

Managing the Urban Environment in Dhaka, Bangladesh

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Abstract

This article brings the contemporary thinking and practice of Urban Environmental Management to the solution of current and persistent environmental problems of Dhaka, the capital and largest city of Bangladesh. A megacity with a population of 10.4 million in 2024, and a metropolitan region of over 23.9 million people (Ferreira, 2022; World Population Review, 2024), it is widely considered to be the most densely populated built-up urban area in the world. Dhaka is an important cultural, economic, and scientific hub of Eastern South Asia, is an important majority Muslim city, and is the largest Bengali-speaking city in the world and is the world's 6th largest city (Dhaka Tribune, 2023). Its GDP ranks 39th worldwide. Nevertheless, it is plagued by overt and serious environmental problems of widespread slum housing, poor air quality, transportation congestion, water pollution and inadequate sewage and sanitation infrastructure among them. The article first considers the context of the city, and then reviews the key issues of poverty alleviation, industry, energy, transportation, wastewater and solid waste, water management and finance. Finally, it proposes a 5-year plan to help alleviate the city's urban environmental problems by utilizing a real-world database and working within the financial institutions of Bangladesh.

Keywords

Urban Planning, Regional Planning, Urban Environmental Management, UEM

1. Introduction

This volume, *Managing the Urban Environment—Dhaka, Bangladesh* is the 11th in a series of books that focus on the practice of Urban Environmental Management (UEM) in developing countries, which both face more immediate, critical problems

than the developed world and have fewer resources to deal with them in a comprehensive manner relevant for their culture. Previous books have proposed environmental plans for Mysore, India (Edelman, 2014), Lagos, Nigeria (Edelman, 2015), Manila, the Philippines (Edelman, 2016), Lima, Peru (Edelman, 2018), Santo Domingo, the Dominican Republic (Edelman, 2019), Jakarta, Indonesia (Edelman, 2020), Istanbul, Türkiye (Edelman, 2021), Bangkok, Thailand (Edelman, 2022), Casablanca, Morocco (Edelman, 2022), and Rio de Janeiro, Brazil (Edelman, 2024). Forthcoming books are planned for San Juan, Puerto Rico, Mexico City, Mexico, Kingston, Jamaica, and Nairobi, Kenya. In the wake of the HABITAT III Conference in Quito, Ecuador in 2016, these studies contribute directly to understanding the urban environmental challenges inherent in achieving the objectives of the conference's final document: *The Quito Declaration on Sustainable Cities and Human Settlements for All* (HABITAT, 2016).

1.1. The Current Study

This is the report of a graduate-level workshop that took place at the School of Planning, College of Design, Architecture, Art and Planning, University of Cincinnati, USA from August through December 2024. The objective of the workshop was to prepare students to work overseas in data-poor environments as professional consulting planners. Several lectures were given to set the framework of the mixed class of twelve domestic and international students to operate in seven collaborative sector-level working groups or teams preparing a 5-year plan for metropolitan Dhaka, Bangladesh utilizing a real-world database and a limited budget.

1.2. Dhaka Today

In 2008, Dhaka celebrated 400 years as a municipality, and it is the center of political, economic and cultural life in Bangladesh. It is the seat of the Government of Bangladesh, many national companies, and leading Bangladeshi educational, scientific, research, and cultural organizations. Since its establishment as a modern capital city, the population, area and social and economic diversity of Dhaka have grown tremendously, and Dhaka accounts for 35% of the country's economy. The city is known for its rickshaws, Kacchi Biryani, art festivals, street food and religious diversity.

Traditional products include *jamdani* (fine-quality muslin), embroidery, silk, and jewelry. Among the city's major industries are jute processing and the manufacture of chemicals, pharmaceuticals, textiles, leather goods, ceramics, and electronics products. A strong export-oriented garment industry emerged in the late 20th century, and Bangladeshi manufactured clothing items are sold in department stores throughout the United States, Canada and Europe (Ibid.).

2. Poverty Alleviation

Dhaka the capital city of Bangladesh is among those cities in the world that has the highest population of slum dwellers within urban areas. The slums of Dhaka

are a perfect example of urban poverty, with millions of residents living in squalor, cramped living conditions, limited living space, no access to clean water nor proper sanitation, little to no access to education, health care, or employment. These communities encounter health dysfunction associated with bad sanitation as well as restricted socio-economic opportunity.

The research identifies four primary areas where interventions are needed: employment creation, housing and urban infrastructure, labor market and auxiliary programs and services, and education and human resources development. These are important areas through which the poverty cycle can be interrupted and new, sustainable changes for the inhabitants of the slums can be initiated. Dealing with these problems calls for multilateral involvement of local, national, and even international agencies. Some of the proposed strategies in the containment of these problems include investment in physical infrastructure to address the poor current state of roads, sanitation, and waste management investing in construction of affordable houses to enhance living standards. In addition, measures that are recommended for the labor market include: improved vocational training and employment opportunities for women and youth. Cash transfer services and subsidies on healthcare will also supplement general economic security.

Concerning the goals of the 8th National Development Plan, it is emphasized that the envisaged investments aim at building and rehabilitation of public utilities and amenities such as roads, sewers and drains, solid waste management among others. All these improvements are sufficiently important for the overall improvement of the population's health, to decrease the spread of disease, and increase people's opportunities to find easier access to the markets through better means of transportation. The probable fiduciary need for the above listed infrastructure projects is between half a billion and one billion dollars in five years. In addition to this, affordable housing projects will be an important part of the plan with a need for \$300 - \$700 million. An additional aspect of the reconstruction effort is provision of housing subsidies for families from hazardous zones, and the construction of safe community facilities, schools and clinics which would help enhance the quality-of-life remote slum regions.

Another key area of focus in this research is Economic Empowerment. This particular social research offers an integrated concept to labor market reforms among which are the policies on vocational training, skills development as well as job creation initiatives specifically for women and youths. These are in view of providing the inhabitants of the slum areas with the competency level demanded in higher wage employment. Hence economic stability. The financial costs for labor market reforms and social protection programs are projected at \$200 million-\$300 million. These investments shall bring about a structural change in the livelihoods of the residents in the slum to minimize their susceptibility to economic volatility.

Enhancing educational enrollment is another component of this study. The solutions suggest subsequent construction of new schools, improvement of the ex-

isting infrastructures, and improving or training teachers to enhance general education in the slum areas. Educational programs will ensure that the residents of slums, especially children, receive the opportunity that they need to break out of cyclical poverty. To support educational reforms some \$150 million will be needed for construction of schools, training of teachers, and scholarships for tertiary education. The idea of those interventions, thus, is to deliver education and, in return, give slum dwellers a better future.

The total financial implication for the full implementation of these strategies in the next five years is between \$850 million and \$1.5 billion. This funding is going to have to be a mix of government grants, international donations, PPP and CSR funding. The effectiveness of all these interventions will call for involvement of the government, both local and international organizations, NGOs and the private sector. To make the sustenance and effectiveness of all the intended interventions, each of the partners will be expected to bring their distinctive skills and resources on board.

The study also uncovered several factors that may escalate and impede the achievement of the above-mentioned strategies, such as political instability and bureaucratic problems, as well as the quest for a sustainable, stable source of funding. But these challenges are avoidable when its governance is clear, people's involvement is forced, and there is support for collaborations. The research also revealed areas of strength that are clearly outlined as the ability to create the possibility for slum developments in expanded urban cities around the globe. Thus, striving to ensure an improved multi-sectoral integrated approach towards the sustainable community development of Dhaka city where equitably appropriate environmental, social and economic activities can be formulated to support the rights and needs of all stakeholders during sustainable urban development.

Therefore, this research gives clearcut, further plan for the tactics needed to ameliorate living standards in the slum area of Dhaka. Investment should be made primarily in infrastructure, education, the labor market, and social protection to upgrade the slum areas of Dhaka to secure and sustainable communities. When these strategies are efficiently implemented, millions of slum dwellers will benefit and move towards attaining the greater vision of sustainable urban development in Bangladesh. Nevertheless, there are challenges to overcome through the proposed interventions to provide a way to give the inhabitants of slums a chance for healthier and more prosperous lives.

In the past, physical planning in Dhaka has been poor in effectively responding to these challenges of rapid growth (Yin et al., 2021). The city's infrastructure, such as the transport networks, accommodation, and public utilities, still lags the size of the population. Inadequate or ineffective urban planning has created a disorganized development of the city, and slums are found on the outskirts of Dhaka and along its water bodies, which make them prone to flooding (Ahmed, 2014). Furthermore, government policies have time and again not had the capacity to solve poverty questions like landlessness, labor bondage, and insecurity of re-

sources. These matters have been compounded in recent years by fraud and ineffectiveness in urban administration, which has failed to enforce housing laws and often completely neglected to provide social services in impoverished communities (Murad et al., 2021).

In the last few years, there have been attempts by the government and international organizations to tackle the issues of poverty in the urban areas of Dhaka, but the performance has been poor (Akther & Ahmad, 2021). Work has been done to alleviate extreme poverty to some extent; however, there are still a huge number of inhabitants living in poverty because of numerous problems that this city has been facing for several generations now. The overall low efficacy of poverty reduction programs depends on several factors encompassed by Dhaka's socio-economic structure, which comprises housing problems, healthcare, education, and social issues like corruption, employment in informal sectors, and acts of environmental degradation (Khanom et al., 2023). Often, there is a need for effective solutions at different levels: governmental policies, foreign assistance on both individual and collective bases, and local campaigns for change.

Since the independence of Bangladesh, Dhaka has faced some real developmental issues. In recent years, population growth has outpaced the physical growth of the city, creating many issues (Roy et al., 2021). The waves of migration to the city mainly consisted of illiterate people from rural areas because of job opportunities and natural calamities like floods and cyclones that have ravaged farmland (Rezaul Islam et al., 2020). This has led to the urbanization of Bangladesh, particularly in Dhaka, where factories such as garment industries have greatly impacted the Bangladeshi GDP, and provided job opportunities to the rural women who migrate from the rural areas. Over the years, this has put pressure on the infrastructure in Dhaka, especially because the city was not designed to accommodate the millions of people who currently live there (Ahsan, 2023).

3. Industry

The war for liberation in 1971 saw Bangladesh gain its independence. However, it saw much of its national industry destroyed in the process. The nation lost much of its industrial output, and cottage industries once again became a significant part of the economy for a period. Facing economic hardship due to industrial loss, the government began funding various agencies to help improve the nation's industrial output. Dhaka has been consistently growing throughout the past century, and today is home to many large industrial sectors. This is mainly due to the implementation of industrial policy plans every 4 - 6 years, encouraging rapid industrial growth. Recently, the government has been encouraging growth within rural regions of Bangladesh. However, much of their policy involves Dhaka due to its constant need to provide work and high industrial output.

3.1. Modern Slavery

Modern slavery remains an ongoing issue in Dhaka, particularly within the brick,

readymade garment (RMG), pharmaceutical, and information technology (IT) sectors. Despite various efforts to combat these practices, vulnerable populations continue to face exploitation and abuse ([Global Slavery Index, 2023](#)). Researchers have highlighted that inconsistent data collection and reporting methods hinder effective international collaboration against modern slavery. The lack of education and proper resources leads to exploitative practices and vulnerable workers. Many employees do not even know what their rights are.

In Dhaka's brick kilns, forced labor is a significant concern. Workers, including children, often endure hazardous conditions with minimal compensation. Labor exploitation is widespread in Dhaka, especially in informal RMG factories. The fast-paced, price-driven fashion industry is the primary motivator for modern slavery. The fashion industry is identified as one of the biggest promoters of modern slavery, with clothing being the second-highest product at risk of being made by modern enslaved people. A 2022 study revealed that 86% of workers in the informal RMG sector met the criteria for forced labor, with women and internal migrants disproportionately affected. Workers face wage exploitation, receiving illegally low wages for their time and work ([Nafiu, 2021](#)). The Pharmaceutical Supply Chain Initiative notes that a complex supply chain can hide labor practices, including forced labor.

Due to the growth of the pharmaceutical sector, without strict enforceable guidelines, it leaves room for oversight. Much like Dhaka's pharmaceutical industry, Bangladesh's IT sector is rapidly growing and offering employment opportunities. The IT industry often relies on complex global supply chains for hardware components. There is a risk of labor exploitation at various stages, including raw material extraction and manufacturing.

3.2. Ready-Made Garment Industry

The textile industry in Dhaka began gaining momentum in the 1980s. With Bangladesh having a large, low-wage labor force, the country became a prime location for garment production. With its numerous factories and proximity to ports, Dhaka continued to grow as the center of this boom. Local entrepreneurs largely drove early investments, while foreign investors began entering the market later.

Today, Bangladesh has 4000 RMG factories, with about 1100 of them in Dhaka. The textile and garment industry contributes around 80% - 85% of Bangladesh's total exports and 11% of the country's GDP. The sector employs over 4 million workers, a significant percentage located in or around Dhaka. Bangladesh's economy is dependent on the readymade garment industry. However, the industry is environmentally damaging, with poor working conditions, low wages, pollution, and ambiguous workers' rights. This industry has massed so much money and invested so much capital that the problems must be addressed or regulated correctly. Even with policies in place, years of protest, and disasters striking, external forces are finally pushing for a greener future instead of the government. Though

not immediately implemented, these changes have the potential for a brighter, more sustainable future. Despite international scrutiny and safety concerns, the industry is only increasing in demand due to Western countries.

3.3. Brick Manufacturing Industry

Within the greater Dhaka region, brick manufacturing only makes up 1 percent of the economy within the city. While this is the case and more large-scale sectors within the city have economic impacts, the environmental impact of brick manufacturing in Dhaka is costly enough that it must be addressed. Regarding aerial emissions and concentrations of harmful aerosols, brick manufacturing produces an estimated 30% - 40% of all PM2.5 aerosols found in Dhaka's air. For the level of economic stimulation produced by brick kilns, brick manufacturing has far too many health and environmental implications for it to be a long-term function of the economy.

Industry's impact on the natural environment and human health and safety is a significant issue for Dhaka. Codes are often not maintained or enforced, leading to potential workplace hazards and long-term environmental impacts. Limited regulations lead to pollution within the natural environment. Longstanding issues involving industrial environments are growing more extreme due to climate change. The impacts of dyeing textiles have detrimental effects on the environment, particularly in Dhaka, as noted in a recent study.

3.4. Pharmaceutical Industry

The pharmaceutical industry in Bangladesh, particularly in Dhaka, began to grow after the introduction of the Drug Policy of 1982. This policy prioritized local production and limited the importation of certain foreign drugs, allowing local companies to grow and get a competitive edge. During the 1990s, local pharmaceutical companies expanded rapidly, benefiting from favorable government policies and low-cost labor and manufacturing. The industry became largely self-sufficient. Local companies began producing over 97% of the country's medicinal needs. Presently, the country is still self-sufficient in most domestic products and one of the fastest-growing sectors in the country. Bangladesh is the only Least Developed Country in the world that makes 97% of its product needs.

Foreign investors, patent waivers, and government policies fund the pharmaceutical industry, which is proliferating, with an annual growth rate of over 12%. The industry is expected to reach \$6 billion by 2025. Pharmaceuticals are one of the fastest-growing sectors in the country. The government is heavily invested in the growth of the pharmaceutical sector. With this sector being so highly valued, it will continue to grow due to the rising middle class, technological improvements, and increasing demand for medicine at local and international levels. Exporting medicines to over 150 countries, the sector is increasingly focused on capturing global markets, particularly Europe and the United States.

3.5. Information Technology Industry

Within Dhaka, the information technology sector has experienced rapid growth and improvement over the last decade. The information technology industry within Dhaka is primarily related to communications, with many companies in the United States and other countries outsourcing customer service and call center work to the city. The information technology sector has developed significantly in Dhaka in recent years. As of 2021, this market is valued at just over \$1.4 billion and growing daily. The sector employs over 300,000 professionals, many highly skilled in programming, software development, and IT-enabled services. While this sector makes up a little less than 1% of the nation's total GDP, it has a high potential to allow Dhaka to diversify further its industrial output more ethically regarding comparative pollution and health risks.

With a rapid rise on the internet and technology accessibility of the average citizen in Dhaka, the IT industry will continue to grow. The IT sector in Dhaka began to take off in the early 2000s, driven by increased internet usage of citizens in Dhaka, more opportunities to get a career in IT, and better resources to access the internet.

3.6. Desired Directions

With industrial issues having been outlined above, a brief assessment of what potential solutions can be adopted to develop an improved industrial sector are suggested. The primary goals in relation to industrial improvements within Dhaka are to ensure that the city is able to increase industrial output with a method that is both sustainable and equitable, preventing the degradation of both the environment and public health. Measures to be taken are suggested for the RMG, pharmaceutical, brick manufacturing and IT industries.

4. Energy

4.1. Introduction

When looking at the domestically produced energy supply in Bangladesh, natural gas makes up over 70% of the domestic energy supply, and oil, coal, and renewables combining for around just 2%.

Since gaining independence in 1971, Bangladesh has achieved monumental success in growth and development, from being one of the poorest nations on Earth in 1971, to reaching lower-middle income status by 2015, and maintaining consistent GDP growth amid uncertain global economic conditions. Of critical importance to this growth and development is Bangladesh's energy sector, which has achieved just as impressive milestones in access to electricity and generation capacity, particularly in the 21st century. Bangladesh launched its Vision 2021 plan in 2006 with the ambitious goal of achieving middle-income status by the year 2021 (Mahbub, 2024). Alongside this goal was the equally ambitious plan of achieving universal access to electricity, which the country proudly reported as

being achieved in 2022 (Alam, 2023). However, universal access does not necessarily beget universal usage, and Bangladesh deals with significant issues when it comes to efficiently generating electricity for a population and economy that are increasingly demanding it. The country currently deals with issues of overcapacity, overreliance on imported fossil fuels, high electricity costs, and load shedding (Ibid.). Additionally, corruption and imperfect competition have also been cited as limiting factors for the energy sector that recent governments and foreign actors are increasingly trying to correct for (Shatil, 2023).

The year 1994 would be yet another landmark year wherein the government, recognizing the shortcomings of previous energy sector reforms, would consult with the World Bank and Asian Development Bank and formally adopt the Power Sector Reforms in Bangladesh (PSRB) policy paper, which would serve as the basis for energy sector reforms for the following two decades. However, these energy sector reforms did not work as well as intended during a time when electricity demand was skyrocketing due to high economic performance (Dhaka Electric Supply Company Limited, 2022).

A major incoming addition, which will add diversity to the energy portfolio is the Ruppur Nuclear Power Plant, located 87 miles west of Dhaka. This will be Bangladesh's first nuclear power plant, and the first unit is set for operation in December 2024, while the second is expected to begin operation in 2025, although current political and economic instability might affect this timeline (Desai, 2024). When fully operational, the power plant will add 2400 MW of electricity to the grid, accounting for about 9% of the country's energy demand (Ibid.).

4.2. Energy Profile of Bangladesh

Since 2010, Bangladesh has continued a trajectory of significant enhancements to its energy generation capacity, moving from a generation capacity of 7264 MW in 2010-2011, to 23,482 MW in 2022-2023. Bangladesh's energy generation is primarily based on fossil fuels, with natural gas and oil making up 52.7% and 26% of the energy mix, respectively. Coal (5.5%) and biofuels (15.5%) make up about one-fifth of the energy supply, while renewables make up a very miniscule 0.1% of Bangladesh's total energy supply.

When looking at the domestically produced energy supply in Bangladesh, the story is similar, with natural gas making up over 70% of the domestic energy supply, and oil, coal, and renewables combining for around just 2%.

Bangladesh is not only incredibly reliant on fossil fuels, but is also incredibly reliant on imported fossil fuels, such as oil and liquefied natural gas (LNG). Net energy imports made up 44.3% of the total energy supply in 2022, which constitutes a 579% increase in imported energy since 2000 (International Energy Agency, 2022).

4.3. Energy Crisis in Bangladesh

The numerous issues in the energy sector at a national scale have created a partic-

ularly difficult situation for residents of Dhaka in recent years, with power cuts becoming common throughout most of the city. While load shedding and outages are most common in rural areas of Bangladesh, Dhaka suffers from a different problem. As one of the most densely populated cities in the world, the city has a scarcity of land, which makes it difficult to build enough substations and transmission infrastructure to cope with the city's massive energy demand (Hossain, 2024). It is common for new substation projects to get scrapped because land acquisition is impossible. This is particularly problematic for some of Dhaka's most rapidly developing areas such as the Gulshan Avenue area (Desai, 2024). Amid a political imbroglio: "What's Next for Bangladesh's Nuclear Energy Dreams?" (South Asian Voices, 2024).

4.4. Conclusion

The energy sector of Dhaka faces significant challenges that are unique to the megacity but also parallel the energy issues of Bangladesh. The current energy crisis in the country is defined by overcapacity, fuel shortages, and skyrocketing power generation prices. With the projections of Dhaka's population increasing significantly, these issues will continue to exacerbate problems in the energy sector. The recent political upheaval within the country puts the future of the energy sector and the country's policies in limbo. However, the preliminary actions of the current interim government are encouraging and seem to correct many of the key issues that have caused the energy crisis. It seems that the interim government will continue the environmental goals of Vision 2041 and reduce dependency on non-renewable energy sources. Thankfully, Bangladesh has immense potential to establish an energy portfolio that boasts clean energy with access to an abundance of renewable energy sources. Such renewable energy sources are possible to develop for Dhaka with small-scale systems such as rooftop solar panels and VAWTs. Other avenues of energy generation, like WtE power plants, have high potential in the city. Overall, the complex issues of the energy crisis can be alleviated with transparent government policies, and greater investments in renewable energy. With these changes within the energy sector, Dhaka's energy future can be more sustainable, reliable, and environmentally friendly.

5. Transportation

5.1. Gridlock in Dhaka Transportation

Dhaka, situated along the Buriganga River in the low and tangled plains of the Padma Delta, strikes one as Venetian in nature with its dense and labyrinthine urban fabric. Likewise, Dhaka suffers from the unique transportation challenges this density imposes upon the city. Unlike Venice, however, Dhaka is also a major world city responsible for a significant portion of Bangladesh's industrial output, resulting in a wide diversity of transportation modes being utilized. Automobiles, motorcycles, public transport vehicles, pedestrians, bicycles, and other widely varying modes of transit all drive the circulation of people and goods within the city.

As such, any solution must be thoughtful in considering the variety of modalities impacted. As of the 2018 revision of the United Nation's World Urbanization Prospects, it is estimated that the population of the megacity of Dhaka was approximately 19.5 million, with the potential to become the fourth largest city in the world by 2030 (UN-DESA, 2018). Limited by geography and the outer bounds of sprawl, this population is highly concentrated, more so than most other major world cities, resulting in a population density of more than 23,000 people per square kilometer (World Population Review, 2024). Density can be attributed as the catalyst for most transportation-related issues, especially that of congestion, Dhaka's most serious problem. Other issues plaguing the transportation sector of Dhaka include poor pedestrian and vehicle safety, significant pollution from vehicle emissions, and a lack of integrated infrastructure and traffic management. Congestion seems to be at the heart of most of Dhaka's urban woes, indicating the direction that mitigating solutions should take.

5.2. Public Sector

5.2.1. Buses

Buses serve as one of the primary modes of public transportation in Dhaka, with more than 75 companies operating over 3,500 vehicles across the metro region. While providing for the daily needs of more than 10 million people, the sheer number of buses, many of which are unregulated, in the massively unorganized bus network, and the size of the vehicles themselves acts as one of the biggest contributors to the city's congestion. Dhaka's BRT, operated by the Bangladesh Road Transport Corporation (BRTC), is one of the city's most built out public transportation systems and seeks to remove these buses from the primary vehicular arteries which are so easily clogged with daily traffic.

5.2.2. Rail

Rail is an active, but still limited, form of public transportation. Dhaka Metro makes up the majority of daily rail trips taken, after opening its first line in 2022. 16 stations exist, and while ridership is over 120,000 passengers daily, this is only a small quantity of daily traffic volumes. Rail infrastructure is preferred, as it takes up less space than roadways, often being elevated, but construction is expensive and very slow.

5.2.3. Dhaka Subway

The Dhaka Subway, another rail option, is the most ambitious but least built-out public transportation system the city has, despite having been planned for nearly a decade. While it would help, it is very expensive, and there have been construction problems.

5.2.4. Ferries

Bangladesh Inland Water Transport Corporation (BIWTC), water taxis, and other privately operated speedboat services are the primary purveyors of those trips. While the larger taxi services are regulated legally, their emissions and the emis-

sions of the smaller personal water vehicles are not regulated and contribute to the overall pollution in Dhaka.

5.3. Private Sector

5.3.1. Automobiles

Private vehicles take up the most space on Dhaka's roads. Personal vehicle ownership has increased exponentially over the past few decades, steadily keeping up with the wild population increase the city has experienced. The lack of traffic management systems means that driving is unnecessarily difficult, time-consuming, and dangerous.

5.3.2. Motorcycles

Motorcycles represent a huge portion of traffic volumes on Dhaka's roads, outnumbering cars three to one. They arbitrarily clog any remaining gaps in every roadway in the city, produce huge amounts of toxic emissions from smaller, more exposed, inefficient engines, and create serious safety risks as they tend to follow fewer of the normal driving rules.

5.3.3. Pedestrians/Bicycles

While incredibly valuable in making the city a more walkable and human-scale place, the current conditions significantly limit the opportunities for pedestrians and bicyclists and represent the most dangerous forms of transportation in Dhaka.

5.3.4. Alternative Modalities

Dhaka's diversity of transportation modes results in micro-mobility transportation options being heavily utilized, picking up the slack where the other transportation options leave off but also further filling up the city's roads. These forms of transportation are generally unregulated and vary widely in form, capacity, and motorization. Some common types include the baby taxi, leguna, mishuk, pushcart, rickshaw, and tempo.

5.4. Congestion

The congestion problem in Dhaka is overwhelming with higher rates than any other country! Akbar et al. (2023) ascribe this disparity to the fact that the cities of Bangladesh "are crossed by more water bodies, are more populous, and have fewer major roads." Moreover, a Democracy International survey found that "76% of Dhaka roads are occupied by 6% of the population that owns private cars." To decrease congestion, solutions must either decrease traffic volume or increase road capacity. In a city as dense as Dhaka, the former will be far more feasible to target than the latter. Moreover, "no city has been able to build itself out of congestion" (Fang, 2014).

5.5. Safety

The narrow streets of Dhaka combined with extreme traffic volumes place users

of non-motorized transportation (NMT), such as pedestrians, cyclists, and rickshaw drivers, at the greatest risk of accidents.

5.6. Vehicular Pollution

Vehicles, particularly older models not equipped with modern emission filters, emit several air pollutants that lead to respiratory diseases and a lower quality of life. Particulate matter (PM), black carbon (BC), sulfur dioxide, smog, and lead are all directly related to emissions from vehicles. The two greatest sources of airborne pollution in Dhaka include vehicles and brick kilns (Begum et al., 2004). In 2002, a policy that would ban two-stroke vehicles was introduced.

5.7. Lack of Infrastructure and Management

Dhaka's traffic volume far outstrips the level of infrastructure dedicated to managing said traffic. From elements of road design to public transportation, there has been a systematic underfunding of solutions targeted at creating a safe and regularized road environment. Most evident of this phenomenon is the lack of signalized intersections. There are around 70 signalized intersections among a total of 650 intersections in Dhaka. By coordinating traffic lights, one can more easily resolve control over the movement of traffic in groups, especially as they converge upon arterial streets. The enforcement of traffic law in Dhaka is also not fully realized, allowing for chaos to grip the streets as people do not feel the need to obey laws strictly. A survey by Shahriar et al. (2024) found that 30% of people do not feel the need to follow traffic laws because of the ability to bribe law enforcement.

5.8. Current Plans and Projects

The governments of Dhaka and Bangladesh have both recognized the necessity of large-scale infrastructure projects to target the transportation-related issues outlined above. The least likely of the projects to be constructed is the Dhaka Subway. The project has been in the proposal stage for the past decade and has had numerous feasibility studies completed. Progress among these projects varies widely from early proposals, like the subway and ring roads, to being near completion, such as the bus rapid transit (BRT) system.

As such, the Dhaka Metro Rail (MRT) is far more likely to be completed, especially as it is being consistently funded by aid from the Japanese government. The ring road is also still in a proposed state but is more likely to be completed than the subway because it has already had a funding mechanism identified (private-public partnership). The effects of the ring road would primarily be lessening urban freight traffic by routing it around the city. The BRT is the most fully realized infrastructure project and should be studied closely upon completion to identify whether it has succeeded in increasing the proportion of the population that uses bus services and removed any of that population from the congested roadways. The Dhaka elevated expressway is not as close to completion as the BRT, but its

current sections are operational.

The elevated expressway does not appear to be particularly successful at curbing congestion on local roads, however. Because the elevated expressway uses numerous toll plazas, restricts vehicles that use CNG, and only connects people to the airport, adoption has been slow and mainly used by the wealthy.

5.9. Solutions

There have been solutions undertaken for decades, but they always fall short of their goals. Policy solutions represent the most efficient and cost-effective opportunities to institute systematic and institutional change across the city. These solutions focus on improving the regulatory and governance framework that would allow for more sustainable urban mobility and guarantee the successful implementation of any infrastructure project. They also incentivize the creation of more cohesive governmental bodies that can streamline the decision-making process, improve communication and coordination between the necessary agencies, and prevent funding mismanagement. Policy driven solutions have the potential to address the systemic inefficiencies and operational shortcomings that contribute to Dhaka's congestion crisis. The overarching goal of all policy solutions should be to decrease traffic volumes of Dhaka's roads.

5.10. Total Summary of Costs

Policy recommendations are the most cost-effective option of the suggested solutions. No designated money would need to go to them besides existing management costs. Ideally, the incentives and imbedded policy create an environment where all future development is helping and not hindering the flow of the city. Costs would be imbedded in development requirements, and funds effectively re-appportioned from existing spending patterns. Significant costs will be required for the city to catch up with a standard level of transportation competency. For specific infrastructure related improvements and transportation network integration, upwards of \$50 million will need to be spent on updating pedestrian facilities, safety, and traffic management practices, just for initial implementation. With further investments, and annual maintenance and operation costs, another \$150 million - \$300 million will be needed. For larger-scale infrastructure investments and more radical solutions that would restructure the road networks and decentralize some of the industry, upwards of \$3 billion will be needed.

Naturally, the budget does not allow for this amount of investment to be made at once. Rather, cutting existing budget inefficiency and incremental saving will allow for money to be redirected over time towards projects identified as those with high priority. Enforcement and infrastructure are the greatest costs overall, as all policy and high-level solutions will require either enforcement, infrastructure investments, or both. It has been identified that through corruption and lack of staffing (Shahriar et al., 2024), enforcement will remain a difficult task. Improvements with enforcement are fundamentally related to Bangladesh's govern-

ance and position in the world economy. As such, costs will have to be carefully appropriated to ensure their proper use, mitigating mismanagement and the challenges that have arisen in the past.

6. Solid Waste and Sewage

6.1. Solid Waste

Developing countries are grappling with sewage and waste management due to rising numbers of urban dwellers and increasing rates of consumption. Waste collection systems are in most instances not commensurate to waste generation. As a result, municipalities find themselves overwhelmed partly because of a lack of technical capacity, finances, poor implementation of statutory frameworks and coordination, and the general lack of awareness among urban residents. Ultimately, improper sewage and municipal solid waste management reduces the quality of life and negatively impacts the environment as well as human health and wellness. These factors are very evident in Dhaka.

6.1.1. Solid Waste Generation and Composition

Dhaka, like all megacities, has been no exception in witnessing a significant increase in municipal solid waste, largely attributed to rapid urbanization, industrialization, and population growth. The growing economy allows people to have more disposable income, which creates an upsurge in spending and consumption patterns. The primary agencies tasked with municipal solid waste collection and management are the two city corporations, [Dhaka South City Corporation \(2018\)](#), which manages 75 wards, and Dhaka North City Cooperation, which manages 54 wards, respectively. By 2032, Dhaka is expected to handle 8,500 tons of garbage daily, up from the current 6,500 tons. Solid waste in Dhaka can be categorized as domestic waste, clinical waste, industrial and commercial waste. Typical household waste comprises mainly organic and inorganic waste; inorganic waste is the most dominant at 97.2%, followed by polythene, plastic as well as paper. Plastic consumption in Dhaka has also grown at alarming rates, with an annual per capita consumption of 22.25 kg, more than three times the national average for urban areas. Additionally, approximately 646 tons of plastic waste is collected daily in Dhaka, making up 10% of all the trash produced in Bangladesh. Merely 37.2% of the plastic waste generated in Dhaka is recycled ([Dhaka Tribune, 2023](#)).

Medical waste in Dhaka is also growing as healthcare centers increase in the city. PRISM Bangladesh collects and manages medical waste on behalf of the city corporations. It is incinerated at landfill sites (New Clean Dhaka Master Plan 2018-2022). The other major waste contributor is the production of the apparel and clothing sector, one of the largest in Dhaka. It produces massive textile waste comprising of scrap fabric, panels, yarn, cutting tables, and threads. The nation's current method for managing textile waste is largely informal and one of the main concerns is formalizing this sector to establish transparency and governance (Ibid.). It's highlighted that the throwaway culture, which priori-

tizes convenience, has been increasingly adopted by consumers thereby contributing to less recycling and reusing of clothes.

6.1.2. Solid Waste Collection and Disposal

The collection of municipal solid waste at the source is handled primarily by residents, Primary Collection Service Providers alongside Community-Based Organizations, and, subsequently, discharged into secondary transfer stations. The collection and transportation from Secondary Transfer Stations to landfills as the final disposal site is managed daily by the city corporations. Despite the purported daily collection, about 40% - 60% of the garbage produced in Dhaka city is left uncollected and not disposed of securely (Ahsan et al., 2014). Consequently, all the uncollected waste is discarded into open spaces, roadside, stormwater drains, rivers, and streams compromising air, soil, and water quality. Informal settlements are the hardest hit by the irregular collection.

Dhaka currently relies on landfills as its tertiary method of waste disposal. The two main city landfill sites, Amin Bazar and Matuail, have already exhausted their capacity despite continued use. There are existing residential neighborhoods, water bodies, and agricultural lands that lie approximately 500 meters from the two landfills, posing danger to human health and the environment.

6.1.3. Negative Impacts of Solid Waste

Solid waste in Dhaka contributes to water, soil and air pollution, which impacts the overall livability of the city. The constant foul odor emitted by the landfill sites, including the hazardous smoke from the incinerator, poses serious health risks and complications such as pneumonia to landfill workers, residents surrounding the landfill, and the city at large. Urme et al. (2021) note that flies, mosquitos, birds, dogs and other animals are a constant sight at the landfill sites. Moreover, the author indicates that the decaying mounds of waste are also breeding grounds for mosquitoes which contribute to vector-borne diseases in neighboring areas.

6.1.4. Policies on Solid Waste Management

The Planning Commission, the Department of Environment (DoE), and the Ministry of Environment, Forests, and Climate Change (MoEFCC) are the primary decision-makers in Bangladesh regarding municipal solid waste management policy. These organizations have taken the initiative to craft waste management policies and regulations and implement them since the 1990s.

6.1.5. International Donors

International organizations that have been actively engaged in MSW in Dhaka include JICA—Japan International Cooperation Agency. The organization partnered with the two Municipalities to formulate the Clean Dhaka Master Plan, 2005-2015. The master plan was not entirely successful, and some of its recommendations were carried forward to the New Clean Dhaka Master Plan, 2018-2032 (2018) in which Dhaka's target is to manage waste sustainably by introducing

3Rs and intermediate treatment. Other international organizations that continue to lend technical and financial assistance in managing waste in Dhaka include development banks such as the Asian Development Bank, the World Bank, the German Development Bank, as well as bi- and multi-lateral development agencies such as DFID (Department for International Development, UK Aid), GIZ (German Agency for International Cooperation), SIDA (Swedish International Development Agency), UNICEF (United Nations Children's Fund), and OFID (OPEC Fund for International Development (Matter et al., 2013)).

6.1.6. Recommendations for Solid Waste

1) Waste Reduction

In as much as landfills provide the most economically viable and simplest method of waste disposal, several industrialized countries are transitioning to zero waste, and the circular economy in particular, stressing recycling, reuse, and other sophisticated technologies (Diaz, 2011). *Reduction*, as the first step, involves minimizing waste at source by what Adedipe et al. (2005) term as the prevention principle/avoidance of waste. It sounds rather impractical, but some ways to reduce waste include the use of bags for shopping as opposed to plastic bags, as well as reducing the number of other disposable items like plastic, cups, spoons, and straws. *Reuse* emphasizes the use of objects or items repeatedly like repairing, composting, donating to charity among others, and, finally *Recycling* is another attractive venture that entails transformation of products that have reached the end of their life cycle to create new products.

2) Establishment and Development of Micro-Enterprises in Waste Recovery and Recycling

Informal laborers, who collect, sort, and recycle 15% to 20% of created waste, are crucial to resource recovery in many developing nations. Dhaka can leverage the existing manpower and informal recycling industries by aiding their integration into formal structures, ultimately promoting inclusive and sustainable communities. Dhaka must take advantage of greenhouse gases produced by landfills and its massive solid waste to produce electricity, a move that will reduce waste and contribute to the creation of green jobs. Land scarcity is another element that shows that additional landfill sites are no longer feasible. In the World Economic Forum report "Green Investing: Towards a Clean Energy Infrastructure," published in 2009, Waste to Energy (WtE) is identified as one of the eight technologies having significant potential to contribute to future low-carbon energy systems.

3) Waste to Energy (WtE)

Dhaka must take advantage of greenhouse gases produced by landfills and its massive solid waste to produce electricity, a move that will reduce waste and contribute to the creation of green jobs. Land scarcity is another element that shows that additional landfill sites are no longer feasible. In the World Economic Forum report "Green Investing: Towards a Clean Energy Infrastructure," published in 2009, Waste to Energy (WtE) is identified as one of the eight technologies having significant potential to contribute to future low-carbon energy systems.

6.2. Sewage

Dhaka has experienced exponential growth over the past few decades, resulting in heightened demands on its sewage and wastewater management systems (World Bank, 2023). The inadequacies in these systems have led to severe public health and environmental issues, posing a significant threat to urban sustainability (Hasan, 2023).

Currently, the Dhaka Water Supply and Sewerage Authority (DWASA) oversees the city's wastewater management. The establishment of DWASA in 1963 marked a pivotal moment in the history of sewage management in Dhaka, signifying a formal acknowledgment of the critical importance of sewage management to urban living. Despite ongoing efforts since the 1990s to expand sewer networks, the pace of development has not kept up. Existing Sewage Treatment Plants (STPs) have the capacity to treat only 30% of the sewage produced daily; most of the untreated domestic sewage and industrial effluent is illegally discharged into rivers and canals, causing significant water pollution and flooding issues in the area (Mongabay, 2022). With the rapid population growth, leaving significant gaps in coverage. Currently, two major sewage treatment plants, Dasherbandi and Pagla, serve Dhaka. The Pagla plant, originally constructed in 1978, has a capacity of 120 million liters (about 31,700,640 gal) per day, however, it operates below capacity due to aging infrastructure, necessitating substantial upgrades that have been delayed by budget constraints (VA Tech WABAG, 2023). The Dasherbandi facility, completed in 2022, is the largest in the city with a capacity of 500 million liters per day (132,086,026 gal), significantly reducing untreated sewage discharge into the Buriganga River and thereby improving local water quality (TBS News, 2023).

6.2.1. Impact of Industries on Wastewater

The industrial landscape of Dhaka significantly contributes to the pollution of water bodies in the region. Various industries discharge untreated or inadequately treated wastewater into nearby rivers, leading to severe environmental issues. The textile industry is a primary economic driver in Bangladesh, particularly in Dhaka, where it significantly contributes to the city's employment and export revenues (Khan, 2022). This industry is in districts like Savar, Gazipur, and Narayanganj and is notorious for discharging large volumes of wastewater containing critical pollutants.

Also, the pharmaceutical sector contributes to wastewater pollution through the discharge of harmful chemical residues and antibiotics. These discharges can be particularly damaging to aquatic life and pose serious risks to human health, especially when these contaminants leach into drinking water sources (Ali et al., 2023).

Approximately 217 million cubic meters of wastewater are generated annually from dyeing and finishing processes (Haq, 2022). Furthermore, its wastewater discharge typically includes high levels of biochemical oxygen demand (BOD),

chemical oxygen demand (COD), heavy metals, and various toxic chemicals such as caustic soda (NaOH) (Rahman, 2023; Sultana et al., 2022). In addition, improper disposal of textile effluents has transformed surrounding rivers, such as the Buriganga and Turag, into severely polluted waterways (Ibid.). The leather industry in Dhaka, particularly concentrated in Hazaribagh, is also a major source of environmental degradation, primarily through the release of untreated wastewater and toxic byproducts into local waterways (Hasan, 2023).

The implications of this pollution extend beyond aquatic life; human health is also at risk. The release of untreated wastewater contaminates water sources that communities rely on for drinking and irrigation, which can lead to diseases associated with heavy metal exposure. According to Bhowmik et al. (2023), accumulation of metals like lead and cadmium in the food chain poses long-term health risks for people living near contaminated water.

6.2.2. Challenges in Wastewater and Sewage Management

First, Dhaka's existing sewage infrastructure is outdated and inadequate to meet the needs of the rapidly growing population. The current sewerage network covers only 20% of the city, leaving the majority without access to proper sewage systems (Mongabay, op cit.). This lack of infrastructure exacerbates the problem of untreated sewage being discharged directly into water bodies, contributing to severe environmental pollution (Bhowmik et al., 2023). Additionally, the few existing sewage treatment plants (STPs) have limited capacity, treating only 30% of the city's sewage, which results in the majority being released untreated (Haque, 2023).

Also, financial limitations are a significant barrier to improving wastewater and sewage management in Dhaka. Despite the urgent need for investment in sewage infrastructure, Dhaka government priorities tend to focus on other sectors like transportation and energy (World Bank, 2024a).

There is also a lack of coordination between various government agencies responsible for managing sewage and wastewater in Dhaka. This lack of synergy leads to inefficient service delivery and a failure to enforce existing wastewater regulations effectively (Yin et al., 2021). Moreover, the enforcement of waste management regulations is often lax, leading to illegal sewage discharge and pollution (Haque, 2023).

Finally, public awareness regarding the importance of proper sewage disposal and management is low, which hampers efforts to improve the situation. Many residents are unaware of the environmental impact of improper sewage disposal and are not incentivized to comply with regulations (Bhowmik et al., 2023).

6.2.3. Recommended Solutions for Improving Sewage Management in Dhaka

Dhaka can implement the strategies outlined below to enhance its sewage management. These methods have proven effective in smaller urban areas within Bangladesh as well as in other cities worldwide.

1) Decentralized Wastewater Treatment Systems

This can potentially alleviate some of the burden on Dhaka's overstressed sewage infrastructure by providing localized treatment options. By implementing the decentralized strategies, it can address specific areas that are not served by the central network, improving overall sewage management while reducing environmental impact (Mongabay, op cit.).

2) Relocating Industries to the Outskirts

The government plans to relocate private leather industries to areas outside the city with sufficient land (Rampley et al., 2020). However, progress has been slow. Priority should be given to relocating tannery industries to a remote area north of Dhaka, where a centralized effluent treatment plant could serve all the tanneries, ensuring better environmental management (Yin et al., 2021).

3) Strengthen Coordination Among Government Agencies

A critical issue identified is the overlap of responsibilities among multiple agencies managing the same sectors in sewage treatment, leading to a lack of collaboration (Hasan, 2023). Immediate steps should be taken to enhance coordination between the Dhaka Water Supply and Sewerage Authority (DWASA) and city corporations to implement a more integrated approach to sewage management. Additionally, it is essential to develop a unified policy framework to address the gaps caused by fragmented responsibilities and ensure efficient and cohesive management of the sewage system.

4) Public Engagement and Education

Building community awareness and involving the public in sanitation initiatives can foster a sense of responsibility and drive behavioral change. Public education programs should focus on the significance of proper sewage disposal and the impact of untreated waste on health and the environment. Campaigns promoting the installation of small treatment plants in residential areas can mitigate localized pollution. For instance, in South Africa, the community-led total sanitation initiative focused on educating rural communities about the health risks of untreated waste. Public engagement encouraged villages to achieve "open defecation-free" status collectively (Chambers, 2009).

6.3. Conclusion

In conclusion, solid waste management and sewerage systems in Dhaka present both significant challenges and opportunities that require urgent and strategic interventions to align with the UN's Sustainable Development Goals (SDGs). Specifically, SDG 14, (which emphasizes the conservation and sustainable use of life underwater), SDG 6, (which focuses on ensuring the availability, sustainable management of water and sanitation for all) and SDG 11, (which aims to make cities inclusive, safe, resilient, and sustainable), which are deeply connected to the improvements needed in Dhaka's waste management systems (UN, 2016).

The current state of Dhaka's waste management system is marked by inadequate infrastructure, insufficient waste segregation, and underdeveloped waste

treatment facilities, leading to heightened public health risks and environmental degradation. As of 2024, to overcome these challenges, Dhaka needs to adopt a comprehensive and integrated approach that includes strategies like the 3R (Reduce, Reuse, Recycle) model, better waste segregation, and strengthened collaboration among stakeholders.

The government must prioritize investments in waste management infrastructure, streamline agency coordination, and enhance enforcement of environmental regulations. Industries must also adopt sustainable waste management practices, and the public must actively engage in proper sewage disposal and sanitation initiatives. It is critical that Dhaka's leaders take bold steps now to ensure the city's future sustainability.

7. Water Management

7.1. Background

As of 2024, its metropolitan population is estimated at approximately 23.9 million, reflecting a 3.13% increase from the previous year (Macrotrend LLC, 2024). This rapid growth has positioned Dhaka among the fastest-growing cities globally, though it also faces significant challenges, particularly in water resource management.

Rapid urban expansion has brought about severe environmental and infrastructural issues. Unchecked industrial growth, inadequate urban planning, and a booming population have strained the city's infrastructure. These dynamics have critically impacted Dhaka's natural water systems, leading to a crisis in water management and health issues.

7.2. Dhaka City's Natural Water System

Follow Dhaka's natural water system is intrinsically linked to its geographic location, being surrounded by several major rivers, including the Buriganga, Shitalakshya, Balu, Turag, and Dhaleshwari. These rivers historically functioned as critical hydrological components, serving as natural reservoirs, floodplains, and drainage conduits that supported the region's agrarian economy, fisheries, and navigation routes. The interconnected river network once regulated water flow, mitigated floods, and replenished groundwater reserves. However, the relentless pace of urban expansion, coupled with industrial proliferation, has drastically altered this natural equilibrium. Industrial discharges from tanneries, textile factories, and chemical plants have introduced hazardous contaminants such as chromium, arsenic, iron, and manganese into these water bodies. Pollution metrics reveal alarmingly high biochemical oxygen demand (BOD) levels, particularly in the Buriganga and Shitalakshya Rivers, signifying severe ecological degradation.

Groundwater extraction has intensified due to limited access to safe surface water, resulting in significant aquifer depletion. The Dhaka Water Supply and Sewerage Authority (DWASA), established in 1963, currently supplies approximately 2,110 million liters of water daily, predominantly sourced from 605 deep tube

wells. Only 13% of the water supply originates from surface water sources, exacerbating groundwater dependency and triggering a concerning annual aquifer drawdown of 2 to 3 meters. In addition to environmental degradation, the water system suffers from substantial operational inefficiencies. Water loss attributable to unauthorized connections, leakage, and outdated infrastructure amounts to nearly 29% of the city's water supply. Mitigation strategies have included infrastructure modernization, the installation of water meters, and collaborations with NGOs like WaterAid Bangladesh. Community-based water management models spearheaded by organizations such as Dushtha Shasthya Kendra (DSK) have facilitated access to potable water in underserved areas, fostering social responsibility and localized water governance.

Addressing Dhaka's multifaceted water management challenges necessitates a comprehensive approach integrating environmental sustainability, institutional reforms, and socio-economic equity. Long-term strategies must encompass pollution control measures, investment in resilient infrastructure, and strengthened policy frameworks. Collaborative engagement among public institutions, private stakeholders, and community actors remains vital for ensuring a sustainable and secure water future for Dhaka.

7.3. Water-Based Livelihoods

Fishing communities in Dhaka contribute significantly to the local economy and cultural heritage. Despite forming a crucial part of the socio-economic landscape, fishermen often face socio-economic marginalization. Traditional fishing communities like the Rajbongshi castes are particularly disadvantaged. Water-based livelihoods in Dhaka are intricately linked to the city's riverine ecosystem, shaped by its network of rivers, streams, and canals. These waterways have historically supported livelihoods through fishing, farming, and transportation. However, the rapid pace of urbanization, pollution, and territorial encroachments have severely threatened these traditional livelihoods, particularly along major rivers such as the Turag and Buriganga.

The rivers surrounding Dhaka, including the Buriganga, Turag, and Balu, are heavily polluted due to unchecked industrial discharge, domestic sewage, and encroachments. The Department of Environment (DoE) identified numerous polluting factories along the Buriganga alone, severely affecting fish populations and making fishing increasingly unsustainable. Urban development projects aimed at flood protection, infrastructure development, and land reclamation have led to large-scale encroachments. Demarcation pillars and embankments along the Turag and Buriganga have transformed dynamic riverine landscapes into saleable urban lands, displacing traditional fishing and farming communities.

Despite these challenges, fishing communities demonstrate remarkable resilience through adaptive practices such as livelihood diversification and community-led initiatives. Achieving sustainable urban river management in Dhaka requires policies that balance environmental restoration with socio-economic eq-

uity. Incorporating the voices of fishing and farming communities into policy-making and urban planning processes is crucial.

7.4. Water Justice

Water justice in Dhaka refers to the equitable distribution, accessibility, and sustainable management of water resources in one of the world's most densely populated cities. Dhaka faces significant water challenges, including scarcity, pollution, and uneven access, particularly in informal settlements. The city's water crisis is deeply rooted in socio-political inequalities, climate change impacts, and urban expansion that disrupts natural water bodies like rivers, wetlands, and canals.

Access to water in Dhaka is often mediated by socio-economic status. Wealthier neighborhoods enjoy continuous water supply, while marginalized communities in informal settlements rely on shared or illegal connections, often paying higher rates for lower-quality water.

Dhaka's water governance is fragmented among multiple agencies, creating overlapping responsibilities and ineffective management. Legal frameworks exist but are inconsistently enforced due to political interference and institutional inefficiencies. Moreover, water bodies like the Buriganga, Balu, and Turag Rivers suffer from severe pollution due to industrial discharge, untreated sewage, and waste dumping, affecting aquatic ecosystems and the health of nearby communities.

7.5. Major Challenges

7.5.1. Water Pollution

Water pollution in Dhaka has reached alarming levels due to unchecked industrial discharge, sewage overflow, and rapid urban expansion. Dhaka's surrounding rivers, including the Buriganga, Turag, Shitalakkhya, and Balu, face severe pollution, affecting millions of people. Statistics from various environmental and governmental reports highlight the scale of the crisis.

Household waste is another significant source of pollution. Dhaka generates approximately 7000 tons of solid waste daily, of which only about 50% is properly managed. The rest is dumped into rivers and canals, adding plastics, organic waste, and toxins to water bodies. The Pagla Sewage Treatment Plant, the city's only operational treatment facility, has a capacity of 120,000 cubic meters per day but processes less than 25% of the city's sewage output, leaving much of the remaining waste flowing directly into nearby rivers. Groundwater contamination is also concerning, as approximately 78% of Dhaka's residents rely on tube wells for drinking water. Studies have detected arsenic concentrations exceeding the World Health Organization's (WHO) permissible limit of 10 µg/L in many peri-urban areas. Additionally, nitrate concentrations in shallow aquifers have reached over 50 mg/L, surpassing the safe limit of 10 mg/L, due to fertilizer runoff.

The socio-economic impact of water pollution in Dhaka is profound. Water-borne diseases such as cholera, diarrhea, and typhoid are common, with over

100,000 hospitalizations annually linked to contaminated water. Fishermen have reported a 60% - 70% decline in fish stocks due to pollution,

The encroachment of rivers and canals in Dhaka is driven by unregulated urban expansion, fueled by rapid population growth and high land demand. Unauthorized land filling, where wetlands and riverbanks are filled with earth and debris, is common. With inadequate waste management, a large portion of Dhaka's waste chokes canals, reducing their water-carrying capacity. Low public awareness and weak institutional oversight worsen the crisis. Public awareness campaigns are essential to highlight the importance of preserving waterways (Razi, 2024). Sustainable urban policies, robust legal frameworks, and active Dhaka, the capital of Bangladesh, faces severe environmental challenges due to its geographical location in a flood-prone delta and its rapid, unplanned urban expansion. The city's climate vulnerability is heightened by intense monsoon rains, frequent flooding, and chronic waterlogging, exacerbated by environmental degradation and inadequate infrastructure.

7.5.2. Climate Change Impacts

Dhaka faces severe environmental challenges due to its geographical location in a flood-prone delta and its rapid, unplanned urban expansion. The city's climate vulnerability is heightened by intense monsoon rains, frequent flooding, and chronic waterlogging, exacerbated by environmental degradation and inadequate infrastructure.

Waterlogging has become a persistent issue due to Dhaka's rapid urbanization and the encroachment of its natural wetlands and low-lying retention areas. Over the past five decades, the city has lost nearly 75% of its wetlands, reducing its natural capacity to absorb rainwater, with the environmental degradation compounded by blocked drainage systems, exacerbated by improper waste disposal. On average, the city generates 4000 tons of waste daily, of which nearly 45% ends up in open areas and drains, severely impeding water flow and intensifying waterlogging.

Addressing these challenges requires modernized drainage systems, restoration of wetlands, and the implementation of sustainable water management practices. Community engagement and proactive urban planning are essential to mitigate future flood and waterlogging risks, ensuring a safer and more resilient Dhaka.

The lack of access to clean water, proper sanitation, and functional drainage systems remains a critical public health challenge in Dhaka. Waterborne diseases and vector-borne infections have become recurring health crises, especially during the monsoon season. Addressing these interconnected health risks requires integrated urban planning that includes restoring wetlands, improving drainage infrastructure, enhancing waste management systems, and ensuring access to safe drinking water to mitigate the city's persistent water-related health crises.

Institutional and regulatory gaps pose a major challenge due to fragmented governance, with multiple agencies, including DWASA, the Department of Environment (DoE), and local municipalities, operating with overlapping mandates and

limited coordination. Weak regulatory enforcement further hampers progress as existing environmental laws, such as the Environmental Conservation Act of 1995, suffer from lax implementation due to bureaucratic inefficiency and limited monitoring capacity. Moreover, policy revisions have not kept pace with Dhaka's rapid urban growth, creating regulatory voids in areas like urban wastewater management and informal settlements (Hossain et al., 2019).

7.6. Proposed Solutions

To address these gaps, policy integration through a central regulatory authority is crucial to streamline water and environmental governance (Ahmed et al., op cit.). Capacity building through institutional and technological upgrades, expanding public-private partnerships, and enhancing community participation through awareness campaigns are essential steps. Sustainable financial models involving public-private partnerships and international grants should be secured, while real-time data monitoring systems and strengthened impact evaluation mechanisms can ensure better policy outcomes. By addressing these gaps through integrated planning, enforcement, and sustainable financing, Dhaka can make meaningful progress in ensuring a healthier, more resilient urban environment.

7.7. Policy Recommendations

To address the issue of encroachment on rivers, wetlands, and floodplains, Dhaka can follow examples set by countries like India, which has made significant strides in implementing legal frameworks to protect its natural ecosystems. India's Wetlands (Conservation and Management) Rules, 2017 provide a comprehensive framework that prohibits reclamation, waste dumping, and construction activities in ecologically sensitive zones. The rules mandate the identification and notification of wetlands across states, with strict penalties for violators. A key element of India's approach is the role of the "National Green Tribunal (NGT)", a specialized judicial body that enforces environmental laws, ensuring violators face legal consequences and are required to restore damaged ecosystems. This model ensures legal accountability while deterring future encroachments.

Dhaka can adopt and adapt a similar approach by revising its existing Wetland Conservation Act to include stronger penalties for illegal encroachments and unauthorized developments along critical water bodies like the Buriganga and Turag Rivers. Establishing a specialized environmental tribunal or task force, akin to India's NGT, can expedite enforcement and resolution of encroachment disputes. Additionally, Dhaka can utilize technologies such as GIS and remote sensing to monitor encroachments in real-time, enhancing the ability to detect and prevent illegal activities. Community involvement is also crucial; public awareness campaigns like India's "National Wetlands Day" can educate citizens about the importance of preserving wetlands and the consequences of encroachments.

By integrating stricter legal provisions, robust enforcement mechanisms, and public engagement, Dhaka can effectively address encroachments, restore its nat-

ural ecosystems, and promote sustainable urban planning, drawing inspiration from India's success in tackling similar challenges.

8. Finance

8.1. Introduction: Current Financial Status

8.1.1. Historical Overview

The country has grown its economy from being one of the poorest nations in the 1970s to a powerhouse in South Asia. The economy's status is interconnected with the political condition of Bangladesh. This started in 1971, when Bangladesh (then East Pakistan) was engaged in a war for independence. At independence, Bangladesh was one of South Asia's poorest countries—poorer than India, and much poorer than Pakistan. Today, as Bangladesh celebrates more than a half-century of independence, the country has become a case study in economic development. The economy is the second largest in South Asia. In terms of nominal GDP, Bangladesh ranks 35th globally, whereas in terms of purchasing power parity, it ranks 25th. Bangladesh is considered one of the Next Eleven by several major financial firms. The economy of Bangladesh is among the fastest growing in the world (*Economy of Bangladesh, 2023*).

8.1.2. Underlying Factors in Bangladesh's Economy

It is certain that independence in 1971 was in a great boost for the Bangladeshi economy. Prior to this, the nation faced extreme poverty, with low per capita income and little economic improvement. In the years prior to independence, the country faced various foreign exchange shortages, but there were key changes taking place that would affect the country's overall economy. Bangladesh's telecom sector was flourishing, establishing a deep foundation across the country. The manufacturing sector was gaining strength, empowering women as well. The garment industry employed 1.5 million people by 2001, with most of them women. By that year, garment exports had grown to \$3,125 million, or 52% of total exports. (*Hossain, Kabir, & Latifée, 2019*), and the country is now a leading global exporter of ready-made garments. The interval from 2006 until 2020 can be described as the economy's "15-year gallop", and already in 2006 Bangladesh's economy was growing faster than Pakistan's. In 2020, Bangladesh's growth decreased, which was consistent with global trends brought by the COVID-19 pandemic. Nevertheless, Bangladesh has done remarkably well in comparison to other nations, because of its significant number of pharmaceutical companies. In fact, with 300 pharmaceutical companies, the nation now satisfies 97% of domestic demand (*Basu, 2021*).

8.1.3. Current Financial Status of Bangladesh's Economy

Bangladesh's economy has shown remarkable progress in recent years, emerging as one of the fastest-growing economies in South Asia. As of 2024, the country boasts a nominal GDP of \$455 billion, reflecting substantial economic expansion supported by key sectors such as manufacturing, services, and agriculture. Despite

a GDP per capita of \$2647, which remains below the global average of \$10,589, Bangladesh's consistent average real GDP growth rate of 6.4% over the past decade highlights its resilience and upward trajectory. This sustained growth has been driven by strategic investments, policy reforms, and a robust labor force that collectively contribute to the nation's development, setting a path for future economic aspirations (Focus Economics).

8.1.4. Overall Economic Structure

The comprehensive view of Bangladesh's economic dynamics from 2019 to 2023 highlights resilience within global disruptions and challenges to sustaining balanced growth. Private consumption, which is a significant driver of the Bangladeshi economy, showed considerable fluctuation during the period. It fell to 3.0% in 2020 due to the COVID-19 pandemic, but rebounded to 8.0% in 2021, and again declined to 2.0% in 2023. Similarly, the steady rise in government expenditure in the post-pandemic years underscores Bangladesh's focus on fiscal policy measures and public investment aimed at stabilizing the economy. Meanwhile, the industrial sector, which contracted by 3.6% in 2020 due to pandemic-induced production halts, showed a strong recovery to 10.3% in 2021, stabilizing at 8.4% by 2023, with unemployment gradually improving to 5.1% in 2023, indicating job market recovery. However, fiscal and public debt trends remain concerning; the fiscal deficit widened from -3.6% in 2021 to -4.6% in 2023, while public debt as a percentage of GDP rose from 32.0% in 2019 to 39.3% in 2023, signaling challenges in fiscal sustainability (World Bank, 2023).

The fiscal deficit with rising debt at 39.3% of GDP in 2023 might affect essential investment in other sectors like water, education, health, and infrastructure, as a significant portion of government revenue is diverted to debt obligations. Likewise, a high fiscal deficit can lead to inflationary pressures and questions investor confidence, reducing foreign direct investment (FDI) flows that are vital for industrial and economic expansion (Ibid.; IMF, 2023).

8.2. Microeconomic Analysis

8.2.1. Comparative Analysis

Since its war of independence against Pakistan ended in 1971, Bangladesh has been a significant player in world politics. The nation is advancing in multilateral, technological, developmental, and economic contexts, with increasing social progress and improving human growth indicators. However, in today's context, most of its political decisions are influenced by India. India's strategic interests are arguably challenged by China's ambition to establish regional hegemony and its increasing influence as a counterbalance to U.S. dominance. To mitigate the risk of aligning with Chinese hegemony, India is actively seeking to strengthen its influence over neighboring countries. One of the best examples of this situation would be Bangladesh. China was recently expected to make significant investments in numerous large-scale projects in Bangladesh (Jawad, 2024).

8.2.2. International Trade

Only 34% of Bangladeshi GDP is due to trade (World Bank, 2024b). According to government records, ready-made garments are the leading exports, followed by jute, shrimp and prawns, and footwear, whereas imports are led by iron & steel, edible oil, fertilizers, and petroleum products. The country's main export partners are the U.S. (19.8%), Germany (14.4%), the UK (9.1%), Spain (6%), and France (5.1%). Similarly, the nation's main imports partners are China (21.3%), India (17%), Singapore (8%), Indonesia (5%), and Malaysia (3.9%). (data NBS). Since becoming independent, Bangladesh has had a negative trade balance, with its deficit being financed by international aid and expatriate transfers.

8.2.3. Economic Sector Analysis

Bangladesh's economy is highly supported by three key sectors: agriculture, industry, and services, each contributing significantly to its GDP. The majority of GDP is contributed by the services sector with 51.1%, industry with 34.6% and agriculture with 11% (CIA, 2024). In the industrial sector, the ready-made garment industry is a key force behind Bangladesh's export earnings and economic growth. The services sector, encompassing trade, finance, and communications, has become the largest contributor to GDP, addressing the country's gradual shift toward a more urbanized, service-oriented economy.

1) Agriculture Sector

Although the agricultural sector is gradually declining as a share of GDP, 45% of Bangladeshis are employed in the agriculture sector with rice as the single most important product. (World Bank, op cit.) According to the provisional estimate of the Bangladesh Bureau of Statistics (BBS), the growth of the agriculture sector stood at 2.61% in FY 2022-23, which was 3.05% in the previous fiscal year. During this period among the 4 sub-sectors of the broad agriculture sector, the growth rates of crops and horticulture and fishing have decreased while the growth rate of animal farming and forest and related services has increased, compared to previous fiscal year (Finance Division, 2023).

2) Industrial Sector

The industrial sector is led by the ready-made garment (RMG) industry, which is regarded as the powerhouse of Bangladesh's export economy. Its share of total exports is over 80%, reflecting the country's comparative advantage in low-cost labor and efficient supply chains. Similarly, the pharmaceuticals industry is an emerging contributor to the country's economy. In FY 2019-20, industrial production fell drastically because of the coronavirus pandemic. However, the industrial sector recovered with a growth of 10.29% in FY 2020-21. The Russia-Ukraine conflict also affected the industrial sector's growth in FY 2021-2022, with a decline to 9.86% (Ibid.).

3) Service Sector

The service sector is the largest contributor to GDP, which reflects the increasing urbanization and modernization of the economy of Bangladesh. This sector includes trade, finance, education, healthcare, and information and communica-

tion technology (ICT), with significant employment. Retail and wholesale trade has grown 6.65%, followed by transportation and storage (5.99%), lodging and food service activities (5.89%), information and communication (5.42%), financial and insurance activities (5.76%), education (6.88%), and human health and social work activities (8.36%) (Ibid.).

Dhaka's financial structure is a microcosm of Bangladesh's broader financial ecosystem, encompassing formal, semi-formal, and informal sectors. Its robust infrastructure and strategic importance make it the linchpin of the country's economic activities and financial development. Dhaka is central to Bangladesh's economy, serving as the hub for financial policy implementation. The city's financial institutions provide capital for industrial growth, infrastructure, and commercial expansion, driving employment both directly and indirectly. As the capital and financial hub, Dhaka reflects the broader national financial system and plays a key role in the country's economic activities.

8.2.4. Budgeting

The Finance Minister of Bangladesh has unveiled the national budget for the fiscal year 2024-25, amounting to Tk 97,000 crore (approximately \$8.08 billion). The budget emphasizes key sectors to drive the country's development and address pressing challenges. Sectoral Allocations were as follows Power and Energy: \$2.53 billion has been allocated to ensure sustainable energy supply and infrastructure development. Road Transport and Highways Division: \$3.18 billion is earmarked for improving connectivity and enhancing transport systems. Water Resources: \$0.93 billion will support water management and flood control measures. Industry: \$0.21 billion is allocated to promote industrial growth and economic diversification. Sanitation and Solid Waste Management: \$0.75 billion will improve urban sanitation and waste management systems. Poverty Reduction: \$2.98 billion is dedicated to alleviating poverty and supporting vulnerable populations. Focus on education and healthcare, the education sector has been allocated (\$7.9 billion, representing 11.9% of the total budget and 1.7% of the GDP. This underscores the government's commitment to enhancing the quality and accessibility of education. Healthcare, with \$3.45 billion allocated, the medical sector has been prioritized to improve health services and infrastructure. The allocations reflect a balanced approach aimed at fostering economic growth, reducing inequalities, and improving the quality of life for the citizens of Bangladesh.

Persistent inflation erodes purchasing power, while tight liquidity, rising interest rates, import restrictions, and higher energy prices dampen investment. Private sector credit growth slowed in FY24, and high non-performing loans reflect banking sector stress. The World Bank urges faster fiscal, financial, and monetary reforms to stabilize the economy and boost growth.

8.2.5. Issues in Financial Sector of Bangladesh

Follow Bangladesh's post-COVID recovery faces challenges from high inflation, external deficits, financial sector issues, and limited youth employment, especially

for women and the educated, according to the World Bank's October 2024 update. GDP growth slowed to 5.2% in FY24, projected to drop to 4.0% in FY25 before rebounding to 5.5% in FY26. Rising urban income inequality, with the Gini index increasing from 0.50 to 0.53 (2010-2022), underscores the need for reforms to restore inclusive growth. Youth unemployment remains high despite overall job growth, with urban educated youth particularly affected. Key industries, like ready-made garments, have struggled to create jobs, and regions outside Dhaka faced employment losses. The World Bank urges governance reforms, business climate improvements, and targeted job creation for youth.

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8.2.6. Bangladesh's Long-Term Credit Ratings Comparison

Bangladesh's long-term credit ratings assess its ability to meet sovereign debt obligations. S&P, Moody's, and Fitch each provide ratings that reflect moderate credit risk and stable debt repayment capabilities despite vulnerabilities. S&P rates Bangladesh with moderate risk; Moody's considers economic resilience and external financing pressures; while Fitch highlights growth potential and fiscal challenges. These ratings are crucial for investment decisions, international financing access and policy formulation. They influence borrowing costs and guide efforts to address economic weaknesses, such as diversification, debt management, and corruption, to improve the country's credit profile and foster growth (World Government Bonds, n.d.).

8.2.7. Donor Funding and Foreign Aid

Donor funding and foreign aid have played a fundamental role in the expansion of Bangladesh's economy. Since 1971, Bangladesh has been a long-time partner and recipient of international aid as a developing economy from the Global South. Due to the assistance of international donors and grants, the annual GDP increased during the first three decades followed by independence. Economic growth was accompanied by consistent advancements in poverty alleviation and other socioeconomic indicators. During that period, most of the funding was provided for poverty alleviation and food and commodity aid. Over the years, the contribution of foreign aid shifted towards infrastructure investment, to initiate economic transformation in the country. From the figure, the years 2001-2005 and 2006-2010, project aid constituted 90% and 97% of total aid, respectively, which reached 100% of total aid by 2011, following the trends even in 2024 prioritizing project-based initiatives (Light Castle, 2022). The transition from food and commodity aid to project aid reflects Bangladesh's evolving development priorities. In the present context, foreign aid is more focused on infrastructure and development projects including energy systems, transportation networks, and urban

development.

1) Bilateral Donors

Bangladesh has been a significant receiver of bilateral assistance since its independence in 1971. The Economic Relations Division (ERD) reports that the nation receives substantial assistance from several bilateral donors, mostly in the areas of infrastructure, electricity, water supply, and food security. From emergency relief (food and commodities aid) in the 1970s, bilateral aid has evolved into project-based development support. This involves investments for growing urbanization, industrialization, and climate resilience. Countries like Japan and the Netherlands focus on long-term infrastructure and development, while the U.S. emphasizes immediate humanitarian support. Japan is the biggest bilateral donor to Bangladesh, followed by the United Kingdom, United States, Germany, and the Netherlands. Switzerland stands out with a 13% contribution in the industry sector, followed by the United Kingdom, Japan, and Canada, each contributing 3%. Japan through agencies like JICA leads significantly with 46% allocation in transport and communication, highlighting its focus on infrastructure development in Bangladesh. The Netherlands is the largest contributor with a 60% share, emphasizing its expertise in water reflecting its support for energy development. The United States is the largest donor, allocating 55% of its bilateral aid to the food and aid sector (Light Castle, 2022) management. Switzerland follows with 35%, and the United Kingdom contributes 22%. Japan plays a dominant role with a 42% allocation, reflecting its support for energy development.

2) Multilateral Donors

The **World Bank** was among the first development partners to support Bangladesh following its independence, and it has committed around \$44 billion in International Development Association (IDA) finance throughout the course of the 50-year relationship. This financing is provided in the form of grants, interest-free loans, and concessional credits. to assist the nation in addressing its development priorities. Bangladesh's IDA program is the largest in the world, with 52 current projects receiving almost \$16 billion in finance in 2024 (World Bank, 2024b).

The **Asian Development Bank (ADB)** is one of the leading multilateral donors supporting Bangladesh's development journey. Since 2016, Bangladesh has received an average of \$2 billion per year in external aid from the Asian Development Bank (ADB). Bangladesh's Eighth Five-Year Plan (2021-2025) and Perspective Plan (2021-2041) are in accordance with ADB assistance. ADB has committed \$31.8 billion in public sector loans, grants, and technical support to Bangladesh as of December 31, 2023. There are now 75 loans and 4 grants total \$13 billion .in ADB's sovereign portfolio in Bangladesh.

The **International Monetary Fund (IMF)**'s Executive Board recently approved Bangladesh's request for SDR 2.5 billion (about \$3.3 billion) under the Extended Credit Facility (ECF) and the Extended Fund Facility (EFF) arrangements. This approval enables the immediate disbursement of SDR 352.35 million (about \$476

million). The IMF Executive Board also approved SDR 1 billion (about \$1.4 billion) under the newly created Resilience and Sustainability Facility (RSF). Bangladesh is the first Asian country to access the RSF. The 42-month program will help preserve Macroeconomic Stability, protect the vulnerable, and foster inclusive and green growth. Reforms will focus on creating fiscal space to enable greater social and developmental spending; strengthening the financial sector; modernizing policy frameworks; and building Climate Resilience. In August 2024, the International Monetary Fund (IMF) agreed to provide Bangladesh with \$1.15 billion as the third installment of its multi-billion-dollar loan program (IMF, 2023).

The **European Union** is committed to supporting Bangladesh's journey toward sustainable and inclusive development, aligning its efforts with the national Bangladesh Five Year Plan, the United Nations 2030 Agenda, and the EU's Global Gateway and Indo Pacific Strategies. The EU adopted a Multiannual Indicative Program for the period 2021-2027 under the Neighborhood Development and International Cooperation Instrument (NDICI-Global Europe). Under that framework, the EU allocated €306 million (\$320 million) in grant funding to the partnership with Bangladesh over 2021-2024. Most of the initiative funds go to the energy sector of Bangladesh. It aims to increase Bangladesh's energy efficiency and maximize the use of renewable energy sources to meet its growing energy demand. The Green Energy Transition Team Europe Initiative (TEI) is in place.

The **United Nations** Sustainable Development Cooperation Framework (Cooperation Framework) serves as a coherence tool to guide UN development efforts in Bangladesh, aligning with the Government's 8th Five-year Plan (8FYP) and the 2030 Agenda. Over the five years of the Cooperation Framework, the projected funding requirements stand at \$1.143 billion. The UN agencies in Bangladesh, under the Cooperation Framework have raised or pledged \$693 million by the close of 2023. This enabled the UN family to deliver \$219 million in development programming in 2023 across the five strategic priorities of the Cooperation Framework.

8.3. Sector Finance Proposal

8.3.1. Procedure

The procedure for sectoral financing involves a structured process rooted in strategic evaluation and prioritization. The first prior process deals with economic assessment, analyzing each sector's contribution to GDP, the country's employment, and its involvement in trade. Some of the high-impact sectors, such as industry, are prioritized for funding based on their contribution to national economic growth. Similarly, development needs related to various sectors need to be identified, focusing on existing infrastructural conditions and capacity. It must be ensured that the fund addresses critical challenges and enables long-term sectoral growth. Government policies and targets are the guiding framework, which aligns allocation decisions with national and international commitments. It also includes Sustainable Development Goals (SDGs) or a specific duration development plan

and policy (5 years, 10 years) Similarly, Stakeholder input is then incorporated by engaging local governments, industry representatives, and multilateral and bilateral donors (OECD, n.d.).

8.3.2. Energy

The Energy Team notes Bangladesh has requested a total of \$1.012 billion, which includes \$684 million for renewable energy investments and \$328 million for current energy and non-renewable energy grid investments. The annual investment required to achieve energy goals is \$4.32 billion. The Energy Team proposes it can be funded through the Bangladesh annual budget, with 40% allocated for Dhaka's energy consumption, 70% directed toward renewable energy, and 30% for investments in current and non-renewable energy grids.

Additionally, bilateral donor agencies like JICA (42% contribution) and United Kingdom (16% contribution) have been assisting in various renewable energy projects. The EU's Multiannual Indicative Program for the period 2021-2027 under the Neighborhood, Development and International Cooperation Instrument (NDICI-Global Europe), which includes the Green Energy Transition Team Europe Initiative (TEI) can support a proposed project, which aims to increase Bangladesh's energy efficiency and maximize the use of renewable energy sources to meet its growing energy demand. The ADB and World Bank are also assisting with the energy sector of Bangladesh.

8.3.3. Poverty Alleviation

The Poverty Alleviation Team proposes a total amount needed of \$1.2 billion related to infrastructure development \$750 million for economic empowerment, and a \$225 million social services budget. Bangladesh's proposed FY budget 2024-25 for poverty alleviation is enough to consider different infrastructure developments, economic empowerment and social services projects. Additionally, the United Nations Sustainable Development Cooperation Framework has been supporting the "No Poverty" project in Bangladesh with a contribution of 5% of the available resource. Similarly, there are several funding allocations for quality education, Good Health & Well-being and Zero Hunger.

8.3.4. Transportation

The Transportation Team proposes a short-term requirement of \$2.3 billion for the next 2 years for bus consolidation, pedestrian facilities and initial investments and operations of infrastructure improvements. For the long-term, project costs are \$3.2 billion for rail expansion projects, de-centering Dhaka, and implementation of facilities. Currently, only \$2.3 billion can be allocated for the transportation sector as in the national budget, but additional assistance is sought from bilateral donor countries like Japan and the United Kingdom and multilateral organizations like ADB and the World Bank. Bangladesh's Perspective Plan (2021-2041) in accordance with ADB assistance can assist for the proposed long-term plan worth \$3.2 billion in the transportation sector.

8.3.5. Industry

The industrial team proposes a total cost of \$210 million annually for brick industry kiln replacement, which will reduce harmful aerosol emissions by 40%, industrial environmental inspections and a wage increase policy. The proposed funding can be utilized from an Asian Development Bank (ADB) allocation for the industrial sector. International Monetary Fund and World Bank allocations can additionally be utilized under green growth and climate change goal -related funding.

8.3.6. Sewage and Solid Waste

The Sewage and Solid Waste Team proposes \$646 million for the sewage project and \$1.5 million for solid waste. The International Development Association and ADB allocation of \$154.3 million and an additional \$200 million allocation from fund sources for sewage facility development can be utilized for the proposed funding. The Solid Waste Dhaka North budget allocation is \$0.77 million and an additional \$0.78 million from fund sources can be used for solid waste. The Asian Development Bank funding to the Dhaka Water Supply and Sewage Authority (DWASA) can also assist for the proposed project.

8.3.7. Water

Addressing Dhaka's multifaceted water management challenges necessitates a comprehensive approach integrating environmental sustainability, institutional reforms, and socio-economic equity. Long-term strategies must encompass pollution control measures, investment in resilient infrastructure, and strengthened policy frameworks. Collaborative engagement among public institutions, private stakeholders, and community actors remains vital for ensuring a sustainable and secure water future for Dhaka.

The Dhaka Water Supply and Sewerage Authority (DWASA) has embarked on a \$1.8 billion investment initiative to revitalize the City's water infrastructure, including constructing 4 major water treatment facilities, sourcing water from cleaner, less polluted rivers located up to 60 kilometers from the city. The Asian Development Bank funding to DWASA can also be useful for the proposed project. Nevertheless, the World Bank expects that it will take \$5 billion over 10 years to fully clean the rivers.

9. Conclusion

World Finally it is important to state Bangladesh's urban policies affecting Dhaka include the National Urban Policy, the National Housing Policy, and the Five Year Plans. The government has prioritized urbanization in its development plans since the first Five Year Plan. However, Bangladesh lacks a comprehensive urban policy framework. This makes achieving the government's goals extremely difficult, and the suggestions in this paper for improvements in the critical urban sectors face those difficulties. The **goals** the government would like to achieve include:

- Sustainable urbanization—The National Urban Policy aims to create a sustainable urban future through decentralized and participatory development, and
- Urban governance—This policy seeks to improve accountability and transparency, and to encourage multi-stakeholder engagement.

However, the **challenges** in implementing these goals include:

- The absence of a comprehensive policy: As noted above, Bangladesh lacks an overarching urban policy framework.
- Urban governance issues: City corporations, especially Dhaka's, need to be more accountable and transparent to address sustainability issues.
- Basic services: Many people lack access to improved water and sanitation (Ibid).

Consequently, **policy recommendations** that would lead to creating the conditions for the recommended measures in the sectors outlined in this paper include:

- Improving accountability and transparency;
- Encouraging multi-stakeholder engagement;
- Investing in human capital;
- Strengthening municipal institutions;
- Improving access to basic services; and
- Ensuring inclusive processes for development.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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