

Understanding the Impact of Climate Change on Urban Dynamics in Dhaka, Bangladesh: A Qualitative Study

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Article info

Received: 14 September 2025

Accepted: 22 November 2025

Published: 31 December 2025

Keywords

Impact, Climate Change, Urban,
Dynamics, Dhaka, and Bangladesh

Abstract

This study investigates the intricate interplay between climate change and urban settings in Dhaka, Bangladesh, employing an interpretative phenomenological analysis. Through extensive expert interviews with 20 key policymakers and stakeholders, I conducted a thematic analysis using NVivo12 and the Granheim approach. The study reveals six core challenges confronting the municipal corporation authority in effectively managing urban planning amidst climate change: the proliferation of informal settlements, rapid population influx, strain on essential civic amenities, vulnerability of infrastructure, intensification of heatwaves and associated public health concerns, and the degradation of biodiversity and ecological networks. These challenges significantly impede proper urban operation and handling. Based on our findings, the study advocates for reinforcing legislation and regulations to address overpopulation through strategic urban planning and population control measures. Furthermore, it suggests allocating adequate financial resources for infrastructure development and maintenance to enhance resilience against climate-related hazards. Implementation of measures to mitigate heatwaves and associated health risks is recommended, along with initiatives aimed at preserving biodiversity and ecological networks within urban areas. By providing insights into the complex interactions between climate change and urban dynamics in Dhaka, this study contributes to the development of evidence-based strategies for sustainable urban development. These findings can inform policymakers, urban planners, and stakeholders in their efforts to mitigate and adapt to the impacts of climate change on urban settings in Dhaka, Bangladesh, ultimately fostering resilient and sustainable urban environments.



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Introduction

Climate change significantly impacts urban planning by necessitating adaptation and mitigation strategies. Urban areas face challenges like heat stress, heavy rainfall, and droughts due to climate change, affecting population well-being and infrastructure (Kainz et al., 2023). Demographic shifts globally, with rising populations in some regions and aging societies in others, require urban planners to adjust policies for sustainable and inclusive cities (Friedemann, 2023a). Cities worldwide are developing climate adaptation plans to address vulnerabilities and reduce climate impacts, emphasizing the importance of local policy tools and international comparisons (Tu & Yu, 2023). However, urban climate change planning often neglects social justice aspects, leading to inequities exacerbated by mitigation and adaptation efforts (Pratt, 2023). As global temperatures rise, urban planning must consider environmental sustainability in building and community design to mitigate the impacts of extreme weather events (Norman, 2022a). In western countries, the built environment and infrastructure are particularly vulnerable, leading to population movements and potential conflicts (Aboulnaga et al., 2019). The role of governing processes, community participation, and environmental justice in addressing these challenges is crucial (Holt, 2012). The expansion of urban land is exacerbating these effects, leading to a higher proportion of impervious surface area and artificial heat sources (Trusilova et al., 2009). Despite these challenges, climate change adaptation remains a low priority for city planners and

governors in Europe, with only a quarter of cities having both adaptation and mitigation plans (Carter, 2011; Reckien et al., 2014). Similarly, climate change is having a significant impact on urban settings in Southeast Asia, particularly in terms of flooding and sea level rise (Lord, 2020; Yuen & Kong, 2009). The region's rapid urbanization is exacerbating these challenges, with many cities struggling to control their development. The situation is further complicated by the compounding effects of the COVID-19 pandemic (Lord, 2020). These changes are also leading to cultural shifts, such as migration patterns and changes in livelihoods (Huynh et al., 2014).

Dhaka, one of the fastest-growing megacities in the world, faces multifaceted challenges arising from climate change-induced phenomena such as rising temperatures, erratic rainfall patterns, increased frequency of extreme weather events, and sea-level rise (Shilpi Roy, 2023; Swapan et al., 2017a). These climatic shifts intertwine with the existing vulnerabilities of the city, including rapid urbanization, inadequate infrastructure, insufficient resources, and socio-economic disparities, exacerbating the plight of its residents. Climate change is significantly impacting urban settings in Dhaka, Bangladesh, leading to increased temperatures, extreme weather events, and a range of climate-induced hazards (Rabbani et al., 2011a; Shahid et al., 2016a). These impacts are exacerbated by non-climatic factors such as population density, poverty, and unplanned urbanization (Rabbani et al., 2011a). The resulting challenges include forced displacement, rapid urbanization, and social justice issues (Ahsan, 2019). Additionally, the study on land cover changes in Dhaka reveals rapid urban growth, with a notable increase in urban built-up areas over ten years, impacting the environment and necessitating strong adaptation and mitigation policies (Hossain & Fernández-Güell, 2022). Furthermore, waste management and pollution control are becoming increasingly difficult due to the generation of municipal solid waste and its contribution to climate change (Mamun & Hossain, 2021). Although considerable research has been conducted on the impacts of climate change on urban areas globally, the literature specific to Dhaka, Bangladesh, remains somewhat limited. Existing studies have provided valuable insights into the vulnerabilities of urban settings in Dhaka to climate change. To achieve the objectives above, this research will address the following questions

a) How does climate change effect on urban settings in Dhaka city of Bangladesh?

This literature gap is particularly significant considering Dhaka's status as one of the world's fastest-growing megacities and its high susceptibility to climate-related hazards. Addressing this gap is essential for developing targeted and effective adaptation and mitigation strategies, as well as for promoting social equity and resilience in the face of climate change challenges. Therefore, this study seeks to fill this gap by examining the socio-economic dimensions of climate change impacts on urban settings in Dhaka, Bangladesh, and identifying strategies to enhance resilience among vulnerable communities. By doing so, this research aims to contribute to the existing body of knowledge on climate change adaptation and urban planning, with specific relevance to the context of Dhaka.

Materials and Methods

Study area and settings

The study was conducted in Dhaka, Bangladesh, a densely populated megacity facing significant challenges from climate change. Dhaka has served as the focal point for policymaking and urban development initiatives in Bangladesh. Data were collected through interviews with 20 key policymakers and stakeholders deeply involved in urban planning and development in Dhaka. The research employed interpretative

phenomenological analysis and thematic analysis techniques to explore the impact of climate change on urban dynamics in Dhaka. This study aimed to provide insights into the challenges and opportunities for sustainable urban development in the face of climate change in Dhaka.

Study design and sample size

A qualitative Interpretive Phenomenological Approach (IPA) was used to explore, understand and investigate the climate change effect on urban setting in Dhaka, Bangladesh. The qualitative phenomenology research methodology is appropriate to understand phenomena from the participant's perspective (McCaslin, 2003). Besides, qualitative phenomenology research comprehends human experiences through participant descriptions (Nieswiadomy & Bailey, 2018). Crouch and McKenzie (2006) recommended having less than 20 respondents for qualitative research, as it helps establish intimate connections and improve communication. For qualitative research, (Sandelowski, 1995) advised using a sample size of 10 involving homogeneous individuals. However, Green, J. and Thorogood (2009) noted that most qualitative researchers use 20 or more participants. For our study, we used purposive sampling to select 20 Key Informant Interview to collect qualitative data. For this study, we used a non-probability purposive sampling technique for selecting the respondents (Green & Thorogood, 2018). Table 1 provides the – socio demographic profile of participants.

Data collection and instruments

For this study, the semi-structured interview was employed to gain a deeper understanding of the climate change impact of urban setting in Dhaka city. A semistructured interview explores the more precise facts on the study issue and can supply additional details (Lune & Berg, 2017). Initially, we took three sample field interviews, and afterward, based on the pilot interview, we designed the questionnaire (Hecht et al., 2019). In particular, we designed the interview guidelines and adapted the interview question based on three sample interviews to fit the context. Before the interview, we notified the participants that their presence was voluntary and ensured their confidentiality. Everyone who participated in the interview was assured privately that their identities would not be revealed. However, five potential participants cited privacy concerns as their reason for declining to participate. The total duration of the interview was 29–50 minutes, and it was recorded using a portable audio device. Some respondents were unwilling to participate in the recording procedure, so in some cases, it was written down. Later-recorded interviews were meticulously transcribed and analyzed by other researchers.

Data analysis procedures, validity, and reliability

Instead of utilizing paper and pen to analyze data, we rely on NVivo 12, an intuitive and user-friendly data management and analysis program, that offers superior analytical features (Patton, 2002; (Gibbs, 2018). The NVivo software is the ideal option for coding, categorizing, and theme-building tactics (Anselm L. Strauss, 1987); (Marks et al., 2016) as well as a superb instrument for analyzing vast amounts of text data. Using the NVivo 12 software, we did theme coding, categorizing, and organizing to get more accurate and dependable findings (Zamawe, 2015); (Patton, 2002). The data were thoroughly organized and summarized following the immediate return from data gathering. In particular, the collected data were coded according to each individual's occupation and stored in a separate file. The field-level research assistant transcribed participant observations and interviews and reported the respondents' unaltered remarks verbatim. Then, the collected data was triangulated (Golfashani, 2003)

depending on its nature, classification, and features to ensure the validity, accuracy, and dependability of the data (Winter, 2000). During data collection, our researchers often went to the field to look into things, but they didn't talk to each other first, which is against investigator triangulation guidelines.

Approaches to measuring and coding

Using a data-driven inductive approach (Boyatzis, 1998), six primary themes were identified: 1. Expansion of Informal settlement, 2. Population influx, 3. Pressure on basic civic amenities, 4. Infrastructure vulnerability, 5. Rising heat waves and public health concern, 6. Losing biodiversity and eco-network. Also, a thematic approach was used in the Interpretive Phenomenological Approach (IPA). Regarding thematic analysis, this study followed the five stages of data analysis outlined by Granheim and Lundman (Table 1) to assure the good quality and correctness of the data. (Graneheim & Lundman, 2004).

Table 1: Thematic data analysis procedure using Granheim and Lundman approach

Steps	Description
1. Interview transcription	The interviews were taped and read again after hearing the recordings several times to comprehend the contents.
2. Unit for the formation of meaning analysis	All interviews were analyzed as a single unit. Creating primary codes by abstracting meaning units
3. Comprehensive sorting of similar codes	The grouping of similar fundamental codes into more comprehensive categories.
4. Comparison of codes and establishment of subcategories	In contrast, all codes and data identified similarities and differences. This process resulted in the formation of categories and subcategories.
5. Comparing subcategories and establishing primary categories	The initial interviews yielded a set of codes, categories, and subcategories, and the emerging codes were considered the results due to the content analysis methodology. Two independent researchers examined category data.

Table 2: Defined themes that were derived from the thematic analysis

Themes	Reference Code	Descriptive Coding
Expansion of Informal settlement	161	<i>“Rapid urbanization and rural-to-urban migration have led to inadequate infrastructure and services in these settlements. The spread of informal settlements in Dhaka demands resources and infrastructure, causing overcrowding, environmental damage, and heightened disaster risk”</i>
Population influx	134	<i>“Dhaka’s population growth due to climate issues poses challenges for planners and policymakers. Rising sea levels, frequent flooding, and extreme weather events have forced many people from rural areas to migrate to Dhaka in search of livelihoods and safety.”</i>
Pressure on basic civic amenities	122	<i>“More people and traffic strain urban planning. Despite government efforts, natural disasters often disrupt plans, especially in cities. As a result, transportation systems are heavily impacted by the population increase, causing congestion and environmental problems like air and noise pollution.”</i>
Infrastructure vulnerability	115	<i>“Development in infrastructure, housing, and legal services in Dhaka city leads to urban expansion. When the population surpasses certain limits, it indirectly hampers development efforts. Improvements create jobs but population growth worsens congestion and pollution”</i>

Rising heat waves and public health concern	107	<i>“Poor urban planning in Dhaka results in unplanned settlements due to population growth. Natural disasters and climate change worsen air and noise pollution, leading to health issues and limited job opportunities.”</i>
Losing biodiversity and eco-network	96	<i>“Dhaka’s biodiversity loss threatens its eco-network balance. Urbanization, unplanned development, and population growth destroy vital natural habitats like wetlands and forests.”</i>

Results

The table 3 provides an overview of the distribution of key informants across various professional backgrounds involved in the study. It reflects a diverse range of expertise, including environmental sciences, urban planning, sociology, academia, and governmental bodies responsible for city development and management. Such diversity ensures a comprehensive understanding of the complex interactions between climate change and urban dynamics in Dhaka, Bangladesh.

Table 3. indicates the information of respondent

Rank of Key Informants Interview	No
Environmentalists	2
Urban Planners	3
Sociologists	2
Specialist University Faculty Members	3
Representatives from Dhaka North and South City Corporation	4
Representatives from Capital Development Authority (RAJUK)	3
Ward Councilors	3

Expansion of informal settlement

The study reveals those informal settlements growing rapidly in Dhaka due to urbanization and migration from rural areas. These settlements lack proper infrastructure and services, burdening the city's resources and leading to overcrowding and environmental damage. People in these settlements face social and economic challenges, with limited access to basic services, and worsening urban inequalities. Addressing these issues is crucial for Dhaka's well-being amidst urban expansion. One of my KII dictated that

“Rapid urbanization and rural-to-urban migration have led to inadequate infrastructure and services in these settlements. The spread of informal settlements in Dhaka demands resources and infrastructure, causing overcrowding, environmental damage, and heightened disaster risk”
(KII#13)

This research dictated a wide-ranging impact of climate change, not only on disaster-prone regions but also on urban settlements. Bangladesh, being a small country, faces significant hurdles in accommodating its large population. This challenge is compounded by factors like riverbank erosion, which drives rural-to-urban migration. However, the influx of people into cities is not adequately managed, leading to chaos. Despite citizens' hopes for opportunities in urban areas, the lack of adherence to rules further complicates the situation. Addressing these issues requires effective management and urban planning strategies to mitigate the adverse effects of climate-induced migration on urban environments.

“Climate change affects urban settlement in Bangladesh, posing challenges due to its large population with immediate consequences. Riverbank erosion drives rural migration to poorly managed cities, where newcomers often disregard rules, contributing to chaos.” (KII#02)

The qualitative research reveals that rural migrants' settlement in cities disrupts established urban plans, spawning fresh challenges. Most migrant women who come for employment are typically poor and uneducated, leading to substandard living conditions. They often lack awareness of the city's rules and regulations. Despite allocated areas, they often evolve into informal settlements, enduring without resolution for years. Residents face socioeconomic marginalization and limited access to vital services, exacerbating urban inequalities.

“Rural migrants settling in cities disrupt existing urban plans, leading to new problems. City areas often become centers of unresolved informal settlements for years” (KII#07)

Population influx

Climate change-induced factors, including natural disasters and environmental degradation, are driving rural-to-urban migration to Dhaka. Rising sea levels and extreme weather events force-displacement, overwhelming urban infrastructure. Urgent action is needed to address the strain on housing, sanitation, and services. Proactive measures must focus on building resilience, promoting sustainable urban development, and fostering inclusive growth. Collaboration and international cooperation are vital for mitigating the impacts of climate-induced migration on Dhaka's urban landscape.

“Dhaka's population growth due to climate issues poses challenges for planners and policymakers. Rising sea levels, frequent flooding, and extreme weather events have forced many

people from rural areas to migrate to Dhaka in search of livelihoods and safety.” (KII#04)

Dhaka experiences a substantial annual influx, with approximately ten million people as per the respondent statement migrating for diverse needs, including education and employment opportunities. However, environmental disasters such as river erosion contribute significantly to this migration. The findings underscore the multifaceted drivers behind urban migration, highlighting the pressing need for comprehensive policies addressing both socioeconomic and environmental factors to ensure sustainable urban development in Dhaka.

“People move to Dhaka for work. Every year, about ten million people come for various reasons, including basic needs. In many cases, individuals migrate to Dhaka for education and employment opportunities. However, some migration to Dhaka is due to environmental disasters like river erosion and natural calamities.” (KII#15)

The burgeoning population influx exacerbates Dhaka's urban challenges, intensifying congestion, pollution, and crime. Despite adverse effects, the city adapts, evolving into a multifaceted urban center. The migration surge contributes to diverse activities, reshaping Dhaka into a vibrant metropolis. Climate change emerges as a pivotal factor in population migration dynamics, accentuating the urgency for holistic approaches to address the intertwined challenges of urbanization and environmental resilience in Dhaka.

“This migration burdens our city, exacerbating congestion, pollution, and crime. Dhaka faces challenges including pollution and crime due to overpopulation. As a result, Dhaka has evolved into a diverse urban hub to accommodate the influx of residents, contributing to its vibrancy.” (KII#10)

Pressure on basic civic amenities

Dhaka faces a critical issue with its basic services like water, sanitation, waste management, and healthcare due to rapid population growth and poor urban planning. For instance, the water supply system can't keep up with the city's growing needs, leaving many in informal settlements without reliable clean water. To fix this, urgent action is needed, including better planning and infrastructure to ensure everyone in Dhaka has access to these essential services.

“Rapid population growth burdens Dhaka’s essential services like water, sanitation, waste management, and healthcare, impacting residents’ daily lives. Dhaka’s water supply system fails to keep up with growing demand, especially in informal settlements. (KII#17)

Migration from vulnerable regions like Bhola, Satkhira, and others to urban areas due to factors like river erosion and cyclones exacerbates unplanned urban growth and overcrowding. This influx leads to heavier traffic and unhealthy living conditions. Urgent measures are essential to address these challenges, emphasizing sustainable urban planning and infrastructure development to ensure the well-being of both migrants and existing urban residents.

“People migrating from areas like Bhola, Satkhira, Khulna, Bagerhat, Patuakhali, and Pirojpur face challenges like river erosion and extreme weather, pushing them to urban areas for safety. Yet, this migration leads to unplanned urban expansion, increased traffic, and overcrowding, resulting in unhealthy living conditions.” (KII#03)

Rapid population growth and traffic congestion pose significant challenges to urban planning efforts, exacerbated by frequent natural disasters. Despite government initiatives, urban transportation systems suffer from congestion and environmental problems such as air and noise pollution. This highlights the critical need for resilient urban infrastructure and disaster preparedness strategies to mitigate the adverse impacts of population surges and ensure sustainable urban development in Bangladesh.

“More people and traffic strain urban planning. Despite government efforts, natural disasters often disrupt plans, especially in cities. As a result, transportation systems are heavily impacted by the population increase, causing congestion and environmental problems like air and noise pollution.” (KII#06)

Infrastructure vulnerability

Dhaka's infrastructure vulnerability results from rapid urban growth, insufficient development, and poor planning. This leaves the city exposed to hazards like flooding, traffic congestion, and environmental degradation due to unplanned drainage systems. These challenges undermine the city's resilience and livability. Addressing these interconnected factors is crucial for bolstering Dhaka's infrastructure resilience and ensuring a sustainable and thriving urban environment for its residents.

“Dhaka’s infrastructure vulnerability, due to rapid urbanization and poor planning, leads to issues like flooding, congestion, and environmental degradation. For instance, increased informal settlements generate waste that isn’t properly disposed of. This leads to waterlogging in Dhaka city. (KII#16)

Development in Dhaka's surrounding areas triggers urban expansion, boosting infrastructure, housing, and legal services. However, unchecked population growth hampers these efforts, worsening congestion and pollution despite some job creation through road and infrastructure enhancements. Climate change compounds these challenges, necessitating planned infrastructure, improved drainage systems, and updated transportation regulations. Addressing these interconnected factors is essential for sustainable urban development and resilience in Dhaka's expanding metropolitan region.

“Development in infrastructure, housing, and legal services in Dhaka city leads to urban expansion. When the population surpasses certain limits, it indirectly hampers development efforts. Improvements create jobs but population growth worsens congestion and pollution” (KII#17)

Unregulated rural-to-urban migration has led to the construction of haphazard drainage systems ill-equipped to handle population growth. Improper drainage placement results in waterlogging during heavy rainfall, inconveniencing the public. Often, actions are reactive, responding solely to seasonal conditions without long-term planning. Consequently, drainage systems overflow, exacerbating the situation. Despite recurring issues, repairs are often delayed or inadequate. Addressing these shortcomings demands proactive, comprehensive strategies to ensure effective drainage infrastructure, mitigating the impact of waterlogging, and safeguarding public welfare in the face of increasing urbanization.

“Poorly planned drainage systems for rural migrants cause waterlogging. Overflowing drains during heavy rainfall inconvenience the public. Reactive measures, based on seasons, often

worsen situations without subsequent repairs.” (KII#18)

Rising heat waves and public health concern

The rising frequency and intensity of heat waves present grave public health challenges, particularly impacting vulnerable groups like the elderly and those with health issues. These heat waves worsen air pollution and water scarcity, compounding health risks. Moreover, they trigger heat-related illnesses such as heatstroke, straining healthcare systems further. Unfortunately, responses often lag, exacerbating the situation without adequate repair. Addressing these challenges requires proactive measures to protect public health, including robust healthcare planning and climate adaptation strategies.

“Heat waves increasingly endanger public health, particularly for vulnerable groups like the elderly and those with health conditions. They worsen air pollution and water scarcity, causing heat-related illnesses and burdening healthcare systems.” (KII#11)

The lack of urban planning in Dhaka results in unplanned settlements due to population growth. Natural disasters and climate change impact the city, causing river erosion and floods. Excessive urbanization contributes to air and noise pollution, creating an unhealthy environment and leading to widespread health issues. This hampers job opportunities and overall well-being. Unfortunately, the situation often deteriorates without adequate repairs or preventive measures, highlighting the urgent need for comprehensive urban planning and environmental management strategies.

“Poor urban planning in Dhaka results in unplanned settlements due to population growth. Natural disasters and climate change worsen air and noise pollution, leading to health issues and limited job opportunities.” (KII#09)

City residents struggle to secure adequate housing, education, healthcare, and basic rights for their children. They lack the necessary resources and support systems. Addressing these challenges is crucial for ensuring the future well-being and development of children. This requires mitigation of heat waves and the enhancement of health-related facilities to foster sustainable development. Proactive measures are essential to create a conducive environment where children can thrive and contribute to the future prosperity of the city.

“City residents face difficulties providing housing, education, healthcare, and basic rights for their children. To secure their future, we must reduce heat waves and improve health facilities for sustainable development.” (KII#14)

Losing biodiversity and eco-network

The decline in biodiversity in Dhaka city is alarming, jeopardizing its ecological balance. Uncontrolled urbanization, haphazard development, and population expansion have ravaged natural habitats like wetlands, forests, and water bodies. These ecosystems, crucial for maintaining the city's ecological equilibrium, have suffered significant destruction. Urgent action is needed to address this threat, including measures to preserve and restore these habitats. Safeguarding biodiversity is essential for Dhaka's sustainability and resilience in the face of rapid urban growth and environmental challenges.

“Dhaka’s biodiversity loss threatens its eco-network balance. Urbanization, unplanned development, and population growth destroy vital natural habitats like wetlands and forests.”

Dhaka city, bordered by the Buriganga River and others, suffers from underutilization and neglect of its waterways. Climate change exacerbates this disconnect, disrupting riverine livelihoods and fostering encroachment in adjacent areas. Consequently, water resources are compromised, and aquatic biodiversity suffers. Restoring connections with the rivers is crucial to mitigate these impacts, ensuring sustainable riverine livelihoods, preserving water resources, and safeguarding aquatic ecosystems in Dhaka.

“Dhaka city is on the banks of the Buriganga River, surrounded by others. However, they’re not properly used due to neglect. Climate change worsens this, leading to lost livelihoods, encroachment, disrupted water, and biodiversity loss.” (KII#08)

Pollution has drastically reduced river usage in Dhaka, hampering their role in transportation and other activities. Previously vital for water supply and communication, rivers like Buriganga, Dholai, Turag, and Balu now suffer neglect due to poor urban planning. This neglect has led to deteriorating communication systems and limited water supply, directly impacting residents' livelihoods. To revive river utility and ensure sustainable livelihoods, addressing pollution and integrating rivers into urban planning are essential.

“Pollution has made rivers in Dhaka less usable. They were once crucial for transportation and water supply, but now they suffer due to neglect. This has led to deteriorated communication systems and limited water supply, affecting people’s lives.” (KII#05)

Discussion

The expansion of informal settlements presents a significant challenge to urban planning in the face of climate change. Local community-based knowledge and action are necessary to tackle change (Cobbinah & Finn, 2023) while (Ziervogel, 2021) focuses on transformative adaptation and the consideration of immediate risks. (Pathak & Mahadevia, 2018) postulates the difficulties in mainstreaming climate change resilience in formal urban policies, particularly in the context of Indian cities. The expansion of informal settlements in Dhaka due to climate change is a complex issue that requires a different approach. (Jabeen & Guy, 2015) emphasizes the need for alternative adaptation strategies that consider the co-evolution of poverty, urbanization, and climate risks. (Rahman et al., 2018) reveals the impact of rural-urban migration on the growth of informal settlements and their effect on land use and cover. (Swapn et al., 2017b) the challenges faced by Dhaka, including those related to informal urbanization and climate change, and the need for integrated infrastructure and service planning. Our study found that climate change is driving the rapid expansion of informal settlements in Dhaka. Rural migrants, displaced by rising sea levels and extreme weather, flock to the city, worsening overcrowding and straining infrastructure. Without proper planning and mitigation, these settlements become more vulnerable to flooding and other hazards. Urgent action is needed to develop comprehensive urban resilience strategies, safeguarding vulnerable populations from the impacts of climate change. The impact of climate change on urban planning is a complex and diverse issue. (Norman, 2022b) and (Nowak, 2024) both disclose the need for a paradigm shift in urban problem-solving, with a focus on environmentally sustainable cities. They emphasize the importance of considering the implications of climate change in urban planning, particularly about extreme weather events and rising temperatures. (Friedemann, 2023b) adds to this discussion by pointing out the demographic

challenges that urban planners will face as a result of climate change, such as accommodating an aging society and addressing population influx. Where Tailored urban policies are crucial for mitigating climate change impacts (Fujii et al., 2017). The impact of climate change on population dynamics is a complex issue, influenced by a range of social, economic, and environmental factors (LOCKE, 2009). The potential for significant mass migration due to climate change is a legitimate concern, particularly in developing countries (Stephenson et al., 2010). This migration is expected to occur primarily within countries or regions, with different types of migration posing unique health risks (Barrett, 2012). population affects carbon emissions, while climate change impacts mortality rates and population growth (Lupi & Marsiglio, 2021). On the other hand, our study claimed that climate change is pushing people from coastal areas to Dhaka. This is making the city crowded. Roads, houses, and resources are under pressure. We need to act fast to handle this. We must work together to make Dhaka strong enough to face these challenges.

The impact of climate change on basic civic amenities in cities is a pressing issue, with urban areas facing unique vulnerabilities (Gasper et al., 2011a). These include risks to infrastructure, energy shortages, and scarcity of food and water. Proper building design and the incorporation of green spaces are essential for reducing risks in the environment (Wilby, 2007). Implementation of climate change actions in cities, especially in developing countries, is hindered by resource constraints and other urban challenges (Dulal, 2017). The rapid population growth and uncontrolled urbanization in Dhaka have led to a range of challenges, including the provision of basic urban services, reliable transportation, water and energy supply, sanitation, waste management, and affordable housing (Swapan et al., 2017c). These challenges are further exacerbated by the city's vulnerability to climate-induced hazards, such as flooding, water logging, and extreme weather events (Rabbani et al., 2011b). The city's contribution to greenhouse gas emissions, combined with its vulnerability to climate change impacts, underscores the need for immediate measures to reduce its vulnerability (Alam & Rabbani, 2007a). Where our study dictates that in Dhaka city, climate change is putting extra pressure on basic services. Due to climate change, more people getting the vulnerable situations in rural areas and they are trying to shift from rural to urban areas for better livelihood. This overpopulation creates some sort of problems for urban plans and planners. Urban areas are particularly vulnerable to climate change due to their location and population density (Gasper et al., 2011b). Interconnected urban infrastructure makes cities more vulnerable to widespread failures (Clark et al., 2019). A vulnerability assessment approach is needed to develop urban water infrastructures (Dong et al., 2020). Assessment of city vulnerabilities necessitates the implementation of adaptation policies. (Rome et al., 2019). Dhaka city is highly vulnerable to climate change due to its exposure to multiple hazards, including flooding, and its inadequate infrastructure (Rabbani et al., 2011c). The city's population density, poor infrastructure, and low adaptive capacity further exacerbate this vulnerability (Shahid et al., 2016b). Despite the government's efforts to improve air quality and flood resilience, more effective action is needed to address these challenges (Alam & Rabbani, 2007b). Our study postulated that climate change poses a significant challenge to urban planning by increasing the vulnerability of infrastructure like unplanned drainage systems, housing buildings, unhealthy sanitation, and robust traffic congestion. This extra migrated people in Dhaka city create more pressure on the infrastructure.

The increasing frequency and intensity of heat waves due to climate change pose a significant public health concern in cities (Kovats & Hajat, 2008; Luber & McGeheh,

2008a). Vulnerable populations, such as the elderly and those with chronic diseases, are particularly at risk (Kovats & Hajat, 2008). Urbanization and climate change further exacerbate heat waves (McCarthy et al., 2010). Elevated temperatures have been linked to a higher risk of mortality, especially in urban areas (Basu, 2002). It's essential to have effective public health responses, like heat response plans and better communication, to tackle this growing issue (Luber & McGeehin, 2008b). The impact of climate change on public health in Dhaka, Bangladesh is a growing concern, with rising heat waves being a significant factor (Hasib & Chathoth, 2016). Historical trends and future projections indicate a significant increase in nighttime temperatures and temperature-related extreme events, further exacerbating public health risks (Ahmed Shourav et al., 2016). These risks include direct effects such as heat stress, as well as indirect effects like food and water insecurity and the spread of infectious diseases (Rahman et al., 2019). Our study highlighted that rising heat waves are becoming a big worry for public health. Climate change is the reason for hot waves. People are at higher risk of getting sick from heat-related problems like dehydration and heatstroke. Climate change is making heat waves more frequent and severe. Climate change is having a significant impact on the biodiversity of Dhaka City, particularly in its wetlands and the Sundarbans mangrove forest (Kibria & Yousuf Haroon, 2017; Nishat & Chowdhury, 2019). The city's vulnerability to climate-induced hazards, including waterlogging and flooding (Rabbani et al., 2011d). Despite these threats, there is a lack of specific strategies and policies to address the effects of climate change on biodiversity in Dhaka City (DAS, 2009). Cities face a growing risk of losing biodiversity and eco-networks due to climate change, leading to habitat degradation, disease spread, and added pressure on wetlands and woodlands (Wilby & Perry, 2006a). Green spaces present opportunities for conservation and adaptation to mitigate threats (Butt et al., 2018; Morimoto, 2011; Wilby & Perry, 2006b). The ecosystem services approach can also be used to better plan and conserve urban green spaces (Niemelä et al., 2010). Our findings highlight that climate change has detrimental effects on biodiversity loss in ecological networks. The decline in biodiversity in Dhaka City poses a significant threat to its ecological balance due to uncontrolled urbanization and population growth. Climate change directly or indirectly creates an extra burden for cities. This extended pressure is the reason for environmental degradation and the loss of biodiversity and eco-networks.

Conclusion

In conclusion, this study underscores the critical importance of addressing the intricate interplay between climate change and urban dynamics in Dhaka, Bangladesh. Through comprehensive interviews with key stakeholders and policymakers, we have identified six core challenges facing the municipal corporation authority in managing urban planning amidst climate change. These challenges, ranging from the proliferation of informal settlements to the intensification of heatwaves and associated health risks, significantly impede proper urban operation and handling. Drawing from our findings, we advocate for reinforcing legislation and regulations to address overpopulation through strategic urban planning and population control measures. Additionally, allocating adequate financial resources for infrastructure development and maintenance is crucial to enhancing resilience against climate-related hazards. Mitigation measures aimed at reducing heatwaves and preserving biodiversity and ecological networks within urban areas are also recommended. By shedding light on these challenges and offering evidence-based strategies for sustainable urban development, this study contributes to the ongoing efforts to mitigate and adapt to the impacts of climate change in Dhaka. These insights can inform policymakers, urban planners, and stakeholders in their endeavors to foster resilient and sustainable urban

environments, ultimately safeguarding the well-being of the city and its inhabitants in the face of a changing climate.

Declaration

Funding: The authors didn't receive any internal or external funding sources.

Ethical Approval: Approval for this study has been granted by the Institutional Ethical Review Board of the Faculty of Humanities and Social Science at Daffodil International University, situated in Dhaka -1212, Bangladesh. The study is assigned the Ethical No. Ethics/ Khan01/2023.

Informed consent: Upon comprehending these factors, the majority of participants granted written informed consent, whereas those who were illiterate granted verbal informed consent. Furthermore, the process of acquiring informed permission was sanctioned by the Institutional Ethical Review Board at Daffodil International University in Bangladesh

Author's contribution: Mohammad Marufur Rashid Khan initiated the study's conceptualization and data collection, processed the data, performed statistical analysis, and wrote the whole manuscript.

Conflicts of Interest: The authors stated no conflict of interest.

Data Availability: The data will be available upon reasonable request

Acknowledgments: We would like to thank those who participated in the study for sharing their moving experiences and devoting their time to it so quickly.

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