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

*[1] Sarah Binte Haque , [2] Moumita Roy , [3] Zereen Afroz Tanha

[1] Department of Architecture, Faculty of Architecture & Planning, Chittagong University of Engineering & Technology, Bangladesh.
[2 &3] Department of Architecture, Chittagong University of Engineering & Technology, Bangladesh.
[1] E-mail: arch.sarah026@cuet.ac.bd , [2] E-mail: mrimi0757@gmail.com , [3] E-mail: afroztaha1104@gmail.com

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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.

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Highlights:	Contribution to the field statement:
- 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.	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.

***Sarah Binte Haque:**
Department of Architecture, Faculty of Architecture & Planning, Chittagong University of Engineering & Technology, Chattogram
Email address: arch.sarah026@cuet.ac.bd

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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):

Urban Regeneration	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**
Social dimension (social connections)	-Behavior of neighbours (nuisance) community. -existence and interpersonal relationships. -Ambiance.
Physical dimension (Physical aspect of the dwelling environment))	-Quality of the environment. -Open areas. -Preserving the constructed environment.
Functional dimension (Services and amenities)	-The accessibility of amenities and their closeness. -Job prospects.
Safety dimension (perception of safety and criminality)	-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.

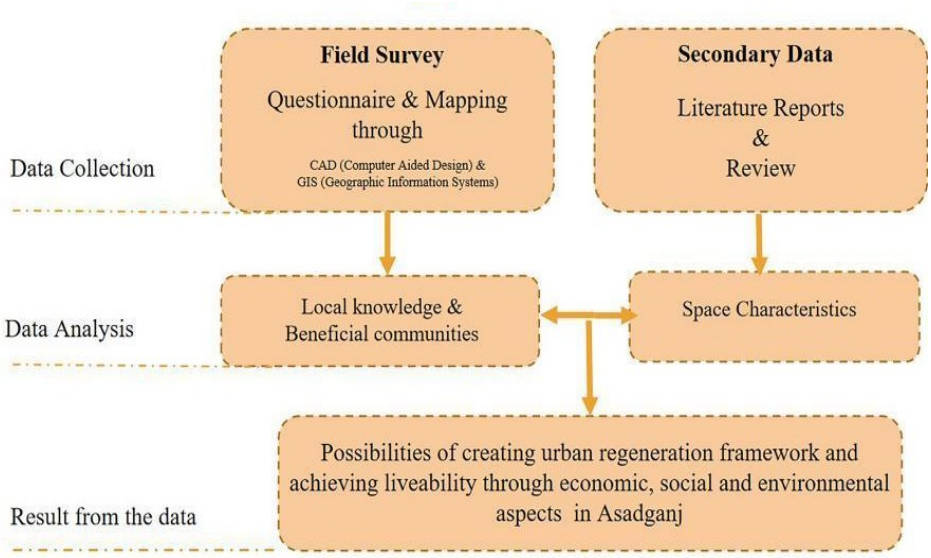


Figure 1. A conceptual model representing the overall methodological process.

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.

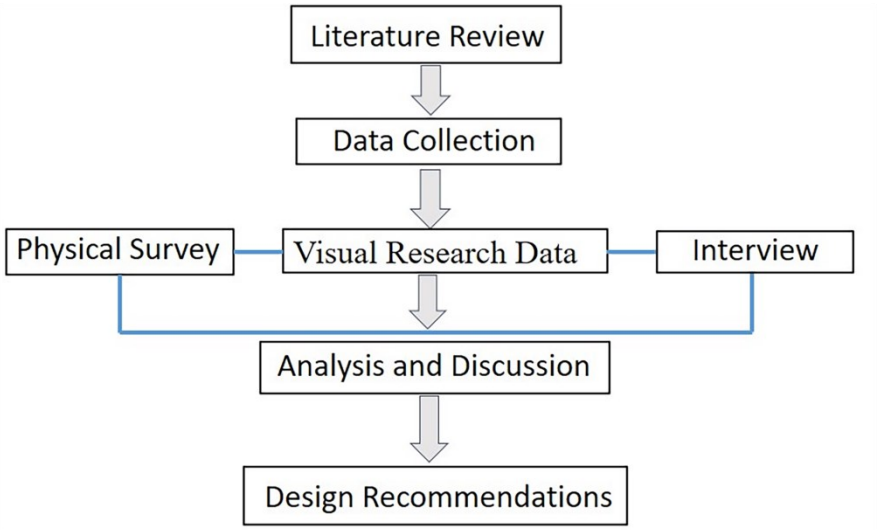


Figure 2. Research Methodology Flow-Chart Study Area.

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).

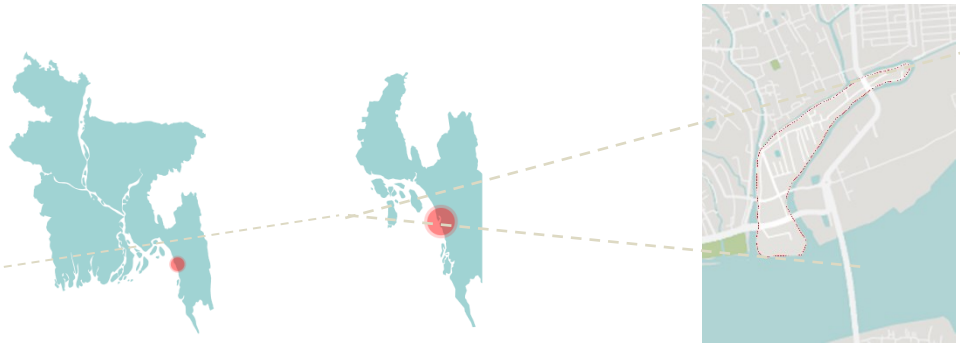


Figure 3. Location of Asadganj commercial area (Source: Chattogram City Corporation, taken in 2023).

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.

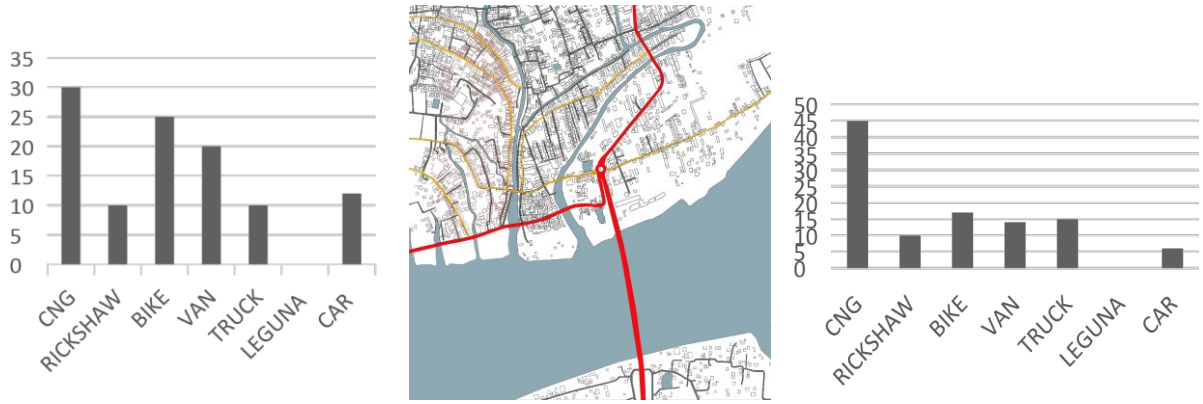


Figure 4. Nodes & Paths of Asadganj Area depicting (a) Mariner's Drive Road -Notun Bridge Node and (b) Notun Bridge Node-Mariner's Drive Road.

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.

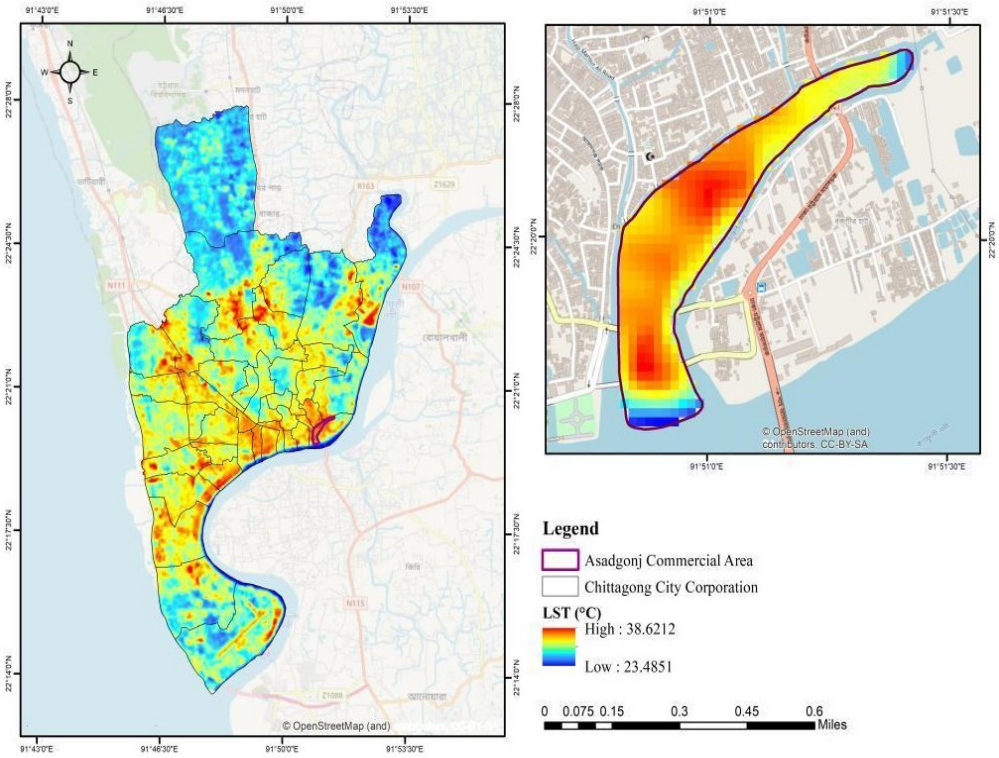


Figure 6. Land Surface Temperature of Asadganj (Chaktai) commercial area (Roy et al., 2024).

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

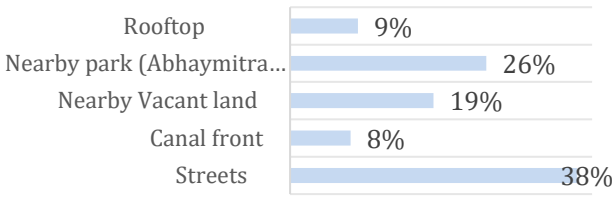
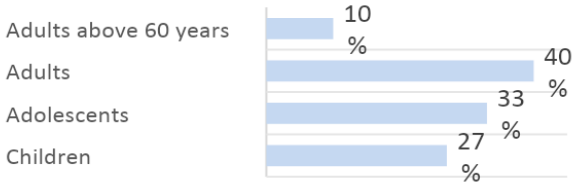
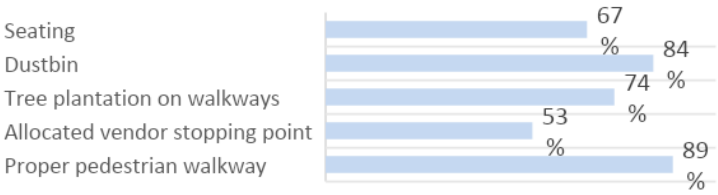
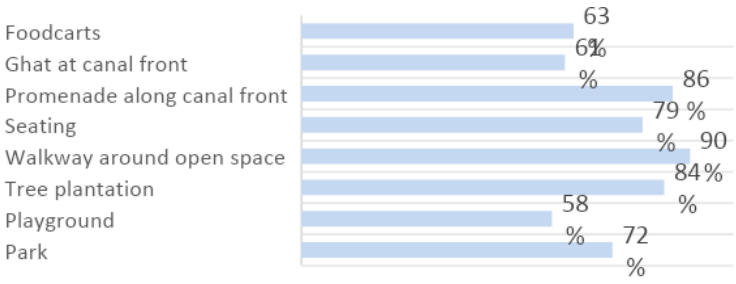
Inadequate public and community access to appropriate open space is one of the main concerns of Asadganj's urban residents. The absence of public spaces hampers economic activity, pollutes the environment, and reduces social stability and security. There is a presence of few open spaces.

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.

Public's present expenditure during their leisure hours	
Tentative users of these spaces (according to age)	
Public's preferences for the improvement of existing road infrastructure	
Public's preferences for open spaces	

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 m² (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).

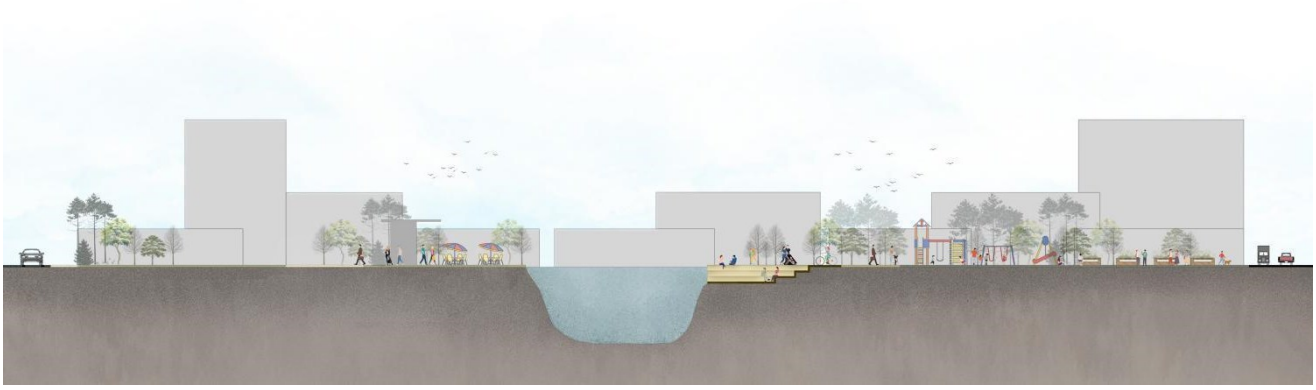


Figure 9. Section of a neighbourhood park (Source: The authors).

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.

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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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