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Korail Informal Settlement in Dhaka: Design Scenarios for Well-being of Community

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Master in Landscape Architecture for Global Sustainability

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Part I

Abstract

The proliferation of informal settlements represents a pervasive global trend. Over the past three decades, in excess of 213 million individuals have inhabited these informal habitats, constituting approximately 25% of the world's urban population (Avis, 2016) Notably, these settlements often gravitate towards water structures within the urban fabric, fostering distinctive cultural practices. Regrettably, these informal settlements are frequently perceived as eyesores, contributing to both visual and social pollution. Consequently, the informal sectors of cities have become isolated entities within the broader formal urban landscape . (Dovey, 2012)

In response to this pressing issue, this project embarks on a journey to explore the potential of landscape architecture as a transformative force. It seeks to enact a design intervention with the overarching goal of considering the overall wellbeing of the informal community. The impetus for this endeavor springs from the author's deep-seated fascination, rooted in personal experiences originating from a developing country in South Asia. The rapid urbanization and burgeoning population in cities have wrought profound changes, eradicating traditional ways of living. Dhaka, the capital of Bangladesh, stands as a poignant example of this transformation. The relentless influx of migrants has not only exacerbated environmental challenges but has also given rise to a critical housing shortage. In response, local residents have resorted to establishing informal settlements, often along watersheds and open spaces, resulting in the expansion of areas such as the Korail Slum, notably situated by the Gulshan Lake. This project in landscape architecture aims to redefine informal settlements, focusing on both providing opportunities for affected individuals and addressing environmental degradation. Beyond physical restructuring, the goal is to create safe spaces, foster community engagement, and generate economic opportunities, particularly for women. The overarching objective is seamless integration into the

city's natural landscape, revitalizing the informal sector for sustainable living while shaping the environment in a way that enhances the quality of life for the urban poor. Central to this vision is leveraging informal settlements as intermediary spaces that foster a symbiotic relationship between formal and informal city elements.

Introduction

Urbanization, a crucial component of modernization, has long been regarded as a sign of economic progress and expansion. While wealthy countries have mostly finished the process, many developing countries, notably South Asian countries such as Bangladesh, are experiencing rapid urbanization that exceeds their economic development and financial capacity. The rapid rate of urbanization in these regions poses issues for governments in sustaining social and economic integration, particularly for the growing number of underprivileged immigrants to cities. Jones (2003) covers current urbanization research and policy formation, highlighting major shifts. The first, characterized by overly fast urbanization in emerging nations, predicts an 80% urban population by 2025, fueling the expansion of informal settlements.Therefore, an uprising volume of poor, marginalised citizens end up in informal settlements in an urban setting. A study report by UN-Habitat stated that over 30 per cent, or approximately an estimated 1 billion people of the world's population, are forced to live in informal settlements, also known as slums. (Panday, 2020)

The informal settlements represent a stark reality of social and economic deprivation, as they lack basic amenities such as adequate water supply, inadequate sanitation facilities, resulting in unsanitary conditions, cramped and precarious dwellings, and persistent concerns about land tenure. Recognizing the worldwide importance of this issue, Millennium Development Goal (MDG) Target 11 committed to a significant improvement in the living circumstances of the nearly 100 million people expected to live in slums by 2020.It is important dive into the nuances of these issues, highlighting the importance of comprehensive interventions to improve the quality of life for these disadvantaged people. (Panday, 2020)

Taking the example of a developing country like Bangladesh, Dhaka's capital is continuously budding with urban sprawl, and the informal settlements are increasing rapidly over time. The fast-growing capital, with 16 million people, has 60 per cent of its residents living in urban slums. This huge sum of people is living in poverty, lacking basic human rights and minimum opportunities to flourish to improve living conditions in social, cultural and overall dimensions. (Noshin Siara Promy, 2019)
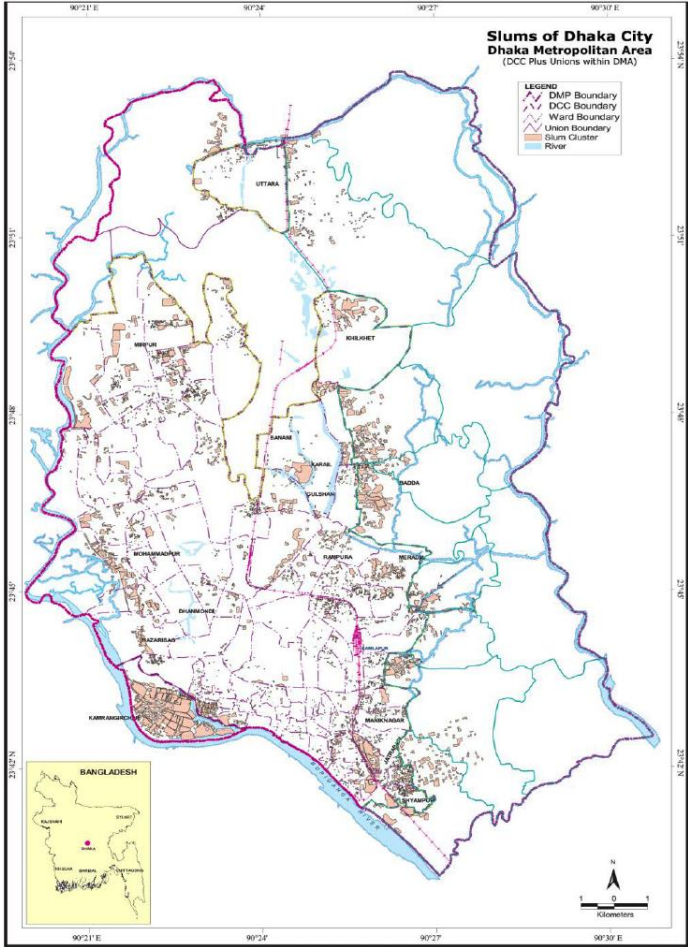
Fig. 1. Dhakka's slums. (Rahman & Atkins, 2014)

Project Aim and Problem Statement

Informal settlements have been a major challenge for rapidly expanding cities, particularly in emerging and underdeveloped countries. In Dhaka's Korail slum, inhabitants face numerous challenges every day. Namely, lack of space, poor quality of life, environmental degradation, and climate-related stressful conditions. The settlement expansion into the lake has determined high water and land pollution levels and enormous difficulties in surviving the flooding seasons. Moreover, the compactness of the slum construction didn't leave spaces for openings between the buildings, and it generated security and safety concerns for women.

However, despite facing these challenges, the inhabitants of Korail persist in their quest for survival. Their ability to forge a connection with the limited space available, using it not just to exist, but to live, is a beacon of hope amid the chaos.

This thesis investigates the challenges faced by inhabitants of informal settlements, focusing on social justice, gender inclusivity, and the right to land and space. The objective is to prioritise the voices and needs of those residing in these spaces for a more sustainable quality of life. Central to this endeavour is the aspiration of inhabitants to connect with green spaces, harnessing this hope to establish sanctuaries explicitly tailored for women, ensuring their safety and well-being. Addressing gender dynamics within public spaces in informal settlements constitutes a pivotal dimension of this project. The potential for a community-driven approach to landscape interventions, such as urban green spaces for women, holds diverse advantages, including environmental restoration, enhanced stability, and economic empowerment.

Research Question:

1. What design strategy can be followed to promote resilience in Korail through economic growth, environmental restoration, and increased stability?

Sub Research Questions

1. Why is a gender-inclusive public space such a critical concern for women in Korail, and what type of landscape intervention effectively echoes their needs and aspirations?
2. What practices are currently in place in Korail to promote urban green spaces, and how do they manifest within the existing framework of the settlement?
3. How can the existing practices be integrated into a more comprehensive and functional design approach on a broader scale?

Methodology

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Chapter 1

Theoretical Framework

Literature Review

Landscape architecture's evolution emerges as a dynamic narrative, reflecting changing cultural perspectives and emerging environmental imperatives. Its historical roots may be seen in the precise creation of formal gardens and parks, which were primarily designed to satisfy the aristocratic tastes of bygone ages. (Desmond, 2015). However, as the urban tapestry grew in the midst of the Industrial Revolution's crucible, landscape architects played a vital role in urban planning, organizing the integration of green enclaves as sanctuaries from the growing industrial maelstrom. (Spirn, 1984). This marked a pivotal shift from private gardens to public spaces, emphasizing accessibility and communal engagement.

The mid-twentieth century saw a paradigm shift highlighted by an emerging ecological concern within the profession. Attuned to the tenuous balance of ecosystems, landscape architects adopted sustainability as an ideal. (Woudstra, 2014). Native flora and fauna were prized components of the designer's palette, while habitat protection became a beacon directing the industry toward a more eco-centric design ethos.

The modern landscape architectural discourse is centered on a strong humanism. Spaces are no longer seen as separate entities, but rather as essential components of the human experience. Physical and psychological well-being is a core element of design considerations. Accessibility and inclusion have taken on new meaning, creating areas that enhance community cohesiveness, social engagement, and communal conviviality. (Corner, 1999)

Therefore, the design of resilient areas, particularly in informal settlements, provides a very relevant instructional environment for a landscape architecture student in line with this evolving role. These human crucibles, which are brimming with promise and vitality, provide a variety of

chances and difficulties for the nascent practitioner. With particular focus, the necessity of community-centric design is addressed. Students are urged to forego playing the part of just designers in favor of taking on the role of active facilitators who may channel the residents' underlying wisdom and ambitions. Informal settlements have drawn a lot of attention in the field of urban development from a variety of sources. Despite several projects aimed at addressing these settlements, it is still necessary to specifically define the contribution of landscape architecture. This chapter does an exploratory analysis while using international case studies to clarify the many facets of informal settlements. It makes an effort to determine the interventions made, including many sectors, and the influence they had on these settlements by a thorough examination. Importantly, this chapter will consider the crucial part that landscape architecture plays in this sector, identifying its relevance and potential transformational power.

Informal Settlements. What is it, and why is it a global concern

In the heart of bustling cities, hidden from the glitzy skylines and affluent neighborhoods, lie the intricate tapestries of informal settlements. Known as slums or shantytowns, these communities have woven themselves into the urban narrative since the late 19th century. If we picture a time of industrial revolution, where city lights beckoned with promises of opportunity, it was in this era that the first seeds of informal settlements were sown, born from the dreams of migrants seeking a foothold in the burgeoning urban landscape. (Gilbert, 2004). From the cobbled streets of Europe to the alleys of North America, these settlements began to dot the globe.

The features of informal settlements change as our cities grow. They have evolved from simple shelters into various habitats, demonstrating the creativity and need of their inhabitants. These communities have fashioned their futures within the concrete jungles, from basic shacks to more robust, yet informal, housing structures. (Davis, Planet of Slums. , 2006). Life's vitality survives in these passageways and courtyards, providing a stunning scene of human perseverance. Informal communities have crossed boundaries and reached every part of our planet. Sub-Saharan Africa, South Asia, and parts of Latin America bore testament to their tremendous impact in the Global South. Rapid urbanization, resource constraints, and political complications

have resulted in vibrant communities with distinct identities and concerns. (UN-Habitat, World Cities Report 2016: Urbanization and Development—Emerging Futures. , 2016). Their influence is seen not just in the physical structures they build, but also in the lives they touch.

Informal Settlements around the Globe

Since informal settlement is a global concern, it is important to examine a few noteworthy instances from the functionality and organizational perspective. Beyond their physical buildings, these settlements represent complex socioeconomic processes, acting as crucibles for human activity within their unique metropolitan environments. I will attempt to uncover the geographical complexities and socioeconomic limitations underlying these communities through an urban morphological review of some informal settlements around the globe in the following discussion.

Kibera

Kibera arose as a village for returning Nubian troops during British colonial control in the early twentieth century. It is now one of Africa's largest informal settlements, with an estimated 200,000 to 500,000 inhabitants. (UN-Habitat., 2018) This densely populated village has an array of ethnicities, including Kikuyu, Luo, Luhya, and Kamba, which fosters a lively social fabric. (Opiyo, 2015). This settlement faces a slew of long-standing limitations. A lack of vital amenities, such as sanitation and power, generates a cycle of environmental vulnerability. This has a direct influence on people' health and general quality of life.

Fig 2: Kibera Informal settlement. (Mwangi, 2020)

Kibera's organizational structure is decentralized but strong. Community-based organizations (CBOs) and self-help groups serve as the foundation of local initiatives, frequently cooperating with non-governmental organizations (NGOs) and government agencies. Local non-governmental organizations (NGOs) such as Kounkuey Design Initiative (KDI) and Carolina for Kibera (CFK) have played critical roles in executing different solutions. These organizations, which are led by community leaders and activists, push for measures in sanitation, healthcare, education, and economic growth. Power structures are frequently participative, reflecting the community's collective spirit. Therefore, despite its obstacles, Kibera functions as a dynamic and close-knit community. (UN-Habitat., 2018)

Dharavi

Dharavi has grown to become Asia's biggest informal community, containing around one million people (UNHabitat, 2016). Its demographic makeup reflects a rich mosaic of communities from many Indian states, with a strong presence from Tamil Nadu and Uttar Pradesh. (BuckLey, 2013)The functioning of the settlement is based on a network of informal and official economic activity.
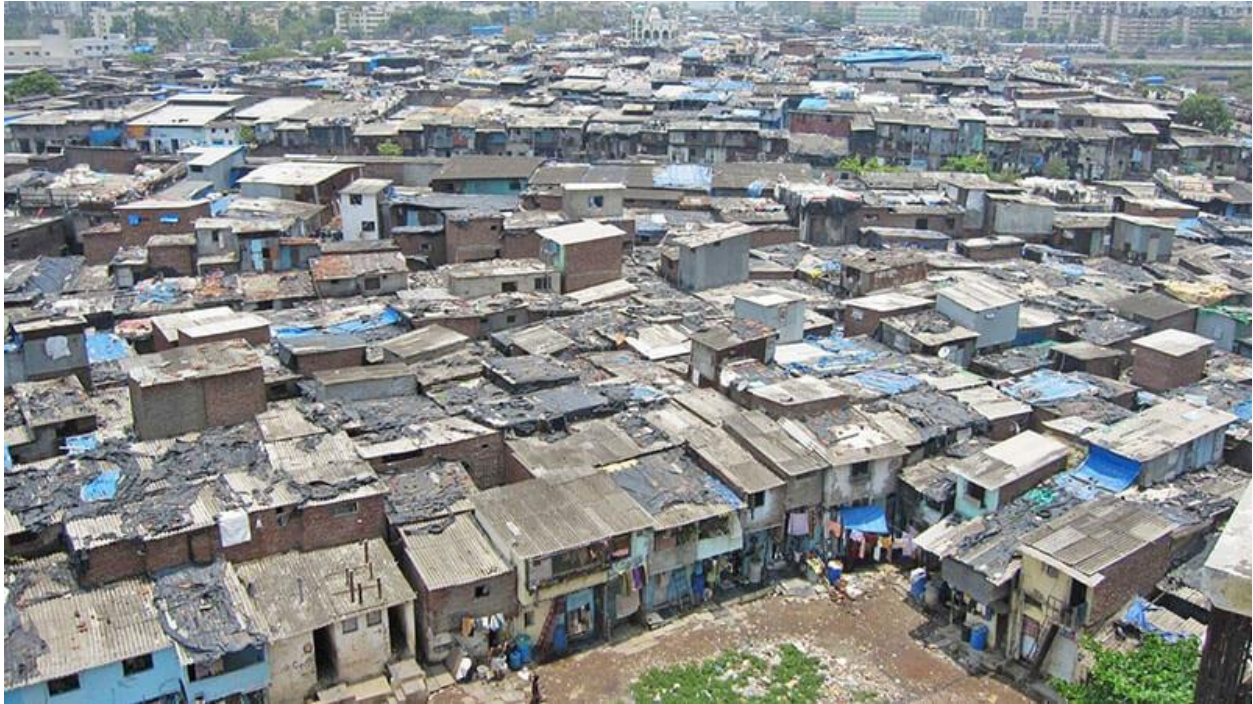
Fig 3: Dharavi, Mumbai. (Cosgrove, 2023)

Small-scale enterprises such as leather, ceramics, and recycling provide substantial contributions to the local economy (Davis, Planet of Slums. , 2006). Organizations such as the Dharavi Redevelopment Project Authority (DRPA) work to enhance infrastructure and living conditions while stressing redevelopment and the preservation of distinctive businesses. This mix of formal and informal systems demonstrates Dharavi's community's adaptability and resilience.

Rochina

Rocinha's (one of the biggest informal settlement in Latin America) population developed tremendously, notably in the 1960s and 1970s, when it was founded by rural migrants seeking work in Rio de Janeiro. Currently, estimates place the population at roughly 70,000 people, while the actual count is difficult to determine due to the informal character of the community (UN-Habitat, World Cities Report 2016: Urbanization and Development—Emerging Futures. , 2016). The settlement is home to a wide range of economic activity, including informal marketplaces, small companies, and service providers (Perlman, 2010). Its difficult geography needs innovative land-use methods. However, ongoing issues include restricted access to vital services like sanitation and dependable energy (UN-Habitat, Housing Policies to Support Transformation in Informal Settlements., 2016)

Fig 4: Rochina, Brazil. (bobbyjetstream, 2018)

NGOs, government organizations, and community-based groups are all included into the Rocinha organizational framework. Associations such as the Residents' Association of Rocinha.

play an important role in advocating the community's concerns..Rocinha's tenacity and contribution to Rio de Janeiro's economic and cultural environment demonstrate the city's importance. (UNHabitat, 2016)

Khayelitsha

Due to forced relocations and apartheid practices that sent non-white residents to the outskirts of Cape Town, Khayelitsha was created in the early 1980s It has 400,000 people, most of whom are of Xhosa descent, reflecting the demographics of the Western Cape province as a whole. (UN-Habitat., 2018).

Fig 5: Khayelitsha, Cape Town. (Photos, 2023)

While many people commute to work in downtown Cape Town, the community also has a thriving informal economy, which includes small enterprises and services (UN-Habitat., 2018)Khayelitsha is the result of a dynamic interaction between advocacy organizations, community-based organizations, and state agencies. The Khayelitsha Development venue (KDF), for example, serves as a venue for community participation and advocacy (Khayelitsha Development Forum). Local groups such as the Social Justice Coalition (SJC) push for better

access to basic services and social justice (Social Justice Coalition). These institutions promote interaction and collaboration among community members and external stakeholders, resulting in a more inclusive and participatory approach to development. (UN-Habitat., 2018)

Design Case Studies

Role of Different Stakeholders and Case Study Analysis

Role of Government

Governments approach informal settlements as complex urban phenomena, recognizing their role as important aspects of urban landscapes while tackling crucial challenges such as poor housing, insufficient services, and land tenure instability. This dual viewpoint needs complex policies that combine social capital preservation with focused urban growth. In many situations, governments prefer renovating existing settlements to improve living conditions, expand infrastructure, and ensure legal tenure for inhabitants, in accordance with participatory urban planning principles. (UN-Habitat, Housing Policies to Support Transformation in Informal Settlements., 2016) The increasingly popular concept of in-situ development strives to utilize available resources while integrating these communities into the urban fabric, anchored by the necessity of community empowerment. An example of such government involvement is the Dharavi Redevelopment Project.

Dharavi Redevelopment Project
The Dharavi Redevelopment Project is a joint initiative involving a variety of partners, including government agencies, private sector companies, and community groups. The Maharashtra Slum Rehabilitation Authority (SRA), in collaboration with private developers, is key to the project's execution. In addition, the Dharavi Redevelopment Authority (DRA) has been created to monitor and coordinate the project's different parts. It is an example of a government initiated

redevolpment plan with collaboration thereby it is useful to discuss the strategies of this project critically to understand the issue. (Patel S. &., 2017)

Strategies and Critical Analysis

The major goal of the Dharavi Redevelopment Project is to turn Dharavi into a vibrant urban region defined by sustainability and liveliness. The ambitious objective of slum rehabilitation, which entails temporarily relocating residents to alternate accommodation while their old houses are renovated, is central to this project. Residents will be reintegrated into their improved housing after the new housing units are built. While this restorative endeavor shows promise, it presents an important issue about possible gentrification, which might be caused by changes in affordability dynamics. It is vital to evaluate the potential impact on low-income inhabitants, who may face difficulties adjusting to the new socioeconomic landscape. (Patel S. &., 2017)

In line with redevelopment efforts, the government intends to build improved infrastructure, such as roads, commercial businesses, and the formation of mixed-use areas, as well as increased recreational amenities. While these changes are unavoidable in cities, it is critical to recognize the concerns of low-income inhabitants who may experience difficulty adapting to the changed environment. Despite the project's admirable emphasis on community interaction, a better understanding of inhabitants' viewpoints and lives is required. This would allow for a more nuanced meeting of their distinct expectations, ensuring that the redevelopment is not merely focused on surface-level aesthetic upgrades and economic success. Rather, a concentrated effort should be made to generate long-term economic growth, together with a comprehensive strategy to up-skilling and empowering the workforce to meaningfully contribute to the overall development paradigm. (Patel S. &., 2017)

Role of International Organization and Aid

International organizations and assistance groups are critical in resolving the issues raised by informal settlements. Organizations such as UN-Habitat and international non-governmental organizations (NGOs) such as Habitat for Humanity play an important role in mobilizing financial and technical resources, as well as giving experience in urban planning and development. They concentrate on comprehensive interventions, such as home renovations,

infrastructure development, and livelihood enhancement, with the goal of improving the living conditions of persons living in informal settlements (UN-Habitat, Housing Policies to Support Transformation in Informal Settlements., 2016)These interventions primarily help low-income communities, marginalized groups, and vulnerable populations by addressing specific needs. Collaboration is a key feature of successful informal settlement operations. Local governments, non-governmental groups, community-based organizations, and university institutions collaborate closely with international organizations. This collaborative approach capitalizes on the aggregate capabilities of several stakeholders, resulting in a comprehensive, context-responsive strategy. (Payne, 2017) However, it is critical to recognize the limits of their involvement. Sustainability remains a concern, as project financing may be time-limited, potentially leading to service discontinuity. Furthermore, negotiating political and institutional variables in host nations might have an impact on intervention success, emphasizing the significance of context-specific tactics which is often the case while implementing such a project. The Kibera Upgrading project by UN Habitat is a great example to discuss in this regard.

The Kibera Upgrading Project

UN-Habitat's Kibera Upgrading Project is a comprehensive intervention aiming at improving living conditions and supporting sustainable urban development in Kibera.UN-Habitat has been essential in advancing the project's execution in collaboration with local authorities and non-governmental groups. The program has placed a strong emphasis on community involvement, actively integrating Kibera locals in the planning and decision-making process.The building of better housing units, the supply of vital amenities such as clean water and sanitation, and the establishment of common areas for social activities and economic possibilities are all important components. (HABITAT, UN-Habitat in Kenya: Kibera. , 2018)

Strategies and Critical Analysis

The major commendable aspect of this project is that it has taken the community's needs seriously and adopted a collaborative approach to building the community. It has integrated skills development and job placement services in the project to help the community's economic growth while also taking care of the roads and buildings. They have actively sought community

engagement in the construction phase to enable people interact with the project. In order to enhance resilience, they have also prioritized environmental and social sustainability.

The fundamental restriction, however, is a lack of control over the local authority as well as knowing and recognizing the power dynamics in the community. Kibera has a complicated land tenure structure, making it difficult for an international group to comprehend and act on it from afar. Furthermore, internal government and political activities are off limits, therefore the long-term feasibility of such a scheme is frequently questioned. The perfect balance of power dynamics and community participation is difficult to achieve, so providing funding and really establishing a large-scale change for the long term and monitoring it were two different things. (HABITAT, UN-Habitat in Kenya: Kibera. , 2018)

Role of Urban Planners, Architects and Landscape Architects

The knowledge of urban planners, architects, and landscape architects in developing holistic solutions that include spatial planning, architectural design, and landscape interventions is essential while dealing with informal settlements. Urban designers, architects, and landscape architects collaborate with local governments, community leaders, non-governmental groups, and citizens to create in inclusive design approach. This inclusive approach guarantees that initiatives are sensitive to the community's individual needs and ambitions. Participatory planning, in which communities actively engage in decision-making, is a distinctive method for their role where initiatives are tailored to the community's individual needs and preferences, resulting in more meaningful and long-term benefits. Also, engaging stakeholders generates a sense of ownership, which ultimately contributes to the efforts' long-term sustainability and success. However, many obstacles can arise due to resource constraints, political and bureaucratic hurdles, and the complex socio-economic dynamics within informal settlements which they have to deal with while collaborative with Government, NGO aids and other stakeholders.

Now-a-days, addressing resilience and adaptability in urban informal settlements is a major driving force for urban planners, architects, and landscape architects. Several entities, including architectural companies, educational institutions, and NGOs, have worked extensively together

to address this challenging topic. The Columbia University Centre for Resilient Cities and Landscapes, Beyond Private Limited in India, The Kounkuey Design Initiative (KDI), Jana Urban Foundation in India, and Urban Think Tank (U-TT) are all notable examples of organizations that have made significant strides in improving informal settlements and promoting resilience through community engagement. Here, I will focus on two separate initiatives led by Urban Think Tank and KDI, giving an analytical framework to distinguish their diverse viewpoints and the vast domain within which urban planners, architects, and designers operate.

The Empower Shack Project by UTT

The "Empower Shack" initiative in Cape Town's Khayelitsha stands out in design approach taken by an architectural/planning point of view.I t adopts a community-centered approach, actively including residents in the design and building process. This collaborative initiative uniquely shifts away from typical top-down interventions by encouraging residents to take responsibility of their living areas. The project also emphasizes the use of local materials and building processes, displaying a dedication to sustainable and culturally aware design. This not only creates a sense of place, but also assures that the project may be replicated in similar circumstances. Therefore, the project not only addressed the pressing need for improved living conditions but also generated a feeling of community and social cohesion by merging refurbished housing units with shared common areas. The inclusion of economic options, such as small-scale business and training programs, led to citizens' improved lives and economic resilience which promoted a sustainable living impact. (Tank., 2019)

*Strategies and Critical Analysis*The project expertly combines a community-centric design approach, which is an essential component in developing strategies to tackle informal settlement development. The inclusion of communal spaces and the encouragement of cooperative economic endeavors are promising steps toward instilling in people a feeling of collective identity and economic empowerment. Nonetheless, it is critical to recognize that scaling this method to a densely inhabited settlement poses a slew of logistical challenges. While this strategy is effective on a smaller scale, its execution in bigger, more crowded environments may be far more difficult to execute effectively. Furthermore, while the initiative provides immediate

and short-term comfort, long-term resilience requires constant management and sustained funding. Factors like long-term health care and proper waste management, which are critical components of holistic development, need special attention and integration into the project's structure to provide a genuinely comprehensive approach. (Tank., 2019)

Kiberia Public Space Project by KDI

The Kiberia Public Space project, located on the boundary of Soweto East and Silanga communities in Kibera, tackles the crucial issue of flooding and the attendant issues experienced by the community. Due to recurring flooding, this location was once deemed inhospitable, leaving it unreachable by foot and resulting to its classification as a dumping site. (KDI, 2006)

Community members were empowered to identify and prioritize major issues such as floods, safety concerns, poverty, and a lack of recreational possibilities for children through a participatory approach comprising workshops. These issues were combined into a unified, integrated design that gave a holistic answer to the area's numerous problems. The proposal includes a pavilion, office space, garden, bridge, and gabions, among other useful aspects. Within a holistic framework, these components act in tandem. For example, the pavilion is used by a school and a church, and its roof captures rainwater while also promoting sustainable agriculture and producing cash. (KDI, 2006)

Strategies and Critical Analysis:

Community participation was an important key in this project as well. Community members were empowered to identify and prioritize major issues such as floods, safety concerns, poverty, and a lack of recreational possibilities for children through a participatory approach comprising workshops. These issues were combined into a unified, integrated design that gave a holistic answer to the area's numerous problems.The NNDC group was formed to supervise the site's day-to-day operations, programming, and maintenance. While the initiative has achieved great success, it is critical to recognize its limitations. The expansion of land-grabbing activities, which resulted in the destruction of the original playground, was one major setback. This issue focuses on the continuous battle to safeguard and sustain public spaces in informal settlements. Also, the project's long-term viability is dependent on its capacity to obtain regular funding and resources

while tackling developing obstacles like as trash management and larger socioeconomic concerns that continue in Kibera. (Opiyo, 2015)

Chapter 2

Context introduction

Dhaka City

Geographical Characteristics

Dhaka, Bangladesh's capital, serves as a dramatic microcosm highlighting the complicated link between human activity and the resulting changes in the surrounding environment. Dhaka is located between 23 58' and 23 90' North latitudes and 90 33' and 90 50' East longitudes, on a generally flat alluvial terrace known as the Modhupur terrace from the Pleistocene epoch, (BL, 1968).

The city's topography is defined by four major river systems that run south, west, north, and east, respectively: the Buriganga, Turag, Tongi, and Balu. Dhaka's outskirts have wetlands and vestiges of historic river beds, contributing to the region's distinct scenery. According to FAP, the area's surface elevation ranges from 1 to 14 meters, with the bulk of built-up regions being at altitudes ranging from 6 to 8 meters. ((FAP), 1991).

Major Peripheral Rivers of Dhaka:

The rivers Balu and Sitalakhya grace Dhaka's eastern periphery, while Turag and Buriganga flank its western bounds. To the north, the city is bordered by Tongi Khal, and to the south, the Dhaleshwari River completes the natural demarcation. Tongi Khal interconnects Turag and Balu

rivers, and further downstream, Dhaleshwari and Sitalakhya converge south of Narayanganj before merging into the Meghna River. (Jaman, 2017)
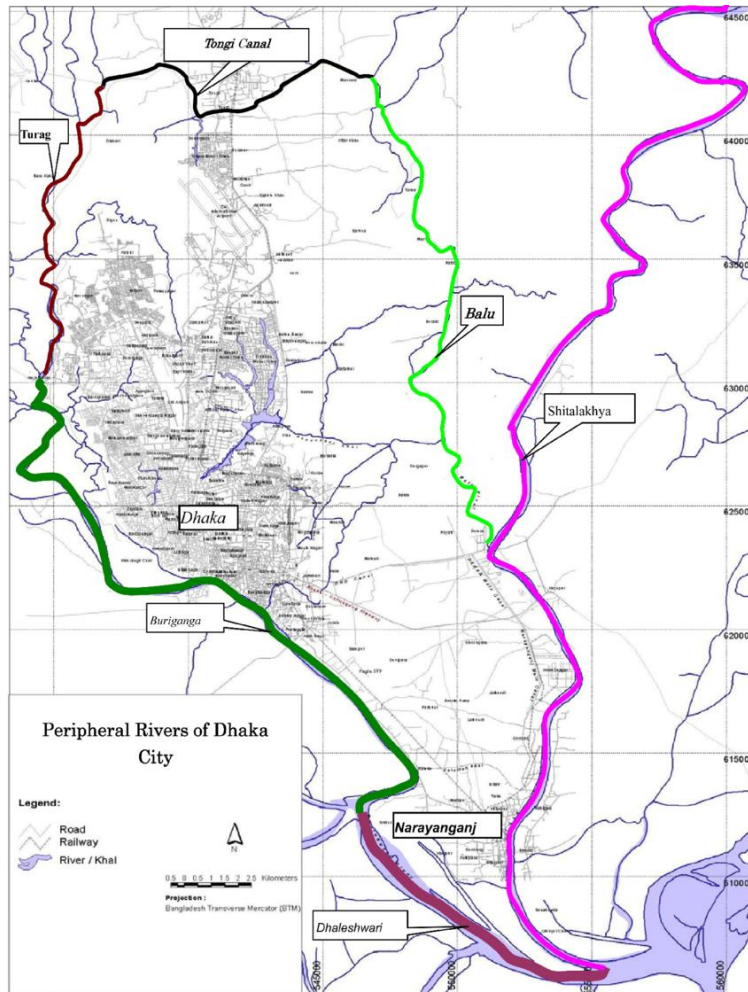
Fig 6: Peripheral Rivers of Dhaka (Banu, 2013)

These rivers exhibit a dynamic hydrological rhythm, receiving water from the Jamuna (Brahmaputra river) during the wet season. In the dry season, the upper reaches of these water bodies experience gradual replenishment as groundwater is released into the river systems. Tidal variations, originating from the Bay of Bengal, exert influence on the lower reaches of these rivers. During the monsoon season, river levels soar to approximately 6.5 meters MSL (mean sea level), only to recede to around 2.5 meters MSL in the dry season, as reported by the Flood Forecasting and Warning Centre of the Bangladesh Water Development Board. (Jaman, 2017)

In line with urban river systems in other rapidly industrializing emerging nations, the rivers that run through Dhaka City, also suffer the brunt of the region's vast and vigorous economic expansion. While Greater Dhaka is a critical engine driving Bangladesh's economic growth,

accounting for 40% of the country's GDP, the concomitant rise in pollution levels, over-extraction of groundwater, and inefficient water use practices pose significant challenges for the Turag-Tongi-Balu river system in central Dhaka. This essential water network receives a significant input of household and industrial effluents, with increased pollution loads related to the formation of new industrial expansions and settlements. The cumulative effect has a negative influence on the overall quality of river water, emphasizing the need for extensive interventions to minimize the environmental toll and maintain the ecological integrity of these vital rivers.

The periphery rivers that encircle Dhaka form a critical watershed, providing a key water source for a variety of functions like as irrigation, heavy and light industries, aquaculture, animal farming, municipal water supply, and wastewater dilution. However, the surface water along these rivers is severely polluted, owing mostly to the direct discharge of untreated urban and industrial wastewaters. Unauthorized industrial growth has occurred along the banks of the Buriganga, Turag, Tongi Khal, and Balu rivers, especially converting them into industrial areas. Notably, the Buriganga River, which runs through the southern outskirts of Dhaka, passes through highly inhabited and industrial zones. Through several paths, including Hazaribagh tanneries, city drains along the river, Dholaikhal, and the Pagla sewage treatment plant, the river becomes a receptacle for household and industrial effluents.
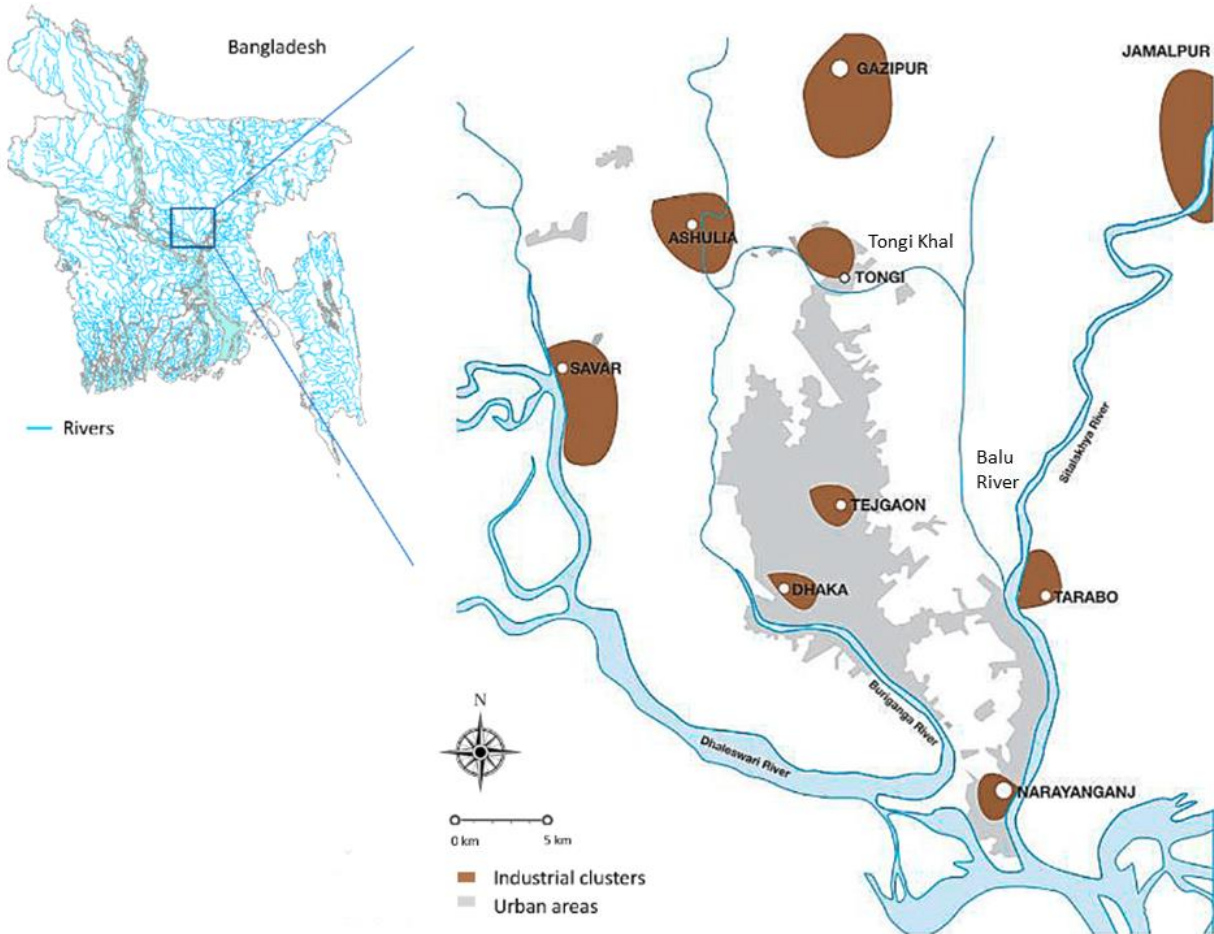
Fig 7: Industrial Clusters around Peripherial Rivers of Dhaka (Sakamoto & Ahmed, 2019)

Furthermore, significant drainage canals from the city center contribute to industrial and home trash disposal into the Buriganga. The Turag and Tongi Khal rivers run along the western and northern flanks, respectively, while the Balu River runs down the eastern side of Dhaka, containing the industrial townships of Tongi and Savar. In the Tongi EPZ, there are various tanneries, dyeing industries, brick fields, aluminum industries, battery manufacturing units, pharmaceutical industries, soap industries, ink manufacturing units, and textile, paint, iron, and steel workshops. This industrial enclave's effluents immediately damage the Turag River and Tongi Khal, aggravating the pollution burden. As a result, rivers have become dumping grounds for a wide range of solid, liquid, and chemical waste. (Hasan, 2017)

Urban Growth

Dhaka is the largest metropolitan city in Bangladesh. It achieved the status of a 'megacity' in 2001 when its population reached 10.7 million, as documented by BBS in 2003. (BBS, Population Census 2001, National Report , 2003) Notably, between 1990 and 2005, Dhaka witnessed a remarkable doubling in size, transitioning from 6 to 12 million residents, a testament to its status as the fastest-growing megacity globally, with an annual growth rate of 4.4 percent (Burkat, 2018) 34 percent of countries overall population is residing in Dhaka and the city is the land of opportunities for its economic, political and social sectors. The growth of the capital city has been significant over the last five decades, the thriving reason to be migration from other cities or rural areas, rapid urbanization and incorporation of former outlying regions. This city has a transitory history from sixteenth century to the present day over six different periods of development and corresponding urban transformations that can be notable in the settlement patterns of the Dhaka city. (1) The Pre-Mughal Dhaka before 1608 (2) Dhaka city under the Mughal period from 1608 to 1764 (3) Dhaka under the East India company from 1764-1858 (4) Dhaka under the British reigns from 1858-1947 (5) Dhaka as the provincial capital of east Pakistan (1947-1971) and finally (6) Dhaka as the capital of Bangladesh since 1971 Through this process the city has reached to its current situation where political instability, poverty, natural calamity are major issues of development. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)
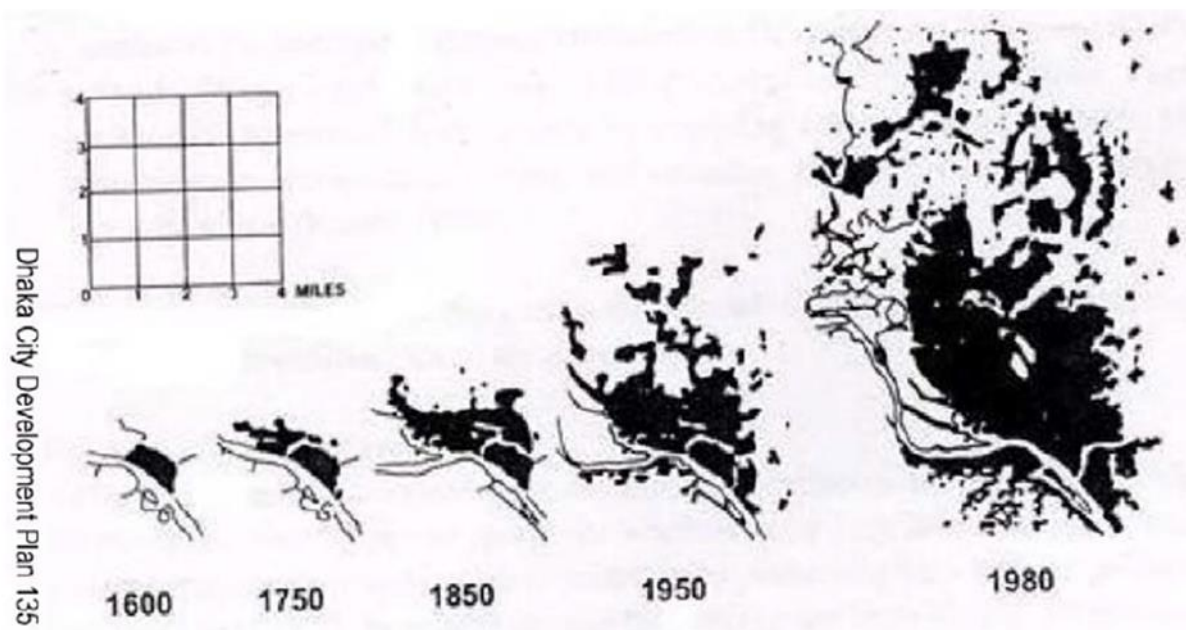
Fig 8: Expansion of Dhaka over years. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Problematics of Urbanization

The growing number of people living in Dhaka's cities has been a major driving force behind the construction of vital infrastructure and services, like as water supplies, roads, sewers, and drainage systems. As a result, the city has significantly expanded into the nearby floodplains and low-lying areas. There was a sharp increase in urbanization between 1960 and 2005, with the proportion of land under cultivation rising from 11% to 34%.This urbanization phenomenon is characterized by a demand-driven, unplanned, and bottom-up process, transforming the existing landscape without due consideration for potential consequences and the imperative of environmental sustainability, as elucidated by Brookfield in 1988. (HC, 1988) The adverse effects of such unbridled urban growth are particularly pronounced in humid tropical regions, as articulated by Sire in 1991. (G, 1991)

Wetlands. Drainage and Flood Situation

The natural drainage system in tropical regions, where monsoons deliver significant amounts of precipitation at particular times of the year, has historically depended on gravity-driven flows through networks of streams and rivers. (MS & Z, 2009) Nonetheless, JICA (1991) reported that the relief-controlled landforms of Dhaka were historically effectively drained via big rivers, low-lying regions, and streams and canals (locally called 'khals') to the floodplain. The city, formerly referred to as the City of Channels or the Venice of the East, was blessed with a large number of lowlands, canals, and channels that allowed for effective drainage.

Regretfully, the current situation presents a sharp contrast, since uncontrolled development has resulted in the filling up of canals, marshes, and depressions, both inside and outside of the built-

up metropolitan region. These careless urbanization techniques have consistently destroyed natural flow patterns and destroyed water bodies, which has led to drainage congestion and flooding brought on by rainfall in several parts of the city. (JICA, 1991)

Legend

∿	River
∿	Major Road
∿	Secondary Road
∿	Other Roads
▮	Slum settlements
▮	Flood-prone areas
▮	Areas not flooded during 1998 flood
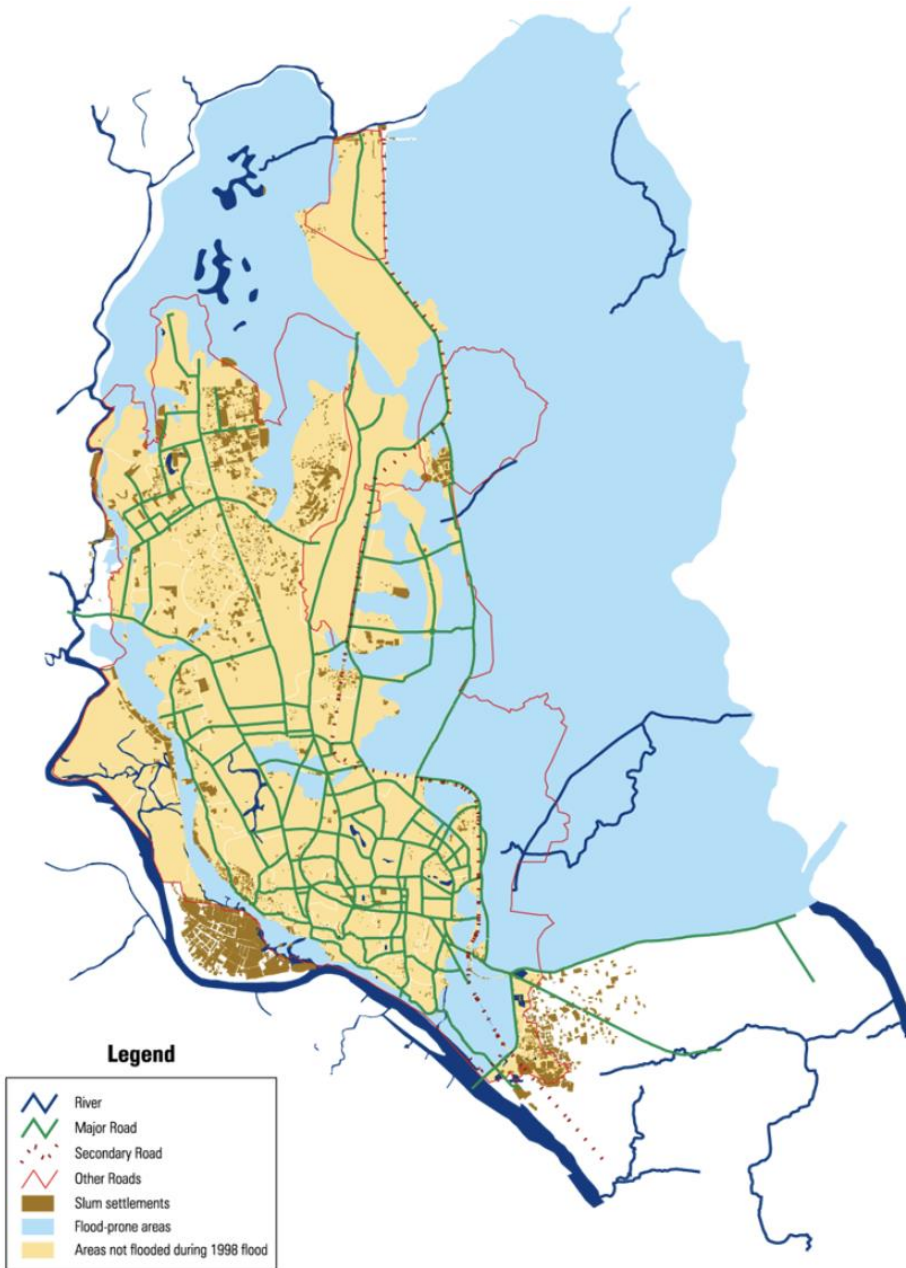
Fig 9: Flood map of urban slums in Dhaka.. ((CUS), 2006)

Urban Slums in Dhaka

History of Urban Slums in Dhaka

Slums in Bangladesh emerged in the aftermath of the country's independence in 1971, a time defined by enormous obstacles and severe destruction. Following the fight for independence, Bangladesh suffered severe food, clothing, and housing shortages, as the battle had depleted the country's resources and infrastructure. Despite the existence of slums prior to the war, the post-liberation era saw a significant growth in their construction, fuelled mostly by mass migration of destitute rural communities to Dhaka in search of better prospects. In 1974, the first ever proper survey was slum was conducted by Centre for Urban Studies upon request of Government of Bangladesh and UNHCS. Another study was conducted in 19991 by CUS which was followed by another survey in 1996. The slum population was cluster was found to be 275,000; 718,143 and 1.5 million respectively for the year 1976, 1991 and 1991. In 2005, Dhaka had an estimated 3.4 million people living in some 5000 slums and in 2010, the population of the city of Dhaka had estimated to be 17.6 million people, with up to 60% in the slums. Therefore, it is evident that the slum population has been increasing rapidly after the liberation of Bangladesh (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020).

Density of population in slums

The average population density in slums in Bangladesh was 831 persons per acre or 205,415 people per km2. This density figure is extraordinary, given that almost all residential structures in slum areas were single stored. Dhaka had the second highest density at 891 persons per acre. ((BBS), 2015)

Housing conditions

The socio-economic development of a country has direct bearing on housing condition and household facilities of the people. The housing structures within slum areas are made of relatively cheaper materials like straw, leaves, polythene sheets, wood, bamboo, coarse papers etc. These structures can be easily moved on short notice from one place to other and can be

erected quickly. Generally the slum dwellers live in low cost housing structures. Most of them live in Kutcha/Tin-built houses. ((BBS), 2015)

The majority of slum houses (56%) were of very poor quality (weak and temporary structures or kutcha units), while another 42.4 percent were semi-pucca(half tin half mud) type. A very small proportion (1.1%) was dilapidated older buildings, while only 0.5 percent was good quality homes. The physical quality of slum housing was generally better in Dhaka compared to other cities in Bangladesh. However, the fact that slums in Dhaka and some of the other towns showed a relatively high prevalence of semi-pucca structures does not automatically allow one to conclude that the overall housing situation there was good since such houses normally had very high room crowding and very low per capita floor space. ((BBS), 2015)

Slum Land Ownership Pattern

In Dhaka SouthCity Corporation 74.94% slum households possess or own the land on which their residences were being built. On the other hand, Dhaka North City Corporation (61.24%) of the country slum households mostly live on government land. ((BBS), 2015)

Rental pattern in slums

In slum census 2014 it is evident that about 64.87% of households live in rented houses, about 27.25% in own houses, 6.99% in rent- free houses and 0.89% in others category nationally. Also , Dhaka City Corporation has 80.31% of rented households in slum. ((BBS), 2015)

Problematic of Living in an Urban Slum in Dhaka

Dhaka, the capital city of Bangladesh, , with over 4 million people living in informal settlements is facing various challenges to provide safe living condition to the dwellers. The slums are characterized by overcrowding, poor sanitation, and inadequate infrastructure, making them some of the most challenging living conditions in the world. The houses are often small and cramped, with families living in a single room, and lacking basic amenities such as running

water, proper toilets, and electricity. The narrow alleyways between the houses are often flooded during the rainy season, creating unsanitary conditions and increasing the risk of waterborne diseases. The lack of proper waste management also contributes to poor hygiene, with trash often piling up on the streets and in open drains. (Burkat, 2018)

Despite these challenging conditions, the residents of Dhaka's slums are often hardworking and resourceful, making a living through informal labor such as rickshaw driving, street vending, and garment work. However, their precarious living conditions make them particularly vulnerable to the impacts of climate change, with frequent flooding and other extreme weather events exacerbating the challenges they already face. (Studies., 2017)

In recent years, there have been efforts to improve the living conditions in Dhaka's slums, including providing access to clean water and sanitation facilities, as well as building more durable housing. However, progress has been slow, and many residents continue to struggle with poverty and hardship.

Categorizing Dhaka's slums based on various factors

Living conditions

The slums in Dhaka are characterized by overcrowding, poor sanitation, and limited access to basic services such as water and electricity. They often lack proper sanitation facilities, and residents rely on shared toilets that are often in a bad state. In addition, the slums are deprived of proper access to clean water, and residents often have to purchase water from private sources, which is expensive and of poor quality. They also fail to provide proper healthcare facilities, and residents often have to rely on informal healthcare providers or travel long distances to access public healthcare facilities. (Bank A. D., 2018)

The living conditions in Dhaka's slums have a significant impact on the health and wellbeing of their residents. The lack of proper sanitation and access to clean water leads to a high incidence of waterborne diseases such as diarrhea, cholera, and typhoid. Overcrowding and poor

ventilation in the slums also contribute to the spread of communicable diseases such as tuberculosis and respiratory infections. (UN-HABITAT, 2018)

Housing Facilities

The housing facilities that urban slums provide the dwellers are very poor and filled with many problems. One of the main problems of housing in urban slums in Dhaka is overcrowding. In many slums, families live in small, cramped rooms, and several families may share the same room. This can lead to a lack of privacy and a higher risk of disease transmission. Another problem is the lack of access to basic services such as clean water, sanitation facilities, and electricity. According to a study by the World Bank, only around 30% of the households in Dhaka's slums have access to piped water, and around 90% rely on shared or public toilets. (bank, 2015). This lack of basic services can have a significant impact on the health and wellbeing of slum dwellers.

Furthermore, housing in urban slums in Dhaka is often unsafe and poorly constructed. Many slums are built on low-lying land that is prone to flooding, and the housing structures themselves are often made of flimsy materials such as corrugated iron or bamboo. This makes slum dwellers vulnerable to natural disasters such as floods and cyclones. (Studies., 2017) In addition, slum dwellers often face eviction and displacement. According to a report by Amnesty International, the Bangladeshi government has been carrying out a campaign of forced evictions of slum dwellers in Dhaka since 2010. This has left many slum dwellers homeless and without access to basic services. (International, 2017)

Employment Condition

Many slum dwellers work in the informal sector which offers low wages, poor working conditions, and a lack of job security. According to a report by the International Labour Organization, around 80% of the workforce in Bangladesh is engaged in the informal sector. (Organization, 2019) Mostly, in urban slums in Dhaka, many people work as day laborers, domestic workers, or street vendors. These jobs often pay low wages, and workers may not have

access to benefits such as healthcare or social security. In addition, workers in the informal sector may be vulnerable to exploitation and abuse. (UNDP, Urban Poverty Reduction through Employment Generation: A Study on Dhaka City Slums., 2017)Many slum dwellers in Dhaka also work in the garment industry. The garment industry is a significant source of employment in Bangladesh, but workers in this industry often face poor working conditions, low wages, and long working hours. According to a report by Human Rights Watch, workers in the garment industry in Bangladesh often work 14-16 hours a day, 6-7 days a week, and earn wages that are below the minimum wage. (Watch, "Work Faster or Get Out": Labor Rights Abuses in Cambodia's Garment Industry, 2015)

Even when employment is available, the types of employment available can be challenging. The low wages and lack of benefits make it difficult for workers to support themselves and their families. Secondly, the poor working conditions and long working hours can have a significant impact on workers' health and wellbeing. Also, workers in the informal sector sometimes do not have access to legal protections, making them vulnerable to exploitation and abuse. (Star, 2021)

Gender roles

Traditional gender norms are mostly observed in slums, where women are expected to take care of domestic duties and child-rearing, while men are expected to be the primary breadwinners. These gender roles can have significant consequences for women in slums, including a lack of safety, exposure to violence, and exclusion from decision-making processes. One of the main problems with gender roles in urban slums in Dhaka is the lack of safety for women. Women in slums are often subjected to sexual harassment and violence when they leave their homes, particularly when they need to use public toilets or walk to work. According to a study by Plan International, 95% of women in Dhaka's slums reported experiencing sexual harassment, and 60% reported experiencing sexual violence. (International., 2018)

In addition, women in urban slums in Dhaka also face exclusion from decision-making processes. They may not have a say in important decisions that affect their lives, such as financial decisions or decisions about their children's education. This leave women feeling

disempowered and can contribute to their marginalization. Furthermore, gender-based violence is a significant problem in urban slums in Dhaka. Women may be subjected to domestic violence, sexual violence, or harassment from neighbors or community members. According to a study by the World Bank, around 30% of women in Dhaka's slums reported experiencing physical violence from their partners. (Bank W. , Women in the City: Analyzing the Urban Gender Gap in Employment and Entrepreneurship., 2014)

Education

Education in Dhaka's urban slums is frequently hampered by poor quality and limited access for children. Despite attempts by the government and non-governmental organizations to improve access to education, many children in Dhaka's urban slums lack access to basic education, and literacy rates remain low. One of the most significant problems to education in Dhaka's urban slums is a shortage of schools and skilled instructors. Many slum schools are overcrowded and lack basic facilities, making it difficult for students to learn. According to a Save the Children survey, almost 40% of schools in Dhaka's slum regions lack permanent structures. (Children, 2013)

Furthermore, poverty is a big impediment to education in Dhaka's urban slums. Many families cannot afford to pay for school fees, uniforms, and books, and their children may be required to labor to help support the family. This can prevent youngsters from receiving an education or cause them to drop out. As a result of these difficulties, literacy rates in Dhaka's urban slums are low. According to a UNICEF research, the literacy rate in Dhaka's urban slums is approximately 60%, compared to the national literacy rate of roughly 72%. (UNICEF, 2019)

However, certain attempts are being undertaken to promote education in Dhaka's urban slums. For example, the government has implemented measures to enhance educational access, including as free elementary education and stipends for low-income students. NGOs are also striving to enhance access to education and education quality in slum regions. (UNESCO, 2021)

Bangladesh's poverty rate is high, and economic inequality is a major issue. As a result, many people in Dhaka are impoverished, and slums are sometimes the only inexpensive housing choice. According to a World Bank assessment, more than 70% of Dhaka's slum residents live in poverty. (Bank W. , Improving Living Conditions for Slum Dwellers. , 2017) Poverty in urban slums can create numerous barriers to social and economic development and has significant implications for social justice. Access to basic services such as healthcare, education, and clean water is often limited leading to a cycle of poor health, limited education, and low economic opportunity. For example, lack of access to clean water and sanitation facilities leads to the spread of diseases such as cholera, diarrhea, and hepatitis which have a significant impact on the health and wellbeing of slum dwellers, particularly children. (UNDP, Urban Poverty Reduction through Employment Generation: A Study on Dhaka City Slums, 2017)

Limited access to economic opportunities, including employment further perpetuates the cycle of poverty. As discussed earlier, many slum dwellers work in the informal sector with a low wage, low working conditions, and a lack of job security. These jobs often do not provide a pathway out of poverty, making it difficult for slum dwellers to improve their economic situation. From a social justice perspective, this represents a significant challenge. It can limit people's ability to access basic human rights and contribute to a cycle of social and economic exclusion. (BBS, Report on the Household Income and Expenditure Survey 2016., 2018)

There have been some initiatives taken to fight this issue. An example of an initiative aimed at addressing poverty in urban slums in Dhaka is the Urban Poverty Reduction Project (UPRP) implemented by the government of Bangladesh and the World Bank which aims to improve the living conditions of slum dwellers in Dhaka by providing access to basic services such as water supply, sanitation, and solid waste management, as well as promoting economic opportunities through microfinance and vocational training programs. (Bank W. , Poverty and Equity Brief, 2019)

Health and Hygiene

The health and hygiene situation in urban slums in Dhaka is a significant concern, with slum dwellers facing numerous health challenges due to inadequate sanitation facilities, poor living conditions, and a lack of access to healthcare services. These issues have a direct impact on social justice, as they disproportionately affect the most vulnerable and marginalized members of society. One of the pressing issues related to health and hygiene in urban slums in Dhaka is the lack of access to clean water and sanitation facilities. According to a study by the World Bank, only around 30% of the households in Dhaka's slums have access to piped water, and around 90% rely on shared or public toilets. This lack of basic services can have a significant impact on the health of slum dwellers, as it increases the risk of waterborne diseases such as cholera and typhoid fever. (Bank W. , Bangladesh: Country Snapshot., 2015) Furthermore, the living conditions in urban slums can also contribute to poor health outcomes. Many slums are overcrowded, with families living in small, cramped rooms that lack ventilation and natural light. This can lead to a higher risk of respiratory infections and other health issues. In addition, slum dwellers are often exposed to environmental pollutants and hazardous materials, which can have long-term health consequences. (Rahman M. H., 2013)

The lack of access to healthcare services is another major issue facing slum dwellers in Dhaka. Many slum dwellers do not have access to basic healthcare services, such as vaccinations, prenatal care, and treatment for common illnesses. This can lead to untreated illnesses and preventable deaths. In addition, slum dwellers may face barriers to accessing healthcare services, such as high costs or a lack of transportation.

The health and hygiene situation in urban slums in Dhaka is linked to several other issues, including poverty, housing, and education. For example, poor housing conditions can lead to poor health outcomes, while a lack of education can limit awareness and understanding of basic hygiene practices. (UNDP, Human Development Indices and Indicators: 2019 Statistical Update., 2019)

Social Security and Violence

Slum dwellers in Dhaka are often exposed to various forms of violence, including physical violence, domestic violence, sexual violence, and gang-related violence. This can have severe impacts on the health, wellbeing, and social mobility of slum residents. Furthermore, the presence of violence in urban slums has a broader impact on the city's overall security situation. The most concerning reason for violence in urban slums is the lack of adequate policing and law enforcement. According to a study by the World Bank, police presence in Dhaka's slums is minimal, and the police often lack the resources and training to address violence effectively. (Bank W. , Dhaka City Profile, 2016) This lack of policing can create a sense of lawlessness, which can lead to an increase in violence. In addition to the lack of adequate policing, socio-economic factors such as poverty and inequality also contribute to violence in urban slums. The lack of employment opportunities, education, and basic services such as health care and clean water can create a sense of hopelessness and desperation, which can lead to violence. Moreover, gang-related violence is prevalent in urban slums in Dhaka, and gangs often prey on vulnerable slum residents who lack social protection and are at risk of being recruited into gang activities. (Migration., 2013)

Slum dwellers are excluded from the formal economy and social protection systems, which leaves them vulnerable to violence and exploitation. The presence of violence in urban slums also reinforces the existing power imbalances and inequalities in society, making it challenging for slum residents to access justice and receive fair treatment. (Watch, "I Wasn't Alone": How Bangladesh's Security Forces are Enforcing Disappearances., 2015)

The role of Equity and Social Justice in Informal Settlements in Dhaka

Equity and social justice are both important principles in creating a fair and inclusive society. Equity refers to the distribution of resources and opportunities to all members of a community, while social justice refers to the fair treatment and protection of all members of a community,

especially those who are marginalized. In the context of informal settlements in Dhaka, the lack of equity and social justice is creating a segregated city, where marginalized communities are concentrated in certain areas with limited access to resources and services. This further exacerbates existing inequalities and makes these communities more vulnerable to the impacts of climate change. (express, 2023)

From a social perspective, the lack of equity and social justice in informal settlements in Dhaka can be traced back to a history of systemic discrimination and marginalization of certain communities, such as the urban poor, migrants, and ethnic minorities. These communities often lack political power and voice, and are therefore excluded from decision-making processes that affect their daily lives. As a result, they are often denied access to basic services, such as water, sanitation, and healthcare, and are more vulnerable to the impacts of climate change, such as flooding and extreme heat. In addition to these social factors, landscape and urban design also play a critical role in shaping the equity and social justice outcomes of informal settlements. Informal settlements are often located in areas that are prone to natural disasters, such as floods and landslides, due to the lack of land use planning and inadequate infrastructure. Furthermore, the lack of public space and green infrastructure in these settlements exacerbates the heat island effect, making them less livable and contributing to poor health outcomes for residents.

An example of how equity and social justice are lacking in Dhaka's informal settlements is in access to basic services such as water and sanitation. According to a study by Azad et al. (2018), informal settlements in Dhaka have significantly lower access to these basic services than other areas of the city. This contributes to poor living conditions and health outcomes for residents of these settlements. Dhaka is not unique in facing challenges related to equity and social justice in its informal settlements. Many other cities in the developing world face similar challenges due to factors such as poverty, inadequate governance and planning, and limited access to resources and opportunities. (Azad, 2018)

To address the lack of equity and social justice in informal settlements, it is important to develop policies and programs that promote inclusive and sustainable development. This requires a comprehensive approach that involves working with the community to understand their needs and priorities, as well as addressing the underlying factors that contribute to inequality and social exclusion. Other factors that are interlinked with equity and social justice in informal settlements

include access to education, healthcare, employment opportunities, and legal protections. Addressing these factors requires a coordinated effort from government, civil society, and other stakeholders to promote inclusive and sustainable development. (Tait, 2017)

To address the challenges, landscape and urban design interventions that prioritize the needs of informal settlement communities can promote more equitable and socially just outcomes. For example, the inclusion of green infrastructure, such as trees and parks, can help mitigate the heat island effect and provide spaces for social interaction and community building. Additionally, designing resilient infrastructure that can withstand natural disasters can improve the safety and well-being of residents. A great example of a landscape and urban design intervention that prioritizes equity and social justice in informal settlements is the Participatory Slum Upgrading Program in Mumbai, India. This program involves working with residents to identify their needs and priorities, and co-designing interventions that address these needs, such as water and sanitation infrastructure, community centers, and green spaces. The program has been successful in improving living conditions for residents and creating a more inclusive and sustainable city. (Patel S. S., 2016)

Climate Justice and The Role of Climate Change in Informal Settlements in Dhaka

Climate justice is a concept that emphasizes the need to address the disproportionate impacts of climate change on vulnerable communities, especially those who have contributed the least to the problem. Climate justice considers both the distribution of the risks and benefits of climate change impacts and the fair and equitable distribution of the costs and benefits of climate change mitigation and adaptation measures. (Wright & Y, 2021)

In the context of informal settlements in Dhaka, climate justice is important because the residents of these settlements are often the most vulnerable to the impacts of climate change, yet they have contributed the least to greenhouse gas emissions. For example, slum dwellers in Dhaka have low carbon footprints compared to residents of formal settlements because they lack access to modern energy services like electricity and natural gas. Despite this, they are at a higher risk of

experiencing the negative impacts of climate change, such as flooding, water scarcity, and heatwaves. The role of climate change in informal settlements in Dhaka is affecting climate justice by exacerbating existing inequalities and creating new ones. Another example to support this is flooding caused by extreme weather events disproportionately affects informal settlements, which lack proper infrastructure and adequate drainage systems. According to a study by Rahman and Rashid (2018), informal settlements in Dhaka are particularly vulnerable to flooding due to poor drainage systems and lack of proper infrastructure. This has led to an increased risk of waterborne diseases and other health risks, further deepening the vulnerability of the residents. (Rahman M. T., 2018)

Therefore, it is evident that Climate change plays a significant role in informal settlements in Dhaka, which are highly vulnerable to the adverse impacts of climate change. The impact of climate change on these settlements is severe due to their low elevation, inadequate drainage systems, and weak housing structures. One of the major phenomena contributing to climate change in Dhaka is rising sea levels due to global warming, which is causing more frequent and severe flooding. In addition, urbanization and deforestation are contributing to increased temperatures, leading to heatwaves that exacerbate health risks and discomfort for residents. (Sultana, 2016)

Another factor is the lack of access to basic services like clean water and sanitation. This exacerbates the risk of waterborne diseases and vector-borne illnesses, which can spread rapidly during floods and other extreme weather events. The lack of adequate waste management also increases the risk of pollution and disease. During the monsoon season in 2017, severe flooding affected over a million people in Dhaka, with informal settlements being hit the hardest. Floodwater contaminated with sewage and other pollutants caused outbreaks of waterborne diseases like diarrhea and cholera. In some areas, water levels rose above the roofs of houses, forcing residents to seek refuge on elevated roads and bridges. (Sultana, 2016)

The urban design of Dhaka as a city is also affected by climate change and its impacts on informal settlements. The lack of proper urban planning and infrastructure in informal settlements can lead to increased risk of flooding and landslides, as well as limited access to

services such as water and sanitation. This can create a vicious cycle where the most vulnerable communities are further marginalized and excluded from mainstream society. In addition, The right to landscape is connected to climate justice in Dhaka informal settlements. Access to green spaces and public parks is limited in many of these settlements, which can exacerbate the negative impacts of climate change and contribute to poor health outcomes and social exclusion. The vulnerable communities in Dhaka informal settlements such as slum dwellers, low-income households, and other marginalized groups who lack access to basic services and resources are disproportionately affected by the impacts of climate change and often face social segregation and discrimination. (Bank., 2018)

Climate justice requires a focus on the needs and rights of the most vulnerable communities, ensuring that they have access to basic services and support to adapt to the impacts of climate change. This includes ensuring that the voices of the affected communities are heard and that they are involved in decision-making processes related to climate change adaptation and mitigation measures. It also involves addressing the root causes of vulnerability, such as poverty, inadequate housing, and lack of access to basic services.

Korail slum

History of its development

Korail slum is a peninsula, encompassed by the Gulshan Lake, in contrast to the posh residences and commercial high-rise at the other side of the water body. It manifested in 1980 initially on the high ground and has grown rapidly ever since, expanding towards the low-lying areas and the water edge due to land shortage. (ACSA,2011)

Fig 10. Korail Slum Location. (Earth, 2022)

In 1961, the Telephone and Telegraph (T&T), now known as Bangladesh Telecommunication Company Limited (BTCL), acquired a parcel of land that eventually became the Korail area. Over time, advancements in communications technology rendered a significant portion of this land, amounting to 90 acres, obsolete for BTCL's transmission equipment. Consequently, in 1990, the land was officially handed over to the Public Works Department (PWD). However, this transfer was allegedly in violation of a pre-existing agreement with the former private landowner. The dispute over ownership led to legal complications, resulting in BTCL reclaiming the 90 acres from the PWD. This situation left three major stakeholders in the dispute: BTCL, PWD, and the original private landowners. In the early 1990s, due to the unresolved ownership issue, various entities, including T&T affiliates, local strongmen (mastaans), and influential figures from different political parties, informally seized sections of the uninhabited land. These occupiers proceeded to unofficially rent out the land and housing to impoverished city dwellers

at affordable rates. The demand for low-cost housing increased, driven by urbanization and evictions in other parts of Dhaka city, such as Agargaon. Consequently, the population of Korail surged, with more than 20,000 families now residing in the area. These residents play a significant role in Dhaka's workforce, contributing to various sectors, including garment production, transportation, construction, land development, domestic services, waste management, small industries, and the informal economy (Shiree, 2012)

Location of the slum

The Korail slum is located in parts of Banani and Gulshan within the 19th and 20th wards of Dhaka City Corporation in Bangladesh and spans approximately 99 acres, although residents estimate its actual size to be between 180 to 220 acres. Accessible through various roads from Gulshan, Banani, and Mohakhali, as well as by crossing Gulshan Lake, Korail comprises two main units: Jamaibazar (unit-1) and Boubazar (unit-2). Boubazar further divides into four sub-sections known as Ka, Kha, Ga, and Gha. Expanding over time, the slum has encroached on the lake through land reclamation and the dumping of waste and soil. In addition to Jamaibazar and Boubazar, other areas like Beltoli Bosti (Slum), T&T Bosti, Baidar Bosti, Ershadnagar, and Godown Bosti are considered integral parts of the larger Korail slum. This dynamic expansion reflects the complex development of the slum, characterized by its fluid boundaries and diverse sections. Accessible through multiple routes and with various sub-sections, Korail has become a significant and evolving settlement in Dhaka, shaped by both its residents and the changing landscape. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

| Unit 1 | | Unit 2 |
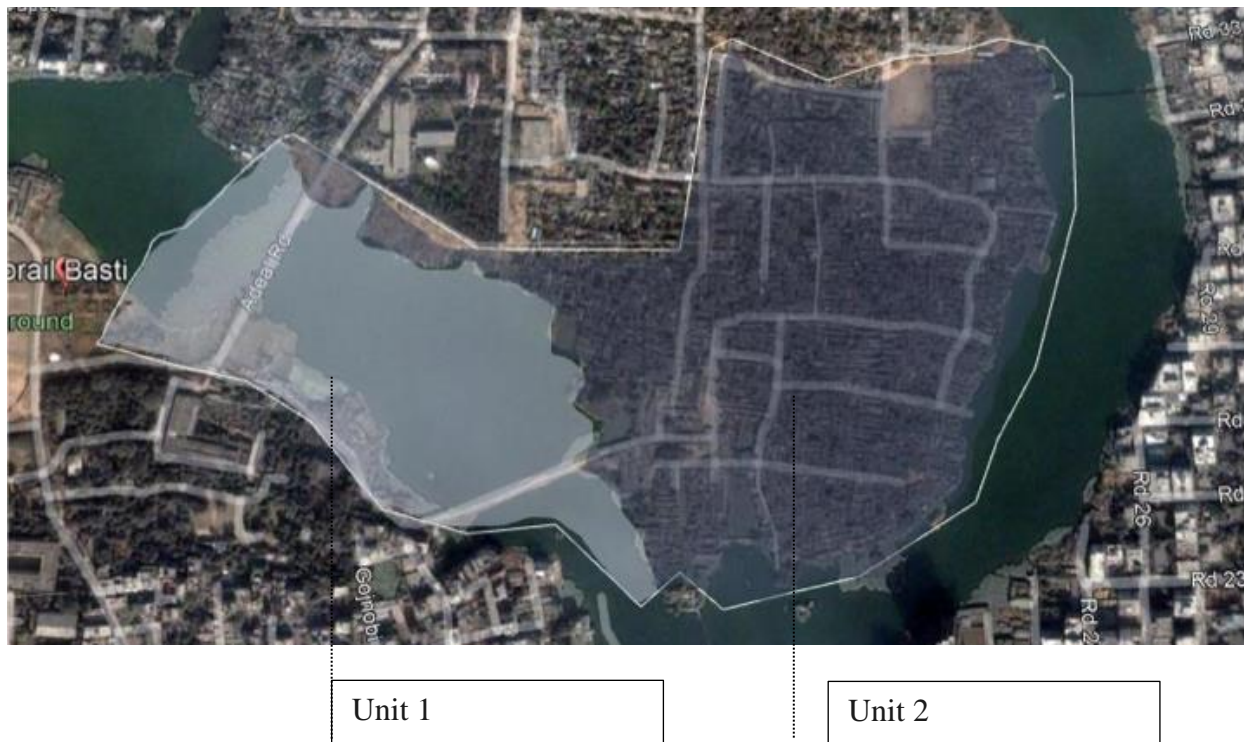
Fig 11. Units of Korail

Socio Demographic Characteristics

Locality and Habitation:

Korail slum is located in Gulshan Thana, hereby stands in contrast to the affluent Gulshan-Banani area. Approximately 38.5% of the population in Korail are considered urban poor, while 31.2% are classified as high-income residents. The remaining individuals fall into the middle-income and higher middle-income brackets.

If we look at the housing patterns in the slum, around 80.5% of the urban poor in Korail live in rented accommodations. In contrast, 46.1% of the high-class population in the Gulshan area own their homes. The residents of Korail slum reside in various types of dwellings, including jhupri (makeshift huts), tin shade structures, and semi-pucca(semi concrete or brick) or pucca(full concrete or brick) houses. In the neighboring areas, which are affluent parts of Dhaka city, luxurious apartment buildings with six or more floors are predominant. There are only a few

two-level individual residences in this area, as the trend has shifted towards taller apartment buildings. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Resttlement Reason and Pattern:

The slum communities in Korail originate from various districts across the country. The earliest inhabitants migrated from Comilla district, and over time, people from other districts such as Barisal, Bhola, Sherpur, Barguna, Chandpur, Jamalpur, Mymensingh, Kishoreganj, and Faridpur joined them. These communities form distinct groups based on their districts of origin and live together in clusters within the Korail slum. (Mridha, 2009)

The primary reason for the migration of these poor communities from rural areas to the city is complex, encompassing socioeconomic and environmental factors. Some of the reasons include land scarcity, river erosion, climatic disasters, and other challenges present in their rural hometowns. (Mridha, 2009)

Study shows that around 71% of the total population in Korail has been living in the area for the past ten years. The duration of residence varies, with the shortest length being three years and the longest being 18 years. (Mridha, 2009)

Demographic Characteristics:

Gender and Age group:

According to the slum dwellers, the estimated total population of Korail falls within the range of 86,200 to 115,000. Among those who claimed the population to be 86,200, they reported 31,950 males, 37,050 females, and 17,200 children under the age of five. (Project, 2009)

Study indicates that 20.7% of the population is comprised of individuals younger than 30 years old. The age group of 40 to 49 years old accounts for 21.9% of the population. The majority of the population, approximately 41.2%, falls within the age range of 30 to 39 years old. The remaining percentage represents individuals who are 50 years old or older. (Project, 2009)
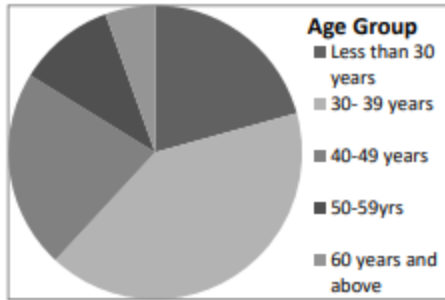
Fig 12: Distribution of Age (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Household characteristics:

The average household size in Korail is reported to be around 5-6 members. However, there is variation in household sizes among the urban poor. According to the study, approximately 69% of households have 5-8 members, while 24% have more than 8 members. The remaining 7% have 3-5 members. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

It is observed that households with a higher number of members tend to have higher income levels. This is often due to the presence of multiple earners within the household, contributing to the overall household income. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)
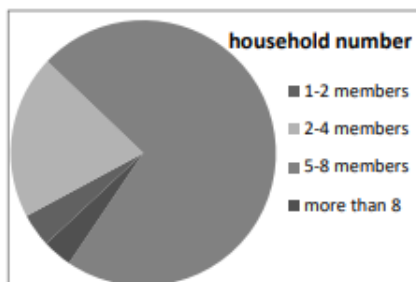

Fig 13: Distribution of members in a house. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Education:

In the case of the urban poor in Korail, a majority, approximately 50.6% of the total population, are illiterate. About 23.7% of the population possesses basic literacy skills, such as knowing the alphabet or being able to sign their name. The remaining 26.9% have never attended school. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Also, 31.3% of the population has attended primary school, while 11.9% have attended secondary school. However, they have not completed their school certificate degrees. Only a small percentage of individuals in the area have successfully completed their secondary and higher secondary school certificate. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)
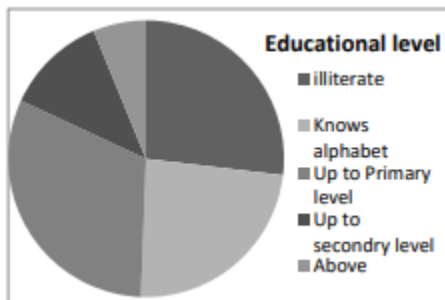

Fig 14: Education Level (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Marital status:

50.3% of the population is married and 46.8% are never married. The rest of the population is either unmarried or widow, separated and divorced. Interestingly, most of the unmarried population is women. (M, 2007)
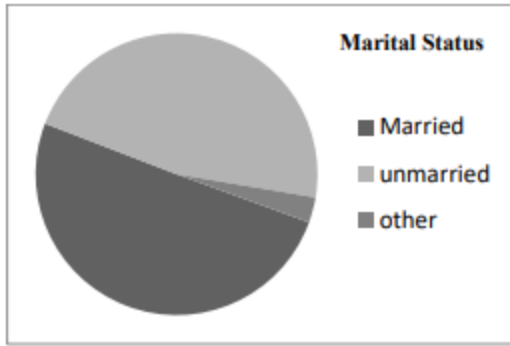
Fig 15: Marital Status (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Socio Economic Pattern:

In Dhaka city, a significant proportion of the urban poor engage in various types of work within the informal sectors. This is primarily due to their limited access to education and employment training, which makes it challenging for them to enter the competitive urban job market. However, the rate of unemployment among the urban poor communities is relatively low, largely because a high number of women actively participate in the urban workforce. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Research suggests that men often undertake physically demanding or high-risk jobs, while women are involved in domestic work or work in the garment industry. Gender role in type of work they do is very evident, making it easy to generalize gender specific roles in job sector. Contrary to the misogynistic patriarchal approach practiced in the country, in informal sector, due to the survival strategy, women are highly observed to participate in jobs and earning a wage. The primary survival strategy for the urban poor is to maximize the number of household members contributing to the workforce, including children. Even though, there might be difference in the income they earn, due to their gender, women contribute significantly to the overall economy of a household of a typical urban slum in Dhaka. (Sinthia, Analysis of Urban Slum: Case Study of Korail Slum, Dhaka, 2020)

Employment pattern:

A study reveals that a substantial portion of the population, approximately 38.3% of the respondents, work as rickshaw pullers. These individuals typically lack formal education and training. Another major group, comprising 21% of the respondents, is employed in the garment factories, which have experienced significant growth in the country. The majority of women are employed in garment factories, making the garments industry really dependent on the urban poor for their cheap labor force.

According to the study, 13.8% of the respondents work as drivers, including personal car drivers and CNG/taxi drivers. It is unfortunate to note that a majority of personal car drivers do not possess a valid driving license. The remaining 10.9% of the respondents are engaged in various jobs such as masons, day laborers, office peons, carpenters, wheelbarrow or van pushers, boatmen, and low-grade employees in private, government, or semi-government organizations. Women, who don't work in garments industries, find work as domestic maids in households and offices. However, it is evident that the work they do are low wage and it is almost next to impossible for them to find a job that can significantly improve the quality of life they have, because of lack of proper education, training and opportunities. (Mridha, 2009) (Project, 2009)

Income Pattern:

The income levels in the Korail slum are generally low due to low wage employment pattern. A study reveals that approximately 42.67% of households have an income ranging from TK 3001-4500, while 28% have an income between TK 2001-3000. The income distribution is similar for households earning between TK 1001-2000 and TK 4501-6000. Only a few households have an income exceeding TK 6000, and the remaining households have incomes below TK 1000. Among the workforce, the rates of income are higher for males compared to females as expected due to the gender roles in labor distribution. Urban poor women, even though are engaged and put equal effort in the work they do, the majority of women earn monthly incomes of only TK 1000 or more. In recent times, there has been a reduction in the involvement of children in work due to the efforts of various NGOs, and parents are more inclined to send their children to school rather than relying on their income. However, children belonging to extremely impoverished families are still occupied in various types of work such as domestic work, scavenging, and

employment in offices or restaurants. Begging remains a popular means of livelihood for some children as well. (M, 2007)

Expenditure Pattern:

The majority of the income earned by the urban poor is allocated towards food expenses, as the cost of living in Dhaka is significantly high. According to the study, the minimum food expenditure ranges from TK 600-1500, while the maximum reaches TK 8000. Housing is the second most significant expenditure for the urban poor, with approximately 66.7% of them living in rented houses. Based on a 2009 survey, the average monthly rent falls between TK 500-1000, with a minimum of TK 300 and a maximum of TK 1200. It is worth noting that house rents have increased substantially in recent years. Non-food items receive very little expenditure from the poor. Some households with members in rural areas allocate a portion of their earnings there, while others save money from their monthly income to invest in livestock, agricultural land, or housing repairs in their rural communities instead of spending it in the city. Access to formal credit sources is limited for the urban poor, forcing them to rely on loans from various sources. More than half of the poor households have outstanding loans. However, the majority (33%) obtains loans from relatives and friends without any interest payment. (Project, 2009)

Urban Morphological Analysis

Structure and Nature of Living in Korail informal settlement

Most of the urban poor in Korail slum live in single-room houses, ranging from 14 square meters (150 square feet), accommodating five to eight members. A few households live in double-room dwellings, up to 18.5 square meters (200 square feet) in size. In the case of single-member households, living conditions are often dire, with 20 to 30 individuals occupying a single room. Families with more than eight members typically reside in dwellings with three rooms. The expansion of houses occurs generally when there is need for more spaces, covering any open space possible in between the other houses. It is also common practice to make the house two

storey without following any guidelines, where tin and brick can coexist in the housing structure making it extremely vulnerable. So, the houses lack proper ventilation making it unbearable to live in scorching heat of summer. The materials aren't enough durable to withstand flooding, which is often the case in wet slums in the area approaching the lake. The houses approaching the lake are seen to have bamboo structures holding the houses raised up to fight against flooding and allowing the water to pass by. But the quality of living in such conditions is extremely dangerous and unhygienic. Mosquitos and flies are common occurrences of living in such conditions, making it very difficult to sustain. (Ahmed, 2013)

Most residents lack individual cooking areas and instead utilize shared kitchens or convert their living spaces into cooking areas. Similarly, individual toilets are scarce, and shared toilet and shower facilities are used, resulting in unhygienic conditions. Males and children often bathe in open spaces. The poor quality of materials and structures used in housing leads to significant problems during the rainy season. Most houses are made of readily available materials taken illegally from construction sites, such as tin, bamboo, bricks, straw polythene etc. Some houses are complex structure of whatever materials found on spot. They don't follow specific way of arranging houses either, making it difficult to operate inside the house in harsh weather conditions. At times, they have to seek shelter in schools, community spaces, or railway stations. They are responsible for rebuilding their houses, as they receive no support from the government, organizations, or even the house owners themselves. (Ahmed, 2013)

Housing Size and Pattern:

The typical size of houses for the urban poor in Korail ranges from 5 meters to 12 meters in length and 3 meters in width. These dwellings are arranged in an irregular pattern without proper orientation. The distance between houses varies, with minimum gaps of 1 meter and maximum gaps of 2.5 meters. ((CUS), 2006)

Fig 16. Housing Pattern in Two units of Korail Slum (Johnston & Chan, 2020)

The area which was built before is more structured in patterns, because they have government built roads which plays a major role in organizing the housing pattern. Most houses in that area follows the road, and aligns with it either horizontally or vertically, making it more shapely. Even though, the houses lack open space, the order of the houses in that area is much more in line and shape. ((CUS), 2006)

On the contrary the dumping of soil and waste in the previously lake and the newly formed settlement made it very hazardous in the spacing and housing orientation. Since there is no govt built roads, the houses are built wherever there was space, and most houses are in a zigzag shape, following whichever course they can take. The houses don't have any horizontal or vertical alignment and its difficult to find a common pattern. Open spaces and vegetation are lacking in the overall slum, and the street pattern is categorized by chaos and disorganization. There is

minimal connectivity between the dwellings and the major surrounding roads. Even though there are alleys and connection nodes, but they are very narrow making it difficult to give proper access in overall neighborhood ((CUS), 2006).
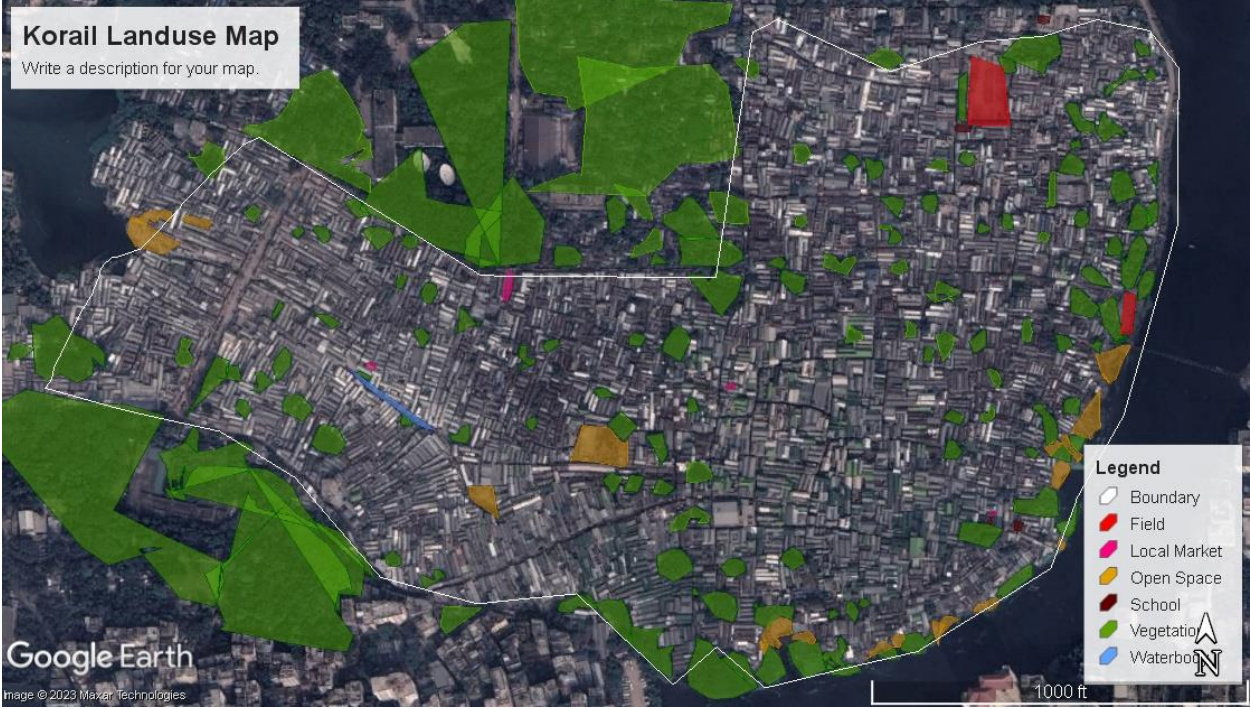

Fig. 17: Landuse Pattern in Korail.

Part II

Chapter 3

Fieldwork

Preface

Despite the fact that I was born and raised in Dhaka, my knowledge of the city's culture was insufficient for Korail, because of its informal character. Given the limited resources and knowledge at my disposal, a comprehensive field study was imperative to inform a tailored design approach for this particular context. The fieldwork required a preparation consisting of a literature review of existing planning documents, reports and papers etc prior to the field visit. It was also important to do thorough analysis of Dhaka city as a whole along with Korail area through mapping taking account of the rivers surrounding the city and the water bodies inclusing flood mapping of the city and Korail in specific.

The field work posed a considerable challenge, as accessing the settlement itself proved to be a formidable task. The geographical and social barriers posed significant hurdles. Recognizing this, I sought collaboration with non-governmental organizations (NGOs) active in the area. Through persuasive efforts, I successfully garnered their support, granting me access to engage with local residents, conducting informal interviews, and capturing visual documentation, including photographs and videos. In June, I embarked on a 15-day field study in Dhaka, Bangladesh, immersing myself in the settlement's environment. During my stay, I established connections with individuals from Dhaka Water Supply and Sewerage Authority (Dhaka WASA), an entity responsible for providing water services to the area. A representative from Dhaka WASA graciously assisted me in numerous informal interview sessions, aiding in my interactions with the local community. Additionally, I was able to engage with the president of the Korail Welfare Community, affording me valuable insights into the settlement's

organizational dynamics. Over the course of eight days on site, I actively engaged with local residents, embarking on walks, engaging in meaningful conversations regarding pertinent issues, and fostering genuine connections. A meticulously prepared questionnaire provided a structured framework for my informal interviews, enabling a systematic and in-depth analysis. Furthermore, I convened meetings with representatives from local NGOs, seeking to deepen my understanding of their roles, contributions, and influence within the community. While the majority of residents proved to be welcoming, affable, and resilient in the face of adversity, the challenging flooding occurrences and densely clustered housing configurations presented logistical constraints in certain areas, especially in the newly built area and areas near the lake boundaries. Nevertheless, I endeavoured to comprehensively cover the settlement encompassing its periphery, the entirety of the old settlement (Fig 1), portions of the newer slum developments, as well as key infrastructures such as roads, open spaces, public venues, markets, and educational institutions. Moreover, I gained firsthand insights into the daily lives of inhabitants through visits to their homes.

Background of the area

Historical Map Analysis:

The most intriguing feature of this urban landscape informal development is the enormous shift in the existing landscape features due to man-made interventions. Gulshan Lake surrounds the slum area, but much of it did not exist before to 2000 and was a part of the lake. According to the Google Earth satellite image, throughout the years, the lake was filled up with soil and solid waste for the community and the formation started to expand into the lake.

Fig. 18: Korail slum in 2003

Fig. 19: Korail slum in 2008
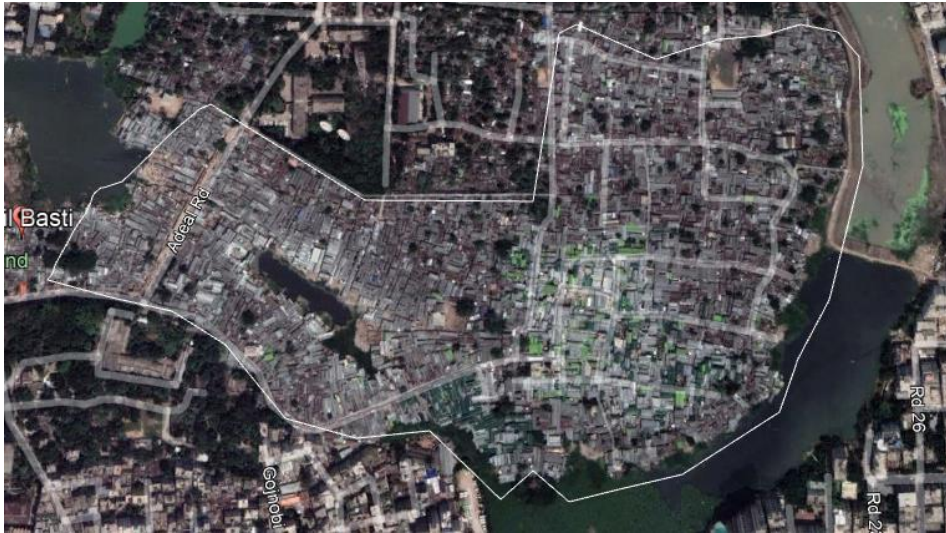
Fig. 20: Korail Slum in 2013
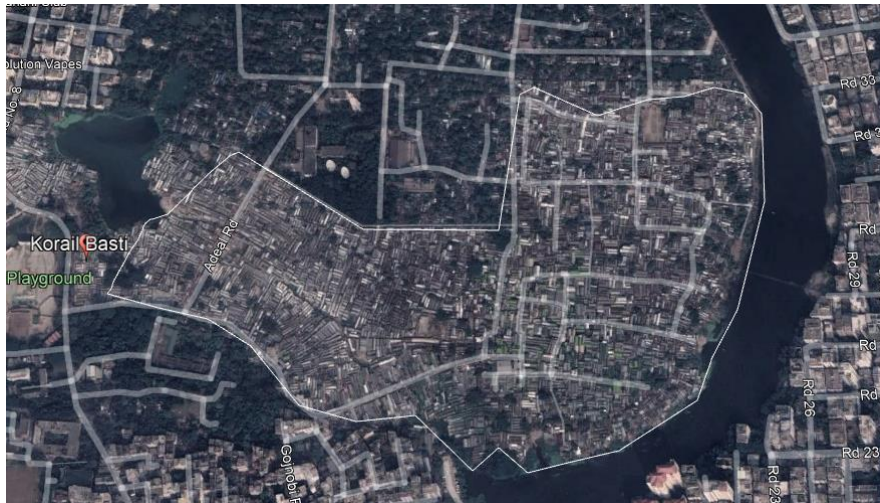

Fig. 21: Korail Slum in 2018

Fig. 22: Korail Slum in 2023

If we examine the region from 2008 to 2023, we can observe the lake gradually disappearing and filling up over time. The graphic indicates a major shift at regular intervals of 5 years. Based on informal interviews conducted while on the ground, the locals confirmed this change, citing competition for land and space as the reason. The process started in 2000, with the first inhabitants of the Korail slum taking over the lake; as more people moved there, the struggle for a piece of land began, and the filling of the lake increased. In order to speed up the filling process, the lake reclamation uses waste products, including organic matter and non-biodegradable things like plastic bottles and sheets, as well as dirt obtained from nearby building sites. Comparing this strategy to others, it is supposedly thought to be more approachable. Furthermore, it has come to my knowledge that anyone looking to start land reclamation paround the lake may buy trash and other waste items nearby for a cheap price.

Fig. 23: Waste is being sold at nearby markets at a cheap rate.

Even now, the lake is threatened by rubbish dumping inside its bounds in order to accommodate more people. The tendency has been going on for a decade and is still growing, despite the lake's instability, flood events, and increase in pollution. The filling process has been boosted by the horizontal housing development related to soil instability. Houses are normally two or three stories high with some exceptions of vertical development in the oldest part of Korail where the soil is more compact and stable.

Whose Space?

The right to land and the right to space is a critical issue in informal settlements since the boundaries are ambiguous. This question is central in the Korail slum. The government owns the property around Korail and the adjoining lake.
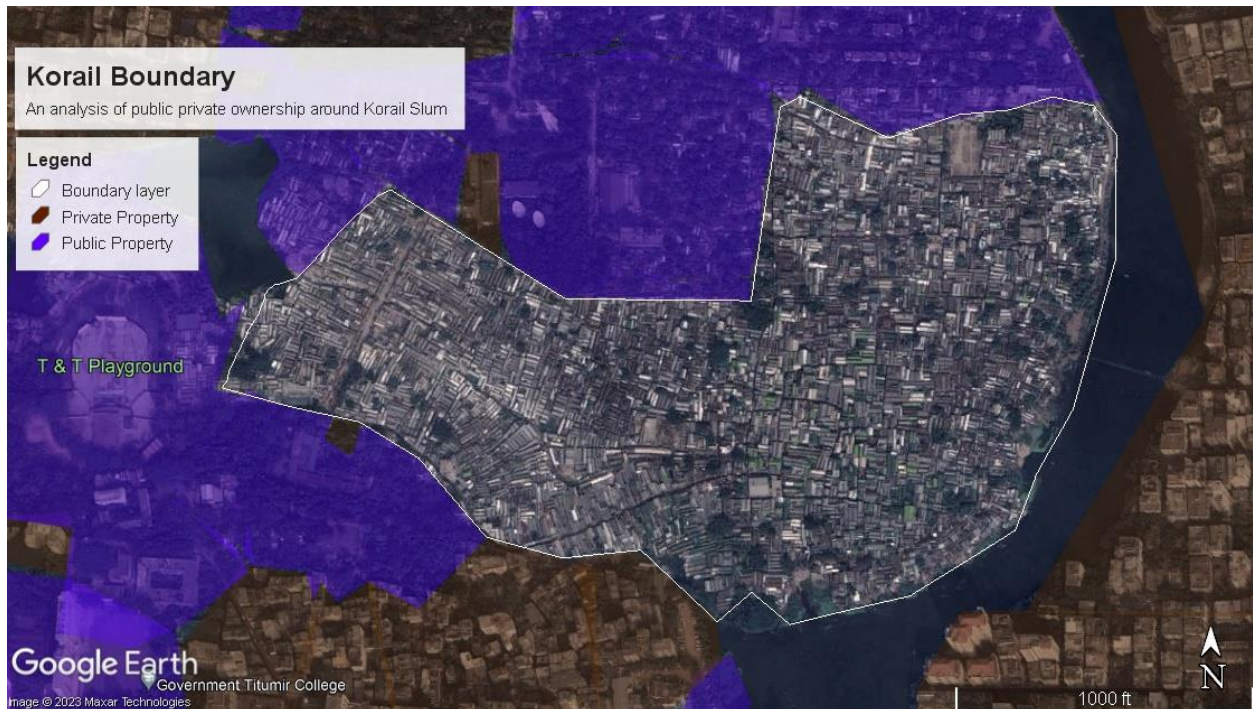

Fig. 24: Public(Govt) and Private Property around the periphery of Korail Slum

Therefore, the area belongs to the government. However, when I asked the locals how they felt about having their property taken back, the issue of space and ownership camee up. Their anreflects the hard work and competition for land reclamation, on, possession and transformation they have passed through since they arrived in their Respondents were reporting that the land was the result of their blood, sweat, and tears. So, they feel this land belongs to them, and they have a legitimate claimm to it. As previously stated, a portion of Korail existed, and people began claiming this arerecting temporary structures. As their roots strengthened, they expanded their domain and altered the uctures. As their roots strengthened, they expanded their domain and altered the expand their domain and alter the nearby terrain. They started filling the lake with soil and rubbish and building the houses without the government's permission. As a result, the informal community grew and continued to spread into the lake. They made significant

alterations to the landscape since they had nowhere else to go and couldn't afford to pay rent and remain, so they began the pattern of claiming the lake as their own. Nonetheless, their claim to this land is uhave construcause the roots they have buried there are too deep. As a result, their legal title to the land claim is still being contested, but it is also a humanitarian issue. Korail inhabitants have constructed roads, lanes, and houses, and they're living their lives in the midst of all the mayhem- the pollution, the crime, the insecurity, and the difficulties. Many of th that legality will not suffice to resolve the issue of who owns theare constructing buildings and even renting them; this has begun a systematic advance on the claim to this land that is so deeply established that legality will not suffice to resolve the issue of whose owns the space?

Boundary and Accessibility

The discussion of Korail expansion focuses on the current trend of growth occurring inside the bounds of the lake rather than outside its boundaries. To understand this occurrence, it is necessary to examine the boundary that surrounds the Korail slum. The TNT Colony, TNT School, and TNT Playfield surround the areas adjacent to the informal Korail settlement. These precincts are methodically laid out within governmental layouts for official structures, residential enclaves, and educational institutions, among other things(Fig. 24). My on-site inspection confirmed the presence of clearly delineated borders in each of these locations, which were protected by substantial concrete fortifications. As a result, unauthorized access to any of these domains is strictly banned.

Fig. 25: Concrete wall in Adeal road between formal and informal settlement

Fig.26: Concrete wall on both sides of Adeal Road to separate the Korail Slum
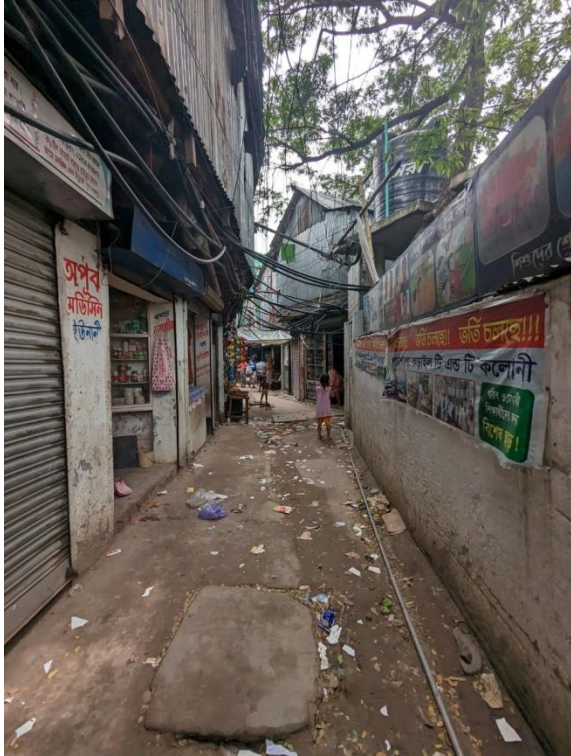
Fig. 27: Concrete wall Boundary between TNT   Fig. 28: Concrete Wall boundary Between TNT
School and Korail.   Office and Korail.

As a result, the community cannot extend beyond the safe government properties that have
already been occupied and are carefully segregated in the informal sector. So there is an
intriguing interplay between the official and informal parts of Korail, with a fairly harmonious
co-existence. However, the lake is not yet entirely covered and the landscape transformation is
still ongoing. The crucial thing to note here is that on the other side of the lake lies Gulshan, a

highly prestigious and rich suburb where the wealthy dwell. (Fig. 27 & Fig. 28)

Fig. 29: The constrast between formal and informal by the boundary of lake.

If the lake filling continues, spreading and reaching the Gulshan district, the vicinity of the informal and reach district could and would cause a lot of social and political troubles.

Aaccessibility to the Korail area is not evident-My firsthand experience states that it is troublesome to get inside the slum area. Korail has no formal entrance and residents mostly

access it by foot through minor gaps in the fence between the formal and informal areas.

Fig. 30: Small holes created in the boundary to enter slum.

Additionally, the slum is so congested that even a rickshaw finds it hard to enter and move inside.

Fig. 31: Small Roads to access the slum,

Landscape Pattern

The landscape layers of the Korail slum have two key features- the lake and the solid settlement. The lake is composed by by a liquid element, the water and the solid component of the soil-at its boundary. However, due to the unlawful filling of garbage and soil in 2000, a large portion of the solid element is not a suitable soil foundation with regular layers. The old part of Korail where the filling was carried out by the government using suitable procedures and sturdy material, had a firm foundation and is now more stable. The newly built area reclaimed by unlawful filling with rubbish dumps has instead an increased instability. So, it is necessary to divide the Korail into two parts. The part with the dark blue colour is the old part of the settlement, and the part with light blue is the new part of the settlement built area that has formed gradually over time.

Fig. 32: Old and New part of the settlement

However, the fundamental distinction between these two locations has to do with how the settlements are shaped and formed. It's crucial to keep in mind that when I talk about stability and instability, I'm not only talking about the ground; I'm also talking about the structural and

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organizational stability of an urban development. The old section of the settlement is a government-planned area with proper road networks and connections with the border regions. It appears almost organized and paced since the dwellings have been constructed over time following road infrastructures- which guarantee that traffic in and out of the region flows smoothly. Additionally, the houses are far more durable in terms of their construction, and the winding lanes connecting the various housings are likewise rather straight. However, in the new area of the Korail, which is was not a part of government-planned area, there are no regulations. The inhabitants initiated the process of land grabbing from the lake, tossing trash, piling up supplies, and erecting dwellings without a plan. The roads are not adequately designed and constructed; rather, they have been hollowed out to make room for housing and are incredibly tiny for vehicles to drive through. Due to the thick housing and poor road infrastructure, I was unable to visit a large portion of this area. Additionally, terrible flooding and sinking occur in this area owing to appropriate ground basis while questioning the residents. Moreover,the pollution is far worse here.

Due to the difference between the two parts Korail, I will analyse the old and new parts of the settlement separately.

Old Part of the Settlement

The old part of Korail settlement distinguishes out for its characteristics in terms of stability, mobility, and infrastructure. It is an integral component of the government's municipal plan, which includes, among other things, well-defined road networks, a proper sewage system, waste management procedures, and a water distribution network. Informal interviews with local residents revealed that this region has seen substantial alteration from its initial occupancy and development. This area had significant volatility in its early phases, owing principally to the social tensions involved with land occupancy, home construction from the ground up, and the effort to create sustainable livelihoods. The pioneers of this area built basic' katcha' / 'Jhupri' houses out of polythene sheets, leaves, and thatches, according to recollections told by inhabitants during informal interviews. These improvised dwellings, while far from permanent,

served as the basic basis upon which the area would eventually expand. As the people'economic situation improved over time, a perceptible shift in construction materials became apparent. Polythene gave way to more durable materials like tin, brick, and concrete shifting from 'katcha'/'Jhupri' houses to 'Semi pucca'/ 'Pucca' houses. Currently, the area has a higher level of stability, as seen by a population living in considerably improved conditions compared to their original journey into this region. The transition from temporary shelters to more permanent houses demonstrates the people' perseverance and creativity in cultivating a vibrant community within the limits of Korail.
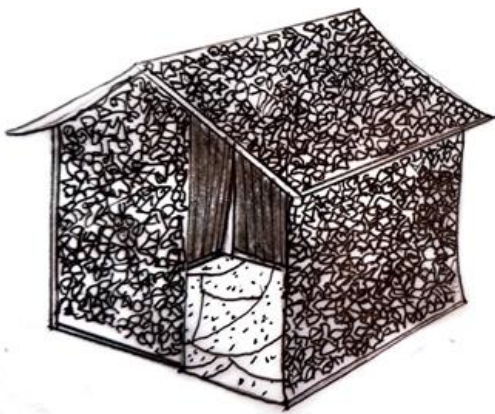
Type of housing : Jhupri
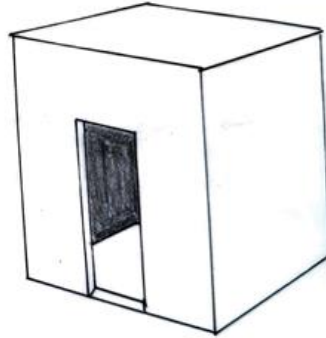Category: Non Durable , non permanemt
Material: Shacks with thatch
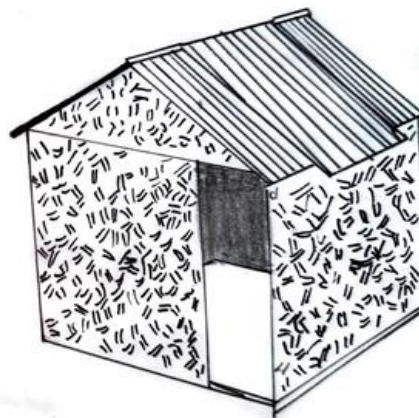
Type of housing : Katcha, Tin Shed
Category: semi Durable Durable , permanemt
Material: Wood, hay, Mud

Fig. 33: Type of housing (i)

Type of housing : Semi Pucca
Category: Durable , permanent
Material: Brick or concrete wall
(Solid material) with Tin roof

Type of housing : Pucca
Category: Durable , permanent
Material: Concrete, cement

Fig. 34: Type of housing (ii)

Housing

Leading towards permanent construction:

Based on empirical observation from field study in the region, currently a common tendency is observed- the majority of the homes in this old part have better structural integrity, thanks to the use of materials like concrete and brick. Also a majority of cases are where a composite technique is used, combining these stronger components with tin and plastic ones. Precarious constructions made of thatch or polythene, on the other hand, are now almost gone.

Communal living

The housing environment is dominated by a communal grouping model, in which groups of residents dwell inside common compounds. This system necessitates a common reliance on necessary services, such as a communal water supply such as a tube-well and communal sanitary facilities. The popularity of two-story homes with a large section of the upper storey constructed using tin as the principal building material is an obvious standard. This architectural disposition

emphasizes the community's flexibility and ingenuity in using existing resources to meet their housing demands.

Fig. 35: Community using one single tubewell for a group of family.

Fig. 36: Common two-storied house with tin and brick.

Space is valuable

During fieldwork, I also observed an intriguing socioeconomic dynamic: persons with higher incomes tend to lease homes that were initially built for others with lower financial means. Furthermore, a notable practice seen involves renting out the bottom floor of these residences for use as garages, notably for the storage of rickshaws. This dual-purpose use of space not only indicates a pragmatic approach to optimizing resources, but it also emphasizes the community's

interconnectedness and adaptive methods.

Fig. 37: Ground floor used as storage garage for Rickshaws.

There is no Space but there is hope for green

Interestingly, even though most homes contain little to no open space, I still observed the existence of tiny green spots tucked in between the homes. Notably, it is primarily women who have taken the initiative to create these spaces, making use of tight spaces and recycled objects like bottles or drums. The information gathered from informal interviews with female residents of this area attests to their obvious interest for gardening activities. Additionally, these people exhibit a steady dedication to gardening, using even the smallest rooftops and other restricted spaces for their gardening attempts.

Fig. 38: Planting of tree in small space.

In my opinion, the housing dynamics inside the old part of Korail settlement consists of an intriguing combination of land and space rights when considered from both a socioeconomic and landscape architectural standpoint. The transition from improvised shelters to more lasting materials illustrates a fascinating progression in land-use patterns, illustrating the adaptive character of property rights in informal settlements. The clustering of houses with shared amenities emphasizes a communal approach to spatial organization, implying the possibility of long-term, community-centric design solutions. Furthermore, the diverse use of lower floors for rickshaw storage demonstrates a versatile approach to spatial design that accommodates the unique demands of a highly populated community. The creation of these modest, ingeniously built green places inside the boundaries of the area is a remarkable grassroots initiative, in my opinion. It's worth noting how important women were in this endeavor, which used repurposed materials to seamlessly blend nature into the urban surroundings. This approach demonstrates the possibility of targeted interventions in addressing the scarcity of green space in highly populated regions, emphasizing the transformational influence of such efforts on the broader urban fabric.

Living Condition

Do we need a window?

In my field observations of Korail, the most noticeable feature is the excessive density of houses, emphasizing the acute lack of open areas. However, a divergence arises inside the settlement's older section, where a well-defined road network allows for a more planned spatial arrangement. A distinct trend toward enhanced housing quality emerges as building stages progress, indicating a rising understanding among occupants of the need of a breathing space. As a result, while the area is still densely inhabited generally, I came across patches of tiny yards and interstitial spaces between homes, which served as dramatic signs of the changing dynamics of spatial allocation inside this area.

However, due to a persistent pattern of theft events, a significant part of homes in the area lack windows for ventilation. Even when windows are present, it is typically at a scale that is noticeably small and therefore insufficient to provide adequate air circulation. Therefore, these homes' capacity to be inhabited throughout the summer is seriously jeopardized. Due to inadequate ventilation and the presence of heat-absorbing materials like tin, I personally experienced an extreme level of thermal discomfort while conducting my investigative interviews.

Privacy is jeopardized but we feel safer than before

The architectural design of the majority of homes has a constrained spatial layout that leaves little room between neighboring houses, giving residents minimal privacy. Female users frequently feel anxious when using these services because of the communal nature of the facilities, which include restroom, bathing, and culinary amenities, particularly at night. A definite security gap continues despite small improvements in the overall environment.

But fortunately, the living condition in this part of the area has significantly improved over the years. Most of the interviewers have expressed that initially, there used to be a lot of cases of assault, violence etc.. But recently the situation has improved. Most communities know each other, so the community can help each other to prevent crime. However, there still have been cases of theft, burglary etc. But the occurrence of crime is lesser than before.

We have Water but is it enough?

According to information provided during an interview with a non-governmental organization (NGO) operating in the region, a UNICEF Water, Sanitation, and Hygiene (WASH) support initiative has been instituted across the entire Korail Slum, in collaboration with Dhaka Water Supply and Sewerage Authority (WASA) and DSK, a non-governmental organization. As stated by the NGO representative, this project has significantly improved access to government-provided water services for many households by connecting to official water pipelines and installing water meters that regulate billing in a way that is affordable for residents.

My firsthand on-site views, however, present a different image. While some homes have seen clear advantages from these treatments, a significant number have been without water for lengthy periods of time, sometimes for two to three days. As a result, inhabitants turn to stockpiling water in various containers such as bottles and drums, hoping to accumulate as much as possible until supply is restored. For the vast majority, the notion of reliable, uninterrupted water supply remains a distant dream.
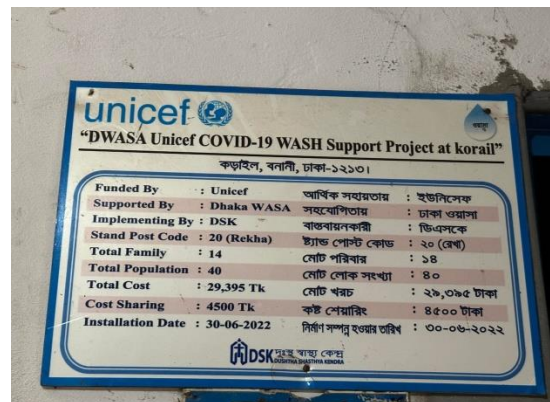

Fig. 39: Residents Store Water in drums

Fig. 40: A unicef water supply initiative

Fig. 41: It is crucial to store water as soon as they get it in the day.

A Waste Management System is operating

The vast majority of houses in this section of Korail operate within the framework of an
organized waste management system. Notably, there are two well-defined garbage disposal sites
nearby that have been precisely located in the following map. (I will insert map later****)
Routine visits are made by an authorized operative, who arrives in a van at regular intervals
throughout the day to facilitate garbage collection from each dwelling. The gathered garbage is
then transported to a centralized waste depository for disposal. Despite these established
protocols, I observed a prominent accumulation of litter spread throughout the ground, indicating
a significant divergence from the waste management system's projected performance.
Conversations with local residents have revealed that rubbish collection services are not provided
evenly to all houses. Households located a long distance away or experiencing logistical
constraints, in particular, are left with no other options for trash disposal. As a result, some

homeowners resort to dumping rubbish into adjacent bodies of water, increasing the environmental risks connected with inappropriate waste disposal techniques.

Fig. 42: Waste Disposal Site

Fig. 43: Waste Collector in a Van

Fig. 44: Dumping of Waste in Nearby Roads.

Public Place and Recreation: Who are the public spaces for?

There are various open public places in the area that are nominally dedicated for local children's leisure, with Ershad Field being the largest. Regrettably, these sites frequently serve as focal points for political activity, drawing a clientele predominantly composed of politically active individuals. While male children are clearly engaged in leisure activities on these grounds, female children are glaringly absent. Conversations with female teenagers aged 9 to 13 indicated categorically that none of them reported using any of these public locations for recreational reasons due to a general sense of unease and security concerns.

Furthermore, a noticeable issue afflicting many local public areas is a lack of maintenance. The presence of garbage and waste products inside these areas severely limits the accessibility and usage of the places for recreational activities. This detrimental situation not only jeopardizes the potential advantages of such sites for the community, but also calls into question the municipality's stewardship in maintaining the integrity and operation of these apparently public spaces.

Fig. 45: Ershad Field which is filled with waste

Tea stalls and bazars are popular but not for women:

Local marketplaces, tea booths, and shaded benches, in my findings, serve as common centres for adult sociability and relaxation. However, it is clear that female engagement in these areas is far lower than male participation. I've noticed that young ladies from 11 to 25 are rarely seen mingling in these public places. They stated in informal interviews with two of them that there is a widespread societal norm that prevents young women from spending lengthy periods of time in these public settings, mostly owing to worries about their personal security. This gap in involvement highlights the significant effect of cultural norms on female attendance and participation in public leisure activities.

Fig. 46: Bou Bazar is a hub for local

Fig. 47: Tea stalls are popular for socialising people

Because the area sits is in a tropical environment, it is prone to intense heat during the sweltering summer months. As a result, open blinds, which were supposed to provide relaxation and foster social contact, have become highly sought-after areas for individuals seeking fresh air. This requirement is exacerbated by the inadequate airflow in densely built dwellings, making these shaded zones essential for those suffering from heat exhaustion. The popularity of these open spaces demonstrates how important they are in creating a more temperate climate for the local populace.

Social Dynamics:The Capitalistic Utopia

Based on observations and interviews I have conducted within the Korail Slum, I have observed a distinct social dynamic in this region of the research area. While it has been shown that this region has a better level of structural organization, there are still visible flaws in the system, such as operational gaps and a noticeable lack of upkeep for the offered assets. Furthermore, questions of accessibility to both facilities and the space itself merit investigation. A closer look into accessibility reveals that long-term inhabitants, many of whom were born and raised in the region, have a historical relationship to the place. This tenancy gives them priority access to newly created amenities, frequently placing them in custodial responsibilities. They are often the spoke person for the community, and thus they speak for their own need at first. There is also a political influence on the accessibility of the amenities. Also, often the people who are connected with the local political parties, representatives, are the people that hold powers to create better opportunity for them and others who flatter them. As an example, The water supply system follows a discernible pattern: residences getting regular water supply are typically occupied by persons with prolonged residency and established ties with the relevant organization. This demonstrates how past residency and network relationships with power holders affect resource access inside the settlement. Also, It has come to my attention via discussion with an informal interviewee that it helps greatly for inhabitants in this is region to engage with powerful individuals, occasionally requiring persuasion or even resorting to bribery, to get necessary services like water and electricity.

Furthermore, when visiting specific homes, it becomes clear that long-term residents typically have a higher socioeconomic level, which is reflected in their homes' greater living circumstances. Many of them have modern conveniences like televisions and even internet connection, which reflect their greater wealth and privilege. They have been able to buy more land and other properties thanks to their prolonged stay in the region, which they now rent out to make money. This has caused a noticeable economic divide in the area, separating the financially successful from the others.

Fig. 48: Inside the house of an affluent home in Korail.

Roads, Connections and movement pattern:

Better Roads but need improvement:

In my field observations, entering the older sector of the settlement proves to be notably facilitated by a well-constructed and interconnected network of roads. The major thoroughfares connecting this area to its peripheries boast a relatively generous width, ranging from approximately 15 to 20 feet. The exterior of the slum is further accessible through roads flanked by sturdily built boundary walls, enhancing both navigability and security. Additionally, an intricate network of narrower interlinking roads within the settlement serves to facilitate the

movement of its inhabitants.
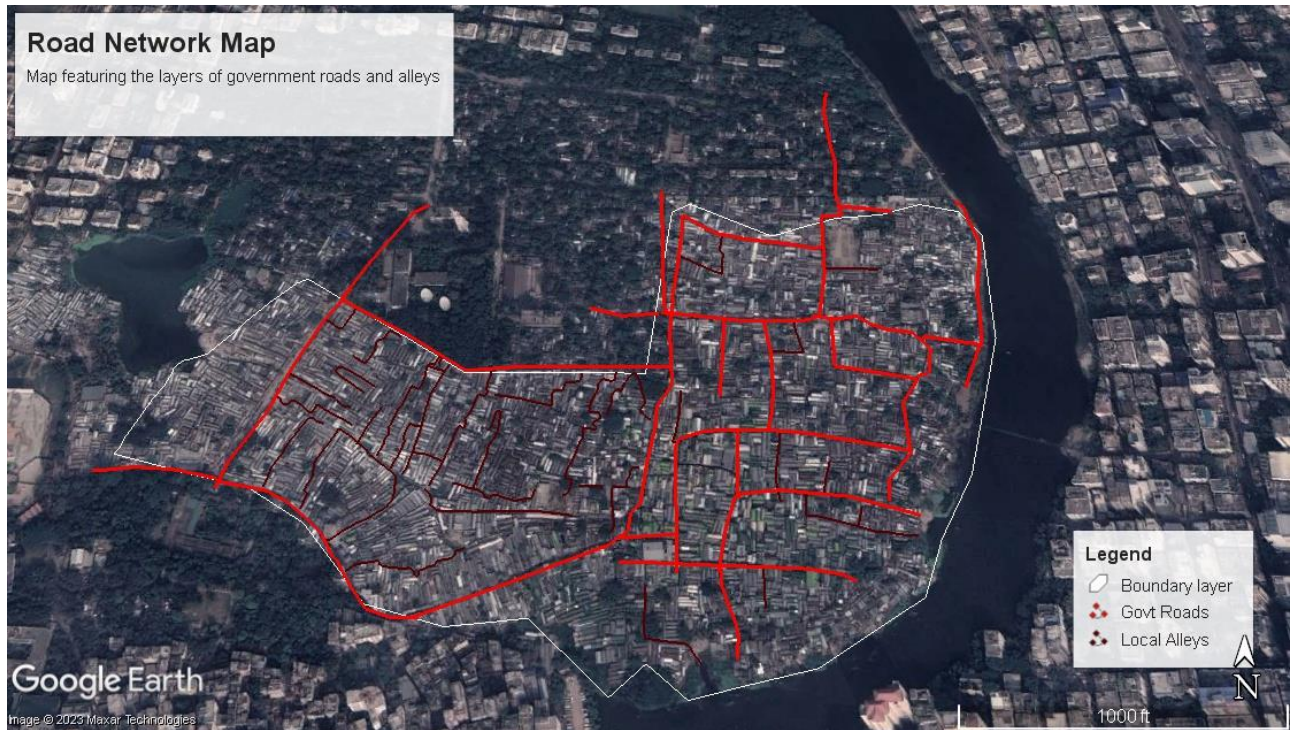
Fig. 49: Map of Road Connection in Korail Slum.

These secondary passageways, however, exhibit a notably more confined dimension. In certain
instances, the spatial constraints are so pronounced that the traversal of two individuals in
opposite directions becomes a considerable challenge. This intricate spatial configuration, while
emblematic of the settlement's organic growth, poses notable implications for accessibility and
communal interaction within the older precincts of the settlement.

Fig. 50: Small local alleys in between houses. Fig. 51: Relatively wide major roads connecting the boundary.

Additionally, in my analysis of these roads, a conspicuous observation pertains to their inadequate maintenance. Many of the sidewalks along the major thoroughfares are encroached upon by street vendors, particularly tea stalls, rendering pedestrian passage challenging. Moreover, the road surfaces are marred by an accumulation of debris, litter, and various utilities, heightening the risk of accidents, including slips and falls, for those traversing them. This compromised state of the roads not only impedes smooth pedestrian flow but also underscores

the pressing need for improved infrastructural upkeep within the settlement.

Fig. 52: Main Roads are occupied by tea-stalls, hawkers, dirt and materials.

Movement is difficult

The prevalent mode of transportation in this area predominantly involves either walking or utilizing rickshaws. Rickshaws are primarily available along major arteries and roads linking key commercial hubs like the bazaar and market. However, to reach these rickshaw-accessible routes, residents often rely on foot, navigating through the narrow alleys and passageways that thread between densely packed homes. These smaller alleys constitute a crucial conduit for daily mobility, serving as the main arteries for commuting to work, school, and other destinations. Due to their restricted width and the absence of room for broader roadways, respondents have noted that reaching their destinations often entails longer travel times. Furthermore, there have been instances of accidents stemming from exposed pipes and utility cables on these paths, a hazard for which there is currently no preventative measure in place.

Accessing residences themselves can present a challenge for the average inhabitant. Given that most dwellings are two-storied, residents have constructed narrow staircases to reach the upper floors, which can be inconvenient and potentially hazardous. The persisting issue of space constraints compounds the already intricate logistics of navigation within the settlement.

Fig. 53: Narrow stairs of a typical two-storied house in Korail.

Vulnerability against Nature:

Flood situation

In my study, it's evident that the older section of Korail exhibits a higher degree of resilience against flooding compared to the newer parts of the settlement. The majority of residents, spanning from the Tnt Colony boundary to the Ershad field, affirm that instances of flooding are infrequent in this part, even in the face of rainfall. Only two specific areas—those adjacent to the lake and in proximity to the Boubazar market—stand out as vulnerable to inundation. The instability of the waste dumping ground near the lake contributes significantly to the flooding in this area. During my visit to a residence near the lake, the impact of this vulnerability was glaring. (map)

Fig. 54: The house is elevated to stand against flooding of Lake

Fig. 55: Water still persists under ground of such a house.

Fig. 56: Connection of the house near lake with water.

Homes in close proximity to the lake have been strategically elevated above the ground to counteract the inevitability of flooding. Even during moderate rainfall, water levels easily reach knee-height within these houses. Navigating the roads near the lake becomes a formidable challenge, as they, too, become submerged. With heavier rainfall, water levels escalate to waist-height within the homes, severely impeding access to essential amenities like toilets and kitchens. The precarious nature of the ground, a consequence of waste dumping in the lake, intensifies this vulnerability. The ground becomes so unstable that it is prone to sinking when submerged. To counteract this, residents resort to the disposal of additional waste and soil to bolster stability and safeguard against sinking—a tangible manifestation of their proactive efforts to adapt to their challenging environment.

Diseases and pollution spread

The community residing here faces an elevated risk of waterborne diseases, a consequence of water contamination stemming from indiscriminate waste disposal. Cholera and diarrhea are distressingly common occurrences, particularly during the rainy season. Residents find themselves in a perpetual struggle against both the adverse effects of environmental degradation and the unwavering force of nature. This precarious balance underscores the profound impact of human activities on the environment and the subsequent repercussions borne by the community. Paradoxically, while these residents are exceptionally vulnerable to nature's retaliations, they find themselves trapped in a cycle of environmental degradation, with limited means to secure a more sustainable living environment. This predicament starkly highlights the infringement upon their right to a safe and healthy living space, emblematic of the complex interplay between human settlement and the natural environment.

Heating stress

Indeed, flooding is not the sole challenge facing the Korail slum. The entire settlement contends with sweltering temperatures exacerbated by limited ventilation. Notably, a discernible pattern emerges in this region; owing to its relative affluence, there exists a greater prevalence of open spaces, affording improved ventilation within residences. Some homes even boast small yards adorned with modest vegetation, serving as a natural buffer against the heat. Consequently, in select areas of the old settlement, the vulnerability to extreme temperatures is comparatively ameliorated. Additionally, there are shaded areas adorned with trees near the lake, offering residents a respite from the heat. This space benefits from the cooling effect of the trees and the refreshing breeze emanating from the lake, rendering it an invaluable retreat for those inhabiting this area.

Fig. 57: A space with shade near the lake.

New part of the Settlement

The emergence of the new sector within the settlement commenced in the early 2000s, with a notable shift occurring in 2008 when extensive landfill efforts were initiated. This endeavor led to the substantial reclamation of the lake area bounded by Adeal Road and its vicinity, ultimately giving rise to this burgeoning section of the settlement. A critical observation made during my fieldwork pertains to the formidable accessibility challenges encountered in this area. Apart from Adeal Road, there exists a conspicuous absence of adequately constructed municipal thoroughfares within this precinct. This dearth significantly impedes transportation, particularly for non-local individuals, necessitating passage through others' residences for movement. Consequently, the challenge of moving and accessing the area precluded comprehensive coverage of the entire new sector during my study. Instead, I primarily focused on key areas such as Bou Bazar, Beltola Mor, Mosharrof Bazar, and the vicinity of Brac School. I was fortuitously able to venture close to the remaining lake situated at the heart of the settlement. Hence, my analysis of this section will be predicated on observations gleaned from my delimited exploration. Nevertheless, I have discerned distinct landscape attributes and encountered notable disparities among the populace, which will be expounded upon in my subsequent analysis.

Housing:Less durable houses

The settlement's new section has seen quick and rushed development, marked by the use of easily available, low-cost materials. As a result, a significant fraction of these freshly constructed dwellings are unstable. Notably, buildings completed in 2008 had a better degree of stability than more recently built residences. In the beginning, dwellings were mostly made of tin and plastic, rather than more lasting materials like brick and concrete. This rushed building method, which avoided the need for a suitable foundation, encouraged the use of plastic, polythene, or tin.
As time progressed, and the settlement's foundation became more stabilized through appropriate soil and waste management practices, newer inhabitants began to acclimate to their living conditions. This transitional phase was characterized by an inclination towards investing in sturdier, better-constructed residences. In my observations within this sector, I noted that the further one ventured towards bodies of water, the more prevalent were the instances of

temporary, inadequately constructed housing structures. This spatial gradient underscores the evolving nature of settlement dynamics and construction practices within this burgeoning sector.

Fig. 58: Inside the tin house of a new settlement area.

Taking this particular house as an illustrative example, informal interviews with its occupants shed light on the challenges inherent in residing within such a structure. The absence of a brick perimeter presents a security vulnerability, compelling the residents to rely on the adjacent house's wall as a makeshift barrier. This practice is widespread in the area, reflecting the financial constraints that deter many from constructing their own brick enclosure. Additionally, the subpar quality of the tin used is a prevalent issue, with numerous sheets exhibiting significant perforations. This compromises their intended purpose and durability. Moreover, the propensity of tin to absorb and retain heat exacerbates the living conditions, rendering the interiors oppressively hot, particularly during the summer months. Furthermore, during rainfall, the material proves inadequate in providing effective insulation, further exacerbating the discomfort experienced by the occupants.

Fig. 59: Tin sheet with holes are used as readily available material to build houses.

Lesser Resources to Share

In this area also, a communal sharing pattern for essential amenities such as toilets and kitchens exists. However, a considerable number of houses lack a properly constructed piped water source, which restricts the extent of this shared resource. Consequently, the availability of communal facilities is relatively lower in comparison to older parts of the settlement due to the inherent scarcity of the resource itself in this area. This underscores the challenges faced by residents in accessing basic necessities within this specific locale.

Living Condition: Where do we breathe?

As previously mentioned, the houses in this area are densely packed and lack any discernible pattern or layout. There is virtually no space between adjacent houses, resulting in a shortage of ventilation within the residences. A significant number of houses in this area are devoid of windows or any openings, a measure taken for added security in the midst of the crowded surroundings and it is much worse compared to the old part of the settlement. Unfortunately, this architectural feature has a detrimental impact on the interior climate. The majority of houses are constructed using tin, a material known for its high heat absorption properties, which exacerbates the discomfort experienced by residents. The interiors become oppressively hot, rendering the living conditions particularly challenging, especially during periods of elevated temperatures.

Fig. 60: There is almost so space between houses.

Water availability, a dream

The UNICEF WASH program has made strides in providing water access in the Korail region, but unfortunately, this particular part faces a challenging situation. Due to limited accessibility, a majority of the houses in this area lack access to water through a regular piped system. Consequently, residents resort to using water from the nearby lake for their bathing and washing needs. As for drinking water, they must either purchase it from the nearby market or negotiate with households equipped with a piped water system, exchanging money for access. In proximity

to areas like Bou Bazar and Mosharraf Bazar, where houses are more accessible, a handful do have a piped water system in place. However, during interviews, it was repeatedly emphasized that water availability remains a critical issue, with many days passing without access to water at all.

Fig. 61: Water is bought and stored in various bottles, drums etc inside.

According to what I've learned through interviews and observations, the present water distribution system falls short of assuring fair access to this crucial resource. Residents have expressed worries about the system's complexity and slowness. They've stated that navigating the process of constructing a water supply system is difficult, owing to a lack of clear instructions on who to approach. The system looks to be complicated and riddled with bureaucratic restraints, making it difficult for the community to traverse successfully.

Scattered Waste and Pollution on a polluted land and water

It's an ironic situation to discuss pollution and waste management when the very ground we stand on is built atop layers of accumulated waste and garbage. This visible reality mirrors the hidden state of the land beneath, symbolizing the pervasive presence of waste throughout the area. Unfortunately, the municipal waste collection plan doesn't extend to the furthest reaches of the new settlement. As a result, residents resort to haphazard disposal, scattering garbage in various places. The nearest waste disposal site is located near the boundary of TNT Colony, a considerable distance from the innermost points of the new settlement. Consequently, waste tends to accumulate along the roadsides, particularly in close proximity to the lake. (Map)

Fig. 62: Waste thrown in the water body.

Space: Public place, Green Elements, Recreational elements: Where to go?:

In contemplating the spatial dynamics of this settlement, one cannot overstate the significance of addressing the density of housing, a critical factor in determining the quality of space available.

Residents require a designated area for relaxation, socialization, and respite from the confines of their homes. Regrettably, in this particular part of the settlement, this need is not easily met. The primary communal space is Mosharraf Bazar, a small market where locals gather for their essential purchases. While there are a few tea stalls, options for communal interaction remain limited.

Fig. 63: TNT field the only field close to the area outside of Korail Boundary.

There is also the TNT Colony field, which serves as a play area for local children. However, being located outside the boundaries of Korail, accessibility is inherently restricted. During interviews with local children, I observed a discernible conflict between the formal and informal sectors in their access to this public field. Despite its intended accessibility to all, teenagers residing in the TNT official vicinity expressed reservations about Korail children utilizing the field. Consequently, children from Korail find themselves either disinterested or, at times, even

prohibited from accessing nearby public spaces and amenities due to the clash of typical capitalistic societal dynamics.

Green elements- a luxury

Despite the presence of scattered trees in the vicinity, this area lacks well-defined green spaces or elements, such as parks, and is notably devoid of open spaces. The neighborhood falls short in providing the essential greenery that contributes to a healthier living environment. Houses here are characterized by a notable absence of yards or any available space for cultivating vegetation or engaging in gardening practices. However, I observed a few houses employing bamboo shades on their roofs, creating a makeshift environment for cultivating creeping plants like gourd and pumpkin. Though these instances are relatively scarce, they stand as a testament to the resilience and determination of the local residents, particularly women, who display a keen interest in gardening. Even amidst challenging conditions, these small-scale gardening efforts offer a glimmer of hope and the potential for fostering a stronger connection to nature within this

community.

Fig. 64: Tiny creeping trees on roof within clamped houses.

Social Dynamics: Who gets the upper hand?

The dynamics of power allocation in the new part of Korail mirrors the same pattern of the older section of Korail, albeit with a notable distinction. The majority of residents here are relatively recent arrivals, which means they lack the generational influence and advantages enjoyed by long-standing inhabitants. Consequently, they find themselves in a position of relative economic disadvantage, reflected in the condition of their homes. Access to essential resources and facilities is often contingent on their ability to navigate the web of connections held by the more affluent and politically empowered residents in the area.

This places them downstream in the hierarchical structure of this capitalistic society. To illustrate, consider the UNICEF WASH water initiative. Initially, it was made accessible to the more affluent households in the old part of Korail who had stronger connections. Meanwhile, this newer section has yet to receive the benefits of such an initiative, leaving them at a disadvantage and hopeful of establishing connections that may grant them access to water.

A significant portion of those who recently settled here in 2021, particularly in the wake of the COVID-19 pandemic, find themselves grappling with greater challenges compared to their predecessors. Many have lost their jobs and are without a source of income, compelling them to resort to reclaiming a piece of land by depositing soil and waste. However, even this process necessitates negotiation with the local power-holders and often involves elements of bribery. This underscores the persistent disparities between the affluent and the less privileged in this informal settlement, reflecting broader societal inequities.

The affluent individuals, those with stable employment, property ownership, or those who are landlords, continue to hold the upper hand in this socio-economic chain. Their advantageous position grants them better access to resources, leading to an improved quality of life and education. In the newer section of the settlement, the BRAC school stands as the sole educational institution, whereas there are more than four schools in the older part. This stark contrast is not only a matter of convenience, but it also underscores the greater feasibility for children in the older part to attend school.

Conversely, the children in the new section of the settlement often face recent misfortunes and find themselves in a struggle to establish stability. This struggle frequently leads them towards child labor, as they endeavor to contribute to their family's income rather than pursuing formal education. This perpetuates a cycle of systematic regression, making it exceedingly challenging for individuals to break free from the cycle of misfortune. The barriers to progress are substantial, reinforcing the need for targeted interventions to uplift this marginalized segment of the population.

Safety and Security: Am I safe?

Approaching the Korail informal settlement, particularly in the newer sector, safety concerns immediately come to the forefront. As a woman entering this area, I couldn't help but wonder about the level of security. This aspect remains a paramount issue for the residents, especially the women. During my interviews, it became starkly apparent, especially in conversations with the girls, that they do not feel secure even within the confines of their own homes. This heightened sense of vulnerability arises from the influx of diverse individuals and the ongoing changes in this sector, rendering it more unstable. Incidents of theft and robbery are regrettably commonplace, and instances of assault, including sexual assault, predominantly involve outsiders.

As a consequence, the girls are hesitant to venture outside and prefer to remain discreet, shielding themselves from potential threats. It's noteworthy that discussions around safety are often kept private, almost normalized as an expected part of life in this community. This silence perpetuates a cycle of vulnerability and underscores the urgent need for comprehensive safety measures and support systems within the settlement.

Is my house mine?

Financial insecurity is a prevalent issue in this part of the settlement, a fact that became evident through my interviews with residents. This economic instability serves as a significant driver of crime and violence within the community. Additionally, residing at the lower rungs of the socio-economic hierarchy engenders a pervasive sense of helplessness. Many individuals fear potential eviction or the possibility of their homes being claimed by others. Despite their dedicated efforts and investments in their homes, there's a notable lack of confidence in their sense of belonging, particularly when compared to residents of the older settlement. This disparity in security and stability underscores the urgent need for economic empowerment initiatives within the community.

Roads, Connection, Accessibility: Not enough Roads

The central lifeline of the new sector in Korail is the pre-existing Adeal Road, a government-constructed artery that once connected the area to nearby districts like Gulshan and Mohakhali in the formal Dhaka city. This road is fortified by well-structured boundaries on both sides, serving as a clear demarcation between formal and informal territories. However, beyond Adeal Road, the area lacks adequately constructed roads. Local thoroughfares and alleys are also in short supply, leaving limited spaces between tightly-packed houses to facilitate movement. This scarcity of infrastructure poses significant challenges for daily mobility within the settlement. (Fig. 49)

Movement is next to impossible

The narrow interstitial spaces that serve as makeshift pathways between houses prove significantly inadequate for accommodating the substantial population residing in the area. During interviews, residents emphasized the challenges they face in navigating these cramped passageways. With limited access to rickshaws, they predominantly rely on foot for mobility, and as one ventures deeper into the settlement, the difficulty of movement becomes increasingly pronounced.

Fig. 65: Available spaces in between houses function as connection roads.

Vulnerability against nature: The land is sinking

The residents of this area are particularly vulnerable to natural disasters, including flooding and heat waves. By reclaiming the existing lake, they inadvertently placed themselves at a heightened risk during periods of rainfall. The innermost sections of the new settlement are still inundated with water, and the overall stability of the area is compromised, leading to sinking during flood events. This prompts residents to deposit additional waste and soil to stabilize the ground. However, this measure can only provide a limited level of protection. The susceptibility to flooding is further exacerbated by the inadequate construction of some houses, which lack the necessary durability to withstand such events. Houses with tin roofs riddled with holes, and those relying on nearby concrete walls for support, are particularly susceptible to flooding, resulting in occupants contending with inundated living spaces.

Fig. 66: The undurable tin houses make it difficult to fight against flood

Weather is always a curse

In my discussions with the residents, the recurring issue of extreme heat during the summer months was consistently emphasized. The absence of adequate ventilation and open spaces exacerbates this, leading to exhaustion and often resulting in illnesses. It's important to note that Bangladesh's tropical climate brings with it a predominance of hot weather throughout the year. Yet, the challenges extend beyond just coping with heat. The construction materials and design of the houses in this settlement also pose difficulties during the winter months. Residents face a dual struggle as they lack both the means to invest in adequate clothing and the financial capacity to enhance the insulation of their homes. The permeability of these structures allows the biting

cold to seep in, intensifying the discomfort. Regardless of the season, the residents find themselves in a state of constant adversity.

Chapter 4

Design Proposal

My design philosophy is based on the integration of the landscape with human habitation, recognizing that each locale carries its own rich tapestry of history, culture, and narrative.

My Thoughts, Design Inspiration after the field study

In the course of this field study, my close engagement with the residents provided me with a profound insight into their daily lives. Their resilience in the face of numerous challenges served as a remarkable source of inspiration. From a landscape architecture perspective, I was particularly struck by how some individuals ingeniously utilize their limited space to establish a robust living environment. Amidst the tumultuous surroundings, I found myself drawn to the potential of creating a multifunctional green space.

One poignant image that spurred me in this direction was the evident passion and enthusiasm the residents, particularly the women, exhibited towards incorporating green elements. Many of them were raised in rural settings with gardens and abundant trees, fostering a deep-rooted connection to nature. They expressed a profound sense of attachment to a place when it boasts green features, a sentiment that resonated strongly with me during our interviews.

Fig. 67: One tree planted in a tub.

Fig. 68: Green space along the lake

The functional aspect of green spaces also holds significant financial implications for them. Several women, for instance, who had open space near the lake, shared that they have successfully sold surplus vegetables in the local market.

My primary impetus extends beyond the mere establishment of a green space for soulful nourishment and financial sustainability. It also encompasses the ambition to foster an inclusive public space where gender inclusivity thrives. Given the women's keen interest in gardening, this envisioned space could serve as a sanctuary for women of all ages to unwind and engage in recreational activities. Moreover, by emphasizing a female-driven space, we can create a heightened sense of safety for young girls, affording them a secure environment for play and leisure.

The lake's invasion poses a possible threat of total covering, putting the ecological and environmental health at risk. To address this, a transformative approach is proposed, converting the lake into a productive space for food cultivation. This technique not only avoids overgrowth, but it also acts as a vital barrier between formal and informal community spaces. Embracing traditional floating farming methods, inspired by activities in Bangladesh during floods caused by climate change, offers a potential option. Given Korail community's farming and agricultural background, this adaption fits in perfectly with their demands for economic growth, representing my mission as a landscape architect to build resilience through community-beneficial techniques.

Designing the Korail border to the lake

As I already mentioned in the chapter on the analysis, Korail slum expansion in the past decades happened to the detriment of the lake. (Fig. 69)
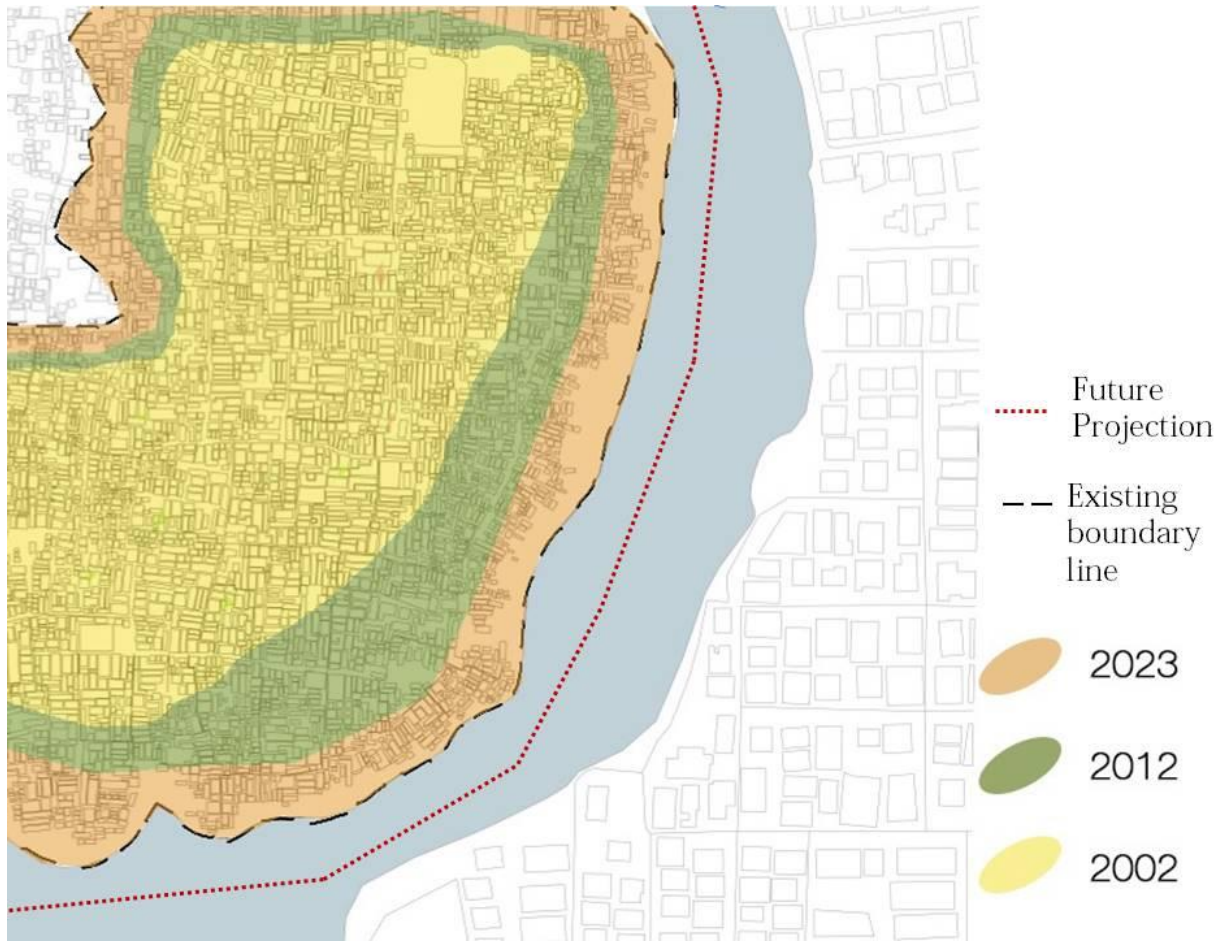
Fig. 69: Korail slum expansion into the lake

As we are discussing, one scenario is that the Korail boundary near the lake will be moving, and people will continue to take over the lake to construct houses as I projected in this map (Fig. 69) as a hypothesis in the following section(Fig. 70).
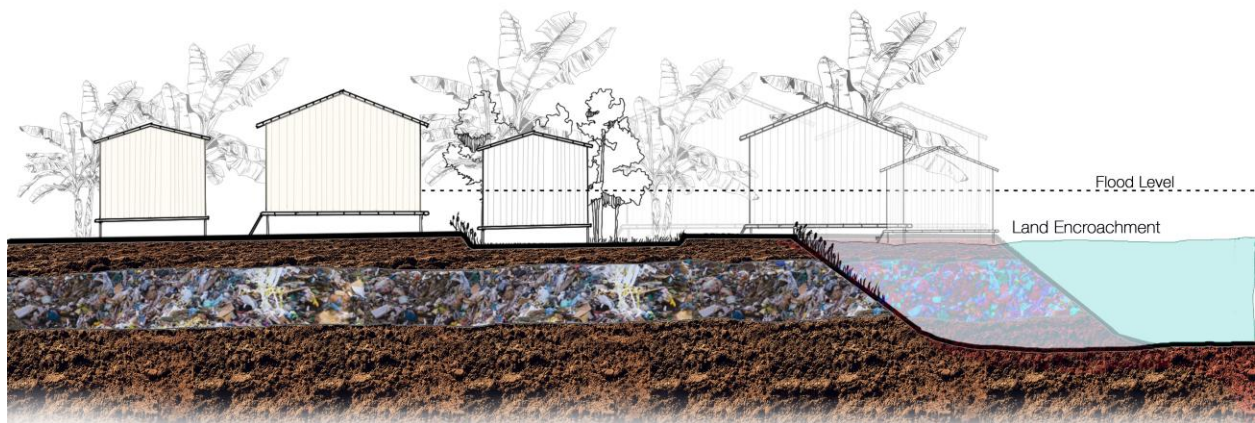
Fig. 70: Korail Slum boundary future projection of expansion

In the design proposal, due to the pressure that slum densification is putting on its borders, I decided to focus on the margin of Korail to the lake. This area is continuously transforming and adapting to the residential, productive, and recreational uses of the community living there (Fig. 71).
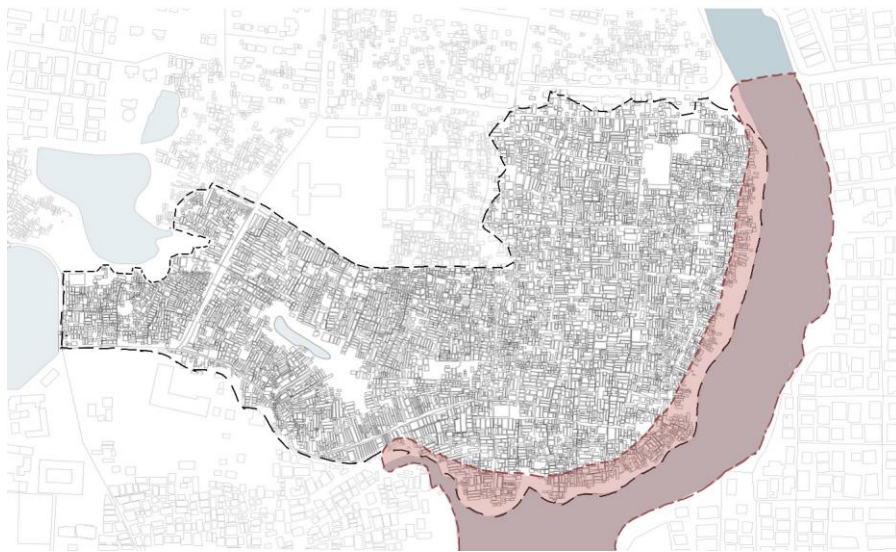
Fig. 71. Area of intervention in the Korail slum, Dhakka

These borderscape areas are accessible by boats through the lake and by a network of streets and tiny alleys that connect the lake to the inland of the slum (Fig. 72).
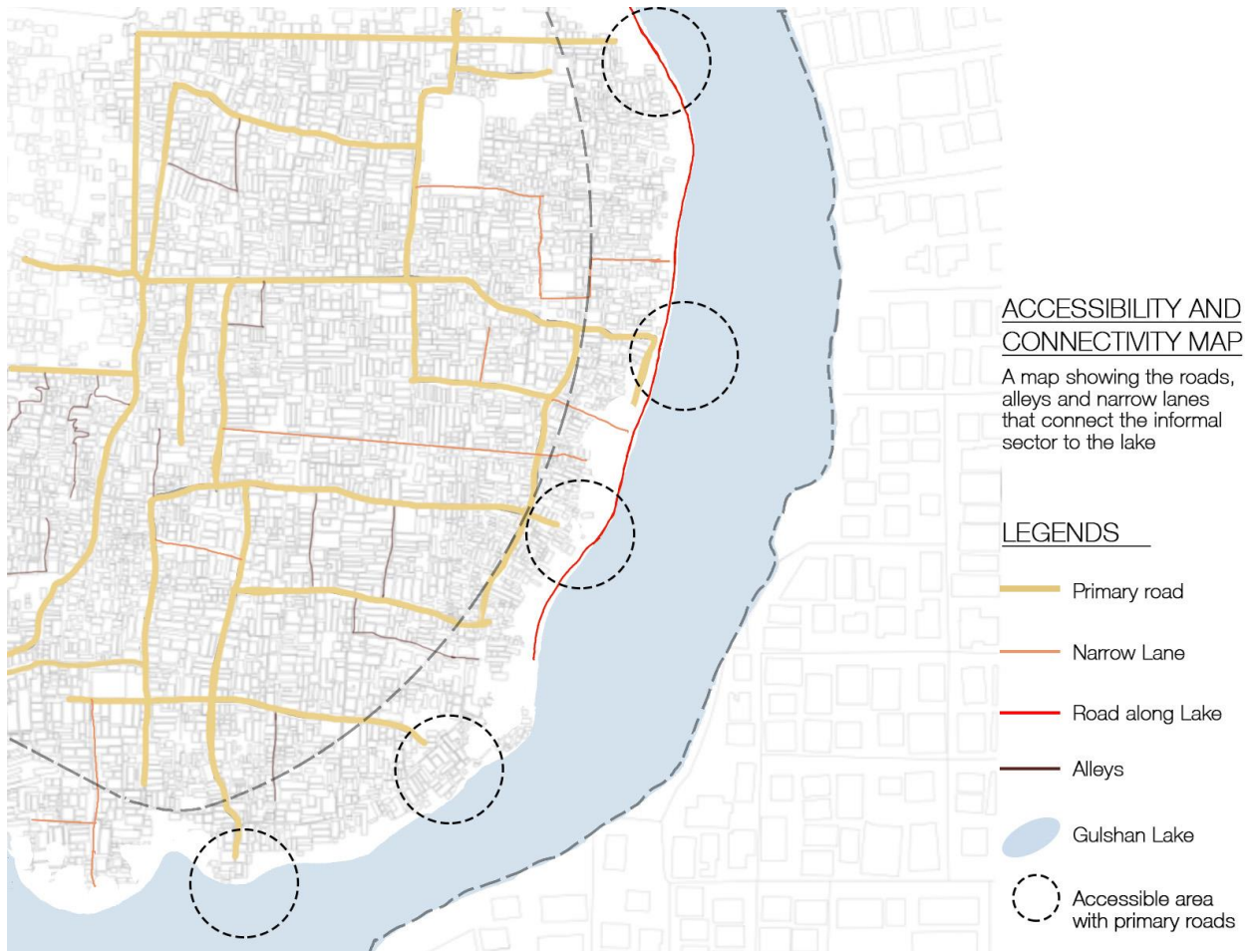
Fig. 72: Accessibility map

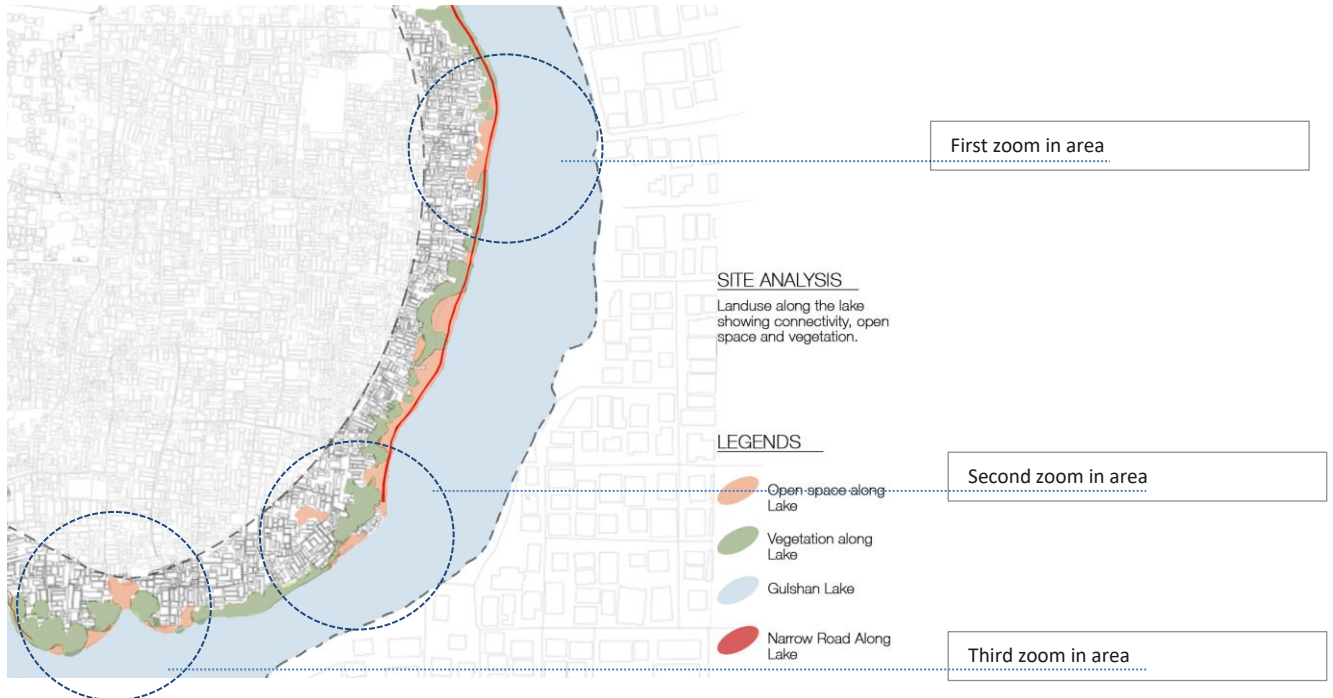*Existing Condition in the Area of intervention:*

Fig. 73: Open spaces typologies on the borderscape areas to the lake

Currently, the site location is characterized by a narrow road that discontinues along the lake border, and the houses are placed among different vegetation and open space(Fig. 73). I will oom in to three places to analyze further the functionality and typology of the vegetation and open space.

Fig. 74: First Zoom (Functionality of space)   Fig. 75: Second Zoom (Functionality of Space)
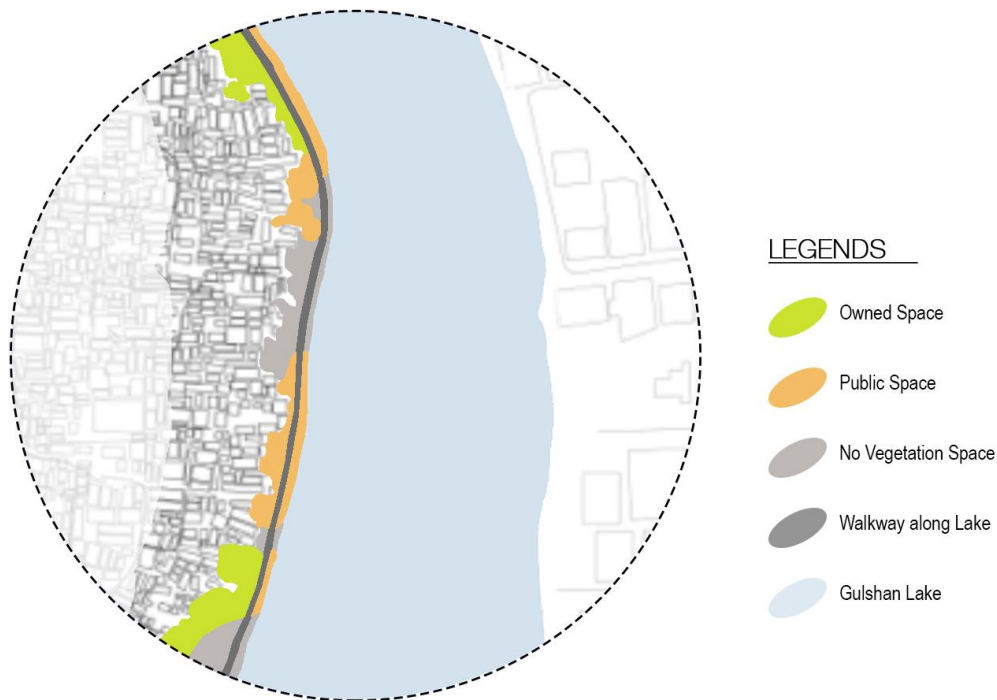

Fig. 76. Open spaces versus occupied spaces

When I zoom in, we can identify the functionality of the vegetation, some vegetated spaces are occupied where residents who have fenced and claimed it as their private space (Fig. 76), whereas, there are many aquatic vegetation, roadside vegetated areas with shrubs and grass, that are not occupiedFig. 74 75). Some open spaces are used as local bazaar, some have benches for them to sit, there is also waste dumped on open space, which pollutes the lake. There is fishing and boating activity on the lake. Fig. 74) (Fig. 75).

Visualizing The lake Peripheral Houses:

In the three zoomed part of the map(Fig. 73), I could separate three types of scenarios for housing near lake, based on how they are placed.
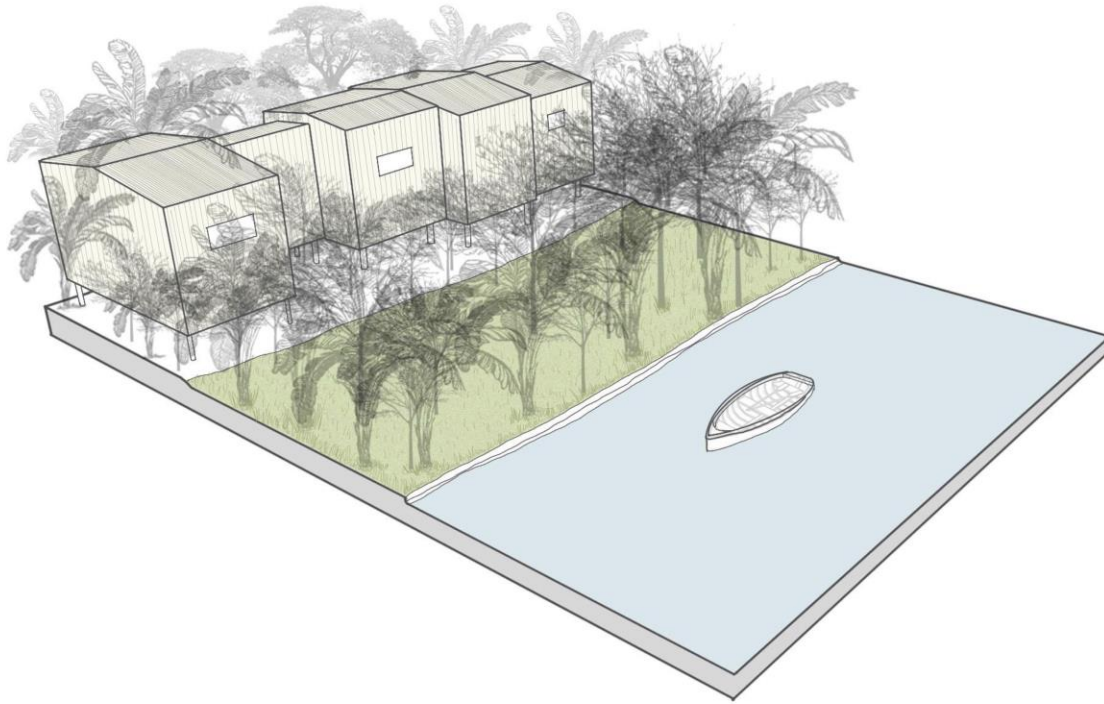
Fig. 77: Houses where there is distinctive vegetated border within Lake and houses. (Zoom 3)
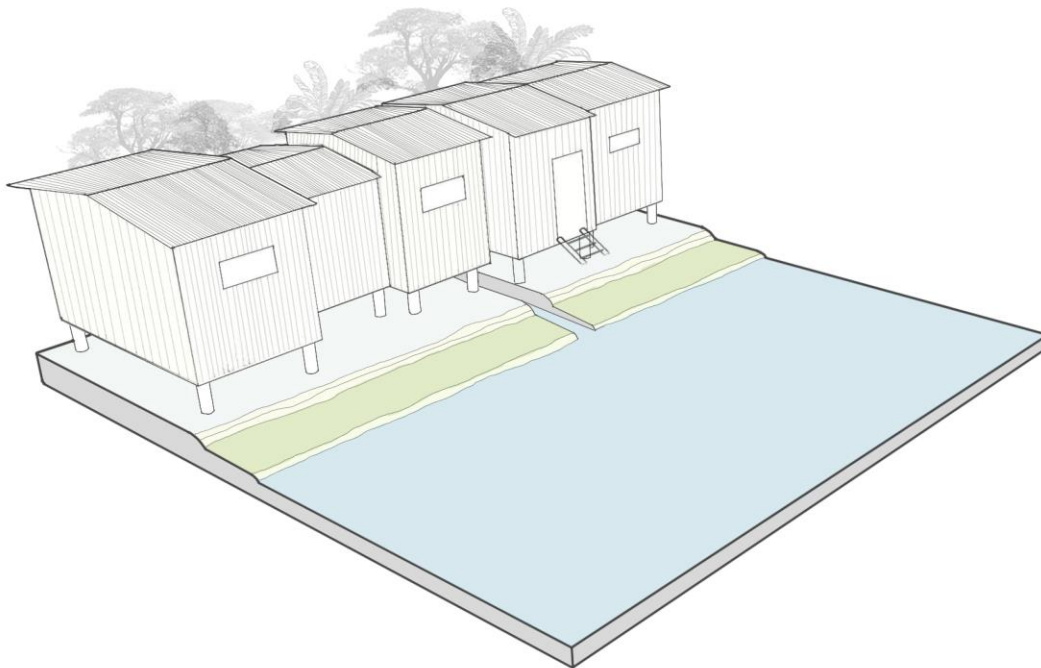

Fig. 78: Houses adjacent to Lake with almost no distance from lake. (Zoom 2)
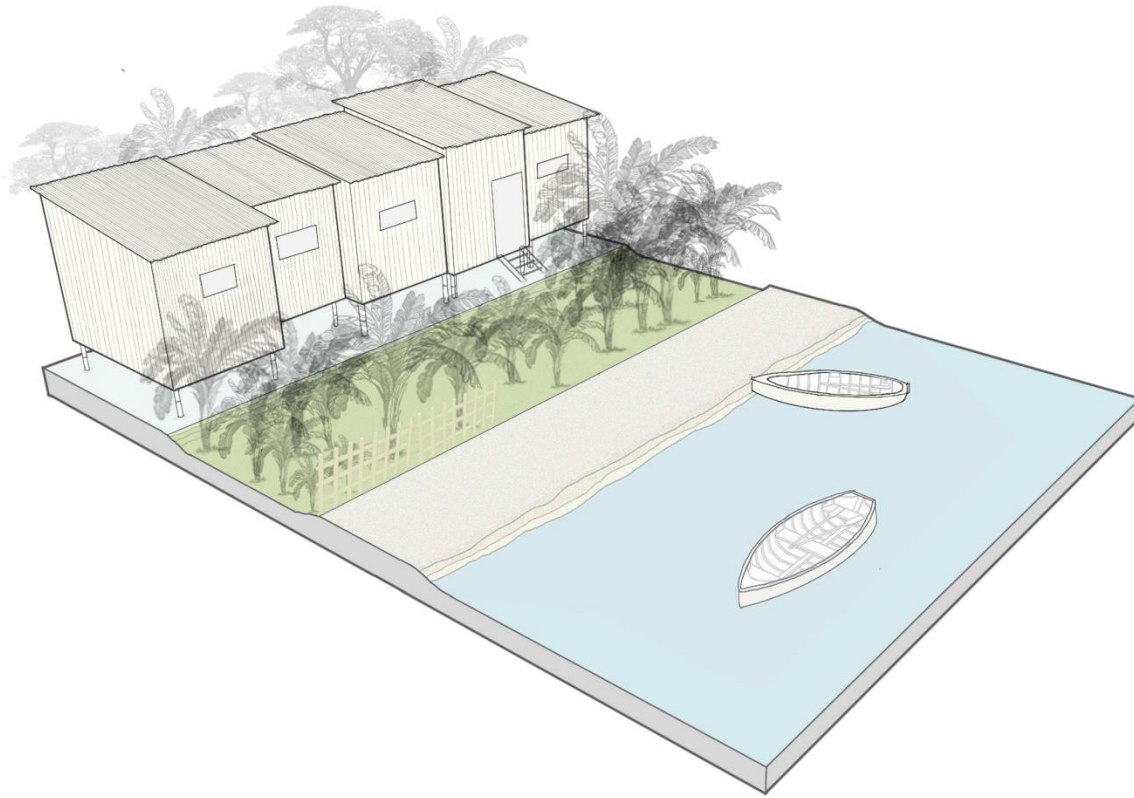
Fig. 79: Houses where there is road and vegetation between lake. (Zoom 1)

It is worth mentioning that the houses are mostly made of tin and brick, and they rise on a s lightly elevated tilt to resist flood water. Because of the placement of houses and the existence of vegetation, the flood scenario is different in each section.

Flooding pressure

The borderscape areas are under continuous flooding pressure. During the rainy season, the border is reshaped by the augmented water level of the lake. To understand the phenomena of flooding in different zoomed parts (Fig. 73), I took three sections near the lake, to highlight the different flooding pressure in different conditions.

Fig. 80: Flood level where there is enough vegetation between the lake and houses (Zoom 3)
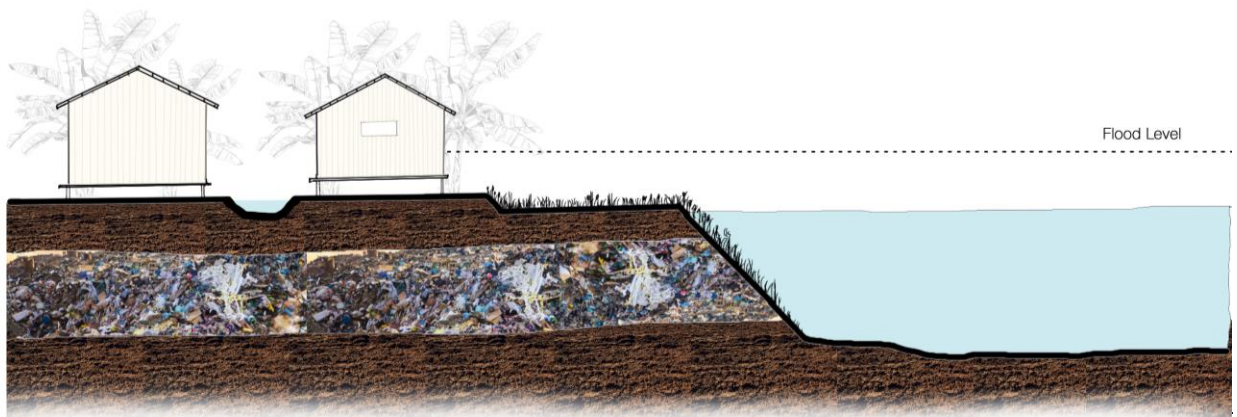

Fig: 81. Flood level where there is not enough vegetation and spaces fronting the lake. (Zoom 2)
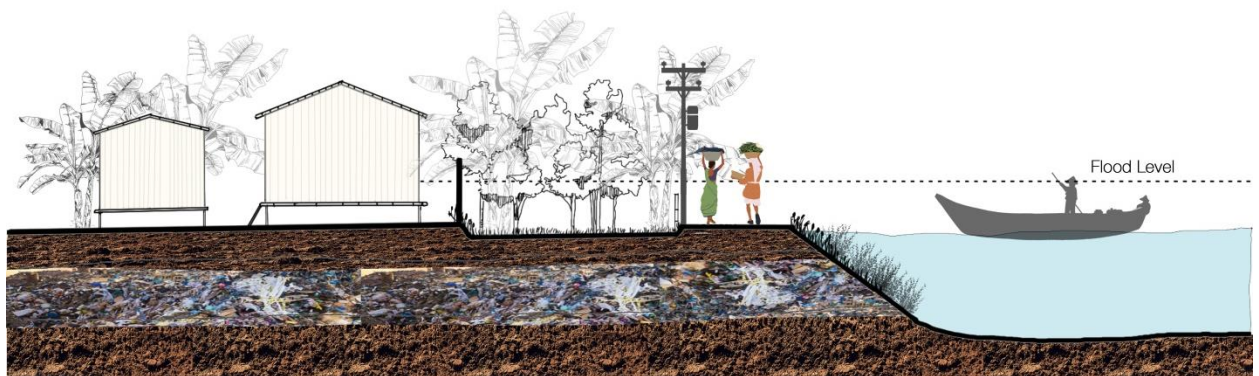

Fig. 82: Flood level where there is a road and vegetation near lake.. (Zoom 1)

Design Intervention:

Because of the flooding pressure, it is difficult for people to have a sustainable way of living. So, I am driven by the approach to design in a way that can help adapt to the flood challenges, Building on the ancient Bangladeshi technique of floating farms, my proposal envisions to create a functional green space just at the border between land and water. This space works together with the areas at the banks of the lake that are reorganised to become community gardens where women can be involved in the production of food, spaces for social interactions and spaces dedicated to fishing activities. . (Fig. 83)

Fig. 83: Design Master Plan

To better explain the proposal, I did two zooms in with details(Fig. 84), (Fig. 85).

LEGENDS

- Open space along Lake
- Vegetation along Lake
- Floating farm
- Gulshan Lake
- Walkway
- Primary roads connected to the Lake
- Cultivated Land
- Community Garden
- Shaded Space for Women
- Street Bazar for Locally Grown Food
- Community Hub with Shaded Benches

Fig. 84: Proposed Design (Zoom 1)

LEGENDS

- Open space along Lake
- Vegetation along Lake
- Floating farm
- Gulshan Lake
- Walkway
- Primary roads connected to the Lake
- Cultivated Land
- Community Garden
- Fishing Ghat

Fig. 85: Proposed Design (Zoom 2)

The floating farms are placed on a floating raft crafted from invasive hyacinths. These rafts provide a resilient platform for cultivating mainly vegetables and fruits such as cucumbers, radishes, bitter gourds, papayas, and tomatoes. The two-month process of raft fabrication results in buoyant platforms around 6 meters long and 1 meter wide, offering a space-efficient alternative to conventional farming (Fig. 86). The floating farms are anchored to the bed of the lake to ensure it won't wash away in flood. (Fig. 89)

Raft: Made of Water hyacinths

Dimension: length 6m (approx), Width 1 m(approx)

Type of Vegetation that grows on raft :

Bitter Gourd

Cucumber

Tomatoes

Papayas

Radish

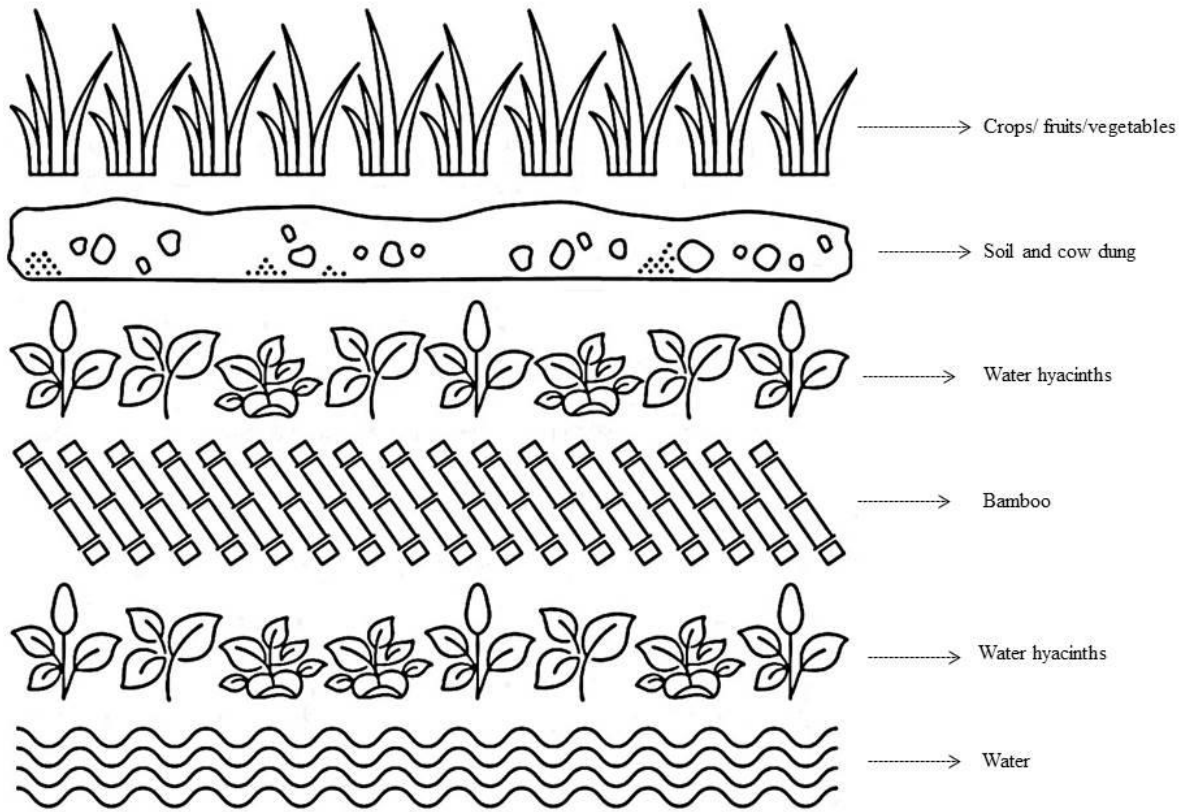Fig. 86: Diagram of Placing of a rafts in a floating farm

Fig. 87: Steps needed to create a floating farm. (action, 2021)
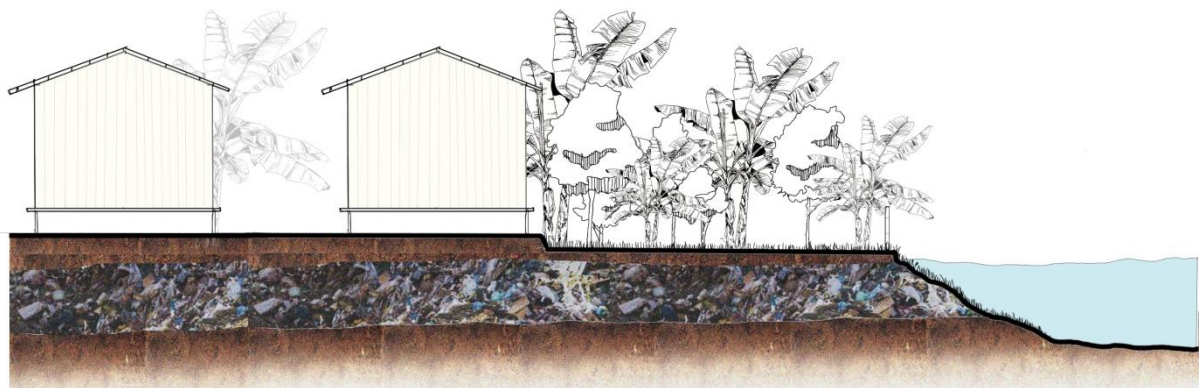
Design Sections:

Fig. 88: Present Condition of Korail

Fig. 89: Future Design Section of Korail

To create a better connection between the cultivated land and the proposed floating farms, I'm proposing to remove some of the fences that are actually defining ownership/appropriation. The aim is to create more inclusive spaces where the community can interact, collaborate, and socialise. I intend to keep the original landuse of community as much elsewhere, taking the lake to create better opportunity. This approach of farming mitigates the challenges of waterlogging, requires minimal land, and eliminates the need for pesticides, presenting a sustainable and adaptive solution to the increasingly volatile monsoon seasons and the broader impacts of climate change on food security. This adaptive technique will be transformed into the lake to promote food production, and economic security even in the event of flooding. (Paul, 2022)

Future Prospects:

Engaging the Women:

Several times in the thesis I mentioned thatthe women are under special consideration in my design. Every steprafts I took, I thoughht about their role and their active participation. According to my research, in the floating farm technique, women are actively taking part in the process of making raft and growing food. (Fig. 91) Also in the community garden, women will take the lead role. Having women at the front will give them the liberty of economic activity. Also when these activites are led by women, the space for women will function as a safe space where they'll feel included.(Fig. 90)
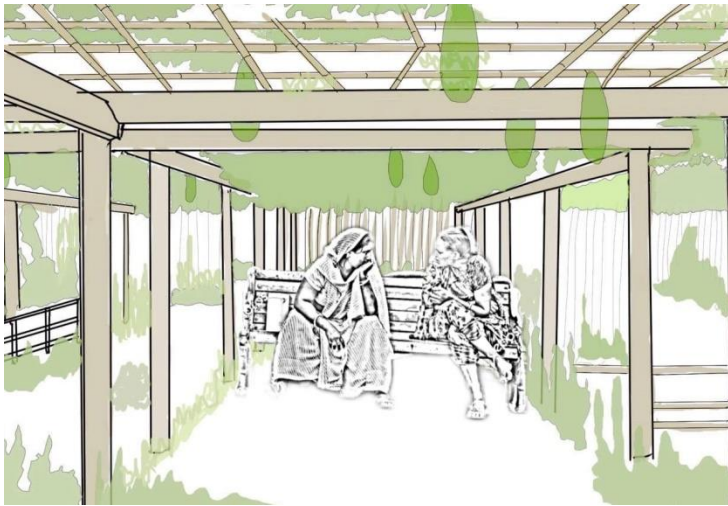
Fig. 90: Women Sanctuary within Community Garden

Fig. 91: Active participation of Women in floating farm

Consequently, in this design approach, women will play a pivotal role in establishing a sustainable, self-sufficient economic venture, emphasizing their ability to carve out their own space and opportunities within this landscape.

Overall Wellbeing:

My design thinking is something that speaks for the community's needs and not something very expensive and capitalistic that the community can't afford. As I imagine, it will change the place into a more vibrant place, where community engagement to promote resilience is faciliated. (Fig. 92)

Fig. 92: Future opportunities within Korail

Fig. 93: Floating farms in Korail Community

Chapter 5

Conclusion

This thesis project has been an invaluable learning experience for me, shaping my core ideology as a landscape architect focused on community connection and well-being. However, the research encountered several limitations. The significance of community involvement in decision-making, highlighted in successful informal settlement case studies like KDI projects, was challenging to fully implement due to time constraints and budget limitations. Despite my efforts to interact with the community and conduct interviews, the vastness of Korail, the largest slum in Dhaka city, prevented a comprehensive study. As a woman, safety concerns limited access to certain areas, impacting the thoroughness of my research.

Designing women-centric spaces in Bangladesh's context, particularly in informal settlements, posed additional challenges. Despite these limitations, the design addresses the main research questions, bridging existing gaps. The integration of community-based farming, with a focus on women's leadership, has proven effective in Bangladesh. The use of water hyacinths for floating farms, readily available in Gulshan Lake, aligns with the cost-effective approach needed for impoverished communities. The active participation of women in floating farming across Bangladesh inspired me to create economic opportunities for them.

The proposal includes the sale of locally grown food in the existing market within Korail, transforming it into a hub and increasing economic prospects. The encouragement of fishing activities contributes to ongoing economic growth. In times of flooding, the floating farms provide a resilient means of income for the community. The increased vegetation along the lake, combined with fishing embankments, addresses soil stabilization, flood protection, and pollution control. The cessation of waste dumping in the lake contributes to its revival. Currently, the public spaces in Korail are not effective and not open to women. Therefore, having functional spaces within this community garden has better prospect of being effective to women as it is occupied and led mostly by them.

Every aspect of the design prioritizes community well-being without overly utopian interventions. Each idea is considered aligning with the community's perspective while striving to create harmony within the informal sector. This approach ensures that the proposed design not only serves as an opportunity for the city but also embodies a sustainable and realistic vision for the betterment of the community.

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