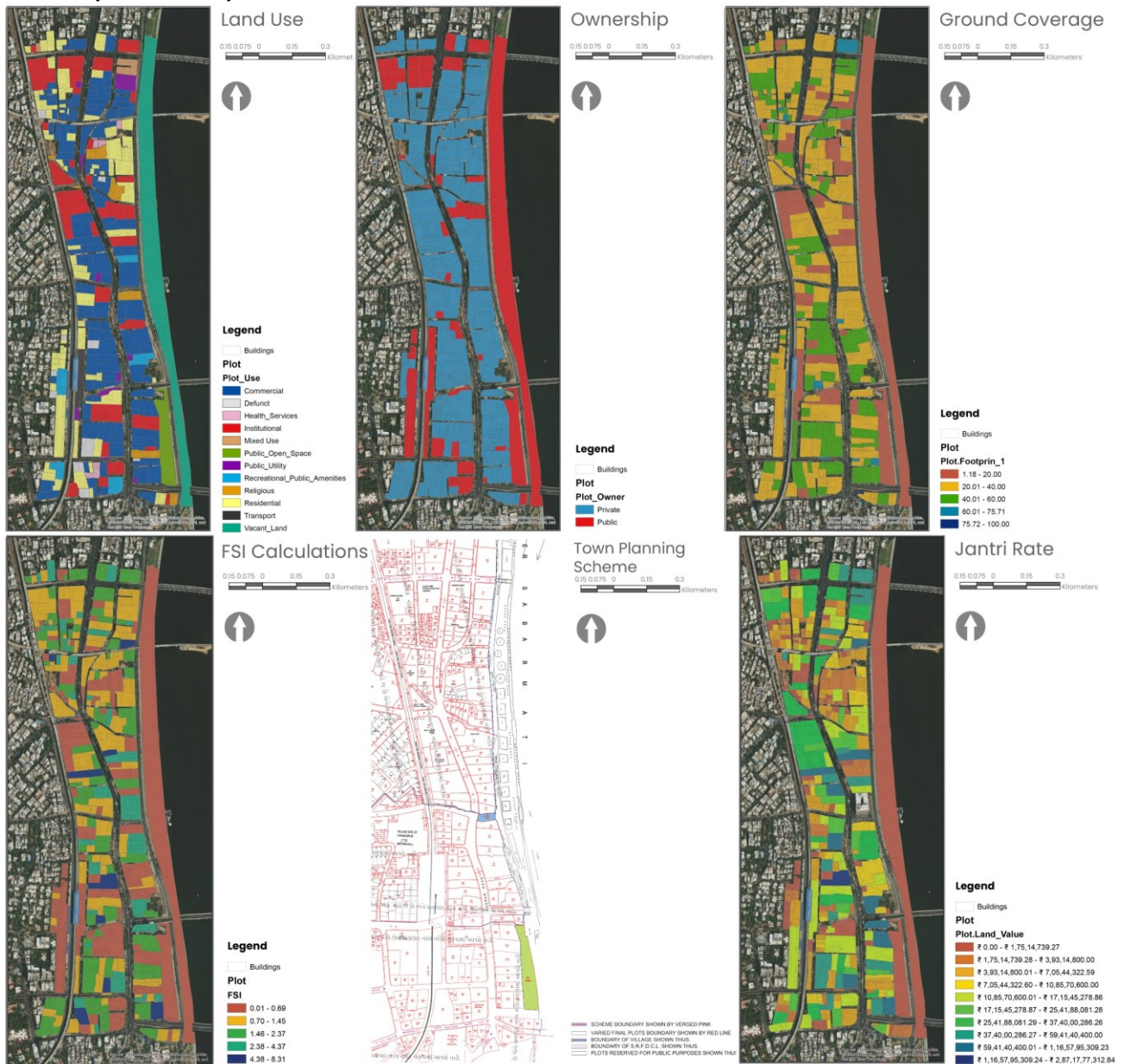


Figure 3. Physical Survey of Site.

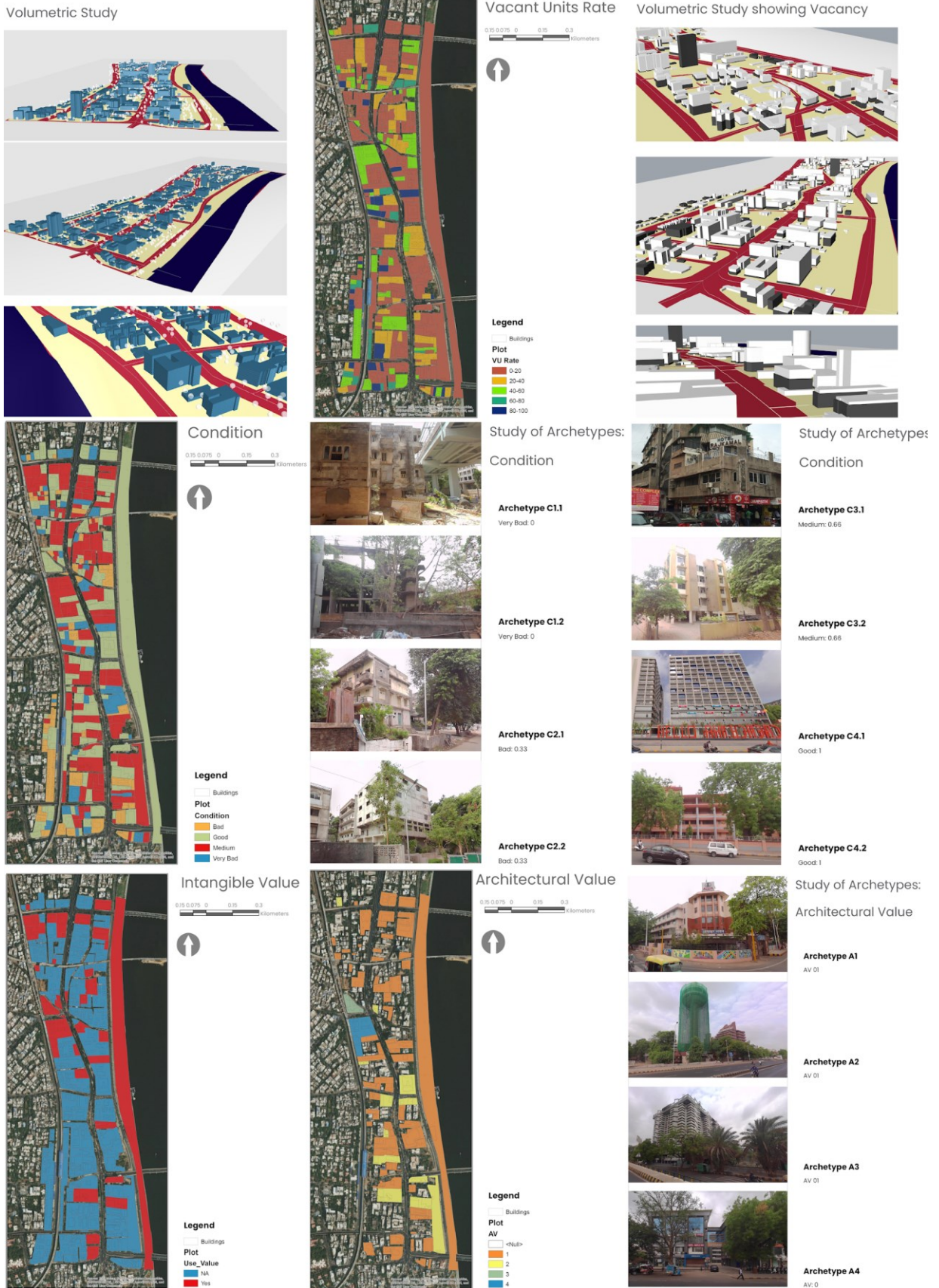


Figure 4. Physical Survey of Site.



### 3.2 The Planning (Whole-To-Part/City Downwards) Lens

Once parameters relating to the urban design analysis are established, then a study of the planning framework, legislation as well as regulations of CBD may help in ascertaining what aspects need to be considered for countering redundancy in the core area depending on the degree and cause of redundancy. These parameters will also help in defining the trajectory of growth and the developmental needs of the city.

#### 3.2.1 Methods

A qualitative method was employed to investigate the process of urban development in the study area. A quantitative method was employed to determine the change in the percentage of existing and proposed land use through a literature review of reports prepared by urban local bodies. Additionally, demographic changes were investigated through the review of available census data.

A mixed method was employed for studying the development of Ahmedabad from 1487 to the present. The qualitative method revealed major milestones in the city's history, such as the establishment of a municipal corporation, economic movements, and infrastructural development. Concurrently, the quantitative approach provided detailed information on the percentage growth in the area through a literature review, physical surveys, and satellite imagery. Additionally, a mixed method was used to study existing development regulations concerning building unit area, ground coverage area, margins, FSI, height, and other factors for interventions in the study area. This included a three-dimensional visualization of the morphology permissible under existing regulations.

#### 3.2.2 Primary/secondary data collected

##### *Market dynamics:*

Changing market preferences and shifting demand patterns could contribute to the decrease in transactions and increasing vacancy. Factors like varying demography, evolving lifestyles, and the rise of new real estate hubs might be responsible for redirecting demand from central locations to the outskirts of Ahmedabad (Mittal & Kashyap, 2015). When real estate capital is redirected to higher-yielding property types and locations, moderately priced components (buildings or districts) of an urban built environment are underinvested in (Derrington, 2021). The Ashram Road CBD has declined from 21% (2021) to 2% (2022) transaction split as compared to the other two CBDs in the periphery which contribute significantly at 83% (2022) from 58% (2021) and 15% (2022) from 22% (2021) in the same period.

##### *Regulatory Frameworks*

Ashram Road is governed by many layers of development control regulations, including those aligned with requirements for a CBD and for Transit Oriented Development, as well as those prescribed by regulatory bodies responsible for each of its multiple development boundaries. Some of these are discussed below:

##### *1. Development Control Regulations (DCR), Ahmedabad*

The maximum permissible floor space index (FSI) of a building unit shall be 5.4 with a base FSI of 1.8 and a chargeable FSI of 3.6. There is no restriction on the maximum permissible building height (subject to clearance from the Airport Authority). The minimum area for a building unit is 3500 sq. m. for buildings with a height of more than 45m. The permissible uses of a building are classified as Dwelling-1,2,3, Mercantile- 1&2, Business, Religious, Educational-1&2, Institutional, Hospitality-1&2, Assembly-1,2&3, Service Establishment, Sports and Leisure, Temporary Uses, Parks, Public utility, Public Institutional.

##### *2. Transit-oriented development (TOD), Ahmedabad*

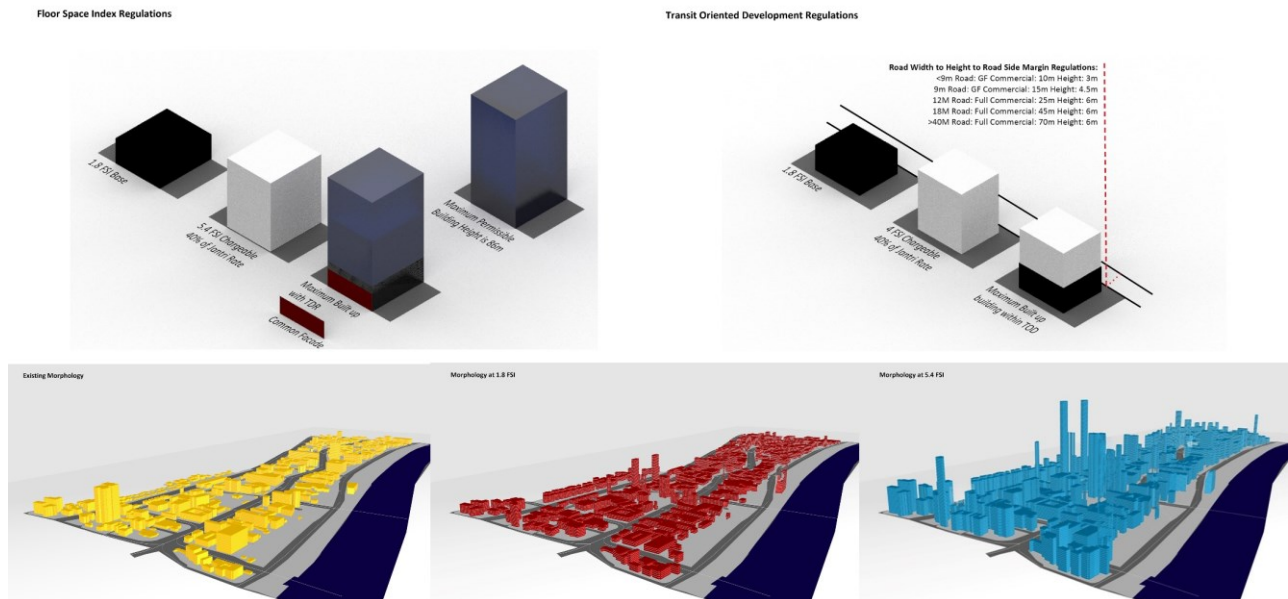
The maximum permissible floor space index (FSI) of a building unit shall be 4 with base FSI as 1.8 and chargeable FSI as 2.2. The maximum building height of a building shall be calculated as per road widths. There is no restriction on the minimum area for a building unit. The permissible uses of a building are classified as Dwelling-1,2,3, Mercantile- 1&2, Business, Religious, Educational-1&2, Institutional, Hospitality-1&2, Assembly-1,2&3, Service Establishment, Sports and Leisure, Temporary Uses, Parks, Public utility, Public Institutional

##### *3. Conditions for Redevelopment, Gujarat*

The redevelopment of a building requires that either the building has completed a period of 25 years from the date of issuance of the development permission by the concerned authority, or that the building has been declared dilapidated, ruinous, or dangerous to any person occupying, visiting or passing by the structure or any adjacent structure of place by the concerned authority. The consent of not less than 75% of the building's members is mandatory for the redevelopment process to take place.

#### 4. Central Business District (CBD) Regulations

The Central Business District (CBD) regulations specify an FSI of 5.4 for development. This supersedes Transit Oriented Development (TOD) regulations. Hence, the application of CBD regulations is done on the existing site to build possible scenarios as per the base floor space index (1.8) and permissible floor space index (5.4).



**Figure 5.** (Above) Visualization of the morphology resulting from the application of CBD and TOD regulations. (Below, from left to right) Visualization of the existing morphology of Ashram Road, morphology at a base FSI of 1.8, and morphology at a permissible FSI of 5.4.

### 3.3 Identification of Issues, Opportunities, and Constraints

According to the study of the function and architectural value of buildings, it is inferred that even the redundant areas in the core city have highly valuable assets that are a source of commerce, character, and identity for the city. The character of these assets is slowly diminishing as they are surrounded by defunct buildings. The loss of economic opportunities is causing a loss in public activity. On overlapping site surveys with the volumetric analysis of vacancy, it is inferred that there is a massive vacancy rate in Ashram Road in both built and open spaces. Built areas have a high number of vacant units that are decreasing the property value of the entire precinct. Open areas are almost entirely private and unused or underutilized, negatively impacting prevalent activity patterns. The study of regulations reveals that the floor space index (FSI) utilized is far less than the available FSI. According to site studies, the condition of the buildings on site was observed to be left in a state of disrepair and low maintenance, which may potentially attract illegal activities. This can lead to a decline in the quality of life and a sense of insecurity and can harm the overall vitality of the area. These observations establish the need for intervention in the selected site.

### 3.4 Multipronged Approaches for Intervention

Observing our cities and landscapes, it becomes clear that utilizing existing sites, repurposing remnants from the past, and adapting old buildings to new functions are practices that have existed throughout human history, beginning as intuitive responses. (Chiacchiera & Mondaini, 2023). It is essential to



approach the development of Ashram Road with a balanced perspective. Instead of viewing it as just another site for CBD expansion, it is crucial to recognize and preserve the specific characteristics that make Ashram Road unique. Maintaining its identity while fostering growth as a CBD requires a thoughtful and sensitive approach. This approach should prioritize a harmonious blend of modern development and the retention of Ashram Road's historical, cultural, and architectural significance. Historical elements, particularly, should be preserved and restored, given the detrimental effect that the loss of historical character can have on urban identity (Sönmez, 2020). A combination of multiple urban design approaches can be used to counter redundancy. These measures can be pro-development, which capitalize on resources that are under-utilized because of redundancy; or pro-preservation, which acknowledge the architectural, social, and cultural value of existing morphology; or pro-both, which make way for infrastructural growth with minimum impact on existing morphology. Pro-development measures include redevelopment, transit-oriented development, and market-driven development. Pro-preservation measures include adaptive reuse and conservation. Measures that combine both development and preservation include area-based development, transferable development rights, and policy-level intervention.

### 3.5 Multi-Criteria Decision-Making Analysis (MCDMA)

Taking into consideration the tangible and intangible characteristics of each plot, an MCDMA method is applied. This method is useful in streamlining and prioritizing multiple alternatives to determine the best one. Since the data sets pertaining to the research were extensive, derived from multiple sources, and included a combination of qualitative and quantitative aspects, MCDMA proved to be a logical decision-making tool. This method is used to rationalize the subjectivities pertaining to each characteristic to make an informed objective decision about what kind of approach may be suitable in each case.

#### 3.5.1 Criteria for MCDMA

The criteria identified for the MCDMA method are based on the qualifying aspects of a CBD. These are listed below:

**Plot area:** The area of the plot determines its walkability, as larger plots create greater travel distances. Bigger plots with areas of 7500-8000 sqm have been identified for intervention.

**Ground coverage:** Lesser ground coverage implies that the rest of the plot may be used for reorganization or enabling newer developments. It has been identified that maximum plots utilize only 30-40 percent of the plot.

**FSI:** If the FSI utilized by plots produces a built-up area that is lesser than the maximum permissible built-up area, then there is scope for optimization. It is observed that the average FSI utilized is 0.7, and the range used by most plots is between 1 to 1.5.

**Roads:** Access to roads is important for the connectivity of plots. It is observed that maximum roads are arterial roads and there is an absence of local roads.

Building names are indicated on the plan to identify the buildings currently present on the site.



**Figure 6.** (From top left to top right, and bottom left to bottom right) Plans mapping the plot area, ground coverage, plot name, land use, ownership, FSI, road condition, architectural value, and vacancy rate.

**Land use:** Studying the present land use determines the current functionalities of each plot. It is observed that most of the land falls under commercial use.

**Ownership:** Public ownership of land is more feasible for any interventions in the given site area. However, this is not a major criterion as the plots will be subjected to reorganization. It is observed that most plots are under private ownership.

**Condition:** The condition of buildings in a plot can help determine the degree of intervention it requires. It is observed that the condition of most plots is between poor and very poor.

**Architectural value:** The presence of unique or important architectural characteristics in the buildings of a plot can determine whether it must be retained. Many plots, particularly in the northern part of the site, were identified as having considerable architectural value.

**Vacancy rate:** The vacancy rate of a plot indicates its current state of utility. It is observed that many plots display 30-70 percent vacancy.

### 3.5.2 Normalization

The criteria for design demonstration have been weighed against the best practices for each criterion to counter redundancy, so that we may quantify the subjective data obtained through the above inferences:

**Plot area:** To promote walkability in plots, an area of 3500 sqm is ideal. Plots larger or smaller than this may be improved through intervention.

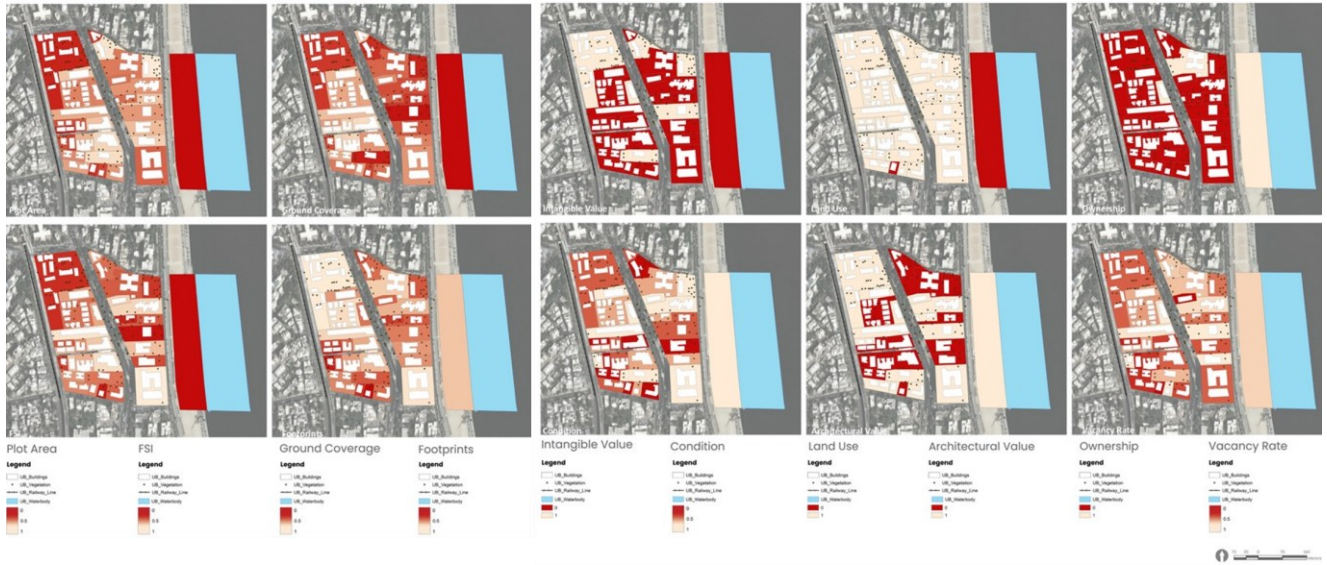
**Ground coverage:** The ideal ground coverage is taken to be 70-100 percent. Below this range, plots may need intervention.

**FSI:** The optimum FSI to utilize the maximum built-up area has been calculated as 4.5 - any plots displaying an FSI below or above this threshold may need intervention.

**Footprint:** Since ground coverage is intended to be between 70-100 percent, the ideal building footprint is calculated to be 3500 sqm.

**Intangible value:** Plots with buildings that have cultural symbolism and historicity or induce an emotional attachment are considered preferable, as opposed to buildings that do not have these features.

**Condition:** Plots that have buildings that are in a good or moderate condition are closer to being ideal and are given preference over plots that are in poor or very poor conditions.



**Figure 7.** Plans mapping the normalization of the plot area, ground coverage, intangible value, land use, ownership, FSI (Floor Space Index), footprints, condition, architectural value, and vacancy rate (from top left to top right, and bottom left to bottom right).

**Land use:** Plots that are still in use are considered ideal as opposed to plots with buildings that are abandoned or defunct.

**Vacancy Rate:** Plots that consist of buildings that have an occupancy of 80-90 percent are considered ideal as opposed to plots with lesser or no occupancy.

**Architectural value:** Plots with buildings that have unique architectural characteristics are considered preferable over plots that do not have such buildings. Additionally, if plots have multiple buildings with significant architectural value, they are considered closer to the ideal as they may be retained.

**Ownership:** Public ownership in plots, which enables them to be utilized, can be considered to be ideal. However, this is not a mandatory criterion.

### 3.5.3 Weightage for Multi-Criteria Decision Analysis

Comparing design demonstration criteria against best practices helps assign scores to each criterion through a multi-criteria decision analysis. A comprehensive weightage is assigned to each criterion. This weightage helps in calculating a consolidated score for each plot which provides a threshold against which we can identify the plots that need intervention.

**Table 1:** Weightage is assigned to individual criteria.

Criteria	Weightage	Determinant (Beneficial)	Rationale
<b>Plot Area</b>	5	3500 sqm	Plot sizes become more walkable with, say, 35*100m
<b>FSI</b>	15	4.5	Qualify for Core Area CBD (4.5)
<b>Ground Coverage</b>	5	1.0	Built to plotline to promote more construction closer to the ground
<b>Footprints</b>	10	3500 sqm	Buildings do not become too large
<b>Intangible Value</b>	10	Yes	Intangible attachment will promote historicity
<b>Condition</b>	15	Good	Identify buildings in disrepair
<b>Land Use</b>	5	In use	The function of the plots will be reassigned



<b>Architectural Value</b>	15	Yes	Promoting aesthetic imageability
<b>Ownership</b>	5	Public	Town planning scheme provides an incentive
<b>Vacancy Rate</b>	15	0%	Identify the number of vacant units in buildings
<b>Total</b>	<b>100</b>		



### MCDA Rating

#### Legend

- UB\_Buildings
- UB\_Vegetation
- UB\_Railway\_Line
- UB\_Waterbody



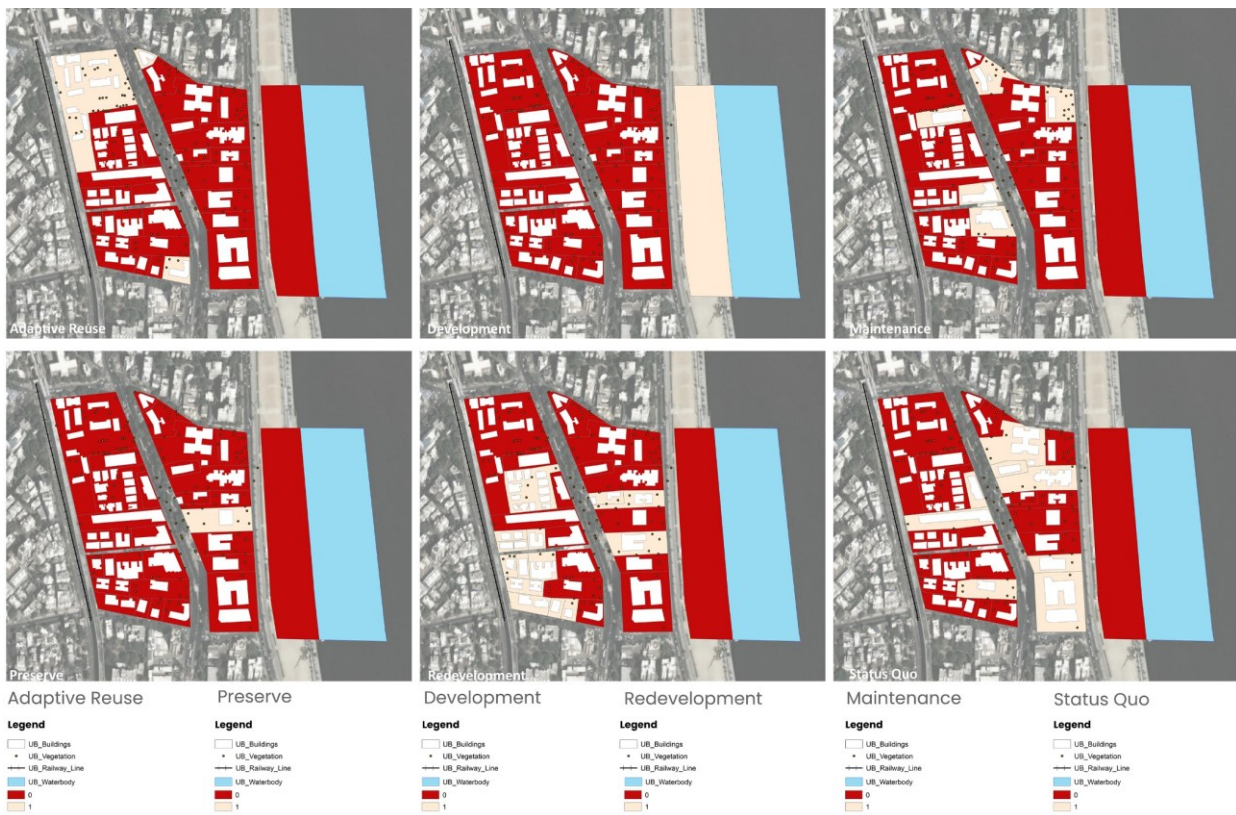
**Figure 8.** Plan mapping MCDA rating.

However, this type of weightage calculation results in a blanket solution which may not be the ideal response for each plot. The entry point for the intervention is also unclear. Therefore, an approach-based weightage must be undertaken. By using approach-based weightage we can focus the criteria on specific approaches. This allows a multi-pronged entry point at the plot level.

Under approach-based weightage, specific criteria are prioritized and in relation to each of these, a specific approach is determined.

**Table 2:** Weightage and Rationale Assigned to Each Proposed Approach.

Sr. No.	Approach	Criteria	Weightage	Rationale
1	Adaptive Reuse	Architectural Value	70	Architectural Value of a building will determine the need to retain a building for appropriation with a new function restore its vitality
		Vacancy Rate	10	
		Land Use	20	
2	Development	Plot Use	100	Open areas are required for future development
3	Maintenance	Condition	40	The condition of a building will ascertain a policy for maintenance and upkeep of the building to avoid deterioration
		Vacancy Rate	10	
		Intangible Value	5	
		Architectural Value	5	
		FSI	25	
		Ground Coverage	15	
4	Preserve	Architectural Value	70	Historicity of a building will provide identity and continuity
		Intangible Value	20	
		Ownership	10	
5	Redevelopment	FSI	40	Plots with lower FSI are impairing the operational potential of the core-area
		Condition	20	
		Vacancy Rate	10	
		Footprints	20	
		Plot Area	10	
6	Status Quo	FSI	30	Plots which utilize more FSI, with buildings which are in a good condition and display a low vacancy rate may not require immediate attention
		Ground Coverage	10	
		Condition	20	
		Architectural Value	5	
		Vacancy Rate	20	



**Figure 9.** Plan mapping ideal plots for adaptive reuse, development, maintenance, preservation, redevelopment, and maintaining the status quo using an approach-based weightage method (from top left to top right, and bottom left to bottom right).



#### 4. Results

According to the study of the function and architectural value of buildings, it is inferred that even the redundant areas in the core city have highly valuable assets that are a source of commerce, character, and identity for the city. According to qualitative and quantitative studies, plots can be categorized according to condition, vacancy, use, and architectural value, amongst other factors. Through the permutations and combinations obtained through such a classification, it is inferred that there is a diversity of typologies in the core area, implying that any intervention would have to be multi-faceted to target each of the unique combinations. Analysis of the census data revealed that the population growth is declining, and the city core is indeed shrinking. This corroborates with the morphological data obtained through the physical survey. Literature studies revealed that there is a vast disparity between the core-area regulations of the Indian context and that of other international contexts. CBD policies are also realized differently in cities around the world, which suggests that these differences may be the enablers for market-led development. Analysis of regulations reveals that 5.4 FSI provided is creating a state-led real estate approach to redevelopment creating high-rise buildings as a blanket solution to the entire Ashram Road resulting in the change in character and identity of the core area of Ahmedabad.

##### *Implications of the MCDMA framework:*

- Elimination of Redundancy: The plot-by-plot approach creates a customized response for each case of redundancy and streamlines available resources, thereby maximizing their potential and reducing wasteful practices.
- Future-ready: Integrating the site with proposed developments takes into account the changing real-estate trends and transportation systems, making the proposed response flexible and adaptable to future needs.
- Context Sensitivity: Attention to the urban character of the site and its historicity ensures that the site's identity is preserved and enhanced to create harmonious and contextually appropriate newer developments.
- Increased open public spaces: Increased number of open spaces generated by reorganizing plots for public utilization, enhance walkability, thereby creating an improved quality of life by providing opportunities for safe and accessible pedestrian and cycling paths, encouraging people to choose these sustainable modes of transport.

#### 5. Discussions

Further research may delve into the mechanisms that render the real estate approach successful without leading to the redundancy of certain areas. By studying successful examples, urban designers can identify the factors and strategies that contribute to the sustained relevance and vitality of neighborhoods and districts over time. This research can inform urban design practices and help create solutions that prevent redundancy. Investigating the economic implications of redundancy is essential to develop informed urban design solutions. Understanding how redundancy affects property values, investment patterns, and the overall economic health of an area can provide valuable insights. By considering these factors, urban designers can propose interventions that support economic diversity, attract investment, and mitigate the negative consequences of redundancy. It is crucial to expand the inquiry beyond core areas and explore how redundancy impacts other parts of the city, such as specialized townships and peripheries. Each area may have unique characteristics and dynamics that influence the way redundancy manifests and its effects. By studying these different contexts, urban designers can identify tailored approaches that work best in each case, fostering resilience, and preventing redundancy. Balancing market-driven urbanism with the longevity of city areas is a critical aspect of addressing urban redundancy. While market forces play a significant role in shaping urban development, it is important to consider the long-term sustainability and liveability of city areas. Urban designers can explore strategies that promote a balance between market-driven growth and the preservation of the city's identity, cultural heritage, and social fabric. Heritage



interpretation can undoubtedly be crucial in revitalizing historic urban areas by engaging in the preservation of the area's cultural values. (Munasinghe, 2022) This approach may involve implementing regulations, incentives, and design guidelines that encourage adaptive reuse, mixed-use development, and community participation.

## 6. Conclusions

Addressing urban redundancy in core areas requires a multi-pronged approach that recognizes the value of the present and the significance of the geographical core in shaping a city's identity and functionality. Cities transform in diverse ways and at uneven rates (Nemouchi, 2023). The detrimental effects of redundancy extend beyond the core and impact the entire city, making it essential to counter this issue. By countering redundancy, cities can unlock a multitude of benefits, including economic revitalization, social vibrancy, and morphological improvement.

Ashram Road exemplifies the challenges posed by redundancy in most cities around the world- the presence of a deteriorating historically significant core area co-existing with contrasting contemporary high-rise developments. In such a scenario, countering redundancy holds not just a morphological but also a cultural value, wherein the attributes that define the core area are retained, thereby keeping its character intact. Newer developments introduced in such an ecosystem consequently enhance, but never replace this character, thereby integrating well within existing systems of connectivity and infrastructure. This study establishes that Ashram Road's redundancy can be tackled more effectively through a thorough assessment of its characteristics that informs intervention. The state-led approach of overall increased FSI to promote high-rise redevelopment is likely to cause damage to the core area's existing assets and character; however, the development is inevitable and necessary.

Drawing inspiration from thriving historic cores as a precedent for countering redundancy provides lessons on land use, density, and street networks. By leveraging successful examples, the proposed framework seeks to ensure the core area's revitalization, adaptability to future needs, and integration with the overall urban fabric.

In conclusion, an approach that considers the multidimensional aspects of redundancy in core areas is crucial for sustainable urban development. In this study, social factors were considered to provide context and inform the research, but the exploration of social dynamics was limited and not extensively delved into. Further research on social factors can enrich potential scholarship around this subject. By embracing the value of the present, addressing redundancy in the core, and implementing a strategic framework, cities like Ahmedabad can breathe new life into their urban cores. Ultimately, countering redundancy is not only a step toward revitalizing the core area but also a pivotal move toward creating more resilient, inclusive, and sustainable cities.

Future studies on this topic can further elucidate the details of each approach. Additionally, parallels can be drawn between the morphological characteristics and socio-cultural parameters, which have not been explored in this research. Further, MCDMA can be used as a reliable tool to inform urban policymaking.

## Acknowledgments

I would like to express my gratitude to the faculty at the Department of Urban Design, School of Planning and Architecture, for their guidance and mentorship in this research. I would also like to thank my parents and my brother for their constant support and encouragement. I am also grateful to Geethanjali Raman for helping with editing and proofreading.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflict of Interests

The Author declares that there is no conflict of interest.



### Data Availability Statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

### CRedit author statement:

Conceptualization, Data curation, Formal analysis, Funding acquisition Investigation, Methodology, Project administration, Writing-original draft: Mohik Acharya, Writing-review and editing: Mohik Acharya & Geethanjali Raman. All authors have read and agreed to the published version of the manuscript.

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### How to cite this article:

Acharya, M. (2024). *Countering Urban Redundancy with a Multipronged Strategy: Lessons from Ashram Road, Ahmedabad*. *Journal of Contemporary Urban Affairs*, 8(2), 489–508. <https://doi.org/10.25034/ijcua.2024.v8n2-12>



Original scientific paper

# People, Places, and Perceptions: Assessing Spatial Quality Attributes of Urban Third-place With Projective Survey

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## ARTICLE INFO:

### Article History:

Received: 6 June 2024  
Revised: 28 August 2024  
Accepted: 3 September 2024  
Available online: 5 September 2024

### Keywords:

Urban Third-Place,  
Spatial Attributes,  
User Perceptions,  
Perceptions and Experiences,  
Human-Centric Urban Design,  
Projective Survey.

## ABSTRACT

*Urban third places, such as cafes, parks, and plazas, are integral to the social fabric of urban environments, providing spaces for informal social interaction outside of home and work. This study explores the spatial quality attributes that define these third places and their influence on user perceptions and experiences. By employing a projective survey, a qualitative research method utilizing ambiguous stimuli to reveal deeper user sentiments, the research identifies key characteristics that contribute to the desirability of these spaces. Findings highlight the significance of physical, functional, and social dimensions, including furniture design, spatial layout, and opportunities for social interaction. These attributes are shown to vary significantly across different age groups, with notable differences in preferences between younger and older participants. The study's insights inform urban designers and architects on creating inclusive, vibrant third places that enhance urban livability and economic vitality. The research underscores the need for a human-centric approach in urban design, emphasizing the importance of accommodating diverse user needs and preferences to foster a sense of community and well-being in urban settings. By understanding the nuanced relationships between spatial attributes and user perceptions, the study contributes to the development of more effective urban design strategies.*

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 509–528.

<https://doi.org/10.25034/ijcua.2024.v8n2-13>

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## Highlights:

The research demonstrates how spatial quality attributes of urban third places contribute to the enhancement of social-economic dynamics in the urban environment.

- The study identifies and analyses critical spatial quality attributes that enhance the overall quality of an urban third place.
- The use of projective surveys in assessing the spatial quality attributes of urban third places represents a novel methodological contribution to urban studies, offering a complementary approach to traditional quantitative methods.

## Contribution to the field statement:

The research contributes by establishing the significance of these characteristics in the formation of an urban third place. It also informs urban designers and architects in practice by identifying the key attributes that create more inclusive and vibrant urban environments influencing the urban economy as well.

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### How to cite this article:

Joshi, U. V., & Nagarsheth, S. (2024). People, Places, and Perceptions: Assessing Spatial Quality Attributes of Urban Third-place With Projective Survey. *Journal of Contemporary Urban Affairs*, 8(2), 509–528. <https://doi.org/10.25034/ijcua.2024.v8n2-13>



## 1. Introduction

Urbanization has rapidly transformed communities, resulting in numerous socio-cultural and urban changes. In many cities, this growth has led to social isolation, privatization, and a competitive lifestyle that often undermines a sense of community. Yet, a healthy community life with social inclusion remains an enduring expectation and has now become a desperate need. This need calls for spaces that offer opportunities for people to gather informally and enjoyably, connecting them as part of a broader community.

In 1989, urban sociologist Ray Oldenburg introduced the concept of the "third place," a setting distinct from the home and workplace that provides a refuge from both. As Oldenburg (1999) elaborates, these third places are informal urban gathering spots that foster inclusive sociability, where conversation is the primary activity and a key means of expressing individuality. These environments are essential for offering people the chance to relax, connect, and converse.

Despite the conveniences of modern life, the value of community remains paramount, particularly in developing countries like India, where community hubs are crucial for societal well-being. Gupta and Law (2023) point out that cities, despite being the primary economic engines of modern civilization, often become uninhabitable due to a lack of consideration for human psychology. This is especially true in India, where urban design frequently neglects human-scale considerations, emphasizing an interdependent relationship between human behaviour and the environment. Understanding this interaction is vital for attracting people to urban public places, as highlighted by Mehta and Bosson (2010). Research and implementation in India have primarily focused on urban planning at the city and neighbourhood levels, but a significant gap remains in comprehending the urban third place from a human-centric perspective. This study seeks to illuminate user perceptions and experiences of these spaces, offering insights that urban designers can utilize to enhance the urban economy.

Urban design and planning at various scales enable the identification of spatial quality attributes. At the city level, an extensive strategy is necessary to analyze spatial qualities, focusing on infrastructure configuration, road systems, and interconnectedness. Neighborhood-level studies emphasize street appearances, building and public space design, and mixed land use. However, the most critical yet often overlooked scale is the human-centric perspective, which is essential for understanding the connection between people and places.

Jan Gehl (2010) notes a wealth of knowledge and expertise at the city and neighbourhood levels, but the human dimension remains understudied. Policymakers and urban designers often lack the necessary attention and sensitivity to this scale. Examining spatial quality attributes from the human dimension is crucial, as they reflect people's perceptions of the urban third place and enhance its design. Gehl asserts that sensory experiences of urban environments are intricately linked to human senses and the proportions and scale of the surroundings. Assessing the spatial quality attributes of third places involves considering characteristics that contribute to their appeal, functionality, and experiential quality, shaping users' perceptions, interactions, and overall experience.

Traditionally, urban environments are perceived visually, limiting spatial understanding of third places. However, true comprehension extends beyond the visual, requiring a combination of non-visual senses for a holistic experience. Madanipour and Madani (1996) argue that limiting understanding to visual perception focuses solely on forms. A deeper exploration reveals space as a three-dimensional experience, encouraging interaction rather than mere observation. This principle applies to spatial design, where creating functional spaces for diverse purposes is paramount. Recognizing that design involves demonstrating ideas for spatial transformation, as Madanipour and Madani (1996) suggest, enhances the spatial experience of third places.

To identify spatial quality attributes of urban third places from a human perspective, we must analyze the environment at eye level, considering design elements like spatial planning, scale, proportion, distances, accessibility, sensory aspects, and human activities. The spatial layout of a third place is among the most significant attributes. The relationship between people and places necessitates



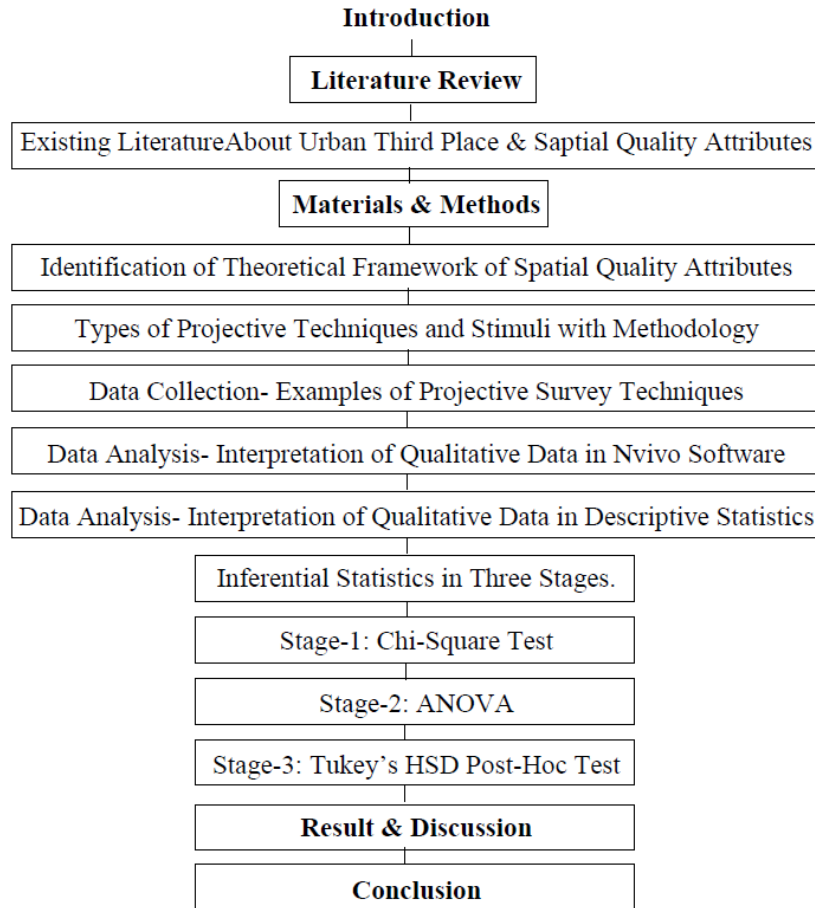
illustrating the physical condition of these spaces. According to Lukito and Xenia (2018), observing individuals' actions and emotions toward places and correlating these observations with environmental characteristics is crucial for understanding their significance.

In his book "Cities for People," Jan Gehl asserts that the spatial layout significantly influences potential utilization. Furniture orientation, design, and arrangement reinforce spatial planning, encouraging longer stays and various forms of interaction. Gallacher (2005) supports this view, emphasizing that urban public areas thrive with diverse purposes, offering activities like formal and informal interactions, leisure pursuits, and social engagement. These activities naturally inspire others to join, creating a vibrant social platform. Safety and security are also significant spatial attributes, as individuals tend to congregate in areas occupied by others, seeking protection (Felson, 1998).

An urban environment rich in visual and auditory experiences captivates individuals. Observing people pass by without cost is a primary urban attraction. According to Gehl (2010), the greatest source of joy is another human being, underscoring the importance of social interaction and engagement through sensory experiences. Places with activities and spontaneous encounters naturally attract people, reflecting the human tendency toward socialization and connection. Social activities require others' presence in public areas (Hajjaliakbari et al., 2021). Convenient access is another crucial characteristic of a successful urban third place, encompassing both physical and visual accessibility. Physical access is defined by proximity and convenience, while visual accessibility enhances the spatial character of urban life, blurring boundaries between built and natural environments. Pedestrian-friendly places like pavement cafes and sidewalks epitomize urbanity at its best. Tarek et al. (2021) state that the absence of transition zones hinders pedestrian experiences and affects overall spatial quality.

Temporality is a unique attribute that enhances third-place appeal. Carmona (2021) suggests that diverse activities stimulate unpredictability and spur spontaneous acts, fostering sociability and festivity. Recognizing temporality in third places embraces their ever-changing nature, contributing to vibrancy and desirability. Third places take many forms, but the individuals and entertainment they offer drive enjoyment (Yuen & Johnson, 2017).

In conclusion, this study aims to explore the critical spatial quality attributes of urban third places and how these impact people's experiences of urban environments. While we've examined these attributes from an urban studies perspective, it is equally important to investigate the perceptions of those who use these places. As Jeffres et al. (2009) note, there is a gap in scholarly contributions that consider the public's perspective and the influence of third places on the quality of life. By actively engaging with communities and prioritizing inclusivity in design, urban planners and designers can create spaces that truly serve the diverse needs of all users. This research seeks to provide insights that urban designers can implement to enhance urban third places, ultimately fostering community well-being, encouraging social interaction, and enriching the urban experience.

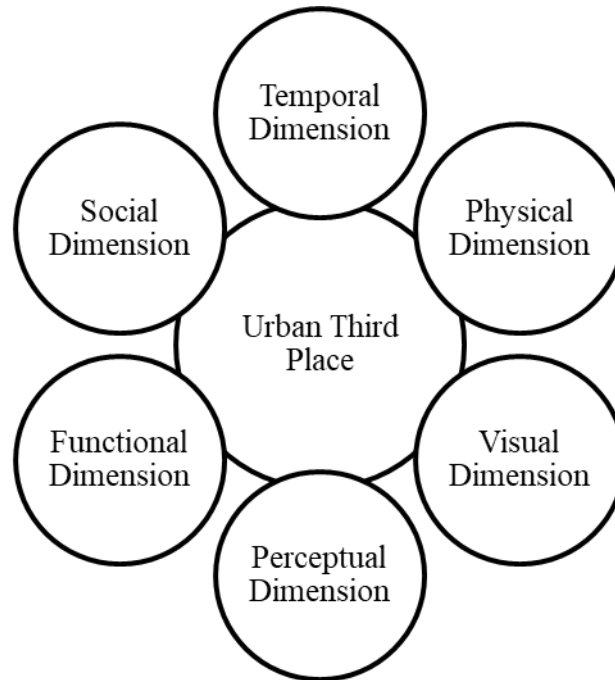


**Figure 1.** Conceptual Model of the Study.

## 2. Materials and Methods

### 2.1 Study Design and Setting

The theoretical framework for spatial quality attributes provides a conceptual basis for understanding and evaluating the characteristics that define a physical place's quality. It provides a comprehensive understanding of what defines a desirable urban third place and how different factors contribute to its overall spatial quality. We employ this framework to categorize the attributes and facilitate statistical analysis. As previously mentioned, we conduct the research at the human scale of urban design, which aids in maintaining a focused scope. Carmona (2021) asserts that examining all dimensions simultaneously makes urban design holistic. To support this approach, he classifies dimensions of urban design into six categories: physical, perceptual, social, visual, functional, and temporal, with an awareness that these characteristics may overlap, reflecting the experiences of everyday urban life. He explicitly acknowledges that this separation is simply for clarity in exposition and analysis.



**Figure 2.** Theoretical Framework of Urban Third Place.

## 2.2 Participants or Subjects

We distributed a survey to a total of 80 participants because this research is part of a pilot study at its early stage, which aims to explore the initial insights of respondents rather than generalize findings to a larger population. Given the nature of qualitative research, we anticipate that a sample size of 80 will suffice to achieve a data saturation point, beyond which further data collection yields no new insights. We divide the sample size into four age groups. Each age group has 20 participants, with 10 males and 10 females, ensuring equal representation in all groups. Thus, within a sample population, while four groups as a whole represent multiplicity, every group represents its homogeneity. Qualitative analysis is generally concerned with enhancing understanding of the world in all its diversity (Ragin, 1992).

## 2.3 Materials and Equipment

This study conducts a systematic literature review to investigate the fundamental concepts, theories, and views of different researchers that are essential to the research inquiry. This helps to provide background information and justification for the research question under investigation. The literature review sub-categorizes the identified dimensions of urban third place into spatial quality attributes, as mentioned in Figure 2, which require analysis.

**Table 1:** Spatial Quality Attributes.

<p><b>Physical Dimension</b></p> <p>Spatial Layout Furniture Design, Arrangement &amp; Orientation Well-proportionate Transition Zones Easy accessibility with shorter distance</p>	<p><b>Visual Dimension</b></p> <p>Visual accessibility between inside &amp; outside Physical planning at human scale</p>	<p><b>Perceptual Dimension</b></p> <p>Sense of comfort &amp; security Sensory experience of well-being</p>
<p><b>Functional Dimension</b></p> <p>Opportunity for seeing, hearing &amp; talking Pedestrian &amp; age-friendly Variety of mixed urban activities</p>	<p><b>Social Dimension</b></p> <p>Opportunity for self-expression &amp; identity Platform for social interaction &amp; engagement Sense of community</p>	<p><b>Temporal Dimension</b></p> <p>Adaptability towards changing built environment Opportunity for sociability &amp; festivity</p>

The study, which aims to investigate users' perceptions of the third place, adopts an exploratory and qualitative approach. A regular quantitative survey involves direct questioning. This technique may not be appropriate for eliciting honest and complete responses. As a result, the adoption of the projective technique is based on the notion that when individuals encounter a vague or poorly structured stimulus, their underlying desires and emotions may manifest. As Spry & Pitch (2020) claim, projective techniques serve as a complement to conventional techniques for eliciting diverse interpretations from users. This approach allows respondents to express themselves beyond their rational thinking, providing a researcher with perceptions of more spontaneous individuals. Projective approaches are divided into three categories: association, completion, and construction, based on the types of responses required (Hofstede et al., 2007). The particular objective of the research guides the selection and application of these techniques during the data collection process.

**Table 2:** Types of Projective Techniques & Stimuli with Methodology.

Sr. No.	Projective Technique	Type of Projective Technique	Type of Stimulus	Methodology
1	Association	Word Association Photo Association	Verbal Verbal-Visual	In order to elicit the initial word that comes to the participants' minds, a stimulus is delivered in the form of a word, sentence, or photograph. (Eldesouky et al., 2015)
		Brand Personification	Verbal	Participants are directed to attribute personality to brands and envision them as human beings or individuals. The objective is to extract factual information as well as symbolic imagery linked to the organisations. (Mesías & Escribano, 2018)
		Photo-Sort Technique	Verbal-Visual	This approach entails presenting a series of photos to participants and instructing them to classify them according to their preferences. (Mesías & Escribano, 2018)
2	Completion	Sentence Completion	Verbal	Participants are presented with incomplete phrases and prompted to fill in the missing

		Story Completion	Verbal	parts with the initial word or phrase that comes to mind in the sentence completion assignment. (Eldesouky et al., 2015)
				Participants are provided with a specific segment of a narrative to focus on, and subsequently, they are prompted to generate their own summary. (Mesías & Escribano, 2018)
3	Construction	Bubble Drawing/ Cartoon Test	Verbal-Visual	Typically, the approach involves showcasing comical individuals in an ambiguous environment and engaging in a dialogue regarding the topic being examined. Test participants are required to complete the dialogue between the cartoon characters by filling in an empty speech bubble. (Rook, 1988)

**2.4 Procedures and Protocols**

We created the online survey using Google Docs ([www.docs.google.com](http://www.docs.google.com)) to gather responses from individuals on physical, perceptual, social, visual, functional, and temporal dimensions. We classify cafes as urban third places and examine them using 10 qualitative questions, as exemplified below. We asked participants about their preferred motives for visiting cafes, their desired activities and experiences, and their connections with cafes.

**Survey Questionnaire- Open Ended**

Upendra Joshi, Ph.D. Scholar, Anant National University, Ahmedabad. Roll No. Ph210010

Q.5: The best thing to enjoy in cafes is.....

Q.6: I usually visit the café to experience.....

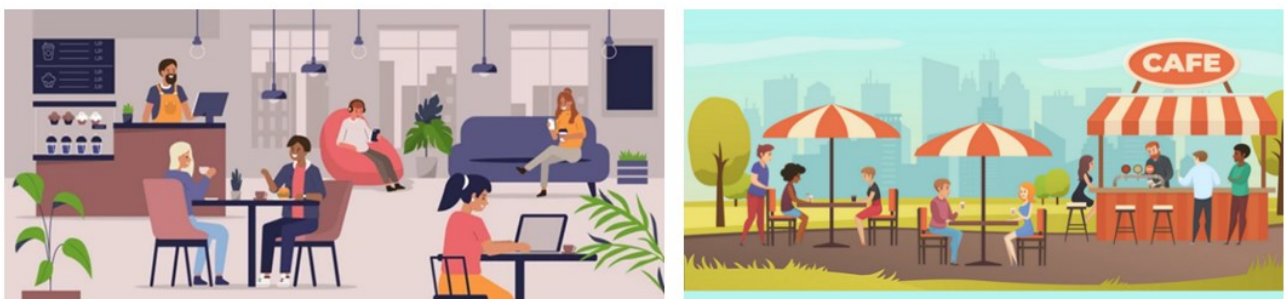
Q.7: What do you think sets your favourite café apart from others you have visited? Do you feel personally attached to it?

**Figure 3: Sentence Completion & Word Association Technique**

Q.8: Relate the following words to either of the images given below.

Comfort, Accessibility, Lifestyle, Taste, Ambition, Second Home, Social Media, Experience, Ambiance, Work/ Study, Nostalgia, Community, Gatherings, Cheap, Modern, Privacy, Social Status

Q.9: Below are the four scenarios about Rohan. Write 2-3 keywords within the scenario you think reflect the relationship between Rohan and the café.



**Figure 4. Photo Association Technique.**

Scenario-1: Rohan was a busy entrepreneur, and he often found solace in the calmness of a cafe amidst his hectic schedule. He would bring his laptop and work from the cafe, enjoying the free Wi-Fi and the comfortable seating. Rohan liked to observe people coming and going, and he found inspiration in

the hustle and bustle of the cafe. He would order a latte and work for hours, finding it to be a productive and enjoyable environment to get things done.

Scenario 2: Rohan was an introvert and found solace in solitude. He loved to spend quiet moments at the cafe, sitting by the window and watching the world go by. He would order a pour-over coffee and immerse himself in a book or simply reflect on his thoughts. The cafe provided him with a peaceful retreat from the noise of the outside world, and he appreciated the calmness and serenity it offered. Rohan found comfort in the simple pleasure of enjoying his own company in the cosy ambience of the café.

..... **Figure 5.** Story Completion Technique.....

Q.4: In the scenario mentioned below, would you prefer spending time in a café?



- 1. Official/ Formal Meetings
- 2. Meeting Strangers
- 3. Informal Meetings
- 4. Working/ Studying Alone
- 5. Reunion with Old Friends
- 6. Improving Social Visibility
- 7. Enjoying Live Sports
- 8. Experience of Lifestyle

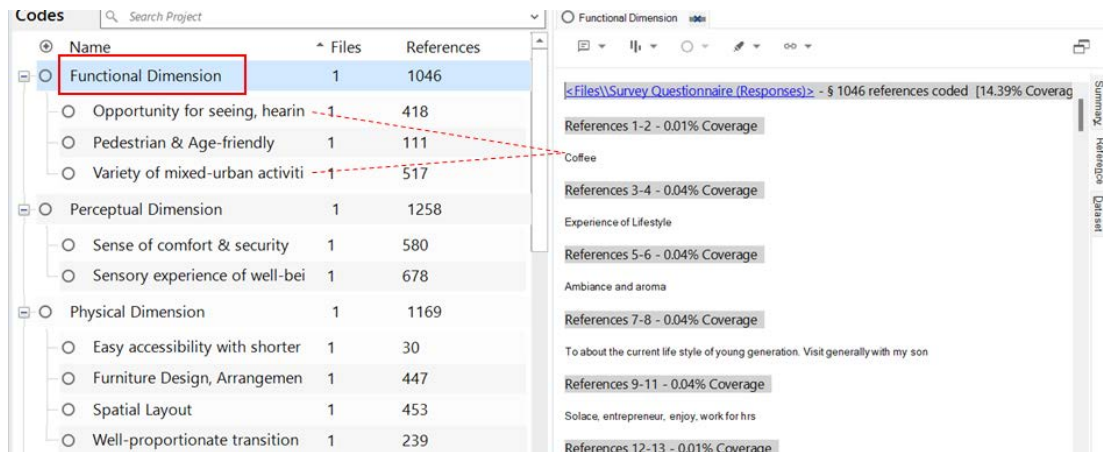
**Figure 6.** Photo-sort Technique.

### 2.5 Data Analysis

We conduct stratified random sampling by categorizing individuals into four age groups: Baby Boomers (56-75), Generation X (41-55), Generation Y (26-40), and Generation Z (11-25). Table 1 categorizes each person's responses into six dimensions, which we then record as a count. We use

Nvivo, a qualitative data documentation software, to document and organize the responses into a grouped frequency distribution table. An example of a functional dimension is shown in Figure 7. Step 1, where individual responses are sub-categorised in respective spatial quality attributes. In Step 2, with the help of Matrix Coding Query, all the responses for spatial quality attributes are allocated against every age group, as represented in Table 3.

Step:1



Step:2

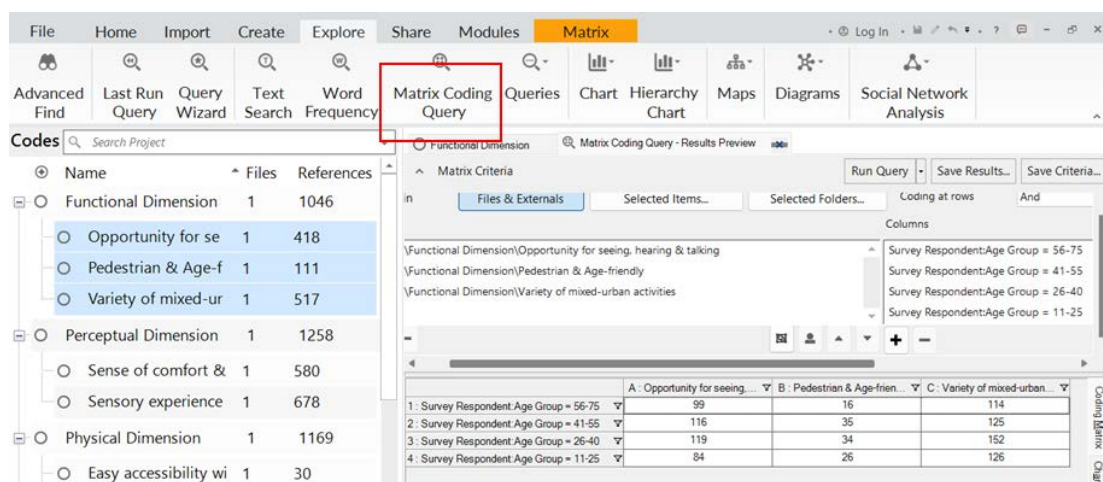


Figure 7. Categorization of Responses (Prepared in Nvivo Software-Developed by the Authors).

### 3. Results

#### 3.1 Presentation of Key Findings

After organizing all the responses into descriptive statistics, we use inferential statistics in three stages to validate the projective technique results and guarantee the robustness of the findings.



**Table 3:** Grouped Frequency Distribution (Count of responses) .

Spatial Attributes/ Age Group		(56-75)	(41-55)	(26-40)	(11-25)
Physical	Easy Accessibility with Shorter Distance	5	9	9	7
	Furniture Design, Arrangement & Orientation	100	102	133	112
	Spatial Layout	99	103	137	114
Visual	Well- Proportionate Transition Zones	53	69	64	53
	Physical Planning at Human Scale	59	77	88	86
Perceptual	Visual Accessibility Between Inside & Outside	56	73	74	65
	Sense of Comfort & Security	134	127	175	144
Functional	Sensory Experience of Well-Being	149	172	195	162
	Opportunity for Seeing, Hearing & Talking	99	116	119	84
	Pedestrian & Age-Friendly	16	35	34	26
Social	Variety of Mixed Urban Activities	114	125	152	126
	Opportunity for Self-Expression & Identity	44	46	54	60
	Platform for Social Interaction	116	136	148	109
Temporal	Sense of Community	65	71	61	52
	Adaptability Towards Changing Built Environment	96	89	110	104
	Opportunity for Sociability & Festivity	112	118	131	102

### 3.2 Statistical Analysis

**Stage 1:** To determine whether there is a statistically significant relationship between a particular age group and its perception of the spatial attributes of third place.

The chi-square test is an inferential, non-parametric statistical test that allows one to draw conclusions about a population based on a sample. Specifically, it determines the relationship between two variables within the population. It evaluates null and alternative hypotheses. In this study, the null Hypothesis (H0) is that there is no statistically significant relationship between a particular age group and its perception of the spatial attributes of third place. Alternative Hypothesis (H1): There is a statistically significant relationship between a particular age group and its perception of the spatial attributes of third place.

Chi-Square is defined by:  $\chi^2 = \sum [O - E]^2 / (E)$ .....Where O- Observed Frequency & E- Expected Frequency

Degrees of Freedom (d.f) = n-1... Where n = No. of Items, Significance Level ( $\alpha$ ) = 0.05

**Table 4:** Chi-Square Test between identified spatial attributes and age groups.

For Age Group (56-75)							
Sr. No.	Dimension	Spatial Attributes	O	E	(O-E)	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E
1	Physical	Easy Accessibility with shorter distance	5	64.25	-59.25	3510.56	54.63
		Furniture Design, Arrangement & Orientation	100	64.25	35.75	1278.06	19.89
		Spatial Layout	99	64.25	34.75	1207.56	18.79
		Well-proportioned Transition Zones	53	64.25	-11.25	126.56	1.96
<b><math>\sum (O-E)^2 / E = 95.27 &gt;</math></b>					<b>Critical value from distribution table= 7.815</b>		
2	Visual	Physical planning at human scale	59	57.5	1.5	2.25	0.03
		Visual accessibility between inside & outside	56	57.5	-1.5	2.25	0.03
<b><math>\sum (O-E)^2 / E = 0.06 &lt;</math></b>					<b>Critical value from distribution table = 3.841</b>		
3	Perceptual	Sense of Comfort & Security	134	141.5	-7.5	56.25	0.39
		Sensory experience of well-being	149	141.5	7.5	56.25	0.39
<b><math>\sum (O-E)^2 / E = 0.78 &lt;</math></b>					<b>Critical value from distribution table = 3.841</b>		



4	Functional	Opportunity for seeing, hearing & talking	99	76.33	22.67	513.92	6.73
		Pedestrian & Age-friendly	16	76.33	-60.33	3639.70	47.68
		Variety of mixed urban activities	114	76.33	37.67	1419.02	18.59
<b><math>\Sigma (O-E)^2 / E = 73 &gt;</math> Critical value from distribution table = <b>5.991</b></b>							
5	Social	Opportunity for self-expression & identity	44	75	-31	961	12.81
		Platform for social interaction	116	75	41	1681	22.41
		Sense of Community	65	75	10	100	1.33
<b><math>\Sigma (O-E)^2 / E = 36.28 &gt;</math> Critical value from distribution table = <b>5.991</b></b>							
6	Temporal	Adaptability towards changing built environment	96	104	-8	64	0.61
		Opportunity for Sociability & Festivity	112	104	8	64	0.61
<b><math>\Sigma (O-E)^2 / E = 1.22 &lt;</math> Critical value from distribution table = <b>3.841</b></b>							

**For Age Group (41-55)**

1	Physical	Easy Accessibility with shorter distance	9	70.75	-61.75	3813.06	53.89
		Furniture Design, Arrangement & Orientation	102	70.75	31.25	976.56	13.80
		Spatial Layout	103	70.75	32.25	1040.06	14.70
		Well-proportioned Transition Zones	69	70.75	-1.75	3.06	0.04
<b><math>\Sigma (O-E)^2 / E = 82.43 &gt;</math> Critical value from distribution table = <b>7.815</b></b>							
2	Visual	Physical planning at human scale	77	75	2	4	0.05
		Visual accessibility between inside & outside	73	75	-2	4	0.05
<b><math>\Sigma (O-E)^2 / E = 0.1 &lt;</math> Critical value from distribution table = <b>3.841</b></b>							
3	Perceptual	Sense of Comfort & Security	127	149.5	-22.5	506.25	3.38
		Sensory experience of well-being	172	149.5	22.5	506.25	3.38
<b><math>\Sigma (O-E)^2 / E = 6.76 &gt;</math> Critical value from distribution table = <b>3.841</b></b>							
4	Functional	Opportunity for seeing, hearing & talking	116	92	24	576	6.26
		Pedestrian & Age-friendly	35	92	-57	3249	35.31
		Variety of mixed urban activities	125	92	33	1089	11.83
<b><math>\Sigma (O-E)^2 / E = 53.4 &gt;</math> Critical value from distribution table = <b>5.991</b></b>							
5	Social	Opportunity for self-expression & identity	46	84.33	-38.33	1469.18	17.42
		Platform for social interaction	136	84.33	51.67	2669.78	31.65
		Sense of Community	71	84.33	13.33	177.68	2.10
<b><math>\Sigma (O-E)^2 / E = 51.17 &gt;</math> Critical value from distribution table = <b>5.991</b></b>							
6	Temporal	Adaptability towards changing built environment	89	103.5	-14.5	210.25	2.03
		Opportunity for Sociability & Festivity	118	103.5	14.5	210.25	2.03
<b><math>\Sigma (O-E)^2 / E = 4.06 &gt;</math> Critical value from distribution table = <b>3.841</b></b>							

**For Age Group (26-40)**

1	Physical	Easy Accessibility with shorter distance	9	85.75	-76.75	5890.56	68.69
		Furniture Design, Arrangement & Orientation	133	85.75	47.25	2232.56	26.03



		Spatial Layout	137	85.75	51.25	2626.56	30.63
		Well-proportioned Transition Zones	64	85.75	-21.75	473.06	5.51
			<b><math>\Sigma (O-E)^2 / E = 130.86 &gt;</math> Critical value from distribution table = <b>7.815</b></b>				
2	Visual	Physical planning at human scale	88	81	7	49	0.6
		Visual accessibility between inside & outside	74	81	-7	49	0.6
			<b><math>\Sigma (O-E)^2 / E = 1.2 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				
3	Perceptual	Sense of Comfort & Security	175	185	-10	100	0.54
		Sensory experience of well-being	195	185	10	100	0.54
			<b><math>\Sigma (O-E)^2 / E = 1.08 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				
4	Functional	Opportunity for seeing, hearing & talking	119	101.66	17.34	300.67	2.95
		Pedestrian & Age-friendly	34	101.66	-67.66	4577.87	45.03
		Variety of mixed urban activities	152	101.66	50.34	2534.11	24.92
			<b><math>\Sigma (O-E)^2 / E = 72.9 &gt;</math> Critical value from distribution table = <b>5.991</b></b>				
5	Social	Opportunity for self-expression & identity	54	87.66	-33.66	1132.99	12.92
		Platform for social interaction	148	87.66	60.34	3640.91	41.53
		Sense of Community	61	87.66	-26.66	710.75	8.10
			<b><math>\Sigma (O-E)^2 / E = 62.55 &gt;</math> Critical value from distribution table = <b>5.991</b></b>				
6	Temporal	Adaptability towards changing built environment	110	120.5	-10.5	110.25	0.91
		Opportunity for Sociability & Festivity	131	120.5	10.5	110.25	0.91
			<b><math>\Sigma (O-E)^2 / E = 1.82 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				
<b>For Age Group (11-25)</b>							
1	Physical	Easy Accessibility with a shorter distance	7	71.5	-64.5	4160.25	58.18
		Furniture Design, Arrangement & Orientation	112	71.5	40.5	1640.25	22.94
		Spatial Layout	114	71.5	42.5	1806.25	25.26
		Well-proportioned Transition Zones	53	71.5	-18.5	342.25	4.78
			<b><math>\Sigma (O-E)^2 / E = 111.16 &gt;</math> Critical value from distribution table = <b>7.815</b></b>				
2	Visual	Physical planning at the human scale	86	75.5	10.5	110.25	1.46
		Visual accessibility between inside & outside	65	75.5	10.5	110.25	1.46
			<b><math>\Sigma (O-E)^2 / E = 2.92 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				
3	Perceptual	Sense of Comfort & Security	144	153	-9	81	0.56
		Sensory experience of well-being	162	153	9	81	0.56
			<b><math>\Sigma (O-E)^2 / E = 1.12 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				
4	Functional	Opportunity for seeing, hearing & talking	84	78.66	5.34	28.51	0.36
		Pedestrian & Age-friendly	26	78.66	52.66	2773.07	35.25
		Variety of mixed urban activities	126	78.66	47.34	2241.07	28.49
			<b><math>\Sigma (O-E)^2 / E = 64.1 &gt;</math> Critical value from distribution table = <b>5.991</b></b>				
5	Social	Opportunity for self-expression & identity	60	73.66	-13.66	186.59	2.53



		A platform for social interaction	109	73.66	35.34	1248.91	16.95
		Sense of Community	52	73.66	-21.66	469.15	6.36
			<b><math>\Sigma (O-E)^2 / E = 25.84 &gt;</math> Critical value from distribution table = <b>5.991</b></b>				
6	Temporal	Adaptability towards changing built environment	104	103	1	1	0.009
		Opportunity for Sociability & Festivity	102	103	-1	1	0.009
			<b><math>\Sigma (O-E)^2 / E = 0.018 &lt;</math> Critical value from distribution table = <b>3.841</b></b>				

We can derive inferences about the association between age and the responses of the sample population by comparing the chi-square value with the critical value from the chi-square distribution table. If the value of  $\chi^2$  is higher than the critical value from the distribution table, the association can be considered significant. In contrast, if the value of  $\chi^2$  is lower than the critical value, the association between the variables is considered to be insignificant. Table 4 shows that the physical, functional, and social characteristics are statistically significant across all age groups. The perceptual and temporal dimensions are only significant for the 41-55 age group. All age groups regard the visual dimension as insignificant.

**Stage 2:** To investigate the most prominent spatial attributes across all age groups in the sample population.

From Stage 1, we discovered that the physical, functional, and social characteristics are the most important for the sample population. We must use other traditional statistical tests to gain a deeper understanding of the association between age groups and responses, in order to support the findings of the chi-square test. ANOVA (Analysis of Variance) is a parametric statistical test that examines the difference in means between more than two groups. We use a one-way ANOVA to analyze the most common responses in the sample population, given that the obtained research data includes one independent variable (age group with four sub-groups) and a quantitative dependent variable (number of respondents). This analysis highlights the spatial attributes of the urban third place that are most desired by the participants. For this analysis, the null hypothesis is: (H0)- There are no preferred spatial attributes among the sample population. Alternative Hypothesis: (H1)- There is at least one statistically preferred spatial attribute in the sample population.

Microsoft Excel software facilitates the performance of ANOVA. Table 5 represents the analysis of ANOVA.

**Table 5:** One-way ANOVA of the Sample Population (Prepared in Microsoft Excel).

<b>For Physical Dimension</b>						
<b>Easy Accessibility with Shorter Distance</b>						
Source of Variation	SS	df	MS	F	P- Value	F- Crit
Between Groups	0.55	3	0.183333	0.689769	0.561077	2.724944
Within Groups	20.2	76	0.265789			
Total	20.75					
<b>Furniture Design, Arrangement &amp; Orientation</b>						
Source of Variation	SS	df	MS	F	P- Value	F-Crit
Between Groups	43.6375	3	14.54583	3.268243	<b>0.025772</b>	2.724944
Within Groups	338.25	76	4.450658			
Total	381.8875					
<b>Spatial Layout</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	9.74	3	3.245833	0.97407	0.409516	2.724944



Within Groups	253	76	3.332237			
Total	263					
<b>Well-proportionate Transition Zones</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	9.74	3	3.245833	0.97407	0.409516	2.724944
Within Groups	253	76	3.332237			
Total	263					
<b>Opportunity for Seeing, Hearing &amp; Talking</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	39.65	3	13.21667	3.743819	<b>0.014472</b>	2.724944
Within Groups	268.3	76	3.530263			
Total	307.95					
<b>Pedestrian &amp; Age-Friendly</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	11.6375	3	3.879167	3.375119	<b>0.02263</b>	2.724944
Within Groups	87.35	76	1.149342			
Total	98.9875					
<b>Variety of Mixed urban Activities</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	8.2	3	2.733333	1.156644	0.331932	2.724944
Within Groups	179.6	76	2.363158			
Total	187.8					
<b>Opportunity for Self-Expression &amp; Identity</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	48.3375	3	16.1125	3.87332	<b>0.012377</b>	2.724944
Within Groups	316.15	76	1.953289			
Total	157.9875					
<b>Platform for Social Interaction</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	48.3375	3	16.1125	3.87332	<b>0.012377</b>	2.724944
Within Groups	316.15	76	4.159868			
Total	364.4875					
<b>Sense of Community</b>						
Source of Variation	SS	df	MS	F	P-Value	F-Crit
Between Groups	9.5375	3	3.179167	1.627596	0.189985	2.724944
Within Groups	148.45	76	1.953289			
Total	157.9875					

Table 5 shows that the P-value is less than the significance level of 0.05 for six spatial attributes: furniture design, arrangement, and orientation; spatial layout; the opportunity for seeing, hearing, and talking; pedestrian and age-friendly; variety of mixed urban activities; and platform for social interaction. This indicates the acceptance of the alternative hypothesis (H1) for these features.

In other words, these are the most prominent spatial attributes of the urban third place, as intended by users. However, for other attributes, the P-value is greater than the significance level of 0.05, leading to the adoption of the null hypothesis (H0).



**Stage 3: To assess the significance of differences between pairs of group means.**

ANOVA highlights important spatial attributes, while Tukey’s HSD Post Hoc Test is used to determine the specific pairs of group means that are substantially different. It is beneficial to go beyond ANOVA analysis to enhance understanding of group interactions and identify significant differences. This study uses a test to determine which age group mean pairings exhibit statistically significant differences in their preferred spatial attributes.

The Tukey’s Criterion (T) is defined by:  $T = Q \alpha (c, n-c) \sqrt{(MSE/ni)}$

Where...  $\alpha$ - Level of Significance (Here,  $\alpha$ - 0.05), c- No. of Columns, n- Total Sample Size, Q- Critical Value of Studentized Range Distribution, MSE- Mean Square Error from ANOVA ni- Sample size of one particular group which in this case is considered equal for all groups

By using this formula, Value of Q -  $Q_{0.05}(4, 76) = 3.715$  (From Studentized Range Distribution Table)

Mean Square Error (MSE) for Physical Dimension from ANOVA= 5.311

Mean Square Error (MSE) for Functional Dimension from ANOVA= 4.678

Mean Square Error (MSE) for Social Dimension from ANOVA= 5.742

Tukey’s HSD value for Physical Dimension =  $3.715 \sqrt{(5.311 \div 20)} = 3.715 \times 0.515 = 1.91$

In similar way

Tukey’s HSD value for Functional Dimension =  $3.715 \sqrt{(4.678 \div 20)} = 3.715 \times 0.483 = 1.79$

Tukey’s HSD value for Social Dimension =  $3.715 \sqrt{(5.742 \div 20)} = 3.715 \times 0.535 = 1.98$

Thus, if the mean difference value of a particular pair of age groups is greater than the identified Tukey’s HSD value, the difference can be considered statistically significant. If the mean value is less than Tukey’s HSD value, the difference is not significant for the pair.

We consider,  $\bar{x}_1$ = Mean of Age Group (11-25)

$\bar{x}_2$ = Mean of Age Group (26-40)

$\bar{x}_3$ = Mean of Age Group (41-55)

$(\bar{x})_4$ = Mean of Age Group (56-75)

**Table 6: Mean of the Responses (Age-Group Wise).**

Sr. no.	Age Group / Mean of Responses	Physical	Functional	Social
1	Age Group (11-25)= $\bar{x}_1$	6.5	6.9	7.4
2	Age Group (26-40)= $\bar{x}_2$	8.05	8.6	7.85
3	Age Group (41-55)= $\bar{x}_3$	6.4	7.25	8.85
4	Age Group (56-75)= $\bar{x}_4$	6.05	6.2	7.35

**Table 7: Mean Differences between Pairs of Age Groups.**

Sr. No.	Tukey’s HSD Value for Physical Dimension = 1.91
1	$ \bar{x}_1 - \bar{x}_2  = 6.5 - 8.05 = -1.55 < 1.91$
2	$ \bar{x}_2 - \bar{x}_3  = 8.05 - 6.4 = 1.65 < 1.91$
3	$ \bar{x}_3 - \bar{x}_4  = 6.4 - 6.05 = 0.35 < 1.91$
4	$ \bar{x}_1 - \bar{x}_4  = 6.5 - 6.05 = 0.45 < 1.91$
5	$ \bar{x}_1 - \bar{x}_3  = 6.5 - 6.4 = 0.1 < 1.91$
6	$ \bar{x}_2 - \bar{x}_4  = 8.05 - 6.05 = 2 > 1.91$
Tukey’s HSD Value for Functional Dimension = 1.79	
1	$ \bar{x}_1 - \bar{x}_2  = 6.9 - 8.6 = -1.7 < 1.79$
2	$ \bar{x}_2 - \bar{x}_3  = 8.6 - 7.25 = 1.35 < 1.79$
3	$ \bar{x}_3 - \bar{x}_4  = 7.25 - 6.2 = 1.05 < 1.79$
4	$ \bar{x}_1 - \bar{x}_4  = 6.9 - 6.2 = 0.7 < 1.79$
5	$ \bar{x}_1 - \bar{x}_3  = 6.9 - 7.25 = -0.35 < 1.79$
6	$ \bar{x}_2 - \bar{x}_4  = 8.6 - 6.2 = 2.4 > 1.79$
Tukey’s HSD Value for Social Dimension = 1.98	
1	$ \bar{x}_1 - \bar{x}_2  = 7.35 - 8.85 = -1.5 < 1.98$
2	$ \bar{x}_2 - \bar{x}_3  = 8.85 - 7.85 = 1 < 1.98$
3	$ \bar{x}_3 - \bar{x}_4  = 7.85 - 7.40 = 0.45 < 1.98$
4	$ \bar{x}_1 - \bar{x}_4  = 7.35 - 7.40 = -0.5 < 1.98$
5	$ \bar{x}_1 - \bar{x}_3  = 7.35 - 7.85 = -0.5 < 1.98$
6	$ \bar{x}_2 - \bar{x}_4  = 8.85 - 7.40 = 1.45 < 1.98$



Table 7 illustrates a particular pair of age group means that are statistically different. For the physical and functional dimensions,  $|\underline{x}_2 - \underline{x}_4|$  are significantly different from each other. In contrast, for the social dimension, there are no pairs of age groups that are statistically different from each other. In other words, age groups (26-40) and age groups (56-75) elicit substantial differences in preferences for both physical and functional dimensions.

## 4. Discussion

### 4.1 Interpretation of Key Findings

The primary findings of this study emphasize the various associations between third-place users and their perceptions of third-place. This study examines an individual's subjective preferences for creating an urban third place, particularly focusing on physical, perceptual, visual, functional, temporal, and social dimensions. The data is analyzed in three stages. In stage 1, the Chi-Square Test of Independence is used to see if there is any significant association between the sample population and the responses received. It is observed that physical, functional, and social dimensions are found to be statistically significant in all groups of the sample population. It reflects the changing necessities of third-place users in the urban environment of cities. As Kara (2019) claims globalization has had a significant impact on the movement of people, their way of life, culture, and the exchange of ideas, leading to changes in urban areas at both macro- and micro-urban scales. In the case of the physical dimension, it greatly influences how people navigate and understand their environment. In the book 'The Image of the City' Chapman & Lynch (1962) emphasise the importance of legibility and elements such as paths, nodes, edges, and landmarks that help users navigate and form the mental maps of urban places. The significance of the physical dimension underscores the need for clear, easily accessible, and aesthetically pleasing urban third places that enhance the user's sense of orientation and place. Incorporating attributes such as furniture design, spatial layout, and transition zones into the design process makes the third place comfortable and inviting. Christopher Alexander, in his book 'A Pattern Language', highlights the same need for well-defined, inviting physical places that encourage public interaction (Alexander, Christopher; Ishikawa, Sara; Silverstein, Murray; Jacobson, 1977). The functional dimension holds crucial importance in terms of drawing users' attention by facilitating a variety of mixed urban activities, opportunities for seeing, hearing, and talking, as well as pedestrian and age-friendly places. Jane Jacob advocates the importance of mixed-use activities, vibrant street life, and functional utility of public places in her book, 'The Death and Life of Great American Cities.' She highlights the role of these places in fostering community engagement and safety through '*eyes on the street*' (Jacob, 1993). The significance of the social dimension primarily stems from the need to encourage community and social interaction. In the concept of 'The Production of Space', coined by Henri Lefebvre, he focuses on the connection between social activities and the formation of spaces. He suggests that space is socially produced and that social interactions are a critical component of how space is experienced and valued (Lefebvre, 1991). So, we can observe that the human-centric approach plays a crucial role in urban design practices. To support the statistical significance of the physical, functional, and social dimensions observed in the chi-square test, an ANOVA is employed as a parametric test in stage 2. It concretizes the initial observations of the results on the basis of which a larger sample population can be tested in order to achieve generalizability of the findings. This test demonstrates that furniture design, arrangement, and orientation, along with spatial layout, are crucial factors for the physical dimension. The most prominent responses for the functional dimension include attributes such as the opportunity for seeing, hearing, and talking, pedestrian and age-friendly features, and a variety of mixed urban activities. These are the attributes again concerned with the human scale. While demarcating the importance of the human dimension, Hussein (2018) adds that boosting walkability, as a component of pedestrianism, results in an improvement in the overall quality of the urban environment. Continuing with social dimensions, a platform for social interaction is the primary quality that is significant for the users. Social interaction at different levels has a huge impact on strengthening the bond within the community. Agboola, O. P., Rasidi, M. H., Said, I. B., Zakka, S. D.,



& Shuaibu (2018) emphasize the importance of social interaction as a medium for the enhancement of human well-being. Thus, when it comes to creating an urban third place, these are the spatial attributes individuals prefer the most. Urban designers can particularly consider all three dimensions holistically, recognising that physical design, functional utility, and social dynamics enhance the quality of urban life. To deepen our understanding of this relationship and gain more insights into the influence of age on these factors, Tukey's HSD Post-Hoc Test is employed in stage 3. It highlights that perceptions of both physical and functional dimensions are considerably different between the age groups (26-40) and (56-75). It means that these two age groups have significantly different preferences and needs, which they expect to be satisfied in the formation of an urban third place. This finding might be helpful in demarcating the criticalness of the term '*inclusive sociability*' in the formation of an urban third place by considering the diverse demands of various age groups in society. From this discussion, we might infer that the interrelationship between spatial attributes of third place, an individual's subjective preferences, and needs and needs along with his or her age contribute to a great extent to forming the subjective 'Sense of Place' of an individual, which can be a pivotal aspect in the field of urban design. It affirms that the design process of cities must accommodate the human dimension in a sensible manner, which can be followed by urban design practices at the neighbourhood and city levels.

#### 4.2 Implication of Future Directions

Thus, as a result of the findings, overall insights can be drawn at the elementary level for practitioners in the field of urban design in order to develop more effective urban third places.

- Human Scale Design: Designing the urban third places that prioritize the human experience by ensuring that these places are accessible, comfortable, and visually appealing to users. (Physical Dimension)
- Multi-functional Use: Creating places that can serve various purposes and activities, allowing for flexibility and adaptability in their use. This approach supports diverse needs and promotes continuous engagement, enhancing the user experience. (Functional Dimension)
- Social Inclusivity and Engagement: Designing places that foster social interactions and are inclusive of all ages, backgrounds, and abilities. This includes providing areas for seating, gathering, and activities that encourage people to connect and engage with one another. (Social Dimension).

#### 5. Conclusion

Thus, this study identifies the patterns of spatial quality attributes that users subconsciously build about the urban third place, which in this case is represented by a café. These patterns of built form, as claimed by Lang (2017) are closely interconnected to satisfy human needs at various levels. While quoting Maslow, H. Abraham, n.d., Lang states that these needs prompt individuals to exhibit particular practices developed in a particular setting that is generally considered a culture. Another significant aspect that we can consider is the result of implementing these strategies in urban third places. A better urban environment boosts person-to-person contact. (Fang & Slaper, 2022) mention that urban third places open avenues for various social, cultural, and economic activities to foster, which are important factors for improving urban economics. Clearly, the socio-economic aspect of urban environments can be greatly impacted by improved urban third places in terms of design, which in turn promotes urban culture.

An apparent impact on social well-being and economic activity may be observed in the following aspects:

- Increased spending with increased foot traffic through accessible, attractive, and comfortable design.
- Increased visibility for local businesses and entrepreneurs through multi-functional design.
- Enhanced social capital and community engagement through inclusive design.

Although this research presents useful insights, the particular data collection method might draw inferences to a limited extent. To respond to this constraint, future studies can be executed around the same phenomenon by performing projective interviews and case studies, followed by quantitative data



collection methods leading to method triangulation. Being exploratory in nature, projective interviews can help generate hypotheses for future investigations.

Case studies allow for a detailed examination of specific urban third places, providing a contextual understanding of attributes. Analyzing multiple case studies allows researchers to identify patterns and differences across various contexts. Case studies can provide real-world examples that illustrate theoretical concepts and demonstrate practical applications. Quantitative surveys are essential for validating the insights gained from qualitative methods as well as generalizing the results. (Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, 2014) mention that triangulation is considered a qualitative research approach that aims to assess validity by combining information from multiple sources. As a result, it might provide a researcher with more practical insights while also improving the precision and generalizability of the results. Thus, a study gives us the strong sense that urban third places must be re-imagined and re-structured from a design perspective in order to have a better socio-economic urban environment that meets contemporary needs.

### **Acknowledgements**

We would like to extend our sincere gratitude to all participants who took part in our survey. Your valuable time and insights have been crucial in making this study possible. Without your willingness to share your experiences and perspectives, this research would not have been feasible.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflicts of Interest**

The author(s) declare(s) no conflicts of interest.

### **Data availability statement**

The data that support the findings of this study are available on request from the corresponding author.

### **Institutional Review Board Statement**

Not applicable.

### **CRedit author statement:**

Ar. Upendra Vinay Joshi: Conceptualized the study, developed the methodology, and conducted the formal analysis and investigation. Prof. Snehal Nagarsheth: Contributed to the writing of the original draft, and performed review & writing. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Joshi, U. V., & Nagarsheth, S. (2024). People, Places, and Perceptions: Assessing Spatial Quality Attributes of Urban Third-place With Projective Survey. *Journal of Contemporary Urban Affairs*, 8(2), 509–528. <https://doi.org/10.25034/ijcua.2024.v8n2-13>



Original scientific paper

# Economic Implications and Public Readiness for Urban Green Space Development in Agra: A Strategic Evaluation in the City of Taj

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## ARTICLE INFO:

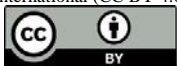
### Article History:

Received: 28 July 2024  
Revised: 1 September 2024  
Accepted: 2 September 2024  
Available online: 5 September 2024

### Keywords:

Urban Green Spaces (UGS);  
Urban life;  
Green city;  
Impacts of UGSs;  
Public Participation.

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### Publisher's Note:

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT



*Urban green spaces (UGSs) improve the environmental value of the city as well as the quality of life for citizens. Unfortunately, many major cities in India are lagging behind the minimum standard of UGS required in the city. For example, Agra city in India, one of the most famous tourist destinations in the world, represents two distinct realities of UGS in the same city. One is the focus of tourism, and the rest is the place of common people with very limited public green spaces, leading to multiple social issues (like spatial polarization, etc.). The secondary data concludes that the PPGC of Agra is lower than the standards, and the ongoing schemes are approached through quantitative methods. Despite having many UGS development schemes, Agra's UGS shows stalled growth. This research examines the policies and programs of UGS development (AMRUT, SCM, etc.) and reviews them to understand the unique gaps and possible regulatory interventions. The study includes an assessment of stakeholders' readiness to accept plausible UGS strategies using an analytical analysis approach. The primary data shows that PPP is the requirement for the integrated development of UGSs. The planners can make policies highlighting citizen's rights and responsibilities to enhance UGSs in Agra.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 529–545.

<https://doi.org/10.25034/ijcua.2024.v8n2-14>

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### Highlights:

- Public participation in urban green space (UGS) development enhances the economic value and sustainability of urban areas.
- Addressing policy gaps and spatial disparities is crucial for effective UGS implementation in high-density areas.
- Roof gardens and green walls can significantly increase per-person green cover in space-constrained cities.
- Inclusive UGS strategies can reduce social inequalities and improve the quality of urban life in Agra.

### Contribution to the field statement:

The article contributes to urban planning by highlighting the economic benefits of urban green spaces (UGS) in Agra, emphasizing increased property values and reduced urban heat effects. It advocates for public participation in UGS development, addressing policy gaps and proposing innovative solutions like roof gardens and green walls to enhance urban sustainability.

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### How to cite this article:

Sharma, D., & Roy, U. K. (2024). Economic Implications and Public Readiness for Urban Green Space Development in Agra: A Strategic Evaluation in the City of Taj. *Journal of Contemporary Urban Affairs*, 8(2), 529–545.

<https://doi.org/10.25034/ijcua.2024.v8n2-14>



## 1. Introduction

### 1.1 Background and Context

The urban green spaces (UGSs) play a crucial role in the society. UGSs help shape the city and provide different social, environmental, psychological, and other benefits. Having appropriate availability and access to UGS in neighbourhood can positively impact the mental and physical health of the urban population (Dipeolu, Ibem, & Oriola, 2022). A writer, philosopher, and art critic of the Victorian era, John Ruskin, says the civilization's greatness can be measured through its cities, and the greatness of the cities is found in the quality of open and green public spaces (Gangwar, 2018). The rapid growth of urbanization is helping increase opportunities and better life but is also becoming one of the reasons for decreasing per-person green cover in cities (Ahirrao & Khan, 2021). The UGSs are decreasing in many Indian cities (Ministry of Urban Development, 2014) and global cities. The decrease in UGSs leads to many social and economic issues, such as a lack of community engagement, negative effects on physical and mental well-being, a decrease in property values in the surrounding, etc. In this research, the role of the policymakers and urban planners with citizen's rights and responsibilities has been highlighted to overcome this issue through an example case of Agra city.

Agra is a city with great cultural significance, heritage value, and great urban spaces. Agra is a city that has the features of a unique and typical Indian city. With the city's three UNESCO World Heritage sites, including one of the world's wonders, 'The Taj Mahal', the city describes uniqueness as being the face of the country from one aspect. On the other hand, Agra has a few features of many different typical Indian cities in terms of its history, culture, industries, etc. Agra has a great history from the Mahabharata period to the colonial period (Perk, 2008) and (Directorate of census operations Uttar Pradesh, 2016), Agra is also well known for its shoe industry, petha (a type of sweet) industry and other (handicraft, carpet weaving, etc.) industries and Agra is well known for its tourism industry (Directorate of census operations Uttar Pradesh, 2016). Therefore, Agra becomes a great case study for this research as it shows many different features or qualities, which can be similar to many other Indian as well as foreign cities to duplicate the results because the lack of urban green spaces is not only an Indian issue.

The heritage of Agra City belongs to different eras, showing layers of history (Perk, 2008). The city was cherished during the Mughal era, and it is well known that the architecture and urban planning in Mughal times were well thought out and focused on luxurious spaces (inside and outside). Agra also has similar features on one side of the city. However, the other part of the city (focusing on the parts with more population density) shows a different picture. Figure 1 shows the two different parts of the city, one where the UGSs show the multi-purpose use (near the heritage sites) and the other where the UGSs show the ghosting of the spaces (old city areas with high population density). Figure 1 also shows the population density map, which describes that the UGS that are ghosted for different reasons are also in the high population density areas. This describes the UGS in high population density areas being ghosted because of the monotonous design and accessibility.

**Parks with Identity and Multi-activity-based Design**



Figure 1: Aram Bagh, Rambagh, Agra



Figure 1: Shaheed Smarak Park, Sanjay Place, Agra

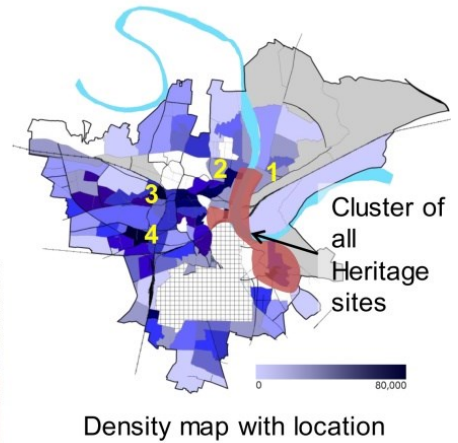
**Parks as ghosted spaces and with common design**



Figure 3: Sector 4R Park, Bodla, Agra



Figure 4: Friends Colony Park, Saket Colony, Agra



**Figure 1.** Spatial disparity in UGS in different parts of the city.

### 1.2 Problem Statement and Research Gap

The increased urbanization in Agra city has shown growth and development in different sectors. Policies and programs like AMRUT, Smart City Mission (SCM), etc., continuously enhance the city's urban green spaces. The executive engineer in Agra Nagar Nigam (Agra Municipal Corporation), Mr. Ravindra Kumar Singh, mentioned a significant increase in urban greenery in Agra, but the areas with high population density are not in focus because of the lack of space availability. He and the deputy director from the forest department, Agra Adarsh Kumar, mentioned that the survival rate of the plantation is around 60 to 65% per year in and around the city. Additionally, they mentioned that this situation is because the people do not anticipate the process. They sometimes remove the plants initially or do not let the workers take care of them, making the plants die, etc. An Agra-based NGO head Mr. Satyam Dixit also mentioned that when people willingly ask him to plant trees in front of their house or their locality, they take care of it independently. These statements clarify that if all the stakeholders (government officials, NGOs and the public) come together, there is a possibility for enhancing the situation. Redevelopment cannot be the first choice for the high population density parts of such rich culture, history, and heritage cities. This research includes discussions with different stakeholders (the government offices responsible for UGS development directly or indirectly), NGO (working on UGS development), and local people to understand their perception of the situation and their solutions for improvement. Ultimately, this research will combine the results and modify them into the initial step for policy planners to incorporate to improve the UGS condition in the city.

### 1.3 Objectives and Hypotheses

**Aim:** To review the available literature on the development of UGS in Agra city and discuss the outcome of people's readiness and their rights and responsibilities for UGS-enhancing strategies.

**Objectives:**

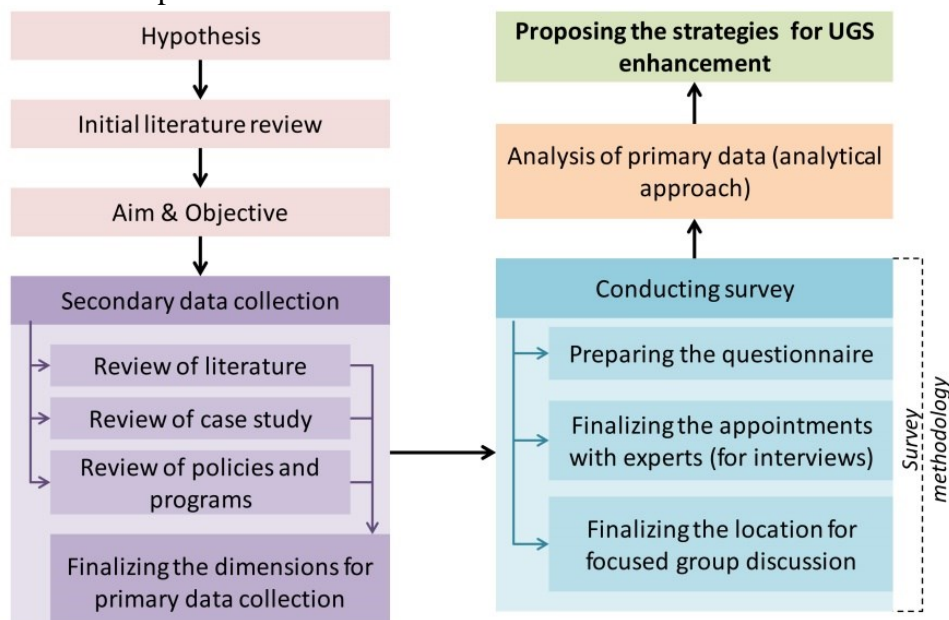
1. To understand the importance of the UGS and their existing condition in Agra, the city of Taj.
2. To review the current policies and programs related to UGSs for Agra city.

3. To identify the critical gaps in the current social, economic and spatial development programs.
4. To review the stakeholders' consultation, users' rights and responsibilities and conclude a road map for enhancing the UGS in Agra city.

### 1.4 Significance and Structure of the Paper

This research focuses on incorporating people's perceptions into strategies for enhancing UGS in Agra city. It includes a few steps that have been illustrated in Figure 2:

- Starting from data collection and analysing the existing policies/programs related to UGS development (like AMRUT, SCM, etc.) and their result in the city. As the research, understand the current situation (lack of UGS in the city) and its reason through secondary data. Then this research understands the gap between available policies and the current situation on the ground and why the policies are not giving a significant result.
  - The literature review includes a review of research papers to understand the importance of UGS and current conditions worldwide and in Agra (focused) and to identify the dimensions of this research.
  - The government policies and programs reviewed in this research are- AMRUT (Atal Mission for Rejuvenation and Urban Transformation), Smart City Mission (SCM), Urban green guideline and URDPFI guidelines by Indian Ministry of Urban Development, Action Plan by ANN (Agra Municipal Corporation).
- Next is to understand stakeholder's perceptions regarding the current situation and their suggestions to overcome the problem.
  - There are two sets of stakeholders- one who makes the policies (the government officials) and the other who lives the positive and negative consequences of these policies (the public).
  - Based on the literature review, the dimensions are finalised, and the samples are finalized based on dimensions.
- Finally, analyse the data and propose suggestions for policy and urban planners to incorporate in the enhancement process of UGS.



**Figure 2.** Research methodology.

This clarifies that Agra, a city with great historical and cultural value, needs more attention in UGS development. Therefore, this research focuses on the lack of UGS and their quality in the high



population density and old city areas, despite having many different UGS development policies and programs. It then solves the problem by involving people in the implementation and maintenance process. This research finds the steps for public-private partnership. It brings the citizen's rights and responsibilities towards the UGS development and maintenance process for enhancing the urban green spaces in Agra city.

## 2. Materials and Methods

### 2.1 Literature Review

Urban spaces have always been vital to different civilizations. Earlier societies valued public spaces for interaction and events, making them society-centric and multi-activity areas essential for growth, such as the Greek Agora and the Great Bath. Today, urban green and open spaces serve different purposes, becoming more individual-centric and mono-activity areas. This section will discuss the definition and benefits of UGSs and the current state of UGSs in Agra, as well as review existing policies and programs. Further, the methodology for the survey will be discussed in detail.

#### 2.1.1. Definition, Benefits of UGS, and Connection with SDGs

The urban green spaces include urban green lands (partly or completely green), trees, shrubs, and other vegetation. It also includes parks, gardens (horizontal and vertical), meadows, forests, and blue-green zones (Haas, Hassink, & Stuvier, 2021). The UGSs help to improve the visual image of the surroundings, and at the same time, UGSs are necessary for the development and growth of the city and its residents.

#### Benefits of the UGSs

Urban green spaces provide social, physical, economic, ecological, and planning-based social benefits. As per 'Urban Green Guidelines', these benefits are discussed further in detail (Ministry of Urban Development, 2014):

1. Social-Physical benefit: UGSs reduce pollution and the urban heat island effect, improve water catchment in flood-prone areas, and influence city land use. They also provide spaces for social interaction, enhancing physical and emotional health.
2. Ecological benefit: UGSs improve air, water, and soil quality, reduce pollution and urban temperatures, and enhance the surrounding microclimate. They also help preserve local biodiversity.
3. Planning benefit: A well-designed hierarchy of green spaces integrated with various land uses enhances the attractiveness of the area. UGSs encourage walking, promote health, and reduce vehicle use, which benefits the environment.
4. Economic benefit: UGSs enhance the quality of the surroundings, increasing property values. They also reduce temperatures, lower buildings' energy load, and provide economic and environmental benefits.

#### Connection with SDGs

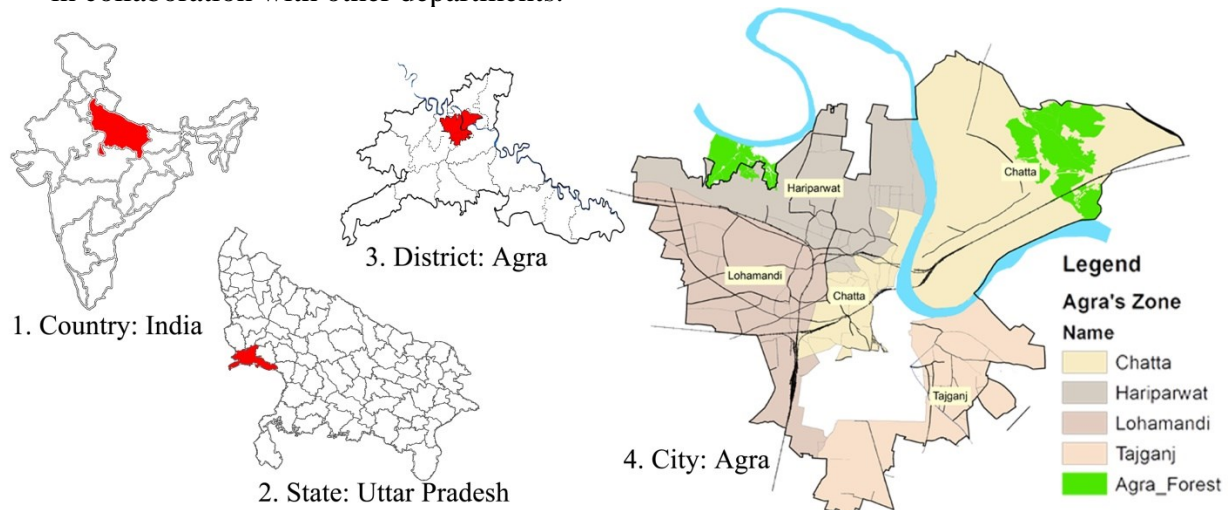
This research supports the SDGs 3, 11 and 13. SDG 3 (Good Health and Well-being) – enhancing UGSs in the city will increase communal interaction by providing physical activity space to improve mental health. SDG 11 (Sustainable Cities and Communities) – developing UGSs will enhance the city's sustainability. SDG 13 (Climate Action) – increasing green cover helps deal with climate change. Hence, the systematic development of the UGSs can help sustain the development of the surroundings.

#### 2.1.2. Introduction to the study area

- **Introduction:** Agra city is situated on the Yamuna river bank in the state of Uttar Pradesh, India. Agra covers approximately 108 sq. km. of area, with a population of 15 lakhs and a population density of 14,683 people per sq.km., as per the Indian census of 2011

(Directorate of census operations Uttar Pradesh, 2016). Figure 3 depicts the location of Agra city.

- **Climatic condition:** The city falls into the composite climatic zone, which is known to be extreme and tropical. As per the district handbook of Agra city (Directorate of census operations Uttar Pradesh, 2016) Agra's maximum and minimum temperatures are 47°C and 3°C respectively. The average yearly rainfall of the city is 686mm. The ground level of Agra City RL varies from 150m to 170m. The river Yamuna stretch in the city is about 9.0 km.
- **Administrative boundary:** There are four major authorities working in Agra- Agra Development Authority (ADA), Agra Nagar Nigam (ANN), or Municipal Corporation of Agra, Nagar Palika Agra, and Agra Cantonment. Then, under the JNNURM scheme in 2006 (known as AMRUT now), Agra Smart City Limited was also formed, a semi-government unit that works in collaboration with other departments.



**Figure 3.** Location and administrative boundaries of Agra city.

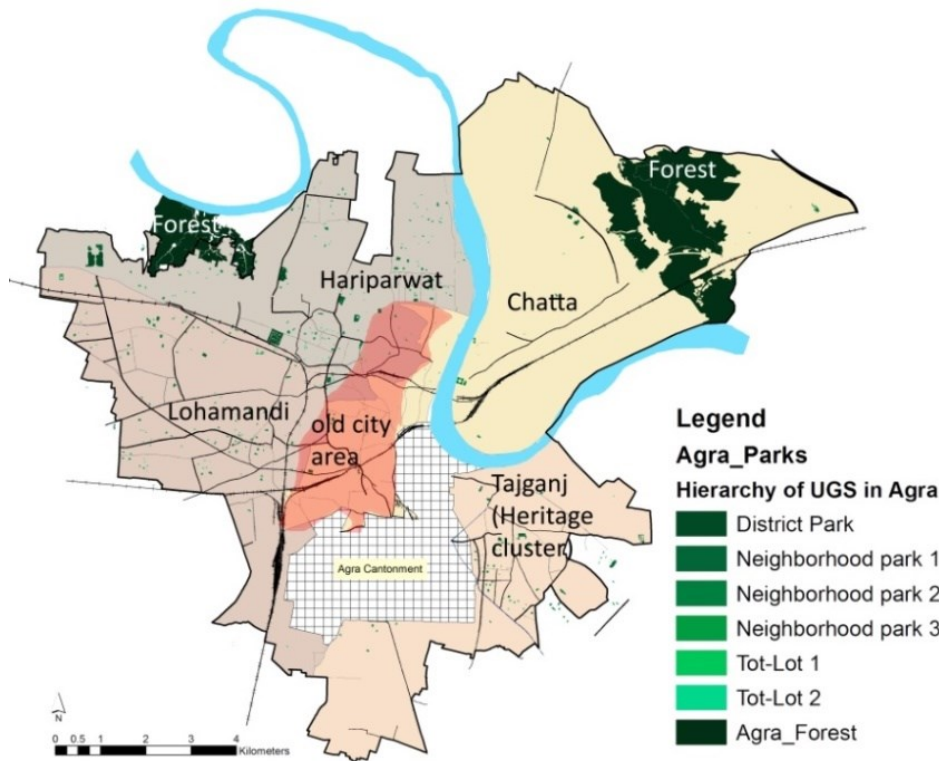
### 2.1.3. Existing green cover condition in Agra

The per capita availability of green cover and open spaces, as outlined in various Indian and international guidelines, has been examined according to sources such as the Ministry of Urban Development (2015), Agra Nagar Nigam, and the work of Gujar, Deshmukh, & Gupta (2022).

1. URDPFI: 10- 12 sq.m. per person
2. WHO: 9 sq.m. per person
3. LEED-ND: 12.5 sq.m. per person

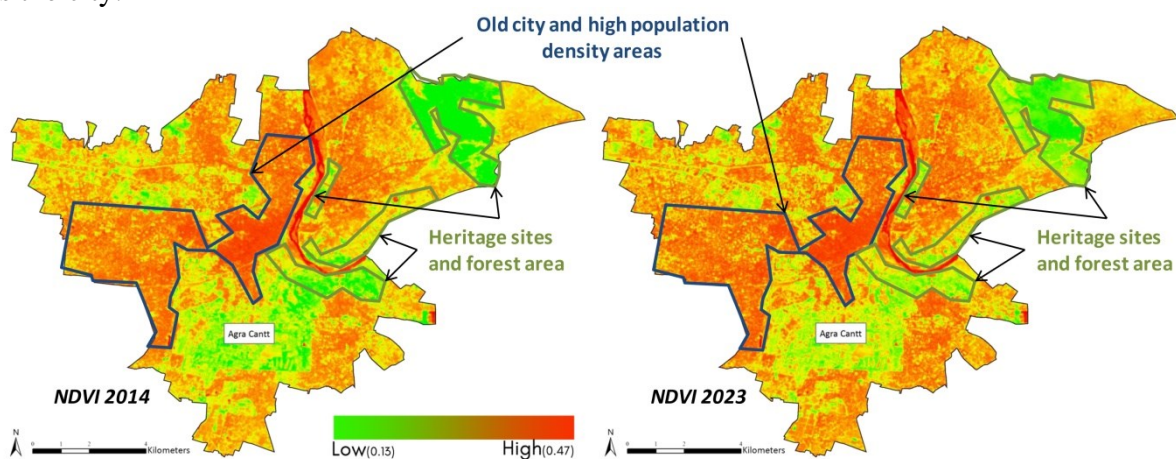
Agra City's per-person green cover (PPGC) is just 2.13 square meters, as reported by the Ministry of Urban Development (2016). This is significantly lower than the standards set by organizations such as URDPFI, WHO, and LEED, indicating a serious shortfall in green cover that requires immediate attention. Additionally, there is a noticeable spatial polarization of Urban Green Spaces (UGSS) within the city, with most green areas clustered around heritage sites and forests. In contrast, other parts of the

city, particularly those with high population densities and in the older city areas, fall well below the minimum standards for green cover per person, as illustrated in Figure 4.



**Figure 4.** Spatial polarization of the UGS in Agra city.

The lack of urban greenery in Agra city can also be understood through the NDVI (Normalized Difference Vegetation Index) map of the city, depicting the changes over a decade. This explains that green cover development and maintenance are focused on the few parts of the city where heritage sites and forest areas exist. The other part of the city, especially the old city area (marked with the blue line in Figure 5), is experiencing a lack of greenery and has not shown any changes (increase) over the past decade. This explains the spatial polarization of urban green spaces in the city. This spatial polarization initiates socio-economic polarization, noticeable through the social inequity of urban green spaces across the city.



**Figure 5.** Stalled growth of UGS in Agra city, depicted with the help of NDVI mapping.

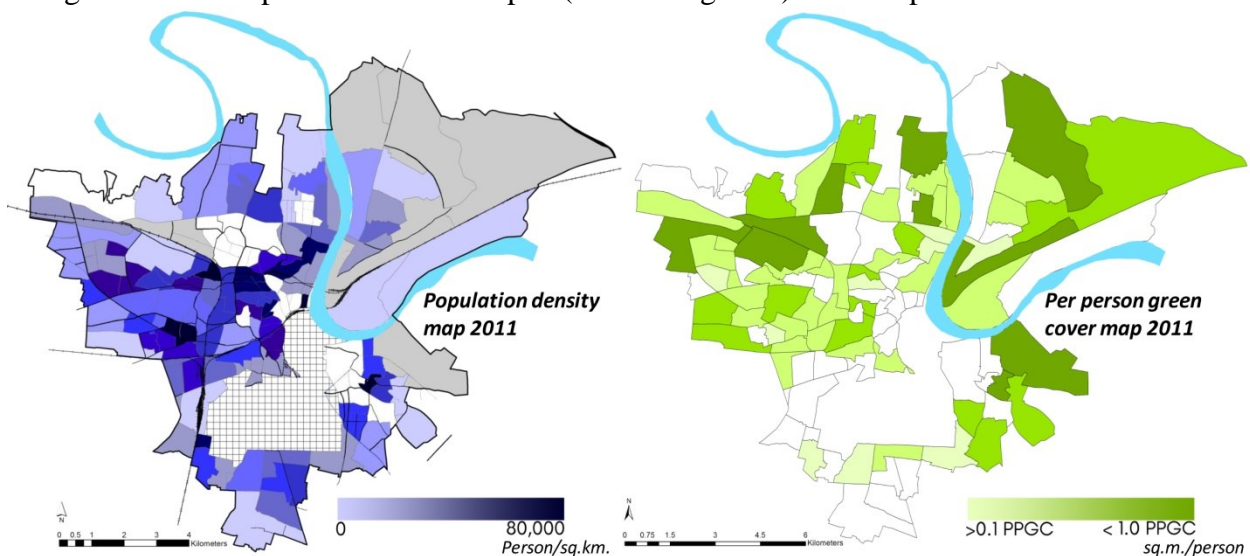
The government of India is working on developing UGS under different national policies and programs such as AMRUT, Smart City Mission, etc. However, the increased population becomes one of the major restrictions in the development process.

As per the urban green guideline, a hierarchy and typology of urban green spaces are mentioned, based on which the UGS in Agra were divided into categories (based on area) discussed in Table 1, illustrated in Figure 4.

**Table 1:** Area of UGS with hierarchy in Agra.

Type	Area division (sqm)	Total area of typology
District park	More than 40,000	0.20 sq. km.
Neighbourhood park 1	5000-20000	0.20 sq. km.
Neighbourhood park 2	2500-5000	0.23
Neighbourhood park 3	1000-2500	0.18
Tot-lot 1	400-1000	0.11
Tot-lot 2	Less than 400	0.02
Forest area	As per the GIS layer	8.46 sq. km.

As mentioned in Table 1, the overall green cover is affected by the forest area available within the city boundary. The major concern is that the old city areas do not show much greenery (referred to from the NDVI map). However, to get more specific information, a ward-wise population density map and per-person green cover map have been developed (refer to Figure 6) and compared.



**Figure 6.** Population density and per person green cover of Agra- ward wise.

This map clearly illustrates that areas with high population density (such as the old city area) have green cover less than 0.5 sq.m. per person or lower green cover in comparison to other wards. Currently, there are active policies and programs aimed at enhancing UGSs. Moreover, the reasons for spatial arrangements will be discussed further in the review of current policies and programs section.

#### 2.1.4. Reviewing the Current Policies and Programs

Many different policies and programs are being implemented at the national and city levels to improve the condition of the UGSs. In this research, the programs focused on Agra will be discussed in detail. A few major programs at the national level will be mentioned to understand the focused working strategies of these policies and programs.

National level:

1) AMRUT (Atal Mission for Rejuvenation and Urban Transformation) (Ministry of Urban Development, 2015):

- Providing infrastructure (physical and social aspects)
- Increase the amenity value of the city by developing green spaces and well-maintained open spaces (social, economic, and environmental aspects)
- Reducing pollution (environmental aspect)

City level (Agra):

1) SCP (Agra Smart City Plan) (Ministry of Urban Development, 2016):

- This plan has nine goals and sub-goals, which are focused on different infrastructural developments in Agra.



- The vision of this plan is "City of Taj – where history is preserved, environment is pristine, infrastructure is world-class, and opportunity is plenty – a safe place to live, a great place to tour" (Ministry of Urban Development, 2016).
  - Goal 7 (G7) is- "Green Habitat", which has a total of four sub-goals. Goal G7.4 is about increasing the green cover from 2.13 sq.m. per person to 6 sq.m. per person.
- 2) Action Plan for increasing green cover (Agra Nagar Nigam):
- Agra has proposed an 'Action Plan to increase the green cover by 15% in Agra', and this document has shown the long-term strategies to achieve it.
  - Increasing green in the existing neighbourhood-level planning
  - Upgrading parks and gardens
  - 15 minutes walk to the park
  - Strict implementation of environmental policies
  - The limitation is that the study is limited to municipal boundaries only.
  - The issue of this plan is that there is limited space for tree planting and water scarcity impacts the growth of the trees.
- 3) AMRUT Annexure (Atal Mission for Rejuvenation and Urban Transformation) (Agra Nagar Nigam, 2020):
- Agra Nagar Nigam (ANN) in 2020 published 'Our Achievements', under AMRUT 2.0 shows the development of parks in Agra city.
  - ANN has developed 18 parks from 2017 to 2020 out total of 346 parks (excluding the ASI protected or heritage sites).
  - Under the AMRUT, different activities have taken place, which have also affected the urban green space in the city- heritage walk development, Beautification of Fatehabad road, Junction improvement, etc.

**Gap identification:** Based on these policies and programs, it is evident that the focus is primarily on environmental aspects, with indirect positive impacts on social and economic benefits. However, neglecting the old city area due to land constraints is apparent. Active policies are oriented towards increasing greenery without considering planning and physical and social benefits. It is also important to develop green spaces in the old city and high population density areas. However, the development officers claim that the people do not cooperate and the condition is not improving. This research will include people's perceptions to understand how their readiness can enhance UGS conditions in the city.

## 2.2 Survey and Indicators

As discussed (with maps), the major problem is around the old city area because of the high population density and lack of land available for UGS development. As per the literature review, a few important dimensions are formed and divided into indicators (see Table 4). These indicators will help in the formation of surveys and primary data collection. These 10 dimensions are as follows:

- 1) Demography: population density, income and age group.
- 2) Planning aspect: UGS-related hierarchy division, area, etc.
- 3) Cultural: quality aspect and behaviour of people toward the UGS.
- 4) Ecology and environment: biodiversity, per person green cover, plantation species, etc.
- 5) Public and private involvement: including people in UGS's development and maintenance process.
- 6) Norms and guidelines: upcoming strategic development plan for UGS of Agra.
- 7) Access to the UGS: accessibility and availability of UGS.
- 8) Institutional management: the current success rate of development of UGS and proposed development strategies and schemes.
- 9) Tools and technology: norms and guidelines section to increase the feasibility of the proposal.
- 10) Safety and security: Safety aspects of the use of UGS.

These dimensions define the aspects of UGS; based on these dimensions, departments were identified, and their respective dimensions were focused on preparing the questionnaire for interview.



### 2.3 Survey Methodology

The survey methodology was developed based on two types of stakeholders: the users and the experts. The users are the local people who will be using the facilities, and experts will be the government officials from all the Agra departments working on the development of UGSs.

The survey methodology included steps from finalizing the survey tool. Secondly, identifying the list of experts and locations for group discussions with users (random voluntary sampling). Thirdly, identify each expert's expertise and customize the survey tool accordingly for efficient and targeted data collection. Finally, analysis of the data collected.

The current policies and program provide quantitative material (like the number of trees, number of developed parks, etc.) and still, there is a huge gap in the required green cover in the city. This research focuses on the qualitative reasons to include the quantitative materials to overcome the gap, which is why interviews and discussions with stakeholders are chosen. The total time taken to complete this research was around 4 to 5 months, which 1 to 2 months were for the survey preparation, modification, and primary data collection as appointment from the right government officials from each department could have taken more time, so the timeline was structure in a way that the days where no interviews were scheduled the site visit and group discussions were conducted with the public on voluntary bases. The wards selected for these discussions were from each population density type (high to medium to low), with about 10% of the city's total population. In each ward, three to five places were identified for group discussion, and only discussions with more than 10 people were considered for the research.

A matrix made the identification of the area of expertise for each department (refer to Table 2), and based on that, the questionnaire was modified before each interview, for example, dimension 'planning' will be a focused criterion for ANN and ADA (municipal corporation and development authority), at the same time PWD and NGO will support their work and other departments will be related in case of need (somehow related), so this is how the matrix works. The questionnaire for focused group discussion with users was done after the interviews with experts so that the gaps mentioned by the experts could be discussed with the users. For example, the common concern raised by experts was that there is a lack of resources for the maintenance process of the UGS, which results in the poor condition of the UGS in the city. Additionally, this concern was raised to the users about their activity and suggestions for this problem.

**Table 2:** Expert's interview and dimensions matrix.

Dimensions	ANN	ADA	HD	FD	CPCB	NGO	PWD
Demography	Important	Opinion/ Support	Somehow related	Somehow related	Somehow related	Somehow related	Somehow related
Planning	Important	Important	Somehow related	Somehow related	Somehow related	Opinion/ Support	Opinion/ Support
Culture	Partially related	Somehow related	Opinion/ Support	Somehow related	Somehow related	Partially related	Somehow related
Ecology and Environment	Partially related	Important	Important	Important	Important	Partially related	Somehow related
Public private partnership	Important	Important	Partially related	Partially related	Opinion/ Support	Important	Opinion/ Support
Institutional	Important	Important	Important	Important	Important	Partially related	Somehow related
Tools and techniques	Partially related	Opinion/ Support	Important	Important	Important	Important	Opinion/ Support
Accessibility	Partially related	Partially related	Somehow related	Somehow related	Somehow related	Important	Important
Safety and security	Partially related	Partially related	Somehow related	Somehow related	Somehow related	Opinion/ Support	Opinion/ Support
Norms and standards	Important	Important	Partially related	Partially related	Important	Important	Partially related

Legend:

Important	Partially related	Opinion/ Support	Somehow related
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### 3. Results

The analysis of the interviews with experts and group discussions with users is based on the analytical approach. From the interviews and FGDs, the important points for recommendation have been identified.

#### 3.1 Analysis of the People's Readiness in the Study (primary data analysis)

In-person interviews were conducted with the experts in each of the department. Additionally, focused group discussions were done with users. Here table 3 includes the results of the focused group discussion with the users, through which their readiness for improvement is brought up.

**Table 3:** The results of the FGDs with the users.

Users Responses				
Wards	Expectations from the government	Will of using personal space for UGS	Involvement in the maintenance process	Vehicle free streets
<b>Ward no: 6, 10, 29, 31, 34, 53, 69, 77, 79, 84, and 92.</b>	<ul style="list-style-type: none"> <li>Free plants</li> <li>The government will also be part of the process.</li> <li>Online connectivity with the government.</li> </ul>	<ul style="list-style-type: none"> <li>People are willing to use the roofs as gardens.</li> <li>For green walls, somehow they showed curiosity towards this concept.</li> </ul>	<ul style="list-style-type: none"> <li>50% are willing to be part of the maintenance process.</li> </ul>	<ul style="list-style-type: none"> <li>People have shown no objection to this concept.</li> </ul>

The interviews are informed in a matrix (Table 4), aligning ongoing or proposed UGS strategies with relevant departments. This analysis reveals the indicator's criticality. For example, the population density only considered by the ADA makes it a critical indicator. At the same time, the use of local species is been considered by all the departments, which makes it an indicator that does not need immediate focus.

**Table 4:** Expert interview analysis matrix.

Indicators		ANN	ADA	HD	FD	NGO	CPCB	PWD
<i>Considered in the process</i>			<i>In future proposal</i>		<i>Not considered</i>			
Demography	Population density							
	Household density and age group							
Planning	Different typologies (hierarchy) of UGS							
	To increase the % of UGS							
Culture	Preservation of heritage							
	Physical and social benefit							
	Separation of zones in UGS as per age group							
	Space of community interaction							
Ecology and Environment	Improvement in the quality of the surrounding							
	Local species of the plantation							
	Environmental benefit							
	Per person green cover							
Public Private Partnership	Benefits for biodiversity							
	Participation of the citizens							
Norms and standards	Norm for green field development							
	Norms for brown field development based on land use							
	Norms for roads, streets and green strips							



	Norms for tree cover and green spaces (adjacent to roads)	Green	Green	Orange	Green	Orange	Green	Orange
	Norms for tot lots and personal gardens	Orange	Orange	Orange	Orange	Orange	Orange	Orange
	Norms for neighbourhood parks	Green	Orange	Orange	Orange	Orange	Orange	Orange
	Norms for roof garden and green wall	Orange	Orange	Orange	Orange	Orange	Orange	Orange
	Use of nature based solutions	Green	Orange	Green	Green	Blue	White	White
Institutional	Financial support from government	Orange	Orange	Green	Orange	Orange	Orange	Orange
	Plantation by authorities	Green	Orange	Green	Green	Orange	Orange	Orange
	Maintenance by authorise	Blue	Orange	Green	Green	Orange	Orange	Orange
Tools and Techniques	UGS development new techniques	Blue	Orange	Green	Orange	Orange	Orange	Orange
Accessibility	Universal accessibility of the UGS	Green	Orange	Green	Orange	Orange	Orange	Orange
	Distance proximity of UGS	Green	Green	Orange	Orange	Green	Orange	Orange
Safety and Security	Safety in and around UGS	Orange	Orange	Green	Green	Orange	Orange	Orange
	Availability of vehicle-safe area	Blue	Orange	Green	Orange	Orange	Orange	Orange

Table 4 clearly outlines the opinions and perspectives regarding the improvement of Urban Green Spaces (UGSs) in the city. Based on this review, several critical points have been identified by both experts and users as areas requiring focused attention.

Highlights (analysis) from the experts' interview:

- The public participation is not considered at any stage by any department.
- There are few vehicle-free market street proposals.
- Per-person green cover is not considered but overall greenery percentage increase is the aim of almost all the departments.
- NGO is currently working as a link between different departments and users.
- Physical and social benefits are not considered in the planning process by any department.
- Dense areas of the city are excluded from the process.
- No such hierarchical division also in the UGS development planning or execution process.

Highlights (analysis) from the discussion with users:

- People are willing to be part of the maintenance process in and around their houses to increase the UGS in the surroundings.
- People are agreeing to make roads vehicle-free for a few hours a day.
- They will prefer simple solutions that will not increase their daily chore.
- They agree to be part of the maintenance process if the government has taken care of the initial process.
- They do want a park or a green space for their kids to play (as most people from high-population areas mentioned there is no space for them to play).

Hence, these few highlights will be considered for the proposal.

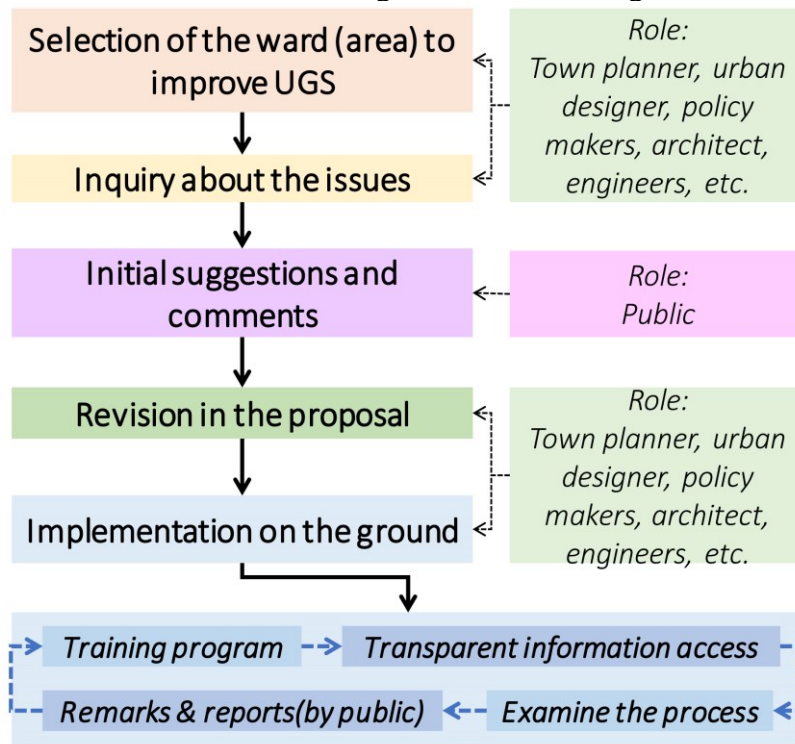
### 3.2 Recommendations

The formation of strategies can be better when it considers three basic needs- the authoriser's suggestion, people's perception, and reinforced by the case examples. Here, the authorities' suggestions and people's perceptions have been collected through primary sources, and the case study (which is not included in this research due to the scope constraints) is done through secondary data, which will help in the formation of final strategies (refer Figure 7).



**Figure 7.** Approach to formation of strategies.

Before finalizing the strategies, it is essential to clarify the participation of government officials, urban planners, policymakers, NGOs, etc., in the process. Stakeholder involvement will entail engaging them, from forming the proposal to submitting reports regarding the condition and maintenance. This stakeholder participation will be elucidated through a flowchart in Figure 8.



**Figure 8.** Stakeholders' participation in UGS enhancement process.



Now, this research will take the discussion towards the final strategic recommendations, which will help the policy planners to initiate the process, and later, they can modify the suggestions based on the requirements of the city and society:

- 1) For the high population density, the area of the roof garden and green wall will be a priority for developing UGS.
- 2) For low population density, area personal gardens and green spaces will be recommended to develop.
- 3) A manual for roof garden and green wall development and all the information related to green cover increase should be available 24x7.
- 4) Commercial buildings and group housing buildings will have to have a roof garden and green wall (all the roof and wall area except the area required for building services). Additionally, the developer will be incentivized with extra FAR.
- 5) The government will provide the irrigation system for the green wall.
- 6) Detached, Semi-detached, and row housing can develop 25-50% of the roof and wall area into a roof garden and green wall (as suggested by the city bylaws).
- 7) The government will provide plants for roof gardens, green walls, and personal gardens for residential buildings.
- 8) The local bodies will develop the parks and roads (ANN, ADA, Agra smart City Ltd.) under the ongoing schemes.
- 9) People will be given incentives (like free parking, free tickets, etc.) as they will participate in the planting and maintenance process.

These recommendations combine suggestions from authorities, people's perceptions and ground reality from the case study.

#### 4. Discussion

Urban green spaces are a necessity of the city. A city having poor quality and lacking minimum requirements of UGS can seriously affect its citizens in different aspects like social, economic, psychological, etc. Agra, the city of Taj, is known for its heritage, culture, and industries. However, there are no reflections of the famous heritage in other parts of the city. Agra city shows major spatial and social disparity in UGS, few of the places have much more than the required green cover (especially heritage sites and city forest area) and other places have much less than the required green cover (especially the high population density and old city areas). Additionally, two major reasons for this disparity are the lack of space for UGS development and people's unethical reaction (destroying the plantation, furniture, etc.) to the development.

Space limitations are a significant challenge, necessitating innovative solutions and consideration of public response. This research examines public readiness and proposes creative approaches to improve the condition of Urban Green Spaces (UGSs) in the city. It identifies gaps in current policies and programs related to UGS development, which led to the central research question: "Despite available strategies, why is the condition of UGSs in the city, particularly in older areas, not improving?" The study involved stakeholders, including experts and users, to gather their perceptions and suggestions for enhancement. It serves as a conduit between the government and the public, facilitating mutual understanding of expectations.

Since green spaces are essential for urban areas, the research suggests that strategies are most effective when they integrate expert knowledge, public engagement, and lessons from existing examples. The study formulated strategies specifically for densely populated, older parts of the city, such as implementing roof gardens, green walls, personal gardens, and green strips, which could increase per-person green cover and reduce the urban heat island effect. Offering incentives is recommended to encourage public participation and provide the government with additional resources for maintenance. The research's framework could be adapted to other city areas, such as institutional land, market zones, and greenfield developments, with tailored guidelines for different building uses.



The study emphasizes the importance of simplifying guidelines and offering incentives that benefit both the public and the government, making this a priority for policymakers. Town planners are encouraged to identify issues and adapt strategies based on local conditions when developing new wards or zones. Additionally, the study highlights the need for stakeholder input before implementing any policy or program, as detailed in Chapter 3. While the research focuses on commercial and residential areas, it can be extended to other land uses, including incorporating river-adjacent areas into blue-green infrastructure guidelines to improve both UGS and river conditions, addressing issues like flooding.

The strategies focus on providing planning, and people will volunteer for maintenance. This process has been used by another Indian city with features similar to Agra' Allahabad (Prayagraj)'. Allahabad has a population density similar to that of Agra. It also has a significant heritage culture and is a famous tourist destination. The Allahabad municipal corporation launched a scheme 'free tree scheme', in which the people will voluntarily contact the ULB for tree plantation near their house, and ULB will take care of the charges of tree planting scalping and tree-guard building. As per the Forest Survey of India report, Allahabad city has increased green cover almost two times (from 30000 to 55000 trees) from 2017 to 2019 (Forest Survey of India, 2019). Similarly, in Agra, this result can be duplicated. Additionally, the incentives and official knowledge from experts in the strategies will help to increase the green cover and provide social, economic, psychological, and environmental value to the city.

## 5. Conclusion

The study of Urban Green Spaces (UGSs) in Agra, the city of Taj, reveals critical spatial and social disparities that challenge the city's ability to provide adequate green spaces, particularly in high-density and older urban areas. Despite the presence of various policies and programs aimed at enhancing UGSs, the implementation has been uneven, with a concentration of green spaces around heritage sites and a noticeable deficiency in other parts of the city. The research highlights the importance of public-private partnerships and the active involvement of citizens in the development and maintenance of these spaces as a key strategy to bridge this gap.

The findings emphasize the need for innovative approaches, such as the development of roof gardens, green walls, and small-scale green spaces, particularly in areas where land availability is limited. By fostering citizen participation and offering incentives, these strategies aim to improve the quality of urban life, enhance environmental sustainability, and reduce social inequalities associated with access to green spaces. The study underscores the necessity for urban planners and policymakers to integrate these considerations into future UGS development efforts, ensuring a more equitable distribution of green spaces throughout the city.

Moreover, the research suggests that the methodologies and strategies proposed could be adapted to other cities facing similar challenges, thereby contributing to broader urban sustainability goals. The study serves as a reminder of the critical role that well-planned and inclusive urban green spaces play in promoting a healthier, more sustainable urban environment.

## Acknowledgements

I extend my gratitude to all the departments of Agra city (ANN, ADA, Horticulture Department, Forest Department, NGO, CPCB, PWD) and to all the users who participated in the survey process and contributed to this research. Lastly, I would like to thank my parents and my brother for their support and motivation.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflicts of Interest

The author(s) declare(s) no conflicts of interest.

**Data availability statement**

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

**Institutional Review Board Statement**

Not applicable.

**CRedit author statement:**

Conceptualization: D.S.; Data curation: D.S.; Formal analysis: D.S. and U.K.R.; Methodology: D.S. and U.K.R.; Supervision: U.K.R.; Roles/Writing - original draft: D.S. All authors have reviewed and approved the final version of the manuscript.

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**How to cite this article:**

Sharma, D., & Roy, U. K. (2024). Economic Implications and Public Readiness for Urban Green Space Development in Agra: A Strategic Evaluation in the City of Taj. *Journal of Contemporary Urban Affairs*, 8(2), 529–545. <https://doi.org/10.25034/ijcua.2024.v8n2-14>

*Original scientific paper*

# Evaluating Urban Heat Island Mitigation Strategies in Rajshahi, Using ENVI-Met: A Remote Sensing Approach

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Received: 16 May 2024  
Revised: 3 September 2024  
Accepted: 4 September 2024  
Available online: 13 September 2024

**Keywords:**

Urban Heat Island,  
Mitigation Strategies,  
Urban Micro-Climature,  
Simulation,  
Thermal Comfort,  
Green Infrastructure,  
ENVI-met Simulation.

**ABSTRACT**

*The Urban Heat Island (UHI) effect is a critical environmental challenge in the 21st century, intensified by rapid urbanization and industrialization. This study focuses on Rajshahi, a rapidly urbanizing city in Bangladesh, where the UHI effect has already begun to manifest significantly. Utilizing ENVI-met software, a comprehensive analysis was conducted to evaluate the effectiveness of urban vegetation strategies, such as green roofs and street planting, in mitigating local temperatures and improving outdoor thermal comfort in Rajshahi's Central Business District. The findings reveal that these mitigation strategies can reduce air temperatures by up to 10 Kelvin, providing substantial cooling benefits. This research highlights the importance of integrating green infrastructure into urban planning to combat the UHI effect, enhance sustainability, and improve the overall livability of urban environments. The study offers valuable insights and practical recommendations for urban planners and policymakers, aiming to foster resilient and sustainable urban development in rapidly growing cities like Rajshahi.*



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**Publisher's Note:**

Journal of Contemporary Urban Affairs stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 546–556.

<https://doi.org/10.25034/ijcua.2024.v8n2-15>[www.ijcua.com](http://www.ijcua.com)

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**Highlights:**

- Increasing green roof coverage will significantly reduce surface temperatures in Rajshahi's Central Business District.
- Street planting along major roads will lower air temperatures and improve outdoor thermal comfort in Rajshahi.
- The combination of green roofs and street planting will result in a greater reduction in the Urban Heat Island effect than either strategy alone.
- The extent of green infrastructure implementation will correlate with decreased energy consumption for cooling purposes in urban buildings.

**Contribution to the field statement:**

This manuscript provides a novel analysis of the Urban Heat Island effect by integrating socio-economic variables with thermal imaging data, offering a comprehensive understanding of UHI's impact on urban communities. The study introduces a new methodology for assessing UHI's social and economic consequences, contributing valuable insights to urban planning and sustainability literature.

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Sadat, N., Hameem, S., & Asaduzzaman, M. (2024). Evaluating Urban Heat Island Mitigation Strategies in Rajshahi, Using ENVI-Met: A Remote Sensing Approach. *Journal of Contemporary Urban Affairs*, 8(2), 546–556. <https://doi.org/10.25034/ijcua.2024.v8n2-15>

## 1. Introduction

The Earth's surface has experienced significant changes during the last fifty years, mostly due to human activity, with extensive urban growth emerging as a major force. Numerous alterations to the environment result from this expansion pace, which frequently matches or exceeds the increase in the population of cities. The worldwide urban area grew at an astounding pace of 168% between 2001 and 2018 (Bhuiana and Jameib, 2024), with the fastest growth rates occurring in Asia and Africa. The UN's 2011 review of world urbanization prospects predicts that this rapidly increasing trend of urbanization would push urban areas. By 2050, urban areas are predicted to house around 70% of the world's population. (Patil & Sood, 2021).

The rapid urban growth driven by human activities is transforming natural landscapes, leading to a surge in heat emissions from sources like solar radiation, power plants, vehicles, and air conditioning units. This shift results in unique microclimates within cities, characterized by varied surface types, densities, and thermal properties. Known as the Urban Heat Island (UHI) effect, this phenomenon makes urban areas significantly warmer than the adjacent rural areas. Cities become hotter, air quality worsens, and the demand for energy spikes, making it harder to achieve sustainable urban living (Oke, 1982).

This situation is not different for Bangladesh, which has experienced an unheard-of increase in urbanization in recent years. With an estimated total population of 169 million (UN, 2017), and a density of 1,153 per square kilometer in 2018 (Anwar, 2020), this developing country has been undergoing rapid urbanization. According to World Bank data, the country's urban population grew from 22.5 million in 1990 to 60 million in 2019. This rapid urban expansion has led to significant environmental challenges in major cities, including a marked increase in temperatures. The loss of natural surfaces such as forests and agricultural lands, driven by diverse climatic conditions and the burgeoning population, has exacerbated these issues. Urban areas are experiencing a worsening trend of rising temperatures, leading to more frequent and extended heat spells. While natural disasters like floods have established mitigation strategies, the recognition of urban warming as a critical issue for these cities has only recently gained prominence.

While Bangladesh as a whole faces substantial environmental challenges due to rapid urbanization, the focus on Rajshahi provides a more localized understanding of these impacts. Rajshahi, a major urban center in northwest Bangladesh, has experienced significant urban growth, which has led to notable environmental transformations. This city, known for its rapid population growth and expanding urban footprint, exemplifies the urban heat island (UHI) phenomenon. In 2011 the population of Rajshahi City Corporation area was 448,087, but in 2018 it increased to 552,791 (Census, 2022). The built-up area of Rajshahi has been growing at a concerning rate. The built-up area of the district has increased dramatically, covering an area of around 165 km<sup>2</sup> between 1998 and 2018. Rajshahi's urban population rate stands notably higher at 32.93% compared to Bangladesh's average of 23.3%. This statistic underscores Rajshahi's substantial contribution to the overall urbanization trend in the country, where it attracts 17.83% of all migration from rural to urban areas (Asaduzzaman & Hameem, 2021). Accompanied by the 188 km<sup>2</sup> of vegetation that was lost. The loss of green spaces and the increase in impervious surfaces exacerbate these temperature differences, making Rajshahi a critical case for studying the effects of urbanization on local microclimates.

The Urban Heat Island (UHI) effect poses a significant threat to urban environments like Rajshahi, yet there remains a notable scarcity of studies detailing potential mitigation strategies and their adaptation and implementation in this specific context. Strategies like green roofs and walls, urban green spaces like parks and tree-lined streets, cool pavements and reflective surfaces, permeable pavements, compact urban planning, and energy-efficient building designs can be very effective for UHI. For example, studies have shown that green roofs and walls can cause a reduction of surface temperatures by up to 3-5°C in cities like New York and Singapore (Oberndorfer et al., 2007). Implementation of cool pavements and reflective surfaces has led to measurable reductions in surface temperatures by 1-2°C in cities like Los Angeles and Madrid (Akbari et al., 2001). These strategies underscore their practical utility in enhancing urban sustainability and resilience to climate change impacts across diverse urban environments.

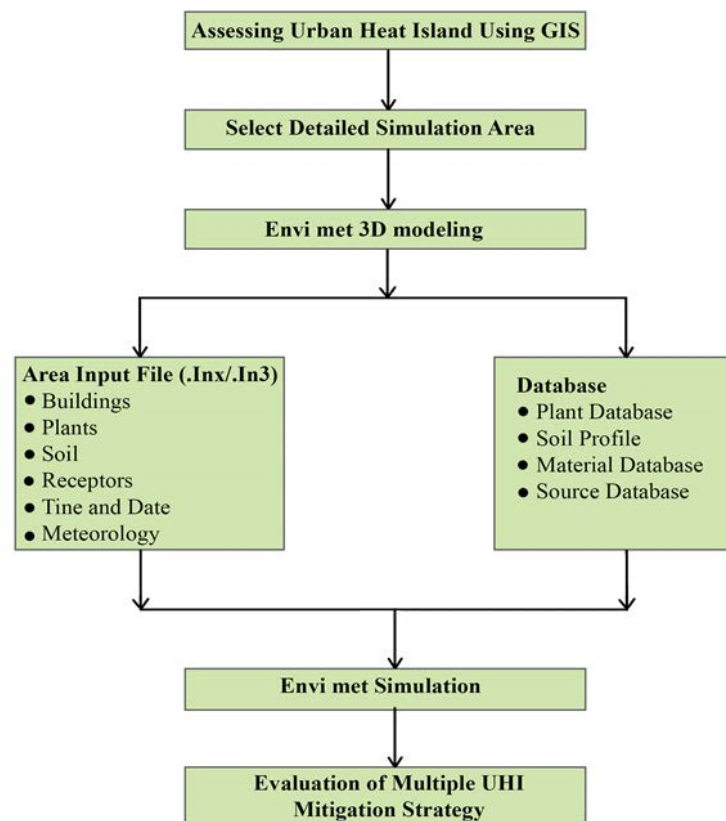
This study's main goal is to explore and promote the use of specific strategies tailored for Rajshahi, focusing on green roofs and street planting. Using simulation tools like ENVI-met software, we aim to measure how these strategies can reduce the Urban Heat Island (UHI) effect and enhance outdoor comfort in Rajshahi's Central Business District. By simulating different scenarios and analyzing the results, our

research aims to offer practical insights into integrating green infrastructure into urban planning to combat heat island effects in rapidly growing cities like Rajshahi. This study adds to the existing knowledge of the practical strategies for sustainable urban development in the face of urbanization and climate challenges. It also aims to provide actionable guidance to policymakers and urban planners on how to make cities more resilient and livable as they continue to grow.

## 2. Methodology

This research is dedicated to investigating the Urban Heat Island (UHI) phenomenon and assessing strategies for its mitigation, utilizing simulations to predict their potential impact. The study follows a systematic approach. The selection of a study area is the initial step, acknowledging the non-universal nature of UHI. This ensures a detailed examination of the cause-and-effect dynamics and parameters within a specific context. Subsequently, an in-depth analysis of the existing UHI effect in the chosen area is conducted, employing a Geographic Information System (GIS), existing data, and records.

A simulation zone within the study area is then identified, serving as a focal point for a comprehensive investigation into UHI and the potential effectiveness of various mitigation strategies. The existing UHI setup within this simulation zone is replicated and simulated to quantify current UHI levels, establishing a baseline for subsequent analyses.

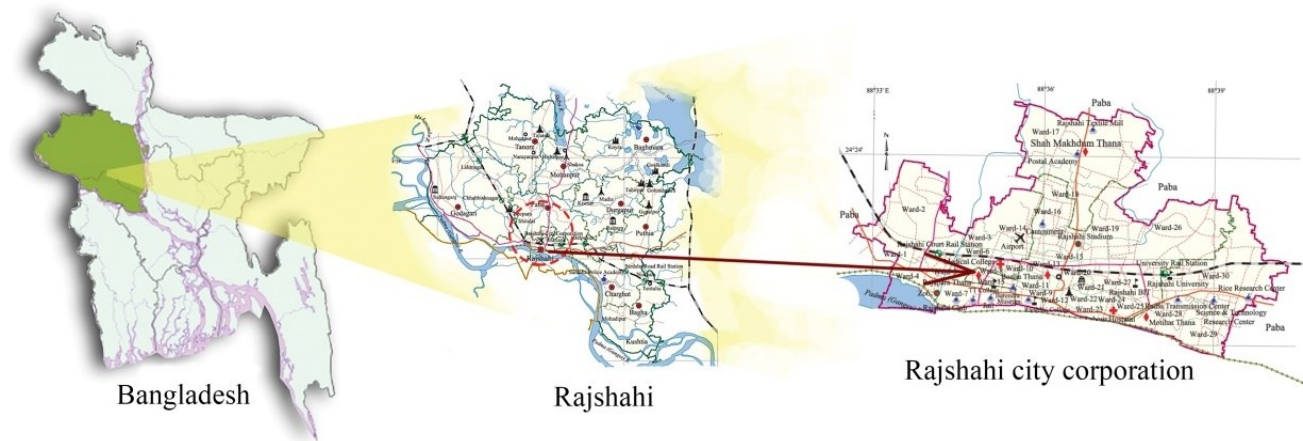


**Figure 1.** Structure of the Study.

Chosen UHI mitigation strategies are implemented within the simulation zone, reflecting a proactive approach to counteracting the UHI effect. The outcomes of the simulation, including temperature variations and other relevant parameters, are calculated using Envimet, providing insights into the impact of the implemented strategies. Results are meticulously compared with the prevailing UHI scenario, revealing the efficacy of selected mitigation strategies by highlighting changes in UHI levels. This systematic process contributes valuable insights into understanding, mitigating, and predicting UHI outcomes, with practical implications for urban planning and environmental management.

### 3. Location and Profile of the Study Area

Rajshahi has almost flat terrain, with surface elevations ranging from 1 to 18 meters. The third-largest metropolis in Bangladesh (Hameem et al., 2023), Rajshahi, is located in the northern region of the country where the number of heat-related illnesses and mortalities, and financial losses is increasing (MoHA, 2019). The district, which covers an area of around 2428 km<sup>2</sup> (Ashma et al., 2022), has a tropical wet-dry climate with an average temperature of 22°C–25°C and an annual rainfall of roughly 1448 mm. However, during summer, temperatures can soar to 42°C or even higher on the hottest days (Shahid et al., 2016). The city frequently encounters heatwaves, defined as sustained daily temperatures of 38°C or more over three consecutive days (Nissan et al., 2017). Over the past 40 years (1981–2020), temperatures between 30–36°C were most common, recorded for nearly 46% of the study period's 14,600 days. Rajshahi sees numerous days with temperatures exceeding 40°C, particularly in April and May, with the highest number of days (196) recorded in April between 38–40°C (Khatun et al., 2016). The city's heat index value reached 41, (Rajib Et.al, 2011). This highlights the prominence of the Urban Heat Island (UHI) effect, significantly impacting the daily lives of its urban dwellers. Thus UHI is very prominent in Rajshahi. Also affecting the daily life of urban dwellers. Rickshaw pullers and vehicle drivers are among the most impacted, losing 20% and 18% of their incomes, respectively (Ashma et al., 2022).



**Figure 2.** Location of the study area.

So, the Urban Heat Island (UHI) issue is a critical concern for Rajshahi. These reasons justify the need to study UHI in this city. Rajshahi's specific conditions make it an ideal location for UHI research within Bangladesh, setting it apart from other areas. Implementing effective mitigation strategies here could greatly reduce the suffering experienced by urban residents due to the severity of UHI effects.

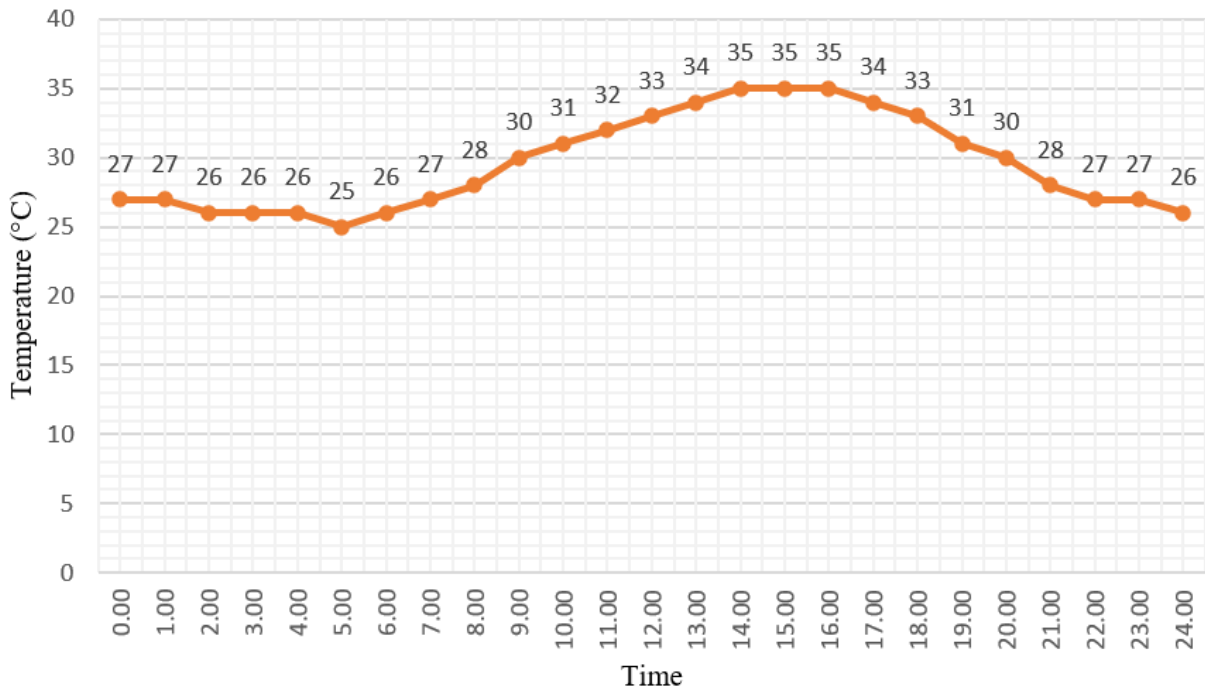
### 4. Heat Island Effect on Rajshahi

As Rajshahi continues to develop, it is experiencing a shift towards urbanization, leading to a decline in vegetative areas and water bodies. Between 1998 and 2018, numerous water features disappeared, being replaced by either vegetation or built-up areas. The proportion of vegetated areas dropped significantly from 50.8% in 1998 to 4.03% in 2018, reflecting changes in land use and land cover (Kafy et al., 2020). This urban expansion has caused a mean temperature increase of up to 6°C in developed regions.

In 2018, large expanses of bare land that were previously water-covered in 1998 remained visible, signalling profound landscape alterations. Urban zones experienced temperatures 2°C to 4°C higher than rural areas, primarily due to reduced plant cover and an increase in impervious surfaces, which changed local thermal dynamics. Consequently, urban surface temperatures averaged 3.68°C higher than ambient air temperatures (Ashma et al., 2022). These changes underscore the critical impact of urbanization on local climates, highlighting the necessity for sustainable urban planning.

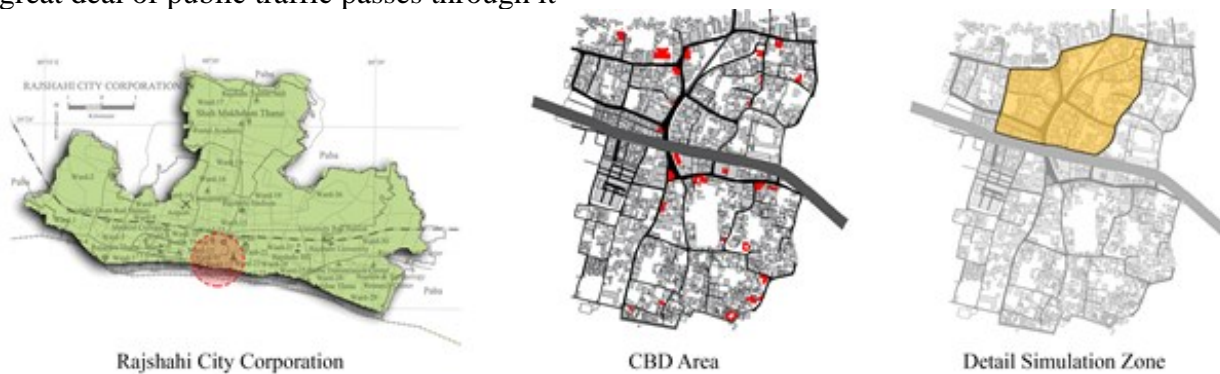
Land surface temperatures (LST) have progressively increased, ranging from 17°C to 25°C in 1998, 18°C to 33°C in 2008, and 26°C to 42°C in 2018. In 1998, 40.28% of the area had temperatures between 28°C and 30°C, which grew to 44.05% in 2008. The city centre has become increasingly susceptible to extreme heat, with an approximately 13°C rise in LST between 1997 and 2017 (Al Kafy et al., 2020). This rapid

increase in surface temperatures suggests a growing risk of amplifying the Urban Heat Island (UHI) effect. Simulated data from June 1, 2020—one of Rajshahi's hottest days—corroborated these observations, confirming a troubling trend. The escalating temperatures contribute to the UHI effect, making urban regions substantially warmer than their rural surroundings.



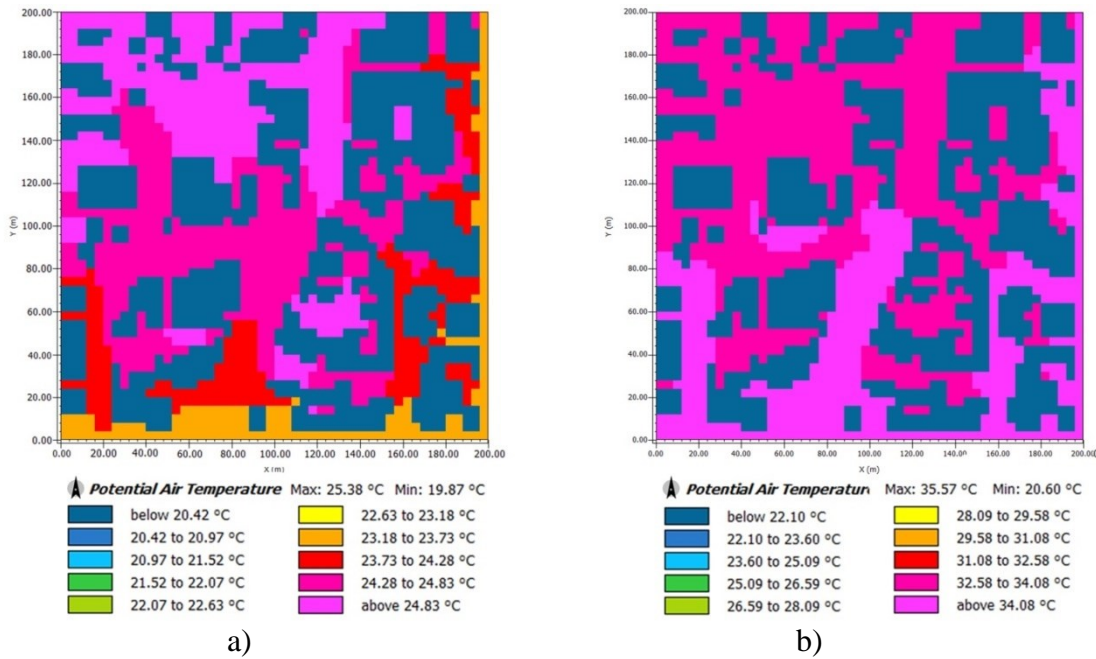
**Figure 3.** Simulated Hourly Weather Data on 01 June 2020.

This raises questions about the UHI's mitigating plans. However, choosing the best plans and implementing them over the entire city is an extremely time-consuming process that may not even be deemed possible. In order to minimize UHI, a more focused zone that is near the CBD region was chosen for a deeper examination. For this reason, the route that leaves the city centre and runs between the train station and the CBD was selected. Since this route serves as Rajshahi's main commercial thoroughfare, a great deal of public traffic passes through it



**Figure 4.** Detailed Simulation Zone.

Additionally, a simulation was run over the chosen zone using Envimet to view the hourly temperature data for this region. It showed that the temperature reaches its maximum point at noon (15:00) at 35°C and its lowest point at five in the morning. But the temperature stays between 30°C and 35°C throughout the whole day, and it starts to drop in the evening and stays between 25°C and 28°C. Furthermore, a temperature map was created in the designated area. Even though this simulation was carried out in June, the data is primarily within this proximity for eight to nine months out of the year because this is a major summer region where summer lasts for about three-quarters of the year.



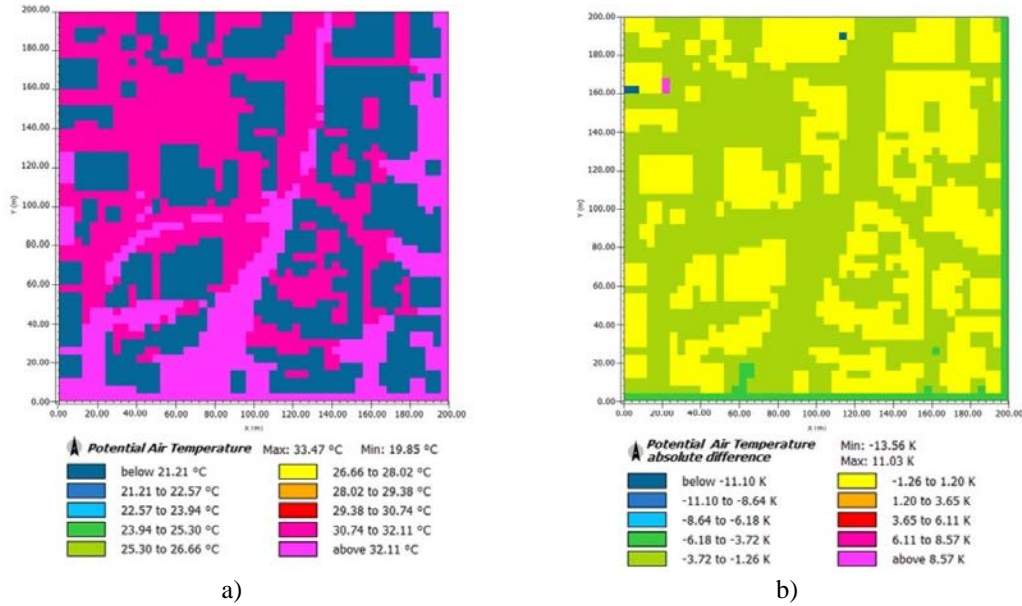
**Figure 5.** Potential Air Temperature 01 June 2020 a) 05:00 am. b) 15:00 pm.

## 5. Heat Island Effect Reduction Strategies

### Strategy 01: street planting

One of the most efficient ways to mitigate the Urban Heat Island (UHI) impact is to strategically plant more street plants (Nuruzzaman, 2015), especially along the major road spine of the zone of interest. The road's breadth plus the existence of a central island or barrier between lanes create the ideal environment for adding vegetation. In order to prevent direct sunlight from damaging the road surface and to absorb a significant quantity of heat, this concept calls for the purposeful strategic planting of trees to offer shade. Street planting is positioned as a potent way to drastically lower the UHI effect in the chosen zone because of its dual use. An extensive Envimet simulation was run on the selected region in order to validate this claim and calculate the precise impact on temperature decrease. The results of the simulation showed that, as predicted, surface heat peaks during midday. Variations in daytime temperatures were between a minimum of around 19°C and a maximum of roughly 33°C. The neighbourhood is now a designated hot zone due to the traffic congestion that exacerbates the heat-related problems. This causes discomfort not just for onlookers but also for building facades, where it radiates heat and makes living conditions worse for occupants.

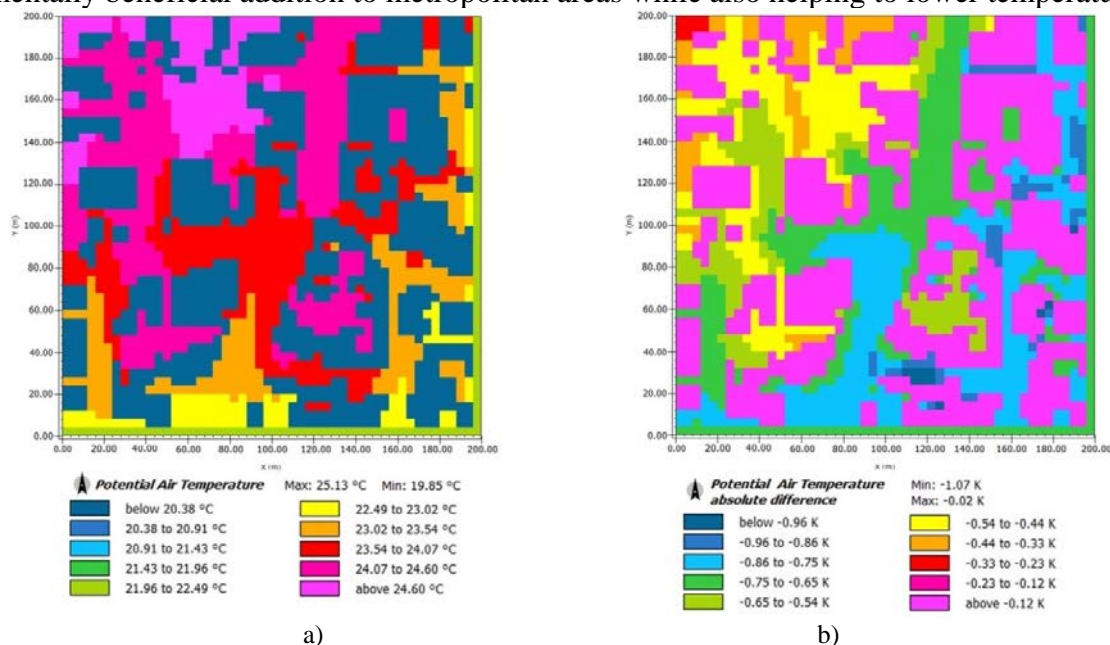
To determine how effective the chosen technique of expanding vegetation—in particular, street planting—was, it was put to the test through simulation. The findings showed a significant temperature variance, down to a high of 8.57 kelvin. However, in some areas, it is about 11 kelvin. This notable drop in temperature highlights the potential benefits of street planting in mitigating the urban heat island effect and enhancing overall comfort levels in the selected area. Thus, the implementation of street planting is demonstrated to be a feasible, useful, and significant approach to mitigating the problems associated with elevated temperatures in cities.



**Figure 6:** a) Potential Air Temperature after street Planting at 15:00 on 01 June 2020, b) Comparison of Potential Air Temperature between before and after street Planting at 15:00 on 01 June 2020.

### Strategy 02: Green Roofing

Taking the fight against the Urban Heat Island (UHI) effect a step further, the emphasis is now placed on green roofing techniques on nearby rooftops and terraces as well as the hard surfaces of highways. By mitigating the effects of direct heat on structures, this supplementary measure offers a comprehensive strategy for lowering the temperature in the designated zone (Tabassum et al., 2020). The intentional growing of flora on roofs as a protective layer that lessens the effects of heat is known as "green roofing". The efficiency of the green roofing technique in lowering surface temperatures was assessed using simulations. The simulation's findings showed a significant drop in surface temperature, with a maximum drop of almost 1 kelvin. This result demonstrates how green roofing may reduce the urban heat island effect and provide a more pleasant urban environment. Furthermore, adding indoor plants to terraces improves the method for reducing heat. The results of the simulation suggest that terraces with indoor plants help to mitigate heat gain. This dual-purpose strategy adds an aesthetically beautiful and environmentally beneficial addition to metropolitan areas while also helping to lower temperatures.



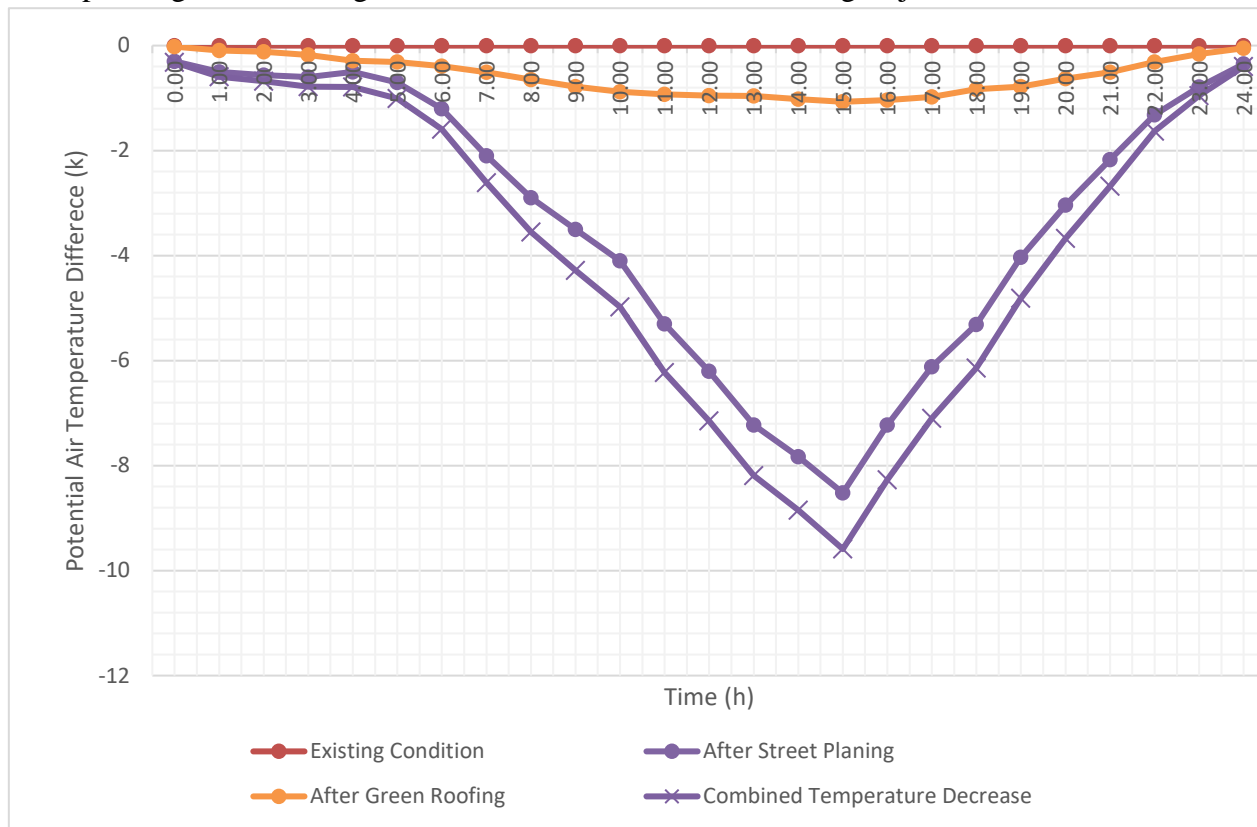
**Figure 7.** (a) Potential air temperature after roof greening at 15:00 on June 1, 2020, (b) Comparison of potential air temperature before and after roof greening at 15:00 on June 1, 2020.

## 6. Results and Discussion

In Rajshahi, strategies like green roofs and street planting are particularly advantageous for mitigating the Urban Heat Island (UHI) effect due to their cost-effectiveness and ease of implementation. Implementing green roofs expenses is relatively low compared to the long-term savings on energy bills (Berardi et al., 2014). When combined with shading or utilized alone, evapotranspiration can lower summertime peak temperatures by 1-5°C. (Kurn et al., 1994).

In the chosen zone, street planting and green roofing techniques each make a significant difference in lowering surface temperatures. In June 2020, simulations showed that when green roofing was used alone, it reduced surface temperatures by almost 1 kelvin during the day when they were at their highest. This suggests that the simulated area is having a beneficial effect on heat mitigation.

By contrast, street planting proved to be a more effective method, exhibiting a significant drop of more than 8 kelvin over the same time of day in the simulated region. Street planting worked well during the day and continued to have an effect at night. This impressive performance demonstrates how Effective Street planting is in reducing surface heat and, as a result, reducing Rajshahi's urban heat island effect.



**Figure 8.** Comparison of the reduction in surface temperature after adopting the mitigation strategies.

Additionally, combining green roofs with street planting was found to create a synergistic effect, reducing surface temperatures more effectively than using either method alone. This complementary approach enhances heat mitigation, making Rajshahi's UHI strategy more effective. Unlike traditional methods such as reflective pavements or expanded air conditioning, which can be expensive and energy-intensive, green roofs and street planting provide a more affordable and sustainable solution.

Research on UHI mitigation in Rajshahi using green roofs and street planting is limited by its reliance on remote sensing, which may not accurately reflect local conditions. Practical challenges such as building suitability, maintenance, and water availability complicate implementation. Additionally, a lack of long-term, Rajshahi-specific data and financial constraints can hinder the effective application and adoption of these strategies.



## 7. Conclusions

In Rajshahi, the study demonstrates that green roofs and street planting are effective strategies for mitigating the Urban Heat Island (UHI) effect by reducing surface temperatures and enhancing urban livability. Simulations conducted using the ENVI-met software show that these strategies can lower air temperatures by up to 10 Kelvin, significantly improving outdoor thermal comfort in the city's Central Business District. This research provides critical insights into the potential of integrating green infrastructure into urban planning to mitigate UHI impacts in rapidly growing cities like Rajshahi, contributing to more sustainable and resilient urban environments.

To effectively combat the UHI effect in Rajshahi, it is essential to expand the implementation of green roofs and street planting throughout the city. Increasing the number of green roofs can substantially lower building temperatures, reduce energy costs, and improve overall urban climate resilience. This approach should be incentivized through subsidies, tax benefits, and policy measures that encourage property owners to adopt green roofing practices. Additionally, expanding street planting along major roads and public spaces, with a focus on native and drought-resistant tree species, can offer a sustainable solution for temperature regulation and urban cooling.

Successful UHI mitigation in Rajshahi requires an integrated approach that involves both green roofs and street planting within the broader framework of urban planning. Policymakers should consider launching pilot projects on public buildings and strategic urban locations to demonstrate the effectiveness of these strategies, thereby fostering wider community adoption. Collaboration with local stakeholders, community education campaigns, and partnerships with environmental organizations will be vital in tailoring these mitigation measures to the city's specific needs and ensuring broad public support and participation.

Future research should focus on assessing the long-term effectiveness of these UHI mitigation strategies under varying climatic conditions in Rajshahi. Additionally, investigating innovative materials, smart technologies for cooling and irrigation, and evaluating the socio-economic impacts, such as energy savings and public health benefits, can further enhance the effectiveness of these strategies. These insights will support the continuous improvement and expansion of UHI mitigation practices, making Rajshahi more resilient to climate change and promoting sustainable urban development.

## Acknowledgements

The authors extend their gratitude to the Bangladesh Bureau of Statistics (BBS) for providing the existing dataset that was instrumental in this research.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflicts of Interest

The author(s) declare(s) no conflicts of interest.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

## Institutional Review Board Statement

Not applicable.

## CRedit author statement:

Nafis Sadat was responsible for conceptualization, methodology, visualization, funding acquisition, and writing the original draft of the manuscript. Sheikh Hameem managed data curation, conducted formal analysis, performed investigations, and developed the necessary software tools. Md. Asaduzzaman oversaw project administration, provided resources, supervised the research process, validated the findings, and contributed to writing, reviewing, and editing the manuscript. All authors have reviewed and approved the final version of the manuscript.



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**How to cite this article:**

- Sadat, N., Hameem, S., & Asaduzzaman, M. (2024). Evaluating Urban Heat Island Mitigation Strategies in Rajshahi, Using ENVI-Met: A Remote Sensing Approach. *Journal of Contemporary Urban Affairs*, 8(2), 546–556. <https://doi.org/10.25034/ijcua.2024.v8n2-15>



Original scientific paper

# Can Urban Design Foster Greater Inclusivity for Women in Public Spaces?

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## ARTICLE INFO:

### Article History:

Received: 5 July 2024  
Revised: 20 September 2024  
Accepted: 29 September 2024  
Available online: 4 October 2024

### Keywords:

Urban Inclusivity,  
Women in Public Spaces,  
Gender Sensitive Urban Design,  
Women Friendly Urban Planning,  
Public Space Safety,  
Accessibility in Urban  
Environments.

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### Publisher's Note:

The *Journal of Contemporary Urban Affairs* remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## ABSTRACT

*As urbanization accelerates globally, creating inclusive public spaces that accommodate women's rights and freedoms becomes increasingly vital. This study critically assesses the impact of urban environments on women in public spaces within the Indian context, focusing on Marine Drive in Kochi, Kerala. Employing field investigations, mapping, and both qualitative and quantitative analyses—including surveys of 100 women—the research explores elements affecting women's quality of life in urban settings. Key factors identified include safety concerns, inadequate accessibility, and insufficient infrastructure that hinder women's equitable participation in public spaces. Literature reviews and case studies highlighted parameters influencing women's experiences, such as land use, mobility, visibility, and safety. A theoretical framework addressing design, physical, environmental, cultural, and economic aspects was developed to create gender-sensitive urban spaces. Applying this framework to the design element of land led to specific guidelines enhancing accessibility, mobility, and permeability, which are crucial for women's comfort and security. The findings contribute to a deeper understanding of women's interactions with urban environments and provide a foundation for urban planners and policymakers to develop women-friendly public spaces, thereby promoting inclusivity and enhancing the overall urban experience.*

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 557–581.

<https://doi.org/10.25034/jcua.2024.v8n2-16>

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### Highlights:

- The accessibility of public spaces is influenced by integrated land use and mixed zoning.
- Women's safety in public spaces is impacted by visibility and natural surveillance.
- Women's mobility patterns are shaped by urban infrastructure and public transport availability.
- Inclusivity of public spaces is enhanced by gender-sensitive urban design and planning guidelines.
- The usability of public spaces is determined by the provision of adequate infrastructure and comfort facilities.

### Contribution to the field statement:

This paper offers a novel perspective on gender-sensitive urban design by analyzing the relationship between women and public spaces in India. It highlights key urban design elements—such as accessibility, safety, and infrastructure—that significantly impact women's participation in public spaces, contributing valuable insights to urban planners and policymakers for fostering gender inclusivity.

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### How to cite this article? (APA Style)

Benny, N., Sunder, R. S., Prajitha, T. K., & Kini, M. K. (2024). Can Urban Design Foster Greater Inclusivity for Women in Public Spaces?. *Journal of Contemporary Urban Affairs*, 8(2), 557–581. <https://doi.org/10.25034/jcua.2024.v8n2-16>



## 1. Introduction

As global populations continue to burgeon and urbanization accelerates, the design and functionality of public spaces have become pivotal in shaping the quality of urban life. Urban areas are increasingly becoming the primary habitat for a significant portion of the world's population, necessitating a comprehensive understanding of how these environments cater to diverse demographics, particularly women. The United Nations World Population Prospects indicate that by 2050, the global sex ratio will balance, underscoring the importance of creating inclusive urban spaces that accommodate the needs of all genders equally (Government of India, Ministry of Statistics and Programme Implementation, 2023).

In recent decades, there has been a transformative shift in the societal roles of women, both globally and within the Indian context. Women are increasingly pursuing higher education and engaging in diverse professional fields, breaking free from traditional domestic confines. This shift is reflected in the rising employment rates and educational achievements of women in India, where barriers in historically male-dominated disciplines are gradually being dismantled (Government of India, Ministry of Statistics and Programme Implementation, 2023). Such progress has amplified the presence and influence of women in various economic sectors, necessitating a reevaluation of urban public spaces that have traditionally been designed with male users in mind (Navid, Moghadam, & Rafieian, 2019).

Despite these advancements, women continue to encounter multifaceted challenges in urban environments. Safety concerns remain paramount, as women often face inadequate security measures in public spaces, leading to a pervasive sense of vulnerability (Vera-Gray & Kelly, 2020). Additionally, issues related to accessibility and mobility persist, with women frequently relying on public transportation and pedestrian pathways that are not adequately designed to meet their specific needs (Yılmaz, 2018). The spatial configuration of urban areas often fails to consider the unique patterns of movement and activity that women engage in, particularly those balancing domestic responsibilities with professional obligations (Libertun de Duren, 2022).

Furthermore, the social construction of gender roles significantly influences how women interact with and perceive public spaces. As Borgerson (2005) articulates, societal norms and gender stereotypes shape the behaviours and expectations placed upon women in public settings, often limiting their freedom and participation. This is compounded by unequal access to resources and opportunities, which reinforces gender-based disparities in the utilization and enjoyment of public spaces (Banasiewicz, 2017).

The necessity for gender-sensitive urban planning has never been more critical. Traditional urban design paradigms have predominantly prioritized the experiences and needs of men, inadvertently marginalizing women and other gender minorities. This oversight not only hampers the equitable use of public spaces but also diminishes the overall livability and sustainability of urban environments (Parnigoni, 2020). Addressing these issues requires a deliberate and informed approach to urban design, one that integrates the perspectives and requirements of women to foster inclusive and safe public spaces.

This study aims to bridge the existing gaps by critically assessing the impact of urban environments on women in public spaces, with a specific focus on the Indian setting. Through a case study of Marine Drive in Kochi, Kerala, the research seeks to explore the elements that affect women's quality of life in urban settings, analyze the socio-economic, cultural, and environmental factors contributing to gender-based disparities, and propose a theoretical framework to promote gender inclusivity in public spaces. By doing so, the study endeavors to provide actionable insights and guidelines for urban planners, architects, and policymakers to create more women-friendly public environments, thereby enhancing the overall urban experience for all residents.

## 2. Materials and Methods

The methodology for this study is structured to comprehensively analyze the impact of urban environments on women, with specific emphasis on public spaces. The research process began with

an extensive literature review, which explored key concepts such as the definition of public spaces, the evaluation of gendered spaces, and the social construction of gender roles that influence women’s interaction with public environments. The literature review further examined case studies and theories related to women-friendly urban spaces, aiming to identify gaps in existing research and establish a foundation for the primary study. The literature review also highlighted the significance of understanding the social, cultural, and environmental factors that affect women’s participation in public life.

Following the literature review, the primary study focused on a case study of Marine Drive, Kochi, Kerala, where data were collected through a combination of site surveys, interviews, and observations. A targeted population sample of 100 women was chosen to understand their experiences in the urban setting. Data collection also included an analysis of key site attributes such as connectivity, morphology, ecology, infrastructure, and activity patterns. This information was used to develop a conceptual framework integrating the socio-economic, cultural, and environmental factors influencing women’s interactions with public spaces. The findings were then analyzed to highlight the relationships between these variables, leading to the formulation of design guidelines and recommendations for creating women-friendly urban spaces.

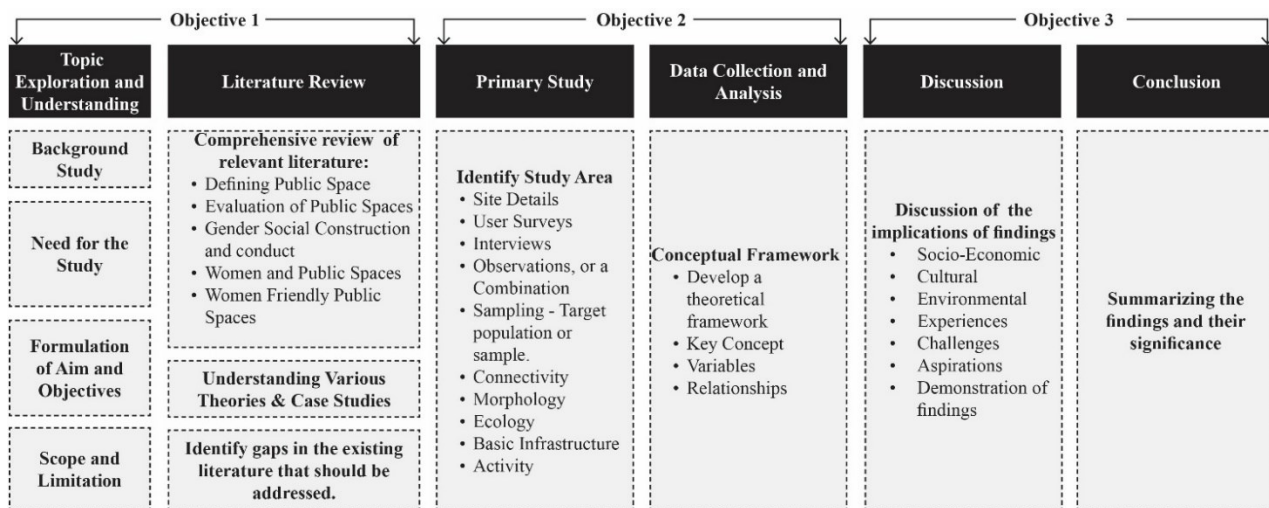


Figure 1. Methodology of the Study.

## 2.1 Literature Review

The literature review explores theories on women's interaction with public spaces, focusing on gender and public spaces, including gender's social construction, behavioural norms, and women's experiences in these spaces. Understanding public spaces and parameters to design a good public space using various theories.

### 2.1.1 Defining Public Space

Public space is described as areas that are open and accessible to everyone, where individuals can engage in various activities either alone or in groups. (M. Francis, 2007). According to UN-Habitat, public space encompasses all areas that are publicly owned or intended for public use, which are accessible and enjoyable by everyone without any cost or profit motive. This includes streets, open spaces, and public facilities. Four main characteristics define public spaces: they must be publicly owned or used by the public, accessible and enjoyable for everyone, free of charge, and not driven by profit. (Johanna Kanen, Jolynn Shoemaker, 2019). An inclusive city is one where citizens have access to all spatial, social, and economic necessities and amenities, such as land, housing, infrastructure, services, good jobs, equal rights, and opportunity to accumulate assets and wealth (WEF, 2022). An area or location that is accessible to the broader public and open to them is called a public space. It is usually a place where people congregate, converse, and partake in a variety of activities—often without the requirement for official admittance or a predetermined goal.



### **2.1.2 Evaluating Public Spaces**

Gender-inclusive space evaluation is essential, particularly for women, as it affects their involvement in public life, safety, and comfort as women frequently experience particular difficulties and safety concerns in public spaces.

- **Concepts of Placemaking:** Placemaking is an urban design strategy that puts people before infrastructure. It seeks to provide public areas that inspire and encourage social engagement and cross-cultural exchange rather than being merely functional spaces (Ellery, et al., 2020).
- **Twelve Quality Criteria for Good Design of Public Spaces:** Gehl developed the 'Twelve Quality Criteria' to assess people's perceptions of public spaces. These criteria are divided into three categories: protection, comfort, and enjoyment. Participants survey the chosen public area to evaluate whether it fulfils these criteria (Lutt, 2018).
- **Five Dimensions of Public Spaces:** A theoretical framework for assessing public space suggests that a high-quality public space should be open and accessible, thoughtfully designed to support various activities, safe, and comfortable both environmentally and physically. It should also provide a sense of control and be enjoyable to the senses. (Mehta, 2014). A Public Space Index (PSI) was developed to evaluate public spaces based on five key dimensions: inclusiveness, meaningful activities, safety, comfort, and enjoyment.
- **Star Model of Publicness:** The Star Model offers a comparative framework to assess how "public" different areas are. To evaluate the complex nature of publicness, it highlights five key dimensions: ownership, control, civility, physical layout, and vibrancy. (Varna & Tiesdell, 2010).

### **2.1.3 Gender Social Construction & Public Space Conduct**

Judith Butler, an American philosopher and gender theorist, asserts that masculine and feminine roles are not determined by biology but are shaped by social constructs (Borgerson, 2005). Actions and conduct within public areas are significantly shaped by gender, which is a social construction. Gender stereotypes, expectations, and social conventions have a huge influence on how people behave and traverse public spaces (Spain, 2020). Based on a person's gender identification, these structures frequently determine whether conduct is seen as proper or acceptable (Banasiewicz, 2017). There are both implicit and explicit cultural standards that dictate the ways men and women should conduct themselves in public (Altman, I., & Zube, 1989).

### **2.1.4 Women and Public Spaces**

According to "Family Fortunes: Men and Women of the English Middle Class, 1780-1850," as capitalism and industrialization developed, middle-class women moved away from productive labour and were increasingly restricted to their homes. Men dominated the public sphere, which included politics, business, and work, while women were confined to the private sphere, focusing on domestic duties and child-rearing (Davidoff, Leonore and Hall, 2018). The integration of theories, practices, and processes is known as Gender Sensitive Urban Planning/Design, and it can be considered a contemporary paradigm. (Navid et al., 2019).

## **2.2 Why Public Spaces Are Not Women-Friendly?**

### **2.2.1 Cities Were Designed by Men, For Men**

Simone de Beauvoir's 1949 book "The Second Sex" explored how women were perceived as the second sex. Men are viewed as the major sex, and women are classified as secondary to them. What sex a person is born with matters. Men are in a superior position of power and have greater opportunities. "Man" refers to a male. What makes a woman different from a "man" Women had to re-evaluate their position as a result (Bauer, 2017). Women still navigate the city facing various physical, social, economic, and symbolic limitations that significantly affect their daily lives in largely gender-specific ways, though not exclusively so. Many of these hurdles are unseen to males because they have fewer experiences with them. The city has been designed to reinforce and accommodate traditional male gender roles, treating men's experiences as the standard. This approach overlooks the challenges women face and fails to consider their daily experiences in urban life (Parnigoni, 2020). The idea of urban development and planning has traditionally prioritized the



demands and viewpoints of men over those of women. Due to this kind of city development, there are several gender-based inequalities in cities.

### **2.2.2 Land Use and Zoning**

Zoning is a significant instrument in regulating land use and it lacks extensive evidence on its implications on women's everyday lives. It is critical to rethink existing zoning trends, including the influence of centralizing or decentralizing public facilities and support on women's lives in cities (Montford et al., 1994). Women frequently want to reduce travelling distances across their houses and their jobs, with married women having the shortest trip durations (Nabil & Eldayem, 2015) (Bahadure, 2012). As a result, women tend to limit their job search to a narrower geographic region than males, which might limit their job market competitiveness or confine them to lower-paying local positions ("Women and the Urban Environment," 2014). Furthermore, women frequently have limited access to private vehicles and rely on public transportation for mobility, not just for work commutes but also for domestic chores and shopping to maximize their time.

### **2.2.3 Accessibility**

Utilizing public areas and services without restrictions or hurdles (Yılmaz, 2018). Access to the public realm is thereby limited for women, girls, and people of sexual and gender minorities due to the ensuing division of public and private areas.

### **2.2.4 Safety**

In general, a person's dread of crime can be defined as a sensation of "insecurity" and "fear" stemming from a perception that their security is in danger (Vera-Gray, Fiona, Kelly, 2020). Studies conducted by scientists have found that women and older people are more vulnerable to the fear of crime in urban areas. As a result, women are obliged to choose to stay in safe and secure regions and avoid urban streets, parks, plazas, public transit vehicles, and other places, especially at night. They face uneasiness when roaming the streets and even in their own houses; they limit their children's freedom of movement in the city; and they are forced to take precautions in public areas because of this fear. Women's involvement in the public life of the city is restricted by this circumstance.

### **2.2.5 Mobility**

Getting about the city in a cost-effective, safe, and easy manner. Travel habits tend to differ between men and women. Compared to males, women often use public transit more frequently and travel for many purposes. Women travel more complexly than males do since they often do more household chores and caregiving duties. As a result, in addition to their daily job commute, they must make journeys to schools, childcare facilities, healthcare facilities, and shopping destinations. Additionally, women are more likely to travel with family members who are older or have children (Libertun de Duren, 2022). In India, women utilize public transit one of the most often, according to a World Bank survey. According to the research, 84% of female travels include public transportation. In addition, 45.4% of women and 27.4% of men, respectively, walk to work, according to the research. In India, women use public transportation and walk more frequently than men, who tend to drive more (*India - Toolkit for Enabling Gender Responsive Urban Mobility and Public Spaces*, 2022).

### **2.2.6 Health and Hygiene**

For the sake of women's health and well-being, public places must prioritize hygiene and wellness. It's crucial to dispose of sanitary products in the correct containers (Wendland, C., Yadav M., Stock, A. and Seager, 2018). Emphasizing the value of having access to hygienic and secure restrooms is essential, particularly for women using public areas. Inadequate facilities can make it difficult to maintain cleanliness in many places.



**Table 1:** Various parameters identified from theories.

Concepts of Placemaking	Jan Gehl 12 Quality Criteria	5 Dimensions of Public Space	Star Model of Publicness	Others
<i>Sociability</i>	<i>Protection against</i> Traffic & accidents Harm by Others Unpleasant Sensory Experiences	<i>Inclusiveness</i>	<i>Ownership</i> Public ownership, public function & public use/administrative use/private use Private ownership, public function & public use Private ownership, private function & public use/private use	<i>Land Use</i> <i>Zoning</i>
<i>Uses &amp; Activities</i>	<i>Comfort</i> Options for Mobility Options to stand & linger Options for siting Options for seeing Options for talking/listening Options for play/exercise/activities	<i>Meaningful Activities</i>	<i>Control</i>	<i>Accessibility</i>
<i>Comfort &amp; Image</i>	<i>Enjoyment</i> Scale Opportunities to enjoy Positive aspects of climate Experience of Aesthetic Qualities/ Sensory Experiences	<i>Safety</i>	<i>Civility</i>	<i>Safety</i>
<i>Access &amp; Linkage</i>		<i>Comfort</i>	<i>Physical Configuration</i> Centrality & Connectivity Visual Access Gateways & Thresholds	<i>Mobility</i>
		<i>Pleasurability</i>	<i>Animation</i> Passive Engagement Active Engagement	<i>Health &amp; Hygiene</i>

**2.3 Literature Case Studies**

This section examines design interventions dedicated to enhancing women's experiences in public spaces, that offer practical illustrations of effective strategies and interventions.

**2.3.1 Public Spaces in Buenos Aires**

Buenos Aires, the capital of Argentina, is situated on the western shore of the Río de la Plata estuary. As a major, cosmopolitan city, Buenos Aires has established Design Guidelines in the "Manual for the Design of Public Spaces with a Gender and Diversity Perspective," prepared by the city's government. The guidelines encourage designers to focus on daily experiences and enhance the recognition and visibility of historically marginalized groups.

**2.3.2 Women-Friendly Spaces in Damietta, Egypt**

In the heart of Izbet al-Burg lies a 2,000-square-meter public space with Nile views, near the Egypt Public Library and city council.

**2.3.3 Malviya Nagar, Delhi**

Malviya Nagar, a neighborhood in Delhi, attracts many women from around the globe who choose to live as 'paying guests' there because of its proximity to employment, educational institutions, and services, along with affordable living costs. The research involved gathering spatial data through tracking human behaviour and conducting interviews with both experts and residents.

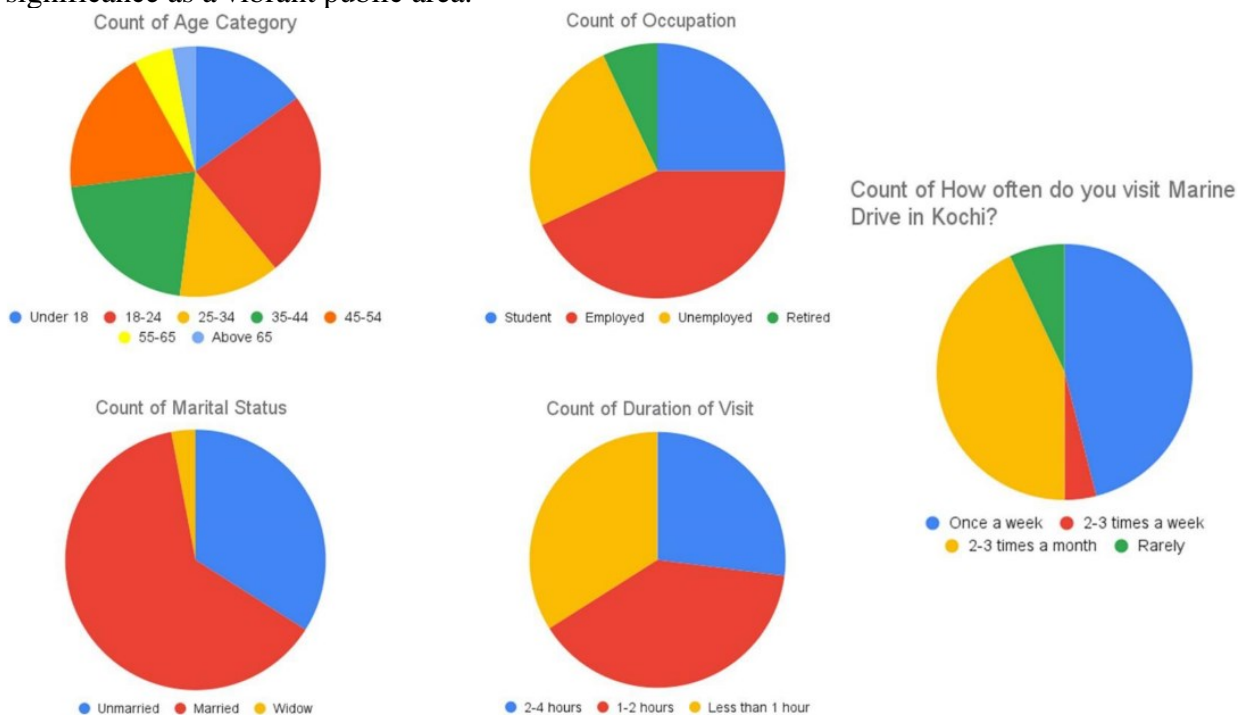
### 2.4 Live Case Study

Kerala has a high sex ratio (1084) and the highest proportion of females in its population among Indian states. Ernakulam, its commercial capital, has the highest rate of female employment in Kerala, making it ideal for studying the impact of urban environments on women in public spaces. Marine Drive is a significant public place in Kochi, Kerala, India (Figure 2). Marine Drive is a beautiful promenade of 2.5 Km along the backwaters with breathtaking views of the ocean and the Kochi cityscape. It is a popular destination for both locals and visitors, offering a tranquil setting for leisurely walks, jogging, and seeing the stunning sunset.



**Figure 2.** Marine Drive, Kochi, India.

The study of Marine Drive in Kochi, Kerala, took an integrated approach, including surveying 100 women to understand their use of the space (Figure 3) during December 2023 and January 2024. It evaluated the connection of Marine Drive with the city's transportation system, its morphological components, such as the coastline and green areas, its environmental aspects, and the sufficiency of its amenities. The study also examined the diverse activities that occur on Marine Drive, highlighting its significance as a vibrant public area.



**Figure 3.** Demographic Breakdown of Surveyed Respondents in Marine Drive, Kochi Study.

### 2.4.1 Connectivity

Marine Drive promenade is designed to be pedestrian-friendly, inviting visitors to wander along the shoreline and take in the scenery. Well-maintained pathways, sitting places, and green spaces improve the pedestrian experience, which makes it a popular spot for recreational walks and socializing. Boating amenities, particularly ferry services and sunset outings, provide tourists with a unique view of the metropolis from the water. It could be understood from the survey that 55% of women highly depend on public transport, 30% depend on walking and the remaining 15% rely on private vehicles to reach the public space (Figure 4). There are bus stops located at walkable distances creating an easy and accessible public space. Marine Drive in Kochi illustrates an easily accessible public place that blends smoothly with its surroundings.

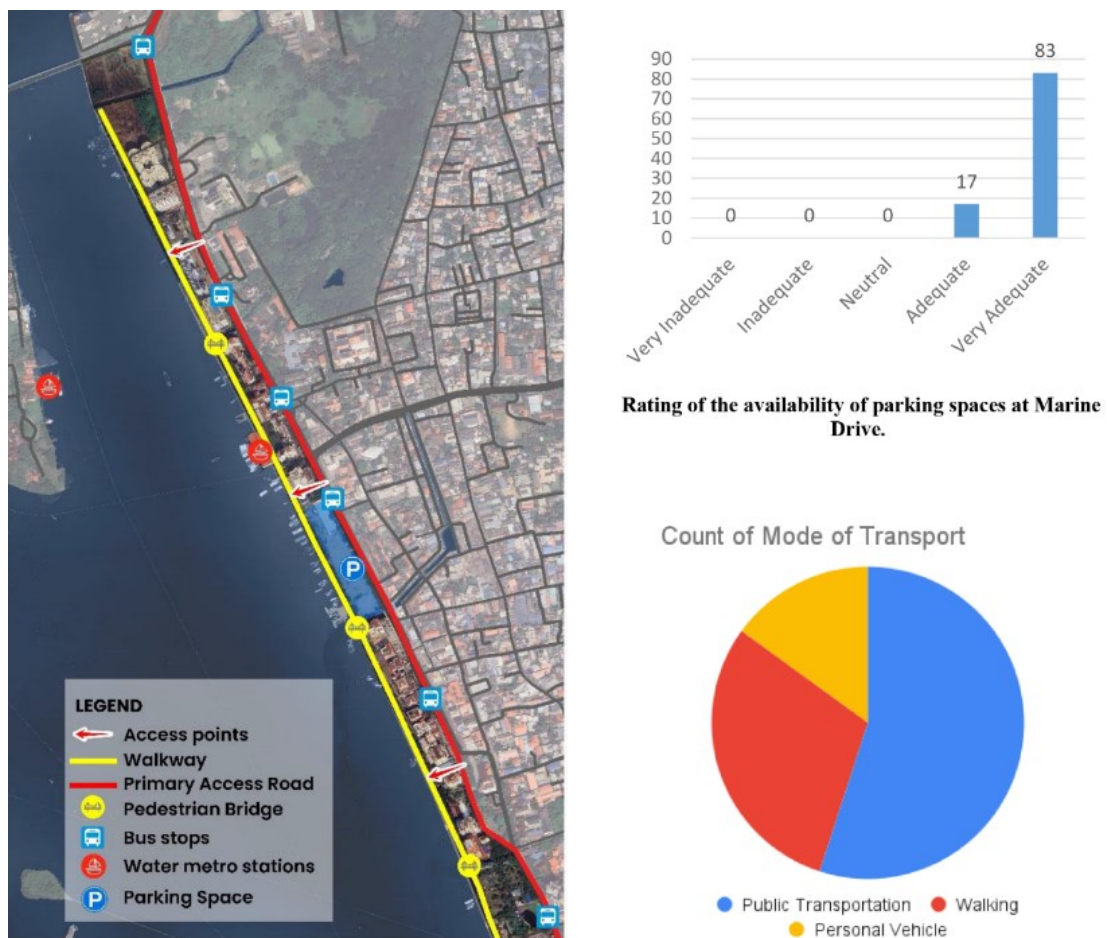


Figure 4. Connectivity of Marine Drive, Kochi.

### 2.4.2 Morphology

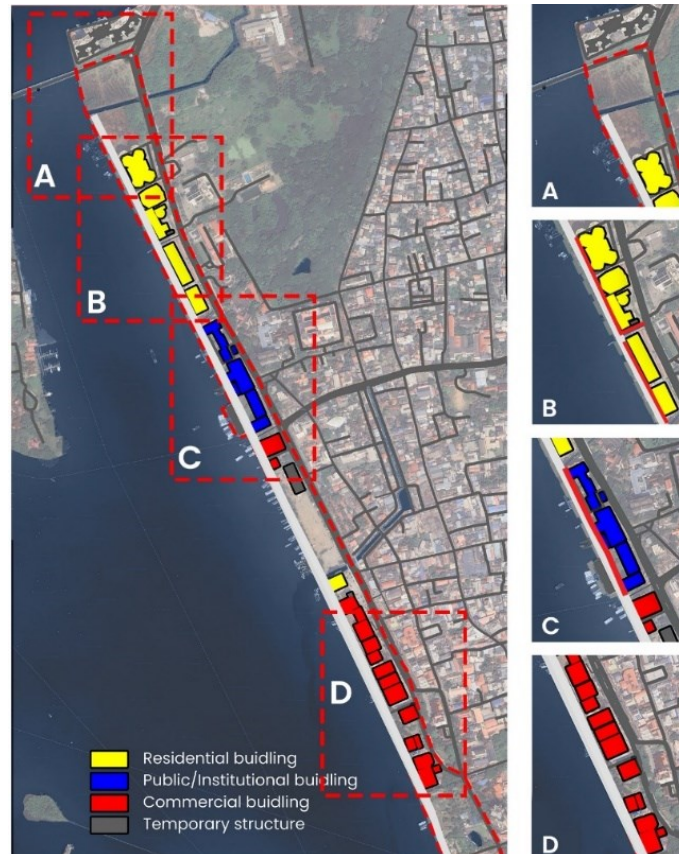
Land use planning is a crucial urban tool for managing various sorts of growth inside a city. Examining the region close to Marine Drive reveals three separate property uses: commercial, public, and residential (Figure 5). This finding emphasizes the direct impact of land use on the use and nature of public places. Each land use type adds to the dynamics of Marine Drive uniquely, influencing its atmosphere, accessibility, and functionality.

○ The industrial unoccupied area (Figure 5. A) is generally inactive, even though it has a potential viewpoint at the end. Unfortunately, women avoid this location unless accompanied by someone owing to safety concerns.

○ Residential areas (Figure 5. B) demand privacy, which frequently results in the construction of boundary walls that create an edge condition along the public space of Marine Drive. These walls, which are both visually and physically impermeable at ground level, provide a feeling of territory. Unfortunately, this may discourage women from visiting certain places owing to safety concerns.

However, ironically, these boundary walls give a sense of protection for women living in the same neighborhood.

- Public areas (Figure 5. C) next to Marine Drive are semi-public, with visually porous edges.
- The commercial area (Figure 5.D) near Marine Drive provides a dramatic contrast. Their public character makes them very porous and visible, creating a dynamic environment that enhances women's safety. These places offer a diverse range of activities, from shopping to dining, resulting in a lively yet secure environment.



**Figure 5.** Built use near Marine Drive, Kochi.

### 2.4.3 Ecology

Marine Drive's ecological backdrop is distinguished by a unique combination of natural features and urban infrastructure. On one side, the enormous lake, provides a picturesque vista, instilling a sense of calm and connection with nature and the presence of the waterfront. On the other hand, the land has a mix of constructed settings and green places. Based on the survey findings, 12% of women perceive the Marine Drive shades to be extremely effective, while 42% believe they are effective. Furthermore, 23% of women are ambivalent about the efficiency of the shades. Furthermore, 8% consider them to be slightly useful, while the remaining 15% say they are ineffective. However, it is important to note that not all sections of Marine Drive have shaded pathways, leaving certain portions open to the weather. This change in shade covering causes microclimatic variances along the promenade, which affects the comfort and utility of different portions.

### 2.4.4 Basic Infrastructure

Marine Drive has a complete variety of fundamental infrastructural features designed to improve visitors' comfort, convenience, and safety while upgrading their entire experience. Lighting fixtures strategically positioned along the promenade provide visibility and security, especially during the nighttime hours. Ample sitting arrangements are deliberately placed, enabling people to rest and enjoy the scenery while also encouraging social interaction. To preserve cleanliness, dedicated dustbins are strategically positioned around the region. Security personnel patrol the area, reassuring tourists and instilling a sense of safety and well-being. Clear signage improves navigation ease by offering

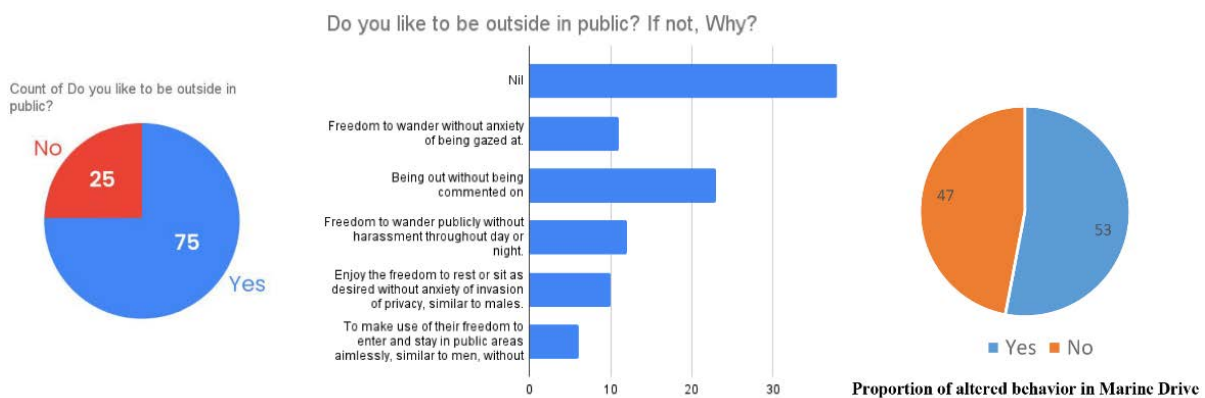
important information about attractions, instructions, and safety rules. Furthermore, the use of tactile pavement makes navigating easier for visually challenged people, fostering inclusion and accessibility. These important infrastructural components work together to improve the operation, aesthetics, and inclusivity of Marine Drive, resulting in a welcoming atmosphere for everyone who visits this place.

**2.4.5 Activity**

Activity is a cornerstone of urban design, influencing the spirit and usefulness of public areas. Activity generators can attract individuals and stimulate various types of engagement and connection. Temporary activity generators like street vendors, art exhibits, food trucks, and seasonal markets add excitement and originality to urban settings adding to the duration of their stay. Permanent activity generators, such as parks, plazas, community centres, and lively streetscapes, provide long-term foci of social activity and interaction. The permanent activity generators in Marine Drive are shops, seating spaces, water metro stations, boats, outdoor gym equipment, and piers. These features promote regular leisure activities, recreation, and social interactions, fostering a feeling of connection and engagement within the urban space. By including both temporary and permanent activity generators, communities may build complex and dynamic public areas that respond to their residents' different needs and interests.

**2.4.6 Inference**

Understanding women's behaviour in the urban environment is critical for designing areas that meet their demands, making their lives easier and more pleasant. Women engage with the cityscape differently for a variety of reasons, including safety concerns, childcare duties, and access to services. According to the poll, 75% of women want to go out in public places, while the remaining 25% don't, for a variety of reasons. These reasons include the desire to roam freely without fear of being stared at or commented on, the desire to wander publicly without fear of being harassed regardless of the time of day or night, the desire to rest or sit without being concerned about privacy invasion, and the hope to use the same freedom to explore public areas aimlessly as men do (Figure 6). Also due to several reasons, women have altered their behavior due to the uncomfortable urban environment (Figure 6). These findings highlight the necessity of fostering secure, inclusive urban settings that encourage equitable involvement of women in public life. Finally, understanding women's behavior in urban settings not only improves their quality of life but also helps the general livability and sustainability of cities for everybody.



**Figure 6.** Survey results of Marine Drive, Kochi.



**Table 2:** Various parameters identified from Case studies.

<b>Buenos Aires, Argentina</b>	<b>Damietta, Egypt</b>	<b>Malviya Nagar, Delh India</b>	<b>Marine Drive, Kochi, India</b>
<i>Security Vision Lighting Natural Surveillance</i>	<i>Recreational Opportunities</i>	<i>Natural Surveillance</i>	<i>Land Use Zoning &amp; Built use</i>
<i>Accessibility</i>	<i>Visual Linkages</i>	<i>Way-Finding</i>	<i>Navigation Way Finding</i>
<i>Mixed Use Various Activities Heterogeneity Flexibility</i>	<i>Multi-functional Spaces</i>	<i>Transparency of Buildings Facades</i>	<i>Safety Lighting Activity Generators</i>
<i>Environment Healthy Inviting Spaces Suitable Species</i>	<i>Accessibility</i>	<i>Openness</i>	<i>Accessibility Seating spaces Facilities Recreation activities</i>
<i>Cultural Landscape &amp; Heritage</i>	<i>Local Community</i>	<i>Lighting</i>	<i>Environment Shades Cleanliness Greenery</i>
<i>Circulation Community Management &amp; Ownership</i>	<i>Thermal Comfort</i>	<i>Mixed-use Improved Accessibility</i>	

### 3. Results

A theoretical framework was developed to address the five primary aspects of a public space: design, physical, environmental, cultural, and economic aspects. The design aspects were attempted to blend with the other four aspects to help develop design guidelines for women-friendly public spaces. The design aspect consisted of design elements/components of a public space, categorized into five categories: land, landscape, surrounding buildings, basic infrastructure, and outdoor furniture (Figure 7). The other four aspects (physical, environmental, cultural, and economic) were further classified as generic and specific, encompassing diverse components (Figure 8).

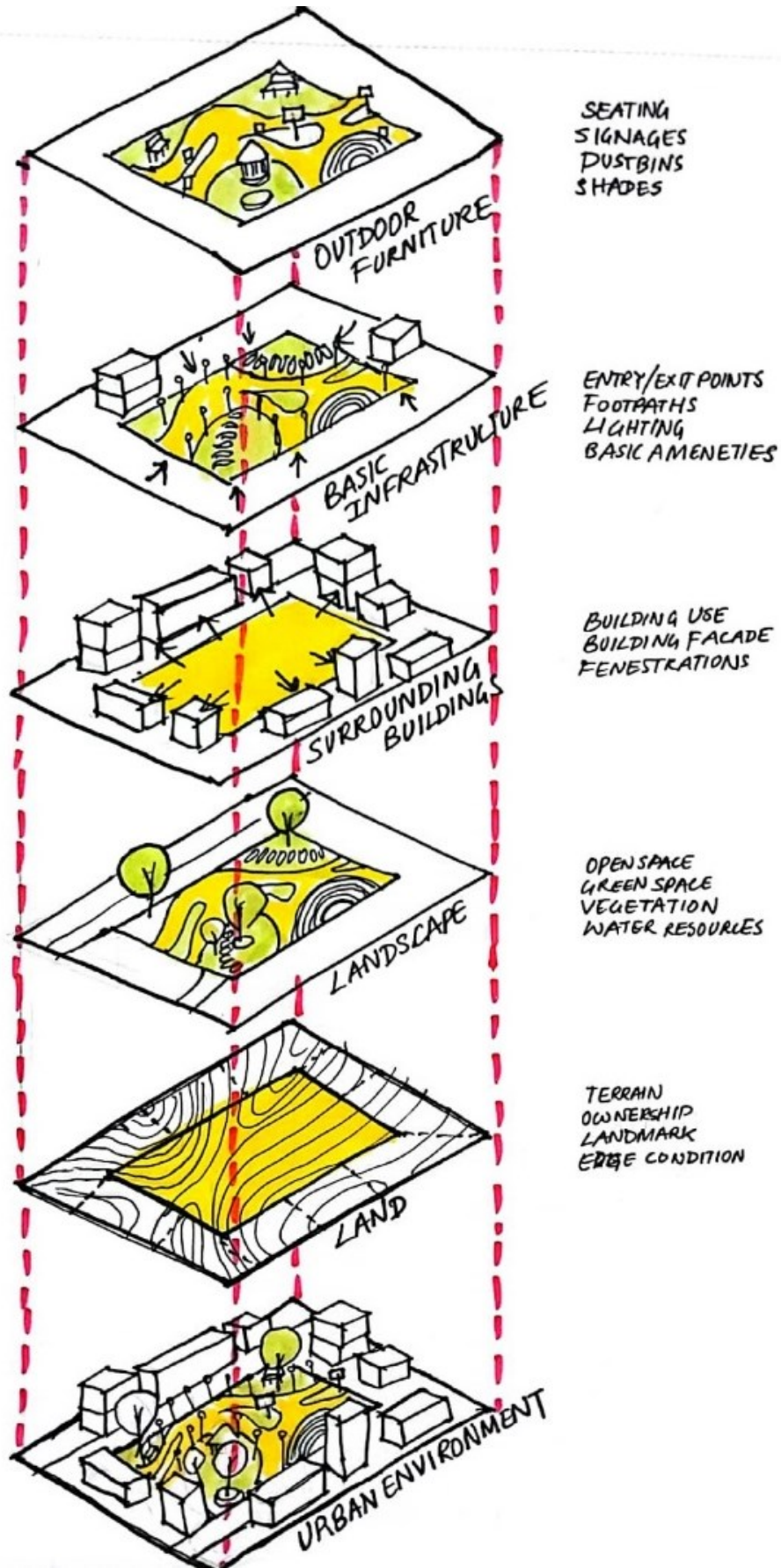
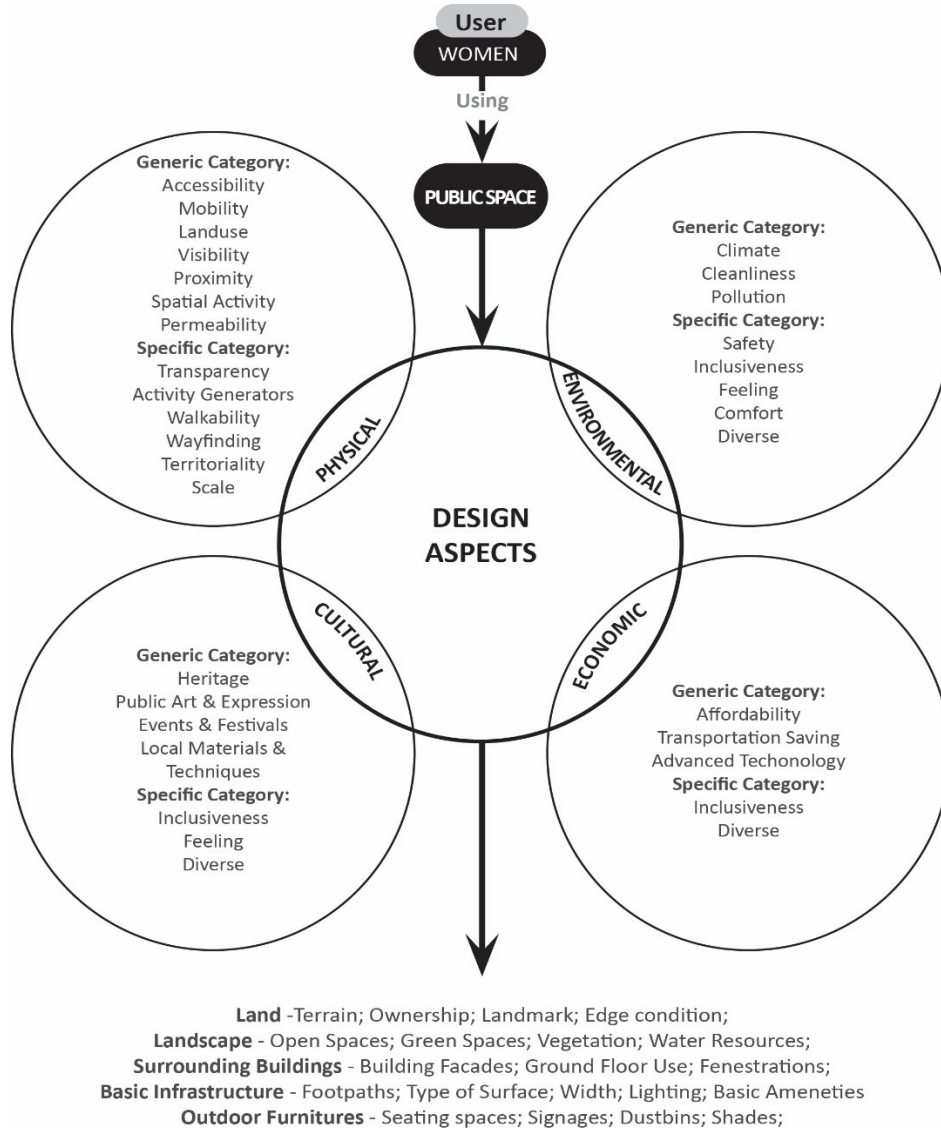


Figure 7. Design Aspects of a public space identified.



**Figure 8.** Comprehensive Design Framework for Gender-Inclusive Public Spaces: Physical, Environmental, Cultural, and Economic Aspects.

### 3.1 Physical Aspects

Physical aspects are those tangible and observable characteristics of public spaces that directly influence the experience of users. In the context of urban environments, these aspects are essential in shaping how people interact with space. Accessibility, for instance, refers to how easily individuals can reach and use places and services. This could be influenced by factors like transportation infrastructure, pedestrian pathways, and entry points to public spaces. Similarly, mobility plays a critical role, dictating the ease with which people and goods move within and around public spaces. Efficient mobility solutions such as well-planned roads, pathways, and public transit options help create more user-friendly urban environments, especially for women who rely on public transport more frequently (Yılmaz, 2018).

Another important physical aspect is land use, which governs how different areas within a city are designated for various purposes. Proper land use planning can ensure that public spaces are integrated seamlessly with residential, commercial, and institutional zones, enhancing their functionality and accessibility. Moreover, visibility—defined as the extent to which different elements and activities in a public space can be seen—greatly affects users’ perception of safety and openness. Clear sightlines can foster a sense of security, encouraging more active use of public areas, particularly by women, who may feel more vulnerable in spaces with obstructed views (Vera-Gray & Kelly, 2020).



Additional specific categories like walkability, territoriality, and wayfinding contribute to the overall experience in a public space. Walkability refers to how easy and enjoyable it is to navigate an area on foot, while territoriality involves the users' sense of ownership and belonging in that space. Effective wayfinding, on the other hand, ensures that users can orient themselves easily and navigate the public space without confusion. Together, these physical aspects influence the functionality, safety, and inclusiveness of public spaces, making them more accessible and appealing for diverse users, especially women.

### 3.2 Environmental Aspects

Environmental aspects address the sustainability and livability of urban public spaces, ensuring they are not only functional but also conducive to the well-being of their users. Climate, as one of the generic categories, has a direct impact on how comfortable and inviting a public space is. For example, appropriate shading or shelter from rain can make a significant difference in the usability of outdoor areas. Similarly, cleanliness is an essential environmental factor, with well-maintained public spaces fostering a healthier and more attractive environment for all users (Francis et al., 2007). Urban spaces with visible dirt or debris can deter public engagement, especially for women who may perceive such spaces as unsafe or unhygienic.

Safety is one of the most critical specific environmental aspects, particularly in the context of gender-sensitive urban design. A safe public space is one where women can move freely without fear of harm or harassment. This aspect intersects with both the physical and psychological experience of the environment, as well-lit and well-patrolled spaces can significantly enhance a woman's sense of security (Vera-Gray & Kelly, 2020). Additionally, inclusiveness in environmental design ensures that the public space accommodates individuals from all walks of life, regardless of age, ability, or background. This includes considering the needs of people with disabilities, and ensuring that public areas are equipped with ramps, tactile paths, and other features to enhance accessibility.

Feelings of comfort and diversity in public spaces are also vital to their success. Comfort refers to the mental and physical state of ease that users experience within the space, which can be affected by factors like seating availability, shade, and rest areas. The diversity of elements and users within a space contributes to its vibrancy and dynamic nature, making it more welcoming and enjoyable for all, including women. Public spaces that are thoughtfully designed to address these environmental aspects are more likely to be actively used, contributing to the overall sustainability and inclusivity of urban environments (Banasiewicz, 2017).

### 3.3 Cultural Aspects

Cultural aspects of public spaces pertain to the elements that reflect the shared history, values, and traditions of a community. Heritage, as a generic category, refers to the preservation of culturally significant landmarks, objects, or spaces that hold historical importance. These elements foster a sense of identity and belonging among users, connecting them to the past while encouraging civic pride (Altman & Zube, 1989). Incorporating public art and expression into urban spaces, such as sculptures, murals, and installations, not only enhances visual appeal but also stimulates community engagement and represents diverse cultural narratives (Davidoff & Hall, 2018). These artistic elements can transform an ordinary public space into a platform for cultural dialogue and social interaction.

Organized events and festivals are another essential cultural aspect that contributes to the vibrancy of public spaces. Festivals, markets, and cultural performances draw people together, creating lively environments that foster social cohesion and enhance the sense of community (Ellery, Ellery, & Borkowsky, 2020). Spaces designed to accommodate these events can adapt to various scales and functions, becoming focal points of urban life. Furthermore, using local materials and traditional construction techniques in public spaces helps to sustain regional character and promote environmental sustainability. Such practices ensure that urban spaces are not just functional but also rooted in their cultural context.



In terms of specific categories, inclusiveness in cultural design ensures that public spaces welcome people from all walks of life, fostering social integration and equitable access (Navid et al., 2019). A strong sense of belonging, or "feeling," is crucial to how individuals experience public spaces. Public spaces should evoke positive emotional responses, helping users feel connected to their environment rather than alienated. This is particularly important for women, who may feel excluded from certain public areas due to social or cultural barriers. By honouring diverse identities and promoting inclusivity, urban planners can create spaces that are culturally rich, accessible, and welcoming for everyone.

### **3.4 Economic Aspects**

The economic aspects of public spaces are closely tied to their sustainability and the way individuals engage with them. Affordability is one of the key generic economic categories, emphasizing the need for public spaces to be accessible to everyone, regardless of economic status. This involves ensuring that people can use these spaces freely or at minimal cost, for purposes ranging from recreation to socialization and informal economic activities like street vending. The affordability of public spaces enhances their inclusivity, making them central to the daily lives of a city's diverse population (Bahadure, 2012). Moreover, when public spaces provide opportunities for economic activities, they contribute to the local economy by encouraging commerce and entrepreneurship.

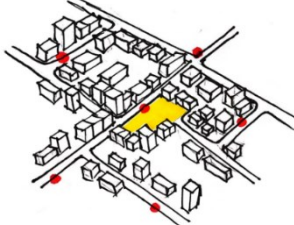
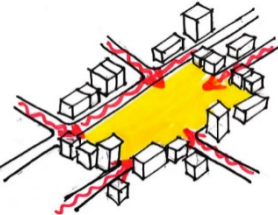
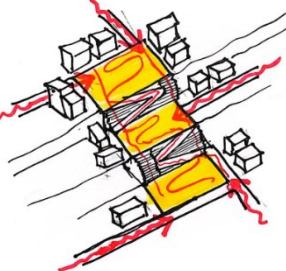
Efficient public transport is another economic aspect that significantly influences the accessibility of public spaces. Well-connected transport networks reduce travel time and cost, making it easier for individuals, particularly women, to access public areas safely and conveniently. The integration of public transportation with urban spaces boosts their utilization, while also supporting broader economic and environmental sustainability goals (Nabil & Eldayem, 2015). Additionally, the incorporation of advanced technology in public spaces can increase their functionality, whether through smart lighting systems, digital navigation tools, or environmentally friendly infrastructure, all of which enhance the overall user experience while reducing operational costs.


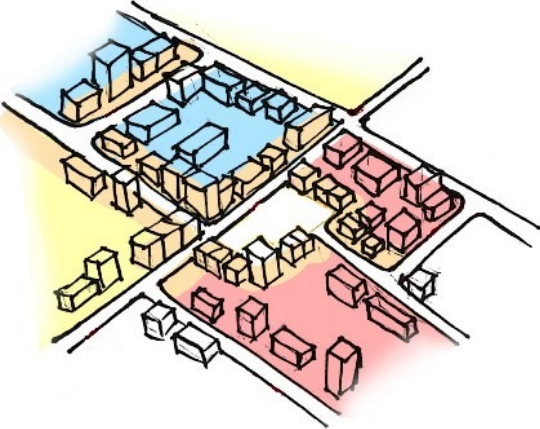
In specific economic categories, inclusiveness ensures that public spaces cater to the diverse needs of various socio-economic groups, offering activities that are meaningful and accessible to all. Diverse spaces—those that host a wide variety of activities and draw in a wide range of users—are economically sustainable because they encourage constant engagement and participation. This diversity fosters dynamic, prosperous public areas that serve as both social and economic hubs within a city. When urban spaces successfully integrate these economic aspects, they contribute to the overall livability and vibrancy of the city, making it more inclusive, accessible, and economically resilient (Lutt, 2018).



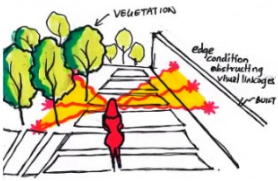
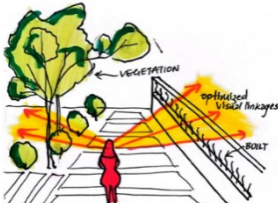
## **4. Discussion**


For demonstration purposes, this theoretical framework is applied to a single design aspect, land. As the globe becomes more urbanized, land becomes an increasingly precious resource. Land serves as a foundation for public spaces, providing a 2D surface on which they may be built and used. Land may be of the public space itself and the abutting land which can be characterized by land use, ownership, and edge condition.


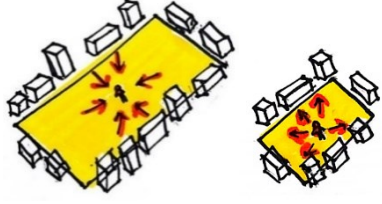
**Table 3:** Discussion and guidelines regarding land as a design element.

		DISCUSSION	GUIDELINES	
PHYSICAL ASPECTS	GENERIC CATEGORY	ACCESSIBILITY	<p><b>Accessibility</b> can be solved by designing roads, pathways, transit stops, etc. It can be addressed at main two levels:</p>  <p><b>Macro level:</b> Most of the women rely on public transport and visit public spaces on their way to and from home, work, or when running errands.</p>  <p><b>Micro level:</b> Women prefer public spaces with multiple entry/exit points as they increase accessibility. It is also considered safe to escape from dangerous situations.</p>	<p>Ensure the provision of Transit stops on or near the public space at a walkable distance by strategic placement and multi-modal connectivity to enhance accessibility and promote sustainable transportation.</p> <p>Incorporate multiple entry/exit points by strategic placement and assure a well-connected urban environment that prioritizes safety and accessibility.</p>
		MOBILITY	<p><b>Mobility</b> - Effective and efficient movement in and around the public space.</p>  <p>Tackled by planning and designing of terrain, roads, pathways, etc. There should be no obstructions in the landscape to allow for full articulation while keeping women's special requirements and safety in mind.</p>	<p>Enhance and optimize the multiple access roads/pathways to have an efficient and effective pedestrian circulation.</p> <p>Ensure unobstructed movement by providing essential routes for diverse users.</p>

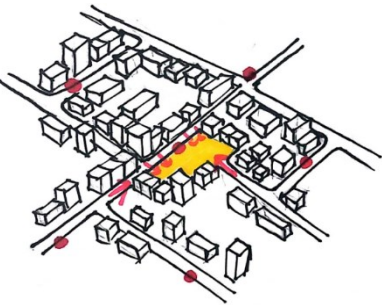
			DISCUSSION	GUIDELINES
PHYSICAL ASPECTS GENERIC CATEGORY LANDUSE		<p><b>Land use</b> influences the built-use of the buildings. Land use of nearby regions and abutting land has a major impact on the public space.</p> <p>Women play multiple roles through the work-life cycle including domestic chores, caregiving, and work. Hence gives rise to complex and frequent travel patterns by reliance on public transport and walking more than men, who drive more.</p> <p><b>Segregated land use:</b> Increases the commute and dependence on private vehicles thereby resulting in loss of time, cost, and energy.</p>  <p>This may result in women being more confined to the private realm and heavy dependence on online goods and services.</p> <p>Segregated land use might lead to inactive spaces due to diverse activities with varying schedules. Mitigation of such inactive spaces is concerned with the behavior and experience of women.</p> <p>Residential areas abutting public spaces are not preferred by women in India, as they are considered unsafe due to several reasons such as visibility issues, territoriality, etc.</p>  <p><b>Integrated land use:</b> Increases walkability and reliance on public transport. It also helps to activate the spaces regardless of time, unlike the segregated land use.</p>	<p>Encourage integrated land uses and mixed land use that strives for a balanced combination such that it complements the public space to enhance the overall vitality.</p>	

		DISCUSSION	GUIDELINES
PHYSICAL ASPECTS	GENERIC CATEGORY	<p><b>SPATIAL ACTIVITY</b></p> <p>Spatial activity: People and entities utilize and engage with public space and their surroundings. It comprises a wide variety of human activities that take place in a public space on a temporary and permanent basis.</p> <p>Temporary Spatial Activity: A short duration of spatial activity that is often meant to energize an area for a limited time.</p> <p>Adaptable and versatile to use for brief periods.</p> <p>Aimed for creating a dynamic and interesting environment.</p> <p>May fulfill particular aims such as recreation, cultural expression, or involvement in the community.</p>  <p>Some of the temporary activities include:</p> <ul style="list-style-type: none"> <li>Pop-up markets</li> <li>Events and festivals</li> <li>Street performances</li> <li>Art exhibition</li> <li>Political protests</li> </ul> <p>Permanent Spatial Activity: A long-term or ongoing use of public space for specified purposes and the uses of abutting buildings.</p> <p>Fixed and enduring characteristics of the public sphere.</p> <p>Part of the overall urban infrastructure and design.</p> <p>Contribute to the long-term identity of the public place.</p>  <p>Some of the permanent activities include:</p> <ul style="list-style-type: none"> <li>Recreational areas</li> <li>Outdoor seating</li> <li>Green spaces</li> <li>Street vendors</li> <li>Performance spaces</li> </ul>	<p>Encourage to design of public spaces with a flexible and adaptive approach to serve daily and occasional needs by flexible zoning, multipurpose spaces, and supporting infrastructure for temporary and permanent activities.</p>
		<p><b>VISIBILITY</b></p> <p>Visual linkages – to see/overlook things and activities at a visible extent without any obstruction whether it be built/natural elements.</p> <p>For safety, natural surveillance, and navigation of public space which is a very important concern for women</p>  <p>Ownership may result in building or defining the abutting land of public space using boundary walls etc.</p> <p>Women are also concerned about too much visibility as that might result in inducing the feeling of being observed or being cornered.</p> 	<p>Encourage abutting lands to incorporate visually permeable boundaries to maintain a clear line of sight for unobstructed views and contribute to natural surveillance by reducing obscured areas.</p>
	<p><b>PERMEABILITY</b></p> <p>Permeability – The extent to which a public space admits or inhibits the movement of the user.</p> <p>Need for visual permeability - Provides transparency</p> <p>Need for physical permeability – Allows smooth transition between the public space and its surroundings.</p> <p>The concern for women's mobility is closely linked to permeability, which influences their perceptions and patterns of conduct in public areas.</p>	<p>Design public spaces ensuring both visual and physical permeability by integrating responsive zoning, strategic positioning of elements, and provision of accesses.</p>	

		DISCUSSION	GUIDELINES																				
PHYSICAL ASPECTS SPECIFIC CATEGORY	TERRITORIALITY	 <p><b>Edge Condition</b> - Perception/sense of boundary between the public and private by using territory markers such as boundary walls, fences, gates, etc., which hinders the natural surveillance and no visual linkages that concern women. Abutting land to the public space can be classified into three kinds, each with varying degrees of public or privateness.</p> <p><b>Private Abutting land:</b> Need for privacy and security of land abutting the public spaces. To engage with abutting public space visually semi-permeable / low front boundary walls can be used.</p> <p><b>Public Abutting land:</b> Need for accessibility and openness. Highly visual permeable/ low front boundary walls/ low front hedges and provision of entry/exit points can be used.</p> <p><b>Semi-Public Abutting land:</b> Need for openness yet concern with the security of land abutting the public spaces. Visually permeable/low front boundary walls can be used.</p>	<p>Ensure surveillance at ground level by building visual linkages using the edge conditions of the land abutting the public space in three different categories:</p> <ul style="list-style-type: none"> <li>• Private Abutting land: Design the edge condition using the visually semi-permeable or low front boundary walls.</li> <li>• Public Abutting land: Design the edge condition using the highly visually permeable/ low front boundary walls/ low front hedges/ hedges along with the provision of entry/exit points.</li> </ul> <p>Semi-Public Abutting land: Design the edge condition using the visually permeable/low front boundary walls by integrating the security concerns.</p>																				
	ACTIVITY GENERATORS	<p><b>Activity generators</b> in public places are components or characteristics that allure people and encourage various types of involvement and interaction. These generators add to the vigour and vibrancy of a public place, creating a dynamic and energetic environment. Activity generators can be broadly classified into:</p> <table border="0"> <tr> <td><b>Events</b></td> <td><b>Elements</b></td> <td><b>Spaces</b></td> </tr> <tr> <td>Cultural Programs</td> <td>Art installations</td> <td>Seating spaces</td> </tr> <tr> <td>Performances</td> <td>Water Features</td> <td>Green spaces</td> </tr> <tr> <td>Protests</td> <td>Outdoor markets and vendors</td> <td>Recreational spaces</td> </tr> <tr> <td>Festivals</td> <td></td> <td>.</td> </tr> <tr> <td>Celebrations</td> <td></td> <td></td> </tr> <tr> <td>Concerts</td> <td></td> <td></td> </tr> </table>	<b>Events</b>	<b>Elements</b>	<b>Spaces</b>	Cultural Programs	Art installations	Seating spaces	Performances	Water Features	Green spaces	Protests	Outdoor markets and vendors	Recreational spaces	Festivals		.	Celebrations			Concerts		
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		DISCUSSION	GUIDELINES
PHYSICAL ASPECTS	WAYFINDING	<p><b>Wayfinding</b> – Users orient and navigate by understanding and observing the surroundings. Landmarks - Reference points or spaces to guide themselves throughout the spaces.</p>  <p>Landmarks could be:  <b>Natural Elements</b> - Vegetation, Water features, Mounds,  <b>Built Elements</b> - Buildings, Monuments, Sculptures, Memorials, Towers, Art installations, Murals</p> <p><b>Natural Spaces</b> - Green spaces, Beach, Forests, Rock Formations, Viewpoints; <b>Built Spaces</b> - Commercial spaces, Recreational spaces, Cultural Spaces</p>	Enhance landmarks within and near public spaces by identifying them according to their significance, which are easily visible to users and contribute to navigation and sense of place.
	TRANSPARENCY	<p><b>Transparency</b> - Subjective notions of openness and visual linkages inside a public space</p> <p>Women are concerned about increased exposure (especially men staring, commenting, etc.) in public spaces because it may cause them to feel monitored, isolated, or vulnerable. Need for a delicate interplay between the impression of visibility and the experience of personal safety in public spaces.</p>	Design public places with a considered approach to transparency by using sensible zoning of landscaping, as well as architectural aspects without endangering women's comfort & safety.
SPECIFIC CATEGORY	SCALE	<p><b>Scale</b> – Pertains to the range and proportion of a space significantly impacts their experience and behaviour.</p>  <p>Women's perception of the scale of public space varies:</p> <ul style="list-style-type: none"> <li>• If large &amp; vast public space results in less connection with the public space - Too much openness may lead to a sense of being watched, cornered, or vulnerable. Such public spaces are preferred by women only for specific events and festivals or designed public spaces.</li> <li>• If adequate and compact public space –a sense of connection with the public space.</li> </ul>	Design public spaces by balancing scale and openness along with its surrounding environment by mindful integration of various aspects such as designated zoning of spaces and landscaping strategically without compromising safety.
	CLIMATE	<p><b>Climate</b> – deals with the comfort of users concerning the sun, rain, and other weather conditions on-site.</p> <p>Responsive grading - In designing public spaces, prioritize the comfort of women by incorporating effective drainage provisions. This may involve mindful grading of the site and addressing natural drainages using the terrain features.</p> <p>Preservation of cultural vegetation/sacred grooves in public space or the land abutting the public space.</p>	Encourage strategies that prioritize the comfort and safety of women by employing responsive site planning and design. Preservation of cultural vegetation within and around public spaces fosters a connection to the environment.
ENVIRONMENTAL	GENERIC CATEGORY		

		DISCUSSION	GUIDELINES
	POLLUTION	<p><b>Pollution</b> – Presence of harmful compounds in the atmosphere. Women are uncomfortable in such an urban environment with noticeable pollution.</p> <p>Identification of the source of pollution in public spaces.</p> <p>Pollution types- could be noise/odor /air/visual pollution.</p> <p>Designate/Zone areas for providing buffers to mitigate pollution.</p>	Encourage pollution mitigation measures by integrating buffer zones and similar activities into public spaces or adjacent land.
	SAFETY	<p><b>Safety</b>- concerns with the protection in public spaces</p> <p>Need for active spaces all day long. Make spaces dynamic and vibrant regardless of time which is greatly concerned with women in aspects such as safety and security.</p>	Promote integrated and mixed development planning which induces active spaces that stress safety to improve the overall vibrancy of public areas.
	COMFOR	<p><b>Comfort</b> – mental and physical condition in the public space</p> <p>Presence of people, especially the presence of women.</p> <p>Psychological comfort: Need for activities and active spaces.</p>	
ENVIRONMENTAL	INCLUSIVENESS	<p><b>Inclusiveness</b> – Spaces that accommodate a wide variety of users in public space</p> <p>Integrate a wide variety of users and activities.</p> <p>Integrate affordable housing and commerce to prevent displacement or gentrification.</p>	Ensure to integration of affordable housing and other land uses to foster a diverse environment, encouraging individuals with a wide variety of backgrounds to contribute to urban inclusion.
CULTURAL ASPECTS	HERITAGE	<p><b>Heritage</b> – Pertains to cultural value</p> <p>Identification of culturally significant spaces in and around public spaces and preservation and conservation of cultural heritage sites</p> <p>Heritage sites or spaces – Foster’s sense of place.</p> <p>Contributes to building a psychological and emotional connection with public spaces. Helps in orienting the users with respect to the heritage</p>	Design to preserve and enhance heritage sites of cultural significance within or nearby public spaces contributing to the sense of identity and history of the place.
	EVENTS & FESTIVALS	<p><b>Events &amp; festivals</b> - artistic endeavours that gather people all together in public places.</p> <p>Helps to create a vibrant and dynamic urban environment</p> <p>Foster’s sense of community</p> <p>Need for designated/zone spaces for accommodating a variety of events and festivals.</p>	Design public spaces with flexible multi-functional areas and accompanying infrastructure that are specifically intended to accommodate diverse events and festivals to foster a feeling of community.
	INCLUSIVENESS	<p><b>Inclusiveness</b> - Spaces that accommodate various users concerning various cultures in public space.</p> <p>Integrate wide a variety of users and activities.</p> <p>Culture encompasses the way of life, religion, customs, and so forth. India's rich cultural heritage helps to shape the identities of distinct ethnicities. Women come from many groups, each with their own set of requirements and preferences, thus it is necessary to embrace other cultures.</p>	Promote welcoming and responsive public places that celebrate cultural variety while instilling a feeling of belonging in all individuals.

			DISCUSSION	GUIDELINES
ECONOMIC ASPECTS	GENERIC CATEGORY	TRANSPORTATION SAVING	 <p><b>Transportation saving</b> – Savings from reduced cost of commute/travel to/from/through public spaces.</p> <p>Most women rely on public transport, so making their journey shorter and more walkable encourages them to use public places.</p>	<p>Encourage economic and environmental sustainability, by defining the access to public places by integrating various access points, creating a network of access points, and placing transit stations in key locations that are accessible by foot.</p>

### 5. Conclusions

This study critically assessed the impact of urban environments on women in public spaces, focusing on the Indian context with a case study of Marine Drive in Kochi, Kerala. The research aimed to explore the elements affecting women's quality of life in urban settings, analyze socio-economic, cultural, and environmental factors contributing to gender-based disparities, and propose a theoretical framework to promote gender inclusivity in public spaces.

The findings revealed that women face numerous challenges in urban public spaces, including safety concerns, inadequate accessibility, and insufficient infrastructure. The literature review and case studies identified key parameters influencing women's experiences, such as land use, mobility, visibility, and safety. The live case study at Marine Drive highlighted specific issues like the impact of land use on activity patterns, the importance of connectivity and morphology, and the need for ecological considerations to enhance comfort and usability.

By developing a theoretical framework addressing five primary aspects of public spaces—design, physical, environmental, cultural, and economic—the study offers a comprehensive approach to creating women-friendly public environments. The framework integrates design elements with other aspects to formulate guidelines that enhance inclusivity and safety. Applying this framework to the design element of land demonstrated how specific guidelines can be developed to address physical aspects like accessibility, mobility, and permeability, which are crucial for women's comfort and security.

The implications of this research are significant for urban planners, architects, and policymakers aiming to foster urban inclusivity. Implementing the proposed guidelines can lead to the development of public spaces that are more responsive to the needs of women, thereby promoting equitable participation and enhancing the overall urban experience.

However, the study acknowledges limitations in capturing the full diversity of women's experiences due to variations in age, socioeconomic background, ethnicity, and life experiences. Future research should involve a broader demographic to encompass the wide range of challenges women face in urban environments. Additionally, applying and validating the theoretical framework in different urban contexts would strengthen its applicability and effectiveness.

In conclusion, this research contributes to a deeper understanding of the interaction between women and urban environments and provides a foundation for developing urban design guidelines for women-friendly public spaces. By recognizing and addressing the unique needs of women, cities can create more inclusive, safe, and vibrant public spaces, ultimately improving the livability and sustainability of urban areas for all residents.

### Acknowledgements

It gives me great pleasure to do this paper as part of my academics. I am deeply grateful for the support, inspiration, and encouragement I have received from many people from various walks of life. To begin with, I would like to express my gratitude and appreciation for Prof. Sharat Sunder R and Prof. Prajitha T.K, whose guidance, support, and encouragement have been invaluable throughout



this paper. The meetings and conversations provided me with the opportunity to think of a comprehensive and objective critique from multiple perspectives. I am profoundly grateful for the guidance, support, and encouragement provided by Dr. Manoj Kumar K, Managing Director at KTIL, throughout the completion of this paper. Our meetings and conversations have not only provided invaluable insights. Many thanks to my classmates and friends who walked with me, each of them is a true inspiration.

### **Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### **Conflicts of Interest**

The author(s) declare(s) no conflicts of interest.

### **Data availability statement**

Data is available on request due to privacy/ethical restrictions.

### **Institutional Review Board Statement**

Not applicable.

### **CRedit author statement:**

Conceptualization: N.B, M.K.K, S.S.R, P.T.K. Data curation: N.B. Formal analysis: N.B, M.K.K, S.S.R, P.T.K. Investigation: N.B. Methodology: N.B, M.K.K, S.S.R, P.T.K. Project administration: N.B, M.K.K, S.S.R, P.T.K. Writing—original draft: N.B, M.K.K, S.S.R, P.T.K. Writing—review and editing: N.B, M.K.K, S.S.R. All authors have read and agreed to the published version of the manuscript.

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**How to cite this article?** (APA Style)

Benny, N., Sunder, R. S., Prajitha, T. K., & Kini, M. K. (2024). Can Urban Design Foster Greater Inclusivity for Women in Public Spaces?. *Journal of Contemporary Urban Affairs*, 8(2), 557–581. <https://doi.org/10.25034/jcua.2024.v8n2-16>



Original scientific paper

# Causative factors of Abandoned Urban Housing Projects and Strategies for Revitalization in Ibadan, Nigeria

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**ARTICLE INFO:**

**Article History:**  
 Received: 5 July 2024  
 Revised: 20 September 2024  
 Accepted: 3 October 2024  
 Available online: 7 October 2024

**Keywords:**  
 Abandoned projects;  
 Causative factors;  
 Revitalization strategies;  
 Urban housing;  
 Nigeria.

**ABSTRACT**

*In Nigeria, over 56,000 projects have been abandoned, leading to negative societal and urban impacts, including wasted investment, job losses, increased crime rates, visual pollution, and disruption of urban planning. These abandoned projects, which include residential, commercial, and industrial buildings, have significant multiplier effects on the construction industry. As the housing sector plays a vital role in a country's economy, the issue of abandoned urban housing projects, particularly in Ibadan, Nigeria's third-largest city, poses serious challenges. These challenges affect the city's economic growth, social cohesion, and environmental quality, yet there is limited research addressing the problem. This paper investigated the causes of abandoned housing projects in Ibadan, aiming to find ways to revive them and prevent future abandonment. A structured questionnaire (n=45) was administered to consultants and professionals in the built environment (architects, engineers, quantity surveyors, and builders). Key causes of abandonment were identified, along with impacts such as building dilapidation, environmental decline, and urban visual displeasure. The paper recommended the establishment of regulatory frameworks for periodic inspections of ongoing projects and requiring developers to have exit strategies for financial setbacks. It also emphasized policies that promote repurposing abandoned buildings for public services, such as affordable housing or community centers. The conclusion stressed that without addressing the root causes, urban aesthetics and adequate housing provision will continue to suffer.*



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**Publisher's Note:**  
 The Journal of Contemporary Urban Affairs remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2024), 8(2), 582–602.  
<https://doi.org/10.25034/ijcua.2024.v8n2-17>  
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Highlights:	Contribution to the field statement:
<ul style="list-style-type: none"> <li>- Inflation has a significant impact on the abandonment of urban housing projects in Ibadan.</li> <li>- The financial capacity of contractors influences the successful completion of housing projects.</li> <li>- Changes in government policies increase the likelihood of project abandonment in Ibadan.</li> <li>- Ineffective project management practices contribute to the abandonment of urban housing projects.</li> </ul>	<p>The study's original contribution addressed the vital yet understudied topic of abandoned urban housing developments in Ibadan, Nigeria. By focussing on Ibadan, Nigeria's third-largest city, this work not only fills a research need but also contributes to the broader discussion of urban housing issues in developing countries. This investigation's findings, including the identification of abandonment causes and potential regulatory and policy solutions, provide useful insights for academics, policymakers, and built-environment practitioners. The study advances the subject of architecture by suggesting techniques for integrating urban planning, economic sustainability, and adaptive reuse of abandoned projects, resulting in better control of urban expansion and housing provision in Nigeria.</p>

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**How to cite this article?** (APA Style)  
 Obakin, O. A., Afolami, S. K., & Akande, O. K. (2024). Causative factors of abandoned urban housing projects and strategies for revitalization in Ibadan, Nigeria. *Journal of Contemporary Urban Affairs*, 8(2), 582–602.  
<https://doi.org/10.25034/ijcua.2024.v8n2-17>



## 1. Introduction

Urban housing projects are key components of city development, aimed at meeting the housing needs of expanding populations while also improving living conditions in cities. The prevalent issue of abandoned building projects in Nigeria's urban areas remains a significant challenge for the construction sector, posing threats to both the environment and societal well-being. This problem, characterized by the discontinuation of construction activities within the contract time frame, not only obstructs infrastructural development but also undermines organized efforts to address the issue. Typically, a project is deemed abandoned when it remains unfinished, fails to meet user expectations, and does not fulfil its intended purpose. Despite various proposed solutions by construction experts, including stricter adherence to procedures and techniques, the rate of project failure and abandonment remains persistently high in Nigeria. The prevalence of abandoned projects extends beyond Ibadan to a national scale in Nigeria. Damoah & Kumi (2018) estimated that approximately 4,000 federal government projects in Nigeria remain unfinished or abandoned, with an estimated expenditure of N300 billion.

Additionally, the Chartered Institute of Project Management of Nigeria (CIPMN) reported that a staggering N12 trillion was spent on 56,000 abandoned government projects nationwide. In Ibadan, Nigeria's third-largest city, abandoned urban housing projects pose a substantial challenge to the city's economic vitality, social fabric, and environmental quality. The severity of this problem is particularly acute in densely populated urban areas where a myriad of factors such as inconsistent government policies, corruption, outdated infrastructure, community interference, and poor planning contribute to the proliferation of abandoned structures (Efenudu, 2019). Consequently, there is a chronic shortage of housing exacerbating the challenges of the housing deficit faced by Nigeria's housing industry (Akande *et al.*, 2024) which has also affected other habitable structures for residential, commercial, and other purposes. Other issues that arise as a result of abandoned projects include economic swings and instability, which are usually recognised as important contributors to the abandonment of housing projects in urban areas such as Ibadan. Meanwhile, there is little empirical research that quantifies the amount to which economic issues such as inflation, currency depreciation, and shifting government policies have a direct impact on the stoppage of housing buildings. This lacuna in the literature necessitates a thorough examination of the economic drivers of project abandonment.

In Ibadan, as in many urban areas, the proliferation of abandoned building projects contradicts the fundamental objective of urban planning, which aims to create safe, healthy, aesthetically pleasing, and sustainable cities. These unfinished projects not only diminish the quality of life for residents but also detract from the city's appeal to visitors and potential investors. Furthermore, project management inefficiencies such as poor planning, a lack of trained personnel, and insufficient resource allocation are frequently cited for the failure of housing projects. Meanwhile, the exact project management shortcomings that contribute to abandonment are little documented, notably in Ibadan. This study emphasises the importance of thoroughly examining project management techniques in housing projects and their impact on project outcomes (Akande *et al.*, 2018b).

The purpose of this study is to analyse the factors that contribute to the abandonment of urban housing projects in Ibadan, Nigeria, with the goal of identifying important difficulties and offering ways to avoid future occurrences. The goals are to (i) identify and analyse the factors that contribute to the abandonment of urban housing projects in Ibadan, (ii) assess the effectiveness of project management practices in urban housing developments in Ibadan, and (iii) propose strategies for mitigating the abandonment of future housing projects based on the results. The research aims to answer three key questions: (1) What factors contribute to building project abandonment in Ibadan, Nigeria? (2) What are the effects of abandoned building projects in Ibadan, Nigeria? (3) What strategies can be implemented to recover abandoned building projects in Ibadan, Nigeria?



## 2. Interconnected Nature of Project Failure and Abandonment

Economic instability, poor project management, regulatory hurdles, and sociopolitical influences all contribute to the interconnection of project failure and abandonment. Numerous authors such as Obakin *et al.*, (2024) have addressed the persistent problem of abandoned construction projects, focusing on factors such as cost, time, and quality, either individually or in combination. However, few have explored the interconnected nature of project failure and abandonment. Notable exceptions include the works of Ikediashi *et al.* (2014), Tijan & Ajagbe (2016), Alao (2016), Alao and Jagboro (2017) and Eja & Ramegowda (2020) which specifically examine abandoned buildings, civil engineering, and educational projects funded by both public and private sectors. Despite this attention, these studies often overlook project-specific factors that contribute to abandonment. Therefore, this research seeks to address this gap by investigating the unique planning, management, and technical challenges inherent in building projects, particularly in the context of Ibadan, Nigeria. The study aims to identify the primary causes of project abandonment in Ibadan, assess its consequences, and propose recovery solutions.

Damoah & Kumi (2018) highlighted several key variables influencing construction project abandonment, including poor planning, inadequate funding, inflation, contractor bankruptcy, changes in project scope, and political issues. Effective project planning is crucial for project success, as emphasized by Ogunde *et al.*, (2017) who attributed project failures to improper planning and scheduling by qualified project managers. However, Alao and Jagboro (2017) found that inadequate planning, deemed significant by Damoah & Kumi (2018), did not emerge as a primary factor in discontinuing construction projects for higher institutions. Instead, mismanagement of funds, insufficient budget allocations, financing challenges, inflation, and contractor bankruptcy were identified as major drivers of project abandonment.

### 2.1 Socio-Political Influences

Project abandonment is substantially influenced by sociopolitical issues such as community resistance, land disputes, and political meddling. In many cases, community opposition stems from poor consultation or perceived detrimental effects of the project on the local population. Political instability and government changes can also cause delays in projects, since new administrations may amend or cancel previously approved plans. The intertwining of these sociopolitical elements with economic and managerial concerns frequently results in a heightened risk of project failure and abandonment. Political corruption in contract awards, poor financing practices, and governmental instability further contribute to project abandonment, as noted by Ubani and Ononuju (2013). Nwachukwu and Emoh (2011) identified additional factors such as inflation-induced cost escalations, payment delays due to bureaucratic barriers, subcontractor incapacity, financial inefficiencies, design changes, and indiscriminate contracting.

Poor contractor performance has consistently been cited as a significant factor in project abandonment in Nigeria (Nwachukwu and Emoh, 2011; Zuofa and Ochieng, 2014; Akande *et al.*, 2018a) exacerbated in complex projects where unskilled management and personnel struggle to navigate technical challenges. Furthermore, Adebisi *et al.*, (2018) highlighted the frequent occurrence of contractor insolvency and company failures, leading to the abandonment of numerous construction projects and detrimental impacts on stakeholders. Various studies conducted in different countries have examined the issue of abandoned building projects, shedding light on its causes and implications. Researchers from Malaysia, including Nagamany (2016), Razak *et al.* (2015), and Ariffin *et al.*, (2018) explored abandoned projects in developing nations. Similarly, studies in Ghana and Uganda by Ofori *et al.*, (2017) delved into this phenomenon. In Pakistan and Oman, Rashid (2020) conducted studies on project failure, albeit without focusing on abandonment.

Political interference and corruption have been consistently identified as major impediments to project success in Nigeria (Nwachukwu and Emoh, 2011; Zuofa and Ochieng, 2014; Amade *et al.*, 2015; Saidu & Shakantu, 2017). This has significantly hampered the growth of the Nigerian



construction industry, as noted by Jagboro (2016), who highlighted the lack of political will hindering infrastructure development. However, private developers currently spearhead many building projects in Nigeria, potentially reducing the impact of government influence and corruption. Another significant factor contributing to project abandonment is cost escalation due to inflation (Nwachukwu and Emoh, 2011; Shehu *et al.*, 2014; Wanjari & Dobariya, 2016; Saidu & Shakantu, 2017). The depreciation of the Naira has exacerbated this issue in Nigeria, resulting in higher costs for imported building supplies.

According to Olubajo *et al.*, (2024) Managing ambiguity in construction projects in Nigeria by selecting and achieving set milestones when coupled with effective cost management through open communication among team members, stakeholders, and vendors is crucial for addressing these challenges. Tijan & Ajagbe (2016) underscored the significant role of community disruption in contributing to the abandonment of construction projects, particularly in Nigeria where this issue is particularly acute. Construction sites often face harassment from various unrecognized groups, colloquially termed "area boys," demanding illegal financial payments from clients. Failure to comply with these demands can lead to serious safety risks for construction workers, including violent confrontations resulting in injuries or fatalities. Consequently, many contractors and sometimes even clients opt to cease work on such projects to ensure safety. However, recent governmental efforts across Nigerian federation states aimed at curbing the activities of these individuals may offer some hope for improvement in this regard.

## 2.2 Economic Instability and Project Management Deficiencies

Economic considerations are commonly recognised as the principal causes of project failure and abandonment. Economic fluctuations, such as inflation, currency depreciation, and changing interest rates, have a direct impact on material, labour, and overall project finance costs. These economic constraints frequently result in budget overruns, making projects unsustainable and eventually abandoned. The economic environment influences not just the feasibility of ongoing initiatives, but also the decision-making process for whether to continue or terminate them. Ineffective use of project management scheduling and other project management techniques is another major contributor to construction project failure and abandonment as identified by Akande *et al.*, (2018a). Poor planning, insufficient risk management, and a scarcity of competent workers can result in major delays and cost overruns. These inefficiencies frequently make projects financially unviable, resulting in abandonment. Furthermore, insufficient project monitoring and evaluation compound the situation, as issues that should have been handled sooner are frequently overlooked until they become insurmountable.

## 2.3 Regulatory Challenges and Interconnectivity of Factors Leading to Abandonment

Government rules and policies significantly influence the success or failure of construction projects. Complex and often uneven regulatory frameworks can cause delays in project approvals, increased expenses, and uncertainty for developers. These issues are especially common in metropolitan locations where land use rules and construction codes are strictly enforced, yet enforcement can be unexpected. Bureaucratic delays and compliance costs can make projects financially unsustainable, resulting in abandonment (Ogunbiyi *et al.*, 2014). Because of the interconnectedness of these factors, project failure is frequently caused by a mix of economic, managerial, regulatory, and sociopolitical issues. Poor project management, for example, may result in cost overruns, which are compounded by economic volatility, while regulatory delays may put a further burden on project budgets. Furthermore, sociopolitical pushback might stall initiatives, causing financial difficulties and, ultimately, abandonment. This intricate interplay of factors emphasises the importance of taking a comprehensive strategy to identify and manage the risks of project failure and abandonment. The linked nature of project failure and abandonment emphasises the importance of comprehensive methods for addressing the various issues that urban housing initiatives encounter. By recognising the economic, managerial, regulatory, and sociopolitical issues at play, stakeholders can design more effective interventions to avoid project abandonment.



## 2.4 Consequences of Project Abandonment to The Built Environment

Abandoned construction projects in Nigeria present numerous challenges, yet research on this issue remains limited. The ramifications of abandonment extend beyond mere construction setbacks, encompassing socio-economic and environmental consequences. Socio-economic impacts such as inadequate livable housing, job losses, displacement of populations, and financial burdens shift between private and public sectors. According to Haruna *et al.*, (2023), housing is one of the essential socio-economic factors that influence not only the quality of life and welfare of individuals but also the welfare of communities. As a result, the construction quality of houses and their integration into the social, cultural, and economic fabric of communities all have a substantial impact on people's everyday lives, health, security, and overall well-being. In addition to these consequences, the environmental effects range from visual blight and erosion to biodiversity loss and pollution. Effective risk management is essential for monitoring and mitigating these risks, especially considering unforeseen factors during project planning that often contribute to abandonment.

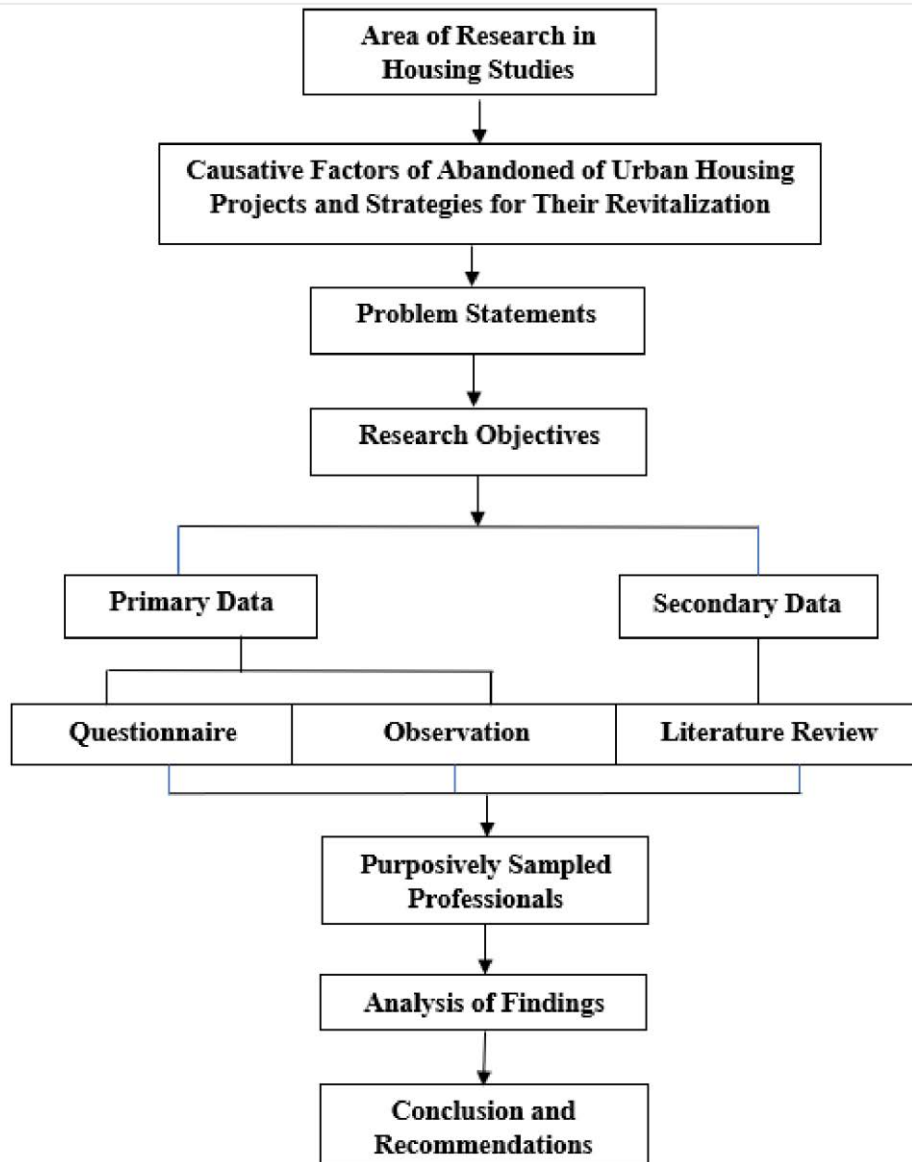
The construction industry in Nigeria has faced criticism for project delays, cost overruns, low productivity, unsafe conditions, and poor quality. Internal management issues exacerbate these challenges, particularly in the context of housing projects, necessitating effective risk management strategies for construction activities. Financial difficulties among developers have also been a contributing factor to project abandonment. Abandoned building projects entail negative economic repercussions such as reduced economic activity, diminished tax revenue for the government, declining living standards, and resource wastage. They also adversely impact the social and economic fabric of neighborhoods, lowering property values and attracting criminal activity like drug trafficking and prostitution due to their secluded nature. Abandonment leads to the squandering of resources, including capital, materials, and manpower, exacerbating societal security and comfort issues. The consequences of abandonment are diverse, affecting populace morale, living standards, resource utilization, employment rates, economic activity, government revenue, and the ease of accessing foreign loans. Ultimately, poor project management not only affects individuals and communities but also undermines government objectives and societal well-being.

Existing research highlights various factors contributing to abandoned building projects, including poor management, detrimental government policies, inefficiencies in public delivery systems, and adverse economic conditions. However, much of the available literature primarily comprises news items lacking credibility and predominantly centered on abandoned building projects. Thus, there is a pressing need for more comprehensive investigations into abandoned construction projects in other Nigerian states.

## 3. Material and Methods

### 3.1 Study Location and Research Design

Ibadan is the capital of Oyo State and the third largest metropolitan area in Nigeria, after Lagos and Kano, with a population of 2,550,593 according to the 2006 census. It is located approximately on latitude 7°23'47"N and longitude 3°55'0"E in south-west Nigeria. Ibadan has a tropical climate with a long-wet season and relatively constant temperatures throughout. This study utilized a descriptive research design, chosen for its alignment with the study's focus on assessing the causes, effects, and recovery strategies of abandoned building projects (Figure 1). This design facilitated the inclusion of essential methods such as sampling, data collection, and analytical tools necessary to address the research questions. The research population consisted of professionals with a minimum of one year of experience in the building and construction industry, including quantity surveyors, civil engineers, architects, builders, and residents of Ibadan. This diverse group provided the required information for data collection. Due to the absence of a sampling frame, a non-probability strategy, specifically purposive sampling, was employed (Figure 1). This method requiring expert insider knowledge of a specific cultural domain, was chosen due to the nature of the study and the limited availability of individuals capable of supplying the necessary information.



**Figure 1.** Methodological Process of The Study.

### 3.2 Research Instrument and Data Collection

Data gathering included creating a questionnaire based on the literature research and using a survey technique. The questionnaire utilized in this study was developed using the literature covered in the study as well as variables for preventing construction project failure and abandonment based on a thorough examination of the literature. The study relied on public sector participants engaged in construction-related activities. The study's data were gathered using a quantitative approach, specifically a questionnaire survey. The questionnaire was created after conducting a detailed examination of the elements that contribute to construction project failure and abandonment. The approach was used to improve the language and dependability of the questions. The study is survey-based research. The strategy combines a literature search with the use of structured questionnaires, which were deemed the most appropriate tool for reaching the study's population, particularly when the instrument can acquire the data required for the study. The variables under inquiry were derived from the literature. As a result of the literature review, the current study's investigation is based on the findings.

The study's respondents were construction practitioners (contractors and professionals) from the construction industry. Questionnaires were distributed to 45 respondents who were purposefully picked from professional groups in Ibadan, Nigeria. Respondents were asked to complete a set of questions



designed expressly for the purposes of the study. Closed-ended questions were selected since they are particularly useful for collecting trustworthy data and, as a result, easier to assess due to the limited nature of the responses. The respondents were asked to reply to 40 questions about construction project failure and abandonment using a Likert 4-point scale, which has been shown to be acceptable in most construction project management literature. The first section (section A) asked for generic information to help determine the respondents' profiles. asks respondents for sociodemographic information such as their gender, educational level, and career background. The second half (section B) included a list of construction stages at which building projects are typically abandoned, ranked on a Likert scale of 1 to 4 by respondents. The final segment (segment C) investigated the causes of the abandoned building project. The fourth section (Section D) looked into the repercussions of abandoned building projects, and the fifth section (Section E) detailed how they may be recovered.

Based on Blaikie & Priest (2019) and Ahadzie (2007), the numerical values were assigned as follows: Strongly Disagree-1, Disagree-2, Agree-3, and Strongly Agree-4. This facilitated response analysis. The questionnaires for project stages of construction in which the building project is typically abandoned contain statements organised into seven elements intended to capture respondents' opinions on the formed questions. The questionnaire to investigate the causes of an abandoned building project contains statements organised into 16 items using a 4-rank Likert scale. The questionnaire regarding the effects of abandoned building projects has 13 statements that are rated on a 4-rank Likert scale.

### 3.3 Ethical and Data analysis Procedure

Ethical considerations, including confidentiality, informed consent, and anonymity, were deemed crucial for this study involving contact with respondents. Informed consent was obtained from each participant before data collection, covering confidentiality, informed consent, and the right to withdraw from the study. Time was spent educating and discussing the study's specifics with potential volunteers, as well as encouraging them to comprehend and actively participate in the informed consent procedure. Potential volunteers were given a detailed description of the study methodology as well as a clear understanding of their participation in the research. The researcher included these people in his study only after they gave their informed agreement. The approach to obtaining informed permission included informing participants about their ability to withdraw from the study. Participants have the right to withdraw from the study at any time. In this study, participants' withdrawal rights were reaffirmed before the survey process began with each individual. While recruiting volunteers, the researcher offered to distribute a copy of the summary of results if asked. If the participants expressed a desire to withdraw from the study, the researcher respected their decision without question. The researchers acquired internal research board clearance for the project before initiating recruiting or data collecting, as required by the university. The goal of the approval is to ensure that the researcher is aware of and adheres to ethical norms set to protect study participants. The researcher was meticulous in safeguarding the anonymity of study participants. Throughout the study, the researcher referred to the participants' organizations in a generic and unidentifiable manner.

The data were analysed using the Statistical Package for Social Science (SPSS). The survey data was coded and fed into the program to compute the appropriate statistics, namely descriptive statistics in the form of charts. Cronbach's alpha was used to determine the reliability of the questionnaire items. Cronbach (1951), Nunnally (1978), and Field (2005) advised that Cronbach's Alpha coefficient be used to test the reliability of data acquired using the Likert scale questionnaire. Thus, for surveys at project stages of development where the building project is typically abandoned, Cronbach's alpha (0.754) indicates an acceptable level of consistency in the collection of items used to evaluate the responses. The Cronbach's alpha (0.890) of the questionnaire used to investigate the causes of abandoned building projects indicates a good level of consistency. The questionnaire for the effects of abandoned building projects has 13 statements and is evaluated on a 4-rank Likert scale; Cronbach's alpha (0.851) indicates a high level of consistency in this set. Following the computation in SPSS, the average Cronbach's Alpha



coefficient of 0.831 was achieved for all of the items, indicating strong internal consistency. Meanwhile, senior academic colleagues and industry professionals assisted in testing the content validity of the questionnaire through a pilot study, before a feasible questionnaire was finally produced and adopted for the study.

**4. Results**

Forty-five questionnaires were distributed to targeted respondents, and all forty-five responses were received. The data was analysed using descriptive statistics in the Statistical Package for Social Sciences (SPSS), a suitable tool for analysing data from larger samples. The completed and returned questionnaires were analysed using percentages. From Table 1 on the professional background of the selected respondents, the analysis revealed that 24.4% were contractors, 26.7% were architects, 22.2% were Civil Engineers, 2.2% were quantity surveyors, 11.1% were builders, and the remaining 13.3% had other professions.

**Table 1:** Professional background.

	Frequency	Percent	Valid %	Cumulative %
Contractors	11	24.4	24.4	24.4
Architects	12	26.7	26.7	51.1
Civil Engineers.	10	22.2	22.2	73.3
Quantity Surveyors	1	2.2	2.2	75.6
Builders	5	11.1	11.1	86.7
Others	6	13.3	13.3	91.1
Total	45	100.0	100.0	

Table 2 presents the educational qualifications of the respondents. The analysis reveals that 26.7% of respondents hold a Higher National Diploma, 43.3% possess a bachelor’s degree, 27.8% have obtained a master’s degree, and 2.2% of respondents hold a PhD.

**Table 2:** Respondent Educational Qualifications.

	Frequency	Percent	Valid %	Cumulative %
HND	12	26.7	26.7	65.4
BSC	20	43.3	43.3	85.4
MSC	12	27.8	27.8	67.8
PHD	1	2.2	2.2	98.0
Total	45	100.0	100.0	

According to the findings presented in Table 3, a significant portion of respondents (53.3%) have accumulated work experience spanning from 1 to 5 years. Additionally, 22.2% possess 6 to 10 years of professional experience, while 11.1% have been in the workforce for 11 to 15 years. Moreover, 13.3% of participants boast a work history of 16 years or more. This distribution suggests that the respondents' collective work experiences align with the desired target timeframe.

**Table 3:** Distribution of Respondents by Years of Professional Experience.

Years of Experience	Frequency	Percent	Valid Percent	Cumulative Percent
1-5 y	24	53.3	53.3	53.3
6-10y	10	22.2	22.2	75.6
11-15y	5	11.1	11.1	86.7
16y-above	6	13.3	13.3	100.0
Total	45	100.0	100.0	



The data presented in Table 4 illustrates the distribution of respondents according to the types of companies they are employed in. It reveals that 48.8% of participants are affiliated with private companies, while 22.2% are associated with public enterprises. Furthermore, 11.2% are engaged in partnership companies, and 17.8% are involved with other types of organizations.

**Table 4:** Company Types.

	Frequency	%
Private Company	22	48.8
Public Company	10	22.2
Partnership	5	11.2
Others (Specify)	8	17.8
<b>Total</b>	<b>45</b>	<b>100%</b>

**4.1 The Causes of Abandoned Building Projects in Ibadan**

Table 5 presents a comprehensive overview of the factors contributing to abandoned building projects, as identified by the respondents. These factors were unanimously recognized as potential disruptors to project completion. Inflation emerged as a significant contributor, with 26 respondents (59.3%) strongly agreeing to its detrimental impact on project continuity, while 15 (37.0%) respondents simply agreed. Conversely, 14 respondents (40.7%) disagreed, and none expressed strong disagreement with this assertion. The demise of a client or sponsor was highlighted as another prominent factor, with a substantial majority of 30 respondents (74.1%) strongly affirming its influence, while 15 (25.9%) respondents agreed. None of the respondents disagreed or strongly disagreed with this notion. Additionally, bankruptcy and insolvency were identified as significant contributors to abandoned building projects in Ibadan, Oyo State. Eighteen respondents (40.7%) strongly agreed with this statement, while 19 (41.7%) simply agreed. Conversely, 5 respondents (14.8%) disagreed, and 3 (4.0%) strongly disagreed.

**Table 5:** Causes of Failed and Abandoned Building Projects in Ibadan.

CAUSES	SA	%	A	%	D	%	SD	%	Total
Inflation	26	59.3	15	37.0	14	40.7	-	-	45
Death of client/ sponsor	30	74.1	15	25.9	-	-	-	-	45
Bankruptcy/insolvency of Contractor	18	40.7	19	40.7	5	14.8	3	4.0	45
Change in project scope/creep	14	29.6	19	48.1	8	18.5	4	3.7	45
Changes in government policies	22	44.4	7	7.4	12	33.3	4	14.8	45
Delay of Materials and Equipment Procurement	11	14.8	24	51.9	10	33.3	-	-	45
Breach of building contract	12	22.2	25	51.6	4	11.1	4	11.1	45
Inaccurate Estimation	13	22.2	26	44.4	4	18.5	3	15.0	45
Land Disputes / Litigation	19	33.3	12	29.6	9	26.0	5	11.1	45
Appointment of Incompetent project manager	12	7.4	13	40.7	25	51.9	-	-	45
Failure to assess clients' financial capacity	9	22.2	16	29.6	12	26.0	8	22.2	45
Project complexity and technicality	4	14.8	23	33.3	12	29.6	6	22.2	45
Faulty Designs	30	74.1	15	25.9	-	-	-	-	45
Unmanaged project delays	26	59.3	15	37.0	14	40.7	-	-	45
Delay in contractor payment	19	33.3	12	29.6	9	26.0	5	11.1	45
Natural disaster	16	14.8	24	51.9	5	33.3	-	-	45



The analysis of the data revealed several key factors contributing to the abandonment of building projects in Ibadan, Oyo State. Among these factors, project change in scope or scope creep emerged as a significant challenge. This refers to alterations in project objectives, plans, or schedules that deviate substantially from previously approved terms. Such changes were strongly acknowledged by 14 (29.6%) respondents, with an additional 19 (48.1%) respondents in agreement. Conversely, 8 (18.5%) respondents disagreed, and 4 (3.7%) strongly disagreed with this assertion. Moreover, changing government policies were identified as a significant cause of abandoned building projects, with 22 (44.4%) respondents strongly agreeing and 7 (7.4%) simply agreeing. However, 12 (33.3%) respondents disagreed, and 4 (14.8%) strongly disagreed with this perspective. Furthermore, delays in material supply and equipment were highlighted as threats to project success. A notable proportion of respondents (14.8%) strongly agreed with this notion, while 24 (51.9%) agreed. In contrast, 10 (33.3%) respondents disagreed. Additionally, breach of building contracts and inaccurate cost estimations were recognized as factors impeding building projects, with varying levels of agreement among respondents. For instance, 12 (22.2%) respondents strongly agreed that breach of building contracts leads to project abandonment, while 25 (51.6%) simply agreed. Similarly, issues such as land disputes, appointment of incompetent project managers, failure to assess client financial capacity, project complexity and technicality, faulty design, unmanaged project delays, delay in contractor payments, and natural disasters were all identified as potential contributors to project abandonment, each garnering different levels of agreement among respondents.

#### **4.2 The Effects of Abandoned Building Projects in Ibadan**

According to the findings presented in Table 6, respondents identified various effects of abandoned building projects in Ibadan, Oyo State, which impact both individuals and society as a whole. One significant effect highlighted is the increased prevalence of criminal hideouts in abandoned buildings. A substantial majority of 25 respondents (74.1%) strongly agreed with this notion, while 15 respondents (18.5%) simply agreed. Conversely, 5 respondents (7.4%) disagreed with this perspective, and none expressed strong disagreement. Additionally, respondents recognized the detrimental impact of abandoned building projects on the standard of living in Ibadan. Specifically, 17 respondents (44.4%) strongly agreed that such projects contribute to a deteriorating standard of living, while 28 respondents (55.6%) agreed. None of the respondents disagreed or strongly disagreed with this assertion.

The data analysis unveiled a multitude of effects stemming from abandoned building projects in Ibadan, Oyo State, as reported by respondents. Among these effects, the utilization of abandoned buildings for criminal activities, particularly kidnappings, garnered significant attention. A substantial portion of respondents (40.7%) strongly agreed that abandoned structures serve as breeding grounds for criminal activities, with an additional 40.7% in agreement. However, 18.0% of respondents disagreed with this assertion. Furthermore, the perpetration of illegal activities within abandoned buildings was also highlighted, with 21 (33.3%) respondents strongly agreeing and 15 (43.3%) simply agreeing. These illegal activities encompass crimes such as rape, storage of stolen goods, and serving as hideouts for criminal elements, potentially compromising public safety and security.

Additionally, respondents recognized the detrimental impact of abandoned buildings on the environment and public health. Specifically, 26.0% of respondents strongly agreed that abandoned buildings contribute to the breeding of deadly organisms, while 37.5% strongly agreed that these projects adversely affect the reputation of building firms. Moreover, 18.5% of respondents strongly agreed that abandoned buildings pose risks to public health safety, and 33.3% strongly agreed that they contribute to environmental devaluation. Moreover, the economic ramifications of abandoned building projects were evident, with 26.0% of respondents strongly agreeing that these projects lead to reduced employment opportunities. Additionally, 11.1% of respondents strongly agreed that abandoned projects result in the wastage of government revenue, highlighting the fiscal impact of such endeavours.



**Table 6:** Effects of Abandoned Building Projects in Ibadan.

Effects	SA	%	A	%	D	%	SD	%	Total
Increased Criminals hid out	25	74.1	15	18.5	5	7.4	-	-	45
Deteriorating standard of living	17	44.4	28	55.6	-	-	-	-	45
Perpetrating of other forms of illegal activities	21	33.3	15	33.3	5	26.0	4	7.4	45
Kidnappings	19	40.7	19	40.7	7	18.5	-	-	45
Building decay/dilapidation	16	14.8	24	51.9	5	33.3	-	-	45
Breeding ground for deadly organisms	14	26.0	22	37.0	7	29.6	2	7.4	45
Affects government revenue	16	11.1	12	29.6	14	51.9	3	7.4	45
It leads to the waste of materials	15	26.0	20	22.2	10	44.4	2	7.4	45
Holding down useful capital	13	26.0	21	29.6	8	33.3	3	11.1	45
Environmental Devaluation	21	33.3	15	33.3	5	26.0	4	7.4	45
The firm’s reputation is affected	23	37.5	15	29.2	10	23.2	4	8.0	45
Public health and safety are affected	13	18.5	18	22.2	10	33.3	5	26.0	45
Reduction in employment opportunities	13	26.0	21	29.6	8	33.3	3	11.1	45

**4.3 The Recovery of Abandoned Building Projects in Ibadan**

According to the findings depicted in Table 7, respondents identified various recovery methods for abandoned building projects in Ibadan, Nigeria which, if effectively implemented, could mitigate the prevalence of such projects. Notably, the implementation of good workmanship emerged as a crucial recovery method, with 20 respondents (44.4%) strongly agreeing and 17 (37.7%) agreeing. Conversely, 5 respondents (11.1%) disagreed, and 3 (6.6%) strongly disagreed with this proposition. Moreover, respondents highlighted the importance of fostering good communication among construction teams as another key recovery strategy. A significant majority of 30 respondents (74.1%) strongly agreed with this notion, while 20 (44.4%) simply agreed. However, 10 respondents (22.2%) disagreed, and 5 (11.1%) strongly disagreed. Furthermore, embracing continuity in government-building agendas was recognized as a potential recovery strategy, with 20 respondents (44.4%) strongly agreeing and 15 (33.3%) agreeing. However, 7 respondents (15.5%) disagreed, and 3 (6.6%) strongly disagreed with this approach.

Additionally, employing contractors with a strong financial base was identified as a recovery method, with 11 respondents (24.4%) strongly agreeing and 19 (42.2%) agreeing. Conversely, 7 respondents (15.5%) disagreed, and 8 (17.7%) strongly disagreed. Lastly, efficient planning at the inception of building projects was deemed essential in reducing the occurrence of abandoned projects. A significant majority of 20 respondents (44.4%) strongly agreed with this proposition, while 11 (24.4%) agreed. However, 9 respondents (20%) disagreed, and 5 (11.1%) strongly disagreed. The data analysis underscores the importance of various strategies in facilitating the recovery of abandoned building projects in Ibadan, Nigeria. Embracing consistency in government policies emerged as a crucial factor, with 12 respondents (26.6%) strongly agreeing and 17 (37.7%) agreeing. However, 6 respondents (13.3%) disagreed, and 10 (22.2%) strongly disagreed with this approach. Similarly, the inculcation of standard project management procedures was highlighted as a vital recovery method, with 23 respondents (51.1%) strongly agreeing and 8 (17.7%) agreeing. Conversely, 8 respondents (17.7%) disagreed, and 6 (13.3%) strongly disagreed with this strategy. Moreover, regular supervision of ongoing projects was identified as essential for project success, with 12 respondents (26.6%) strongly agreeing and 17 (37.7%) agreeing. However, 9 respondents (20%) disagreed, and 7 (15.5%) strongly disagreed with this assertion.



**Table 7:** Recovery of Abandoned Building Projects in Ibadan.

Recovery	SA	%	A	%	D	%	SD	%	Total
Implementing good workmanship	20	44.4	17	37.7	5	11.1	3	6.6	45
Implementing good communication among the construction team	15	33.3	20	44.4	10	22.2	5	11.1	45
Embracing continuity in government building agenda	20	44.4	15	33.3	7	15.5	3	6.6	45
Employment of contractors having a strong financial base	11	24.4	19	42.2	7	15.5	8	17.7	45
Efficient planning at inception	20	44.4	11	24.4	9	20	5	11.1	45
Embracing consistencies in government policies	12	26.6	17	37.7	6	13.3	10	22.2	45
Inculcating standard project management procedure	23	51.1	8	17.7	8	17.7	6	13.3	45
Regular supervision of ongoing projects	12	26.6	17	37.7	9	20	7	15.5	45
Putting a good development technique in place	13	28	14	31.1	9	20	9	20	45
Controlling inflation	24	53.3	8	17.7	10	22.2	3	6.6	45
Availability of construction material	16	35.5	19	42.2	6	13.5	4	8.8	45

Furthermore, implementing good development techniques was deemed crucial for project recovery, with 13 respondents (28%) strongly agreeing and 14 (31.1%) agreeing. Conversely, 9 respondents (20%) disagreed, and 9 (20%) strongly disagreed with this approach. Addressing the root causes of abandoned projects, such as inflation, was also emphasized, with 24 respondents (53.3%) strongly agreeing that controlling inflation could curb project abandonment. Additionally, ensuring the timely supply of construction materials emerged as another crucial factor, with 16 respondents (35.5%) strongly agreeing and 19 (42.2%) agreeing. However, 6 respondents (13.5%) disagreed, and 4 (8.8%) strongly disagreed with this proposition.

**5. Discussion of Findings**

This study aimed to analyse the causes, effects, and recovery strategies pertaining to abandoned building projects in Ibadan, Oyo State. The research revealed various factors contributing to project abandonment. The findings from a detailed understanding of the factors contributing to the abandonment of building projects in Ibadan, Nigeria, highlighted factors such as inflation, the death of a client or sponsor, and bankruptcy or insolvency, which are widely recognized in the literature as critical disruptors to project completion. These findings are consistent with a recent study by Oghenekevwe *et al.*, (2014) and theories in construction management, economics, and project finance. They stated that the strong impact of inflation on the continuation of building projects, as underlined by the majority of respondents, is consistent with current research on the volatility of construction costs. They contended that inflation, particularly in developing nations, has been shown to raise the cost of building supplies and labor, making it difficult for current projects to stay on budget. This frequently results in delays and, in severe circumstances, abandonment when project funding is insufficient to cover the rising costs. The findings supported the views of Okoro (2023), who claimed that the negative effects of inflation on building projects are amplified by a lack of access to financial instruments that can hedge against such economic risks, particularly in countries with volatile economies.

The failure of a client or sponsor as a primary contributor to abandoned projects, as strongly stated by respondents, highlights the vulnerability of construction projects to changes in stakeholder circumstances. This factor is well-documented in the literature and is consistent with the findings of Ogunlana (2008) who found that sudden loss of financial support frequently results in halted construction



activities and an inability to meet financial obligations, ultimately leading to project abandonment. This suggests that the death or departure of a significant financial sponsor can have severe consequences for project management. This issue is especially noticeable in initiatives that rely significantly on individual sponsors rather than institutional funders, who may have more solid contingency plans in place. Bankruptcy and insolvency, identified as important drivers of project abandonment, are consistent with previous research highlighting the financial fragility of many construction enterprises in developing nations. These views are consistent with those of Oladimeji & Aina (2018) who claimed that when enterprises experience financial difficulties, they may be unable to pay subcontractors, purchase materials, or satisfy other important commitments, resulting in project delays and final abandonment. The high-risk nature of construction projects, combined with inadequate financial planning and management, frequently leads to insolvency, which has a direct impact on the project's capacity to complete. These findings are consistent with the broader theoretical framework of construction project management, which emphasizes the relevance of financial stability, stakeholder management, and economic conditions in achieving project success. Inflationary interruptions, sponsor demise, and insolvency underscore the need for more robust risk management measures in building projects, especially in economically unstable countries.

The findings, which show the varied repercussions of abandoned building projects in Ibadan, Nigeria, highlight the tremendous impact these projects have on both individuals and society. These consequences, particularly the increased incidence of criminal hideouts and the decline in living conditions are consistent with recent literature and theories on urban ruin, social disorder, and public safety. The designation of abandoned houses as criminal hideouts is consistent with current research into the link between urban deterioration and crime. Abandoned buildings frequently become sites for unlawful activity such as kidnapping, drug usage, and other criminal behavior. Short *et al.*, (2021) found that abandoned structures, when left unchecked, provide a physical environment conducive to criminal activities, worsening safety concerns in metropolitan settings. The respondents' recognition of the negative impact of abandoned building projects on the quality of life in Ibadan is consistent with current concerns about urban blight and its socioeconomic consequences. Abandoned buildings frequently result in a drop in property prices, less investment, and a lower overall quality of life for residents in the impacted communities. This is corroborated by Mallach (2018) recent studies, which indicate how urban blight, defined as unoccupied and deteriorating buildings, contributes to a cycle of poverty and social degradation, exacerbating economic inequities in metropolitan areas. The notion that abandoned structures serve as breeding grounds for criminal activity, particularly kidnappings, is supported by recent urban security research by Chainey & Tompson (2008). They argued that the presence of abandoned and unmonitored structures allows criminals to operate with relative impunity, raising the probability of violent crimes. This issue is especially severe in areas with limited law enforcement resources, where the physical environment has a significant impact on crime trends. These findings are consistent with contemporary research and theories highlighting the interconnection of urban deterioration, crime, and social well-being. Abandoned building projects not only contribute to an increase in criminal activity, but they also have a significant detrimental influence on living standards, emphasising the critical need for policies and actions to revitalise neglected urban regions.

This study also identified numerous significant recovery approaches for abandoned building projects in Ibadan, Nigeria. The study's methods, which include implementing good workmanship, encouraging effective communication among construction teams, ensuring continuity in government building agendas, hiring contractors with strong financial bases, and engaging in efficient project planning, are consistent with recent literature and theories in construction management and urban development. The emphasis on good workmanship as a critical recovery mechanism is consistent with recent studies that highlight the importance of superior craftsmanship in avoiding construction delays and assuring project completion. According to Adenuga & Dosumu (2012), excellent craftsmanship standards are crucial to minimizing building flaws, which can result in costly repairs, delays, and, eventually, project



abandonment if not handled. The significance of good workmanship is also linked to the larger notion of Total Quality Management (TQM) in construction, as given by Adamu (2017) which argues for continual improvement in quality processes to improve project outcomes. The respondents' assessment of effective communication among construction teams as a crucial recovery technique is backed by project management literature and is consistent with Rehan *et al.*, (2024). According to the authors, excellent communication is widely seen as a critical aspect in the successful completion of construction projects since it promotes coordination, avoids misunderstandings, and ensures that all stakeholders are aligned with project objectives. Communication is especially important in complicated projects, where different teams must work together to minimise delays and project abandonment.

Continuity in government building objectives was also identified as a critical recovery approach, emphasising the importance of continuous policy frameworks in supporting the construction industry. Ogunbiyi *et al.*, (2014) argue that frequent changes in government policies or priorities might disrupt ongoing projects, resulting in delays or abandonment, especially in locations where public projects rely largely on government funding and assistance. This viewpoint is supported by Akhanolu *et al.*, (2016). in the literature, who emphasise the importance of stable and predictable government policies to guarantee that building projects are not harmed by political changes or swings in government priorities. The importance of hiring contractors with a solid financial foundation emphasises the significance of financial stability in project performance. Contractors with adequate financial resources are better prepared to deal with unanticipated expenditures, delays, and other issues that may develop during construction, lowering the likelihood of project abandonment (Olatunji *et al.*, 2024). This is consistent with previous studies that recommend extensive financial vetting and risk assessment when selecting contractors, especially for large-scale or public projects. Furthermore, recognizing efficient planning at the outset of building projects as critical to preventing abandonment is consistent with recognized project management theories. Excellent planning is critical to the successful completion of construction projects since it requires careful coordination of resources, timeframes, and stakeholder expectations. Poor planning can result in resource shortages, scheduling problems, and other challenges that raise the risk of project failure. As a result, the findings of this study are consistent with recent literature and theories emphasising the importance of quality workmanship, effective communication, stable government policies, financial stability, and comprehensive planning in ensuring the success of construction projects.

#### **6. Implications of the study for the construction industry, urban development, and policy-making**

The rate at which construction projects fail to meet their objectives in Nigeria is worrying. As a result, the findings of this study are extremely significant, with both practical and theoretical ramifications. The findings of this study demonstrated that, in addition to technical and environmental difficulties, there are significant managerial challenges when managing building projects. For Nigerian construction managers to address these issues head-on, they must have the necessary abilities while also implementing a suitable strategy within the provided framework. The dynamic nature of clients, the complexity of construction projects, and the ongoing demand for improved and efficient project delivery have put pressure on construction managers, resulting in a slew of management challenges that require a high level of management acumen, capabilities, skills, and strategies to address. As a result, this study has opened the eyes of Nigerian construction managers. It has provided construction practitioners with the necessary skills and methods to address Nigeria's developing construction management difficulties. At the same time, it contributed to the expanding body of knowledge in construction management.

This study emphasises how important it is for the construction industry to have sound financial planning and management, especially in unstable economies like Nigeria. Construction projects need stronger risk management techniques, like financial hedging tools, to minimise desertion. Three major disruptors were identified: inflation, bankruptcy, and the death of sponsors. To reduce these risks, contractors and stakeholders must give financial analyses and planning top priority. The study's implications also emphasized how important it is for government policies to be constant and ongoing in order to support



the building industry. Public projects may be abandoned as a result of frequent shifts in government agendas and goals, underscoring the necessity of long-term policy frameworks that guarantee stability in project funding and implementation. Policymakers should prioritize developing conditions that are less vulnerable to political or economic changes. The study demonstrates that poor craftsmanship and insufficient communication among construction teams play a substantial role in project failures, emphasising the necessity for improved quality control methods and effective project management tactics.

Implementing Total Quality Management (TQM) principles and encouraging clear, open communication channels among all project stakeholders can considerably reduce the likelihood of project abandonment. As a result of abandoned building projects leading to urban blight and an increase in crime rates, urban planners and law enforcement should work together to prevent urban deterioration and crime by reusing abandoned structures or enforcing restrictions that prevent their abandonment. Efforts to revitalise and monitor abandoned properties can boost public safety and living conditions. Furthermore, the study demonstrates that abandoned projects have a detrimental impact on communities by lowering property values and decreasing living circumstances; this highlights the need for socioeconomic interventions and policies to revitalise neglected metropolitan regions. Governments and urban development organisations should undertake community-based development programs to mitigate the long-term impacts of project abandonment.

The study emphasises the necessity of selecting financially solid contractors who can handle unexpected obstacles; this finding supports tougher screening processes and risk assessments when granting construction contracts, particularly for large-scale public projects. This method may reduce the likelihood of project delays and abandonment caused by contractor insolvency. Thus, a comprehensive approach that includes better financial risk management, ongoing government assistance, quality project execution, and urban revitalisation is critical for addressing and preventing abandoned building projects.

## **7. Contribution of the study**

The study contributes to the causes, effects, and recovery strategies associated with abandoned building projects in Ibadan, Nigeria. Several factors contributing to project abandonment were identified, such as inflation, inadequate financing, and increased government regulations. Issues like financial constraints, ambiguous designs, contractor insolvency, indiscriminate contract awards, and volatile government policies were highlighted as key problems. The impacts of abandoned projects were found to be severe, including resource loss, diminished living standards, criminal hideouts, kidnapping sites, and breeding grounds for organisms. Furthermore, the study outlined recovery strategies for the revitalization of Ibadan city that, if appropriately implemented, could mitigate the occurrence of abandoned projects in Ibadan, Nigeria. These strategies encompassed elements like ensuring good workmanship, fostering effective communication among construction team members, adhering to continuity in government construction agendas, timely contractor mobilization, engaging financially stable contractors, and undertaking adequate planning from project inception. These factors and methods were elucidated through a questionnaire and subsequent analysis.

## **8. Conclusion**

The study looked at the causes, impacts, and recovery measures for abandoned building projects in Ibadan, Nigeria. Abandoned building projects in Ibadan have wide-ranging effects on clients, consultants, contractors, the economy, and society at large. To mitigate these effects, recovery measures must be enacted to uplift society. The key findings identified three major variables contributing to project abandonment: inflation, the death of a client or sponsor, and insolvency. Inflation was noted as a significant disruptor, raising construction costs and frequently causing project delays or abandonment, particularly in fragile nations. The death or departure of a client or sponsor exposed the vulnerability of projects that rely on individual financial sources. Bankruptcy and insolvency among construction



companies also contributed to project failures, emphasising the necessity of financial stability. The study also identified severe societal consequences, such as an increase in crime and lower living conditions. Abandoned houses were discovered to function as hideouts for criminal activity, lending credence to the "broken windows theory," which relates urban deterioration to increased crime rates. These projects also reduced property values and caused urban blight, aggravating social inequality and economic problems in the afflicted communities. The recommended recovery techniques included assuring high-quality craftsmanship, enhancing communication among construction teams, maintaining consistency in government policy, employing financially stable contractors, and competent project management. These tactics are congruent with existing construction management theories, emphasizing the importance of quality, financial stability, and sound planning in preventing project abandonment and ensuring project success.

### **Recommendations for professionals and policymakers:**

#### *Professionals:*

- There should be an improvement in risk management strategies through the implementation of financial risk management measures such as the use of inflation hedging instruments, contingency budgeting, and insurance to cover unforeseen circumstances like inflation or sponsor bankruptcy. This will reduce project abandonment risks caused by volatile economic conditions.
- Provision should be made to enhance the financial vetting of contractors by conducting thorough financial assessments of contractors and subcontractors before awarding contracts. It is important to ensure that contractors have the necessary financial stability to handle unexpected costs and delays. This will reduce the likelihood of project insolvency and ensure project continuity.
- Effective Project Planning should be put in place by developing comprehensive project plans that include realistic timelines, detailed resource allocation, and stakeholder engagement. This should be coupled with the use of advanced project management software for better coordination. This will prevent delays and interruptions caused by poor planning and resource management.
- Improved communication within construction teams should be established by establishing clear communication protocols across construction teams, including regular meetings, reporting structures, and collaboration platforms to enhance coordination. This will minimize misunderstandings and misalignment that often lead to delays or project abandonment.
- Priorities exceptional craftsmanship by establishing defined quality standards and adopting strict quality control methods throughout construction. This will ensure high-quality workmanship, reducing the likelihood of mistakes, delays, and costly reworks, and allowing for a smoother project completion.

#### *Policymakers:*

- To avoid project disruptions caused by shifting government priorities, long-term, stable construction policies and financial frameworks should be established across political regimes. This would ensure that ongoing public projects are not abandoned due to political changes, while simultaneously promoting infrastructure growth.
- Establish financial support mechanisms for construction projects, including project bonds, loans, and subsidies, to mitigate economic volatility and inflation. This would lower financial obstacles, allowing projects to proceed even in poor economic conditions.
- Implement laws to prevent project abandonment, including frequent inspections and clear exit routes for developers in case of financial issues or sponsor withdrawal. This will lessen the likelihood of abandonment by ensuring that projects are regularly monitored and contingency plans are in place.
- Prioritise revitalizing abandoned projects for the public good by creating policies to repurpose buildings for public services like affordable housing or community centres. Private investors could potentially be offered incentives to renovate existing structures. This will reduce urban blight, increase community safety, and raise living standards in affected communities.



- Collaborate with law enforcement and urban planners to protect and monitor abandoned structures to prevent criminal activity. Penalties could be imposed on property owners who leave projects abandoned for extended periods. This reduces the use of abandoned structures as criminal hideouts, so boosting public safety and urban quality of life.

Implementing these ideas would help practitioners better manage construction projects, while policymakers will create a more stable and supportive environment for the industry.

More research is needed to investigate the influence of economic conditions and inflation on building projects, with a special focus on the impact of inflation and economic instability on construction costs in developing nations. The study can look deeper into how financial mechanisms such as inflation hedging, cost-cutting techniques, and dynamic budget planning might reduce inflation-related risks in the construction business. This research may result in more refined financial models geared to uncertain economies, potentially lowering the chance of project abandonment. Another suggestion for future research is to consider the function of stakeholder management in reducing project abandonment. This could include discussing how changes in stakeholder circumstances (for example, sponsor death or departure) effect project abandonment and what contingency plans can be implemented to reduce such risks. The study could look into the effectiveness of various stakeholder management strategies, particularly the role of institutional funders versus individual sponsors in maintaining project continuity. Understanding the success of various stakeholder involvement and finance arrangements can help projects maintain resilience and continuity. Furthermore, future studies should concentrate on urban deterioration and crime by investigating the link between abandoned structures and urban crime, particularly in quickly urbanising places. The study could look into specific intervention options (such as repurposing or securing abandoned homes) and their effectiveness in reducing urban crime in various contexts. Such research could equip policymakers with targeted urban planning ideas to minimise crime rates in areas impacted by project abandonment.

Because abandoned building projects have long-term socioeconomic effects on urban communities, such as property values, investment levels, and overall quality of life, future research could quantify the economic and social toll of abandoned projects, including health implications and migration patterns within affected communities. Such research could inform urban regeneration programs targeted at combating socioeconomic deterioration in places with a high rate of abandoned initiatives. Furthermore, strong risk management frameworks must be developed to handle the unique issues that building projects in emerging nations face. This could be addressed by research that identifies, tests, and implements realistic risk reduction solutions such as insurance, financial planning, and stakeholder diversity. Improved risk management frameworks would result in more robust building projects, lowering the possibility of abandonment due to financial or economic disruptions.

There is also a need for research into the efficacy of government policies in promoting long-term construction projects. The study could look into the effect of government policy continuity on the success and sustainability of construction projects, particularly public ones. Such research would help guide policy changes targeted at creating stable environments for long-term construction projects, particularly those involving public infrastructure. Another study might be conducted that compares abandoned initiatives across geographies. A comparative investigation of the causes and consequences of abandoned building projects in various regions of Nigeria or other developing nations would be required. Such comparison research can help reveal regional differences in causal causes and successful healing techniques. The study would provide a broader understanding of the problem, resulting in more region-specific recommendations for preventing and managing abandoned building projects. By focusing future research on these topics, scholars can fill knowledge gaps, improve practical solutions, and broaden the study's contributions to the larger discourse on construction management, urban development, and socioeconomic policy.



### Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Conflict of Interests

The Authors declare that there is no conflict of interest.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Credit author statement

**Conceptualization:** O.A.O., S.K.A. **Data curation:** S.K.A., **Formal analysis:** O.A.O., S.K.A. O.K.A. **Investigation:** S.K.A. **Methodology:** O.A.O., S.K.A. O.K.A. **Project administration:** O.A.O., S.K.A. **Writing—original draft:** O.A.O., S.K.A. O.K.A. **Writing—review and editing:** O.K.A., O.A.O., S.K.A.

All authors have read and agreed to the published version of the manuscript.

### Data availability statement

The data that support the findings of this study are available from the corresponding author, [O.K.A.], upon reasonable request.

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**How to cite this article?** (APA Style)

- Obakin, O. A., Afolami, S. K., & Akande, O. K. (2024). Causative factors of abandoned urban housing projects and strategies for revitalization in Ibadan, Nigeria. *Journal of Contemporary Urban Affairs*, 8(2), 582–602. <https://doi.org/10.25034/ijcua.2024.v8n2-17>

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