Scientific Research Publishing

Advances in Applied Sociology, 2026, 16(11), 923-962
https://www.scirp.org/journal/aasoci
ISSN Online: 2165-4336
ISSN Print: 2165-4328

Environmental Management in the World's Two Largest Moslem Metropoles: Jakarta and Dhaka

David Joel Edelman

School of Planning, College of Design, Architecture, Art and Planning, University of Cincinnati, Cincinnati, USA
Email: edelmadj@ucmail.uc.edu

How to cite this paper: Edelman, D. J. (2026). Environmental Management in the World's Two Largest Moslem Metropoles: Jakarta and Dhaka. *Advances in Applied Sociology, 16,* 923-962.
https://doi.org/10.4236/aasoci.2026.1611054

Received: October 2, 2026
Accepted: November 21, 2026
Published: November 24, 2026

Copyright © 2026 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Jakarta and Dhaka are both very large metropolitan areas, i.e., megacities, which are the largest and most dynamic cities in important developing countries. However, while they have many similarities, especially regarding their environmental problems (to be discussed later in detail), they have geopolitical and historical differences. Although both are Sunni states, Indonesia is composed of 17,000 islands and was the major colony of the Netherlands, while Bangladesh was earlier East Pakistan and still earlier, a part of colonial India. The larger of the two cities is Dhaka. With 24,652,900 inhabitants, it is the world's (and Asia's) 4th largest city. Jakarta is not far behind. Jakarta's population is 11,840,000, thus making it the world's 28th largest city and 15th in Asia. Two different research projects of urban planning graduate students at the University of Cincinnati found that the most critical environmental problems fall in seven main areas, which are analyzed in detail for each metro. They are poverty alleviation, industry, energy, transportation, sewage and sanitation, water management and finance. This paper compares the two approaches.

Keywords

Urban Environment, Environmental Problems of Developing Countries, Sunni Moslem Asian Metropoles

1. Introduction

Urban Environmental Management (UEM) has been receiving increasing attention since 1970 in both developed countries, where it has emerged as a subject of academic research and professional practice, and in developing countries, where it has become an area of concern increasingly. As a field, it is akin to planning and engineering, and it has become an integrated way of dealing with the environmen-

tal problems of cities, metros and regions. Such problems are multi-sectoral, (i.e., manufacturing, services, household, etc.), multi-system (i.e., water supply and management, sewage and sanitation, transport, etc.), multi-level (i.e., central, regional, metro, local and community) and multi-actor (i.e., government, NGO, CBO and private). They require solutions of enormous complexity and cost. Since 1998, thirteen different research projects of graduate students in urban planning at the University of Cincinnati led by the author have studied the environmental problems of cities in Asia, Africa and Latin America, and suggested how they could be ameliorated somewhat if not solved.

This paper compares the approaches of the students to formulate a 5-year plan of solutions to the environmental problems and issues they faced, rather than being told how to solve them, in two critically important Moslem majority metropoles: Jakarta, Indonesia and Dhaka, Bangladesh. This expanded their analytical skills and taught them how to utilize the limited knowledge and resources available to determine implementable solutions for the benefit of the population of these culturally diverse cities bound together by the shared faith of Islam. The students learned about the Moslem world but also gained confidence that the planning skills they were acquiring were transferable to other projects and countries, and they gained a greater appreciation of the skill set that they are developing as planners. Bringing the reality of development to the classroom and asking students to confront it gives them an appreciation of professional practice that the study of theory alone does not. Thus, this project has attempted not only to expand the education of planning graduate students, but also to provide a meaningful contribution to planning pedagogy.

Methodological Approach

The paper is basically a desk study. Reports and statistical databases of the Asian Development Bank, the World Bank, various United Nations and Indonesian and Bangladeshi government agencies were heavily used, as were academic books and articles, reliable Internet sites and English and local language newspapers of Jakarta and Dhaka. Native speakers of Bahasa Indonesia and Bengali were able to assist when translations were required or desirable. The professor had deep and lengthy professional experience in urban planning, energy planning, infrastructure planning and construction in both cities with international consulting engineering firms from Switzerland and the Netherlands. All data sources were vetted. There were frequent class presentations, so all participants were aware of the status of all work throughout the course.

2. Jakarta

With an estimated 2026 population of 287.9 million (World Population Review, 2026), Indonesia is the world's most populous Moslem-majority country, with 87% of the population declared Moslems. Jakarta is a global city with one of the fastest growing economies in the world. It also has severe environmental problems. Seven teams looked at the problems of poverty alleviation, industry, trans-

portation, energy, water, sewage, and sanitation and finance. Each team looked at the current state of its sector, identified the most important issues facing that sector, prioritized them for action over the 5-year planning period, identified solutions, and estimated the necessary funding and sources of those funds. The finance group analyzed the city budget, direct foreign investment and foreign aid to determine if the required financial resources were available and finalized which resources would fund each project.

2.1. Poverty Alleviation

Jakarta, or more accurately, the Special Capital Region of Jakarta (DKI), is one of the most populous urban agglomerations on earth and is the largest in Southeast Asia. The metropolitan area of Jakarta called *Jabodetabek* (for the initials of the cities of Jakarta, Bogor, Depok, Tangarang and Bekasi) has a population that exceeds 30 million with a total area of 4384 square kilometers (1693 square miles). *Ther Jakarta agglomeration is the* 2nd *most populous urban area of the world* after the Pearl River Delta in China. The city of Jakarta proper has a very high population density of 14,464 per square kilometer (37,460 per square mile), while the metro area has a density of 4383 people/ square kilometer (11,353/square mile). Jakarta is now becoming starved for resources by its ever-growing population. The city was designed to handle 800,000 people when founded by the Dutch, although it is now home to up almost 12 million people during the work week, with 250,000 new residents coming to the Jabodetabek region each year (Ibid.). This has given rise to many slums without access to water and other resources, and residents face poor sanitation, a lack of housing and inadequate transportation.

Jakarta's economy depends highly on manufacturing and service sectors such as banking, trade and finance. Industries include electronics, autos, chemicals, mechanical engineering and biomedical sciences. The head office of the Bank of Indonesia and the Indonesian Stock Exchange are both located in the city, as are most State-owned Enterprises and major Indonesian conglomerates.

In Jakarta, people are living in poverty when they spend Rp 578,000 per month ($39.33). By comparison, the US poverty line income is $2145 or less per month. The statistics show the official poverty line is much too low, and it does not represent accurately the truth of how many people are struggling financially to live. Roughly half of Jakarta is composed of slums. Specifically, 445 neighborhoods known as *Rukun Warga* (*RW*) in the Indonesian government system, fall into the slum category. Of all slums, 50% can be found near rivers, while the rest are scattered along train tracks or underneath highways.

Flood Risk Reduction Program

Flooding is Jakarta's never-ending problem and devastating flooding is found throughout the city—in both the slums and wealthy areas. On New Year's Eve and Day 2020, floods inundated the sinking city, leaving dozens dead and homeless. Floods in Jakarta are caused by heavy rains, water runoff from unplanned urban construction and expansion, and the city's geographical features. Flooding means

increasing risk for the urban poor. Floods take away their limited assets. They cannot work and earn money, their children cannot go to school, and they are at risk for serious diseases. Ideally, flood prevention projects should address the main causes of flooding in Jakarta and create permanent solutions. Nevertheless, the political barriers opposing local government are understood. On that account, the project suggested here aims principally to reduce capital risk for the urban poor, thereby reducing what constrains them from climbing the economic ladder.

As a flood risk prevention project, a set of poverty alleviation initiatives for the area is proposed. In Jakarta, makeshift houses were built alongside the river by residents, the majority of whom are illegal dwellers, but there is almost no available land for relocation (Ibid.). Nevertheless, for Jakarta, the project will run for the least amount of time possible, i.e., it is expected to be completed in a one-year period (Figure 1).



Figure 1. Indonesia. This Photo by Unknown Author is licensed under CC BY-SA1.1-verty. Source: https://www.travellerspoint.com/guide/Indonesia/.

Modular Housing Project

A major issue in the slums of Jakarta is safety. The slums are constructed right

next to and on top of each other. As UNICEF has noted, in the most densely packed areas of the slums, they reach four stories high. The ground floor slums are relatively well constructed, but as the slums start to build on top of each other, they become increasingly makeshift. Some of the materials used are wood and scrap metal. Sunlight is hard to come by in the slums. Since the buildings are tall and alleyways extremely narrow, the inhabitants of the slums rely on neon tubes and have light bulbs hanging from wires. The air is stale due to poor circulation, and there is a lingering smell of garbage and sewage. If the dwelling does not have a toilet, the family has to pay around Bp1000 (US$ .07) to use the public toilet (Brown, 2013).

To improve living standards as quickly and easily as possible, a plan has been proposed to create modular housing. Modular housing are small individual buildings that can be prefabricated in a factory as one unit. In this program, the modular homes will be 200 square feet to accommodate an average family of five. The slums that will be targeted first are the ones on the riverbanks because they are the most vulnerable to flooding and have increased sanitation issues from the trash in the river (**Figure 2**).



Figure 2. Flooding of slums in Jakarta. This Photo by Unknown Author is licensed under CC BY. Source: https://www.scirp.org/journal/paperinformation.aspx?paperid=98650.

At the same time as the modular housing project, an affordable housing complex consisting of a high-rise apartment building will be underway. There is a great sense of community in the slums. , and keeping this in mind, the idea of community and communal space will be at the forefront of the design for the high rise. The geography of Jakarta is being destroyed by rising water levels due to climate change and the heavy use of groundwater by a very large and growing population. These two factors do not leave many options for affordable housing other than a high rise.

Jakarta as a center of business, services, trade and finance, offers steady, high

income and countless job opportunities. As a result, every year tens of thousands of people migrate to Jakarta for better employment opportunities. However, rural immigrants with limited skills and a poor educational background have few choices when coming to the city. Many of them would fill the informal sector; usually providing services and operating small food and beverage businesses. 80% of those working in the informal sector ony went to junior high school or below. Many parts of the informal sector might be considered illegal, but this sector is more than 60% of Jakarta's economy. In Jakarta, there are approximately 150,000 street vendors with daily transactions totaling Rp 225 billion (US $20.1 million). However, with a lack of skills and formal education, a large portion of these vendors are vulnerable to external financial shocks, which can easily disrupt their financial stability and possibly force them back into poverty.

In order to control this situation, skywalks are recommended as the last project for poverty alleviation. A skywalk was first introduced by Ridwan Kamil, former mayor of Bandung. Having a similar design to that of the *Highline* in New York City, the Bandung skywalk is an elevated structure above the road and is designated for pedestrians. Named *Texas Cihampelas* (Cihampelas Terrace), the 450-meter walkway was part of the government's effort to accommodate street vendors who previously jammed the sidewalks causing traffic congestion in Cihampelas Road (**Figure 3**).



Figure 3. Teras Cihampelas Skywalk in Bandung. Source: Kompas.com, 2017.

For this project, it is proposed to construct skywalks that will connect the CBD and nearby commuter train stations. This idea is inspired by trend of Transit Oriented Development (TOD). TOD is an approach that advocates development expansion around stations, connecting pedestrian and non-motorized modes of transportation with customer-based local services and public transit. Each skywalk will be 200 meters long and 15 meters wide to allow pedestrian access and

space for business. It is proposed that each skywalk can cater to 50 to 100 vendors, depending on the area needed for each vendor.

2.2. Industry

Jakarta has long been an important trading destination. It was taken by force by the Dutch East India Company in the late 17th century, and the Dutch used the land as a fortress with warehouses for the company. Jakarta, called by the Dutch Batavia, was used as a major port for the lush island of Java, where the Dutch extracted coffee, tea, spices, rubber, palm oil and other "cash crops" for Europe. Jakarta became the economic center of the nation.

Following Indonesian independence in 1949, economic policies shifted to self-sufficiency for agriculture and the export of fossil fuels. President Suharto nationalized some industries, including, oil, natural gas and banking. The period was marked by economic growth, but also reliance on the oil industry. The late 20th century was marked by rapid industrialization and the subsequent urbanization of the country. Beginning in the late-1960s, Indonesia's economy saw an average annual growth rate of 7%. Following the 1997 Asian Financial Crisis, Indonesia went through a period of economic decline and civil unrest. Rising tensions led to Suharto's resignation in 1998, ushering in a new economic way in Jakarta and Indonesia (Ibid.).

Indonesia is in a unique position. It is Southeast Asia's largest economy and is a young country. Over half of the population is under 30 years of age. Along with much of the world, Indonesia (and Jakarta) is moving towards a more integrated digital economy. This global trend is known as Industry 4.0, a shift toward cyber-physical systems in manufacturing processes, such as automation and cloud computing. The Indonesian government has enacted the *Making Indonesia 4.0* initiative to support the manufacturing sector (BKPM, 2019).

The goods produced in Indonesia are neither unique nor complex. The main industries are food products, textiles and apparel, chemicals, automotive, electronics, and petroleum related products. Combined, these industry sectors produced 74.75% of Indonesian output in 2017 (Business Sweden, 2018). Moreover, Jakarta lacks adequate infrastructure, and the environmental outlook is dire. This has led to the planned relocation of government functions from Jakarta to a newly constructed capital in East Kalimantan on the island of Borneo.

The relocation of of government will provide some relief, but it will not stop the growth of Jakarta or alter its status as the most important economic hub in the country, and, therefore, the roadmap laid out for advancing the economy of the country in *Making Indonesia 4.0* is of utmost importance to the city. This plan focuses on net export and cyber-physical systems as the next step in economic growth (Ibid.).

The port of *Tanjung Priok* is the largest port in Indonesia. Located in North Jakarta, the port is crucial to the Indonesian economy. In order to keep up with demand, the port is currently undergoing an expansion aimed at increasing ca-

pacity from 5 million twenty-foot equivalent units to 18 million units. This expansion will work as a catalyst and help Indonesia's economic benefit from a demographic dividend: accelerated economic growth due to a lesser percentage of the population being dependent on others and an increase in the labor force. This is a result of a decrease in fertility. The dependency ratio has been projected to keep improving until 2025, at which point the window to take advantage of this dividend will slowly start to close. This makes the present a prime time for economic development.

The three priorities selected to invigorate the industrial sector are: 1) diversifying and increasing complexity in the manufacturing sector; 2) training youth for a globalized and high performing economy; and 3) continued support and enhancement of the service sector. These are discussed in detail below.

Indonesia is one of the world's largest manufacturing economies. Manufacturing accounts for the employment of 25 million workers and 20% of GDP, totaling US $203 billion in 2017. Manufacturing output has grown steadily in the past five years, but while industry is growing in Indonesia, it is still not as successful as it could be. There is potential for the manufacturing sector to grow, both in terms of output and GDP (Business Sweden, 2018). Manufacturing has long been called an engine of growth, and Indonesia is not exempt from this (Asian Development Bank, 2019).

Indonesia has an opportunity to *move towards a more diverse manufacturing sector* and to upgrade how it produces and exports goods. Indonesian manufacturing is still focused on resource-based products, such as its food and beverage industry and its production of crude palm oil. To succeed in the increasingly competitive global market, Indonesia will need to develop niche and specialized sectors, in which it can dominate and have a competitive advantage. Most of these niche sectors should come from the electronics and chemicals sectors, which already have a relatively higher complexity than other Indonesian products (Asian Development Bank, 2019). To increase Indonesia's competitive advantage in domestic and foreign markets, the government has adopted the *Making Indonesia 4.0* as noted above. There is opportunity for collaboration between government and industry, but a mutual understanding must exist first. The second priority is training youth for a globalized and high-performance economy.

The Indonesian Government has made it clear that *focusing on technical and vocational skills is a top priority* in the *Making Indonesia 4.0* plan. These educational institutions are key to providing Indonesians with the high-level skills currently at a deficit in the labor market. They have taken steps toward increasing enrollment by ceasing to grant new university applications, aiming to steer those who would have established additional universities to instead establish new polytechnic schools. Currently, there are fewer than 300 polytechnic schools nationwide and only 55 million skilled workers. By 2030, the manufacturing sector in Indonesia is expected to have a demand for 11.3 million skilled workers (Arbi, 2019). However, pursuing an education at a polytechnic or vocational school is

seen as undesirable by the majority of post-secondary-education bound Indonesians. Some serious change is needed.

The Development Program (PDEP) to strengthen polytechnic education in Indonesia is primarily funded with a loan from the Asian Development Bank (ADB), as well as the government budget and aid from Canada (Ibid.). The program focuses on altering the education and training provided at polytechnic institutions to be more in-line with real industry needs. This existing system needs to be expanded. Indonesia should aim to increase the loan amount from the ADB, as well as the government budget and aid from Canada (Ibid.). The program focuses on altering the education and training provided at polytechnic institutions to be more in line with real industry needs. Utilizing these expanded funds to focus on polytechnic education in the *Jabodetabek* region would improve training quality and capacity in the nation's most important manufacturing hub.

Indonesia has the potential and desire to move towards a more advanced economy. As economies develop, *an important transition occurs from primary and secondary to tertiary sectors. Tertiary sectors are those that provide a service*, as opposed to the raw material production, extraction and manufacturing seen in the primary and secondary sectors. Indonesia has been shifting from the primary sector, as employment in agriculture and mining continues to fall. The service sector is now the largest employer in Indonesia, accounting for 48%of employment, which is up from one-third of all employment in 1990 (Asia Link Business, n.d.). Moreover, between 2010 and 2017, the service sector in Indonesia grew at an average annual rate of 7.1% (Aisyah, 2019).

2.3. Transportation

Both public and private support for transportation infrastructure, as well as total investment in them, has been alarmingly low. Prior to 1997, approximately 8% of GDP was invested in infrastructure, versus an estimated 3.5% in 2016. This urban infrastructure investment gap continues to widen as demand for efficient public transportation, particularly in Jakarta, continues to increase rapidly. While the demand has increased, urban infrastructure investment, as a share of GDP, has remained at about 3%. Currently, it is estimated that 7% to 7.5% is the share necessary to cover the required infrastructure investments and capital replacement for these projects (Ibid.). Both the slow pace of transportation infrastructure development and its poor quality in Indonesia can be attributed to this underinvestment, Jakarta's transportation networks suffer a myriad of issues alongside these as well.

There have long been neglected policies and institutional reforms in the capital. The city's various transit modes suffer across the board from outdated networks and underutilized deployment. They also have insufficient transport infrastructure, the BRT and local bus systems especially, as they share the same infrastructure as cars and motorbikes. This infrastructure is in real crisis with mainly car and motorbike traffic congesting the larger urban modes, and the city's walkability

is almost non-existent as a result of dwindling public space along these nodes. A lack of urban rail, along with this congestion, has resulted in daily gridlock across the capital, along with alarming pollution rates, which have ultimately greatly reduced the quality of urban life in Jakarta. This congestion also negatively affects the country's investment climate and GDP, as there is lost productivity in these traffic jams and gridlock.

Jakarta currently has 4 major transit systems in place, Transjakarta BRT, Jakarta MRT and two commuter rail lines, including the KRI. There is also a fifth LRT system that opened in November 2019. With the growth of these transit systems, the capital is becoming less car dependent. While the rail systems are increasingly important to the capital's transportation infrastructure, Jakarta's transportation future will ultimately depend on the success of TransJakarta, the city's robust Bus Rapid Transit System. It has the second-highest ridership of all transit systems, but the BRT has opportunities for growth and continued ridership that the other transit networks do not. The system celebrated its eighteenth year of operation as the first BRT system in Southeast Asia in January of 2023. Extending over 240 km, *TransJakarta is the world's longest BRT system*, and, with a daily ridership of over 800,000 people, the network continues to spread while its popularity also continues to grow.

Even with the increased amenities it has provided in recent years, the most critical factor for TransJakarta has been its affordability. It has remained low cost, with current tickets at roughly Rp 3500, equal to US $0.30. Riders now have access to a mobile app that details bus schedules, which has improved the network's efficiency tremendously. There has been a cultural shift for drivers and riders of TransJakarta in recent years, as the system is adjusting to enforcement of its specified stops and no longer picks up passengers at any given point along a route. It has certainly taken many riders time to adjust. However, it is critical that the BRT system be structured in this manner. There are many issues facing TransJakarta going forward, but the critical ones are flooding and enforcement of the dedicated lanes.

Looking towards the future, TransJakarta's overarching goal is to cover 70% of the people near transit in the Jakarta region, which will lead to providing service to over one million passengers daily (Ibid.). It is a major objective, but one that is very feasible with a potentially strong return on investment for infrastructure.

Jakarta's first Metrorail (MRT) was unveiled this past year, and MRT's corridor runs along a similar route as TransJakarta's first corridor line. Once again, integration is critical as some stops have already been integrated into both networks. The MRT is expected to expand to additional corridors, which will all be expected to be fully integrated with TransJakarta's network. This indicates a strong effort on the part of transportation planners to focus on multimodal forms of transportation, while also easing the major gridlock along their routes.

Currently, there is no systematic means of getting from one mode to another. Therefore, if there is such an option, more people will leave their automobiles and

use public transportation, if it is feasible and well-maintained. After all, in 2002, BRT was one of the most used modes, but due to issues relating to its speed and efficiency, people started turning away from it. If these problems are solved, and there is a way to connect the modes to each other, people will use public transportation more eagerly. *Gojek* and *Grab* are the one viable option that can be used to fill the gap that is needed to connect the different modes, especially because of how well-spread their use is in Jakarta. The effect that Gojek, for example, has on Indonesia's digital economy is huge, since it has secured around US $1.5 billion of capital from companies such Google and Tencent, and it contributes annually around US $705 million to the Indonesian economy. Additionally, more than one million people are working as drivers in Indonesia alone. Therefore, Gojek (an Indonesian company also operating in Vietnam, Singapore, Thailand and the Philippines) and its competitor Grab can be used as buffer connectors between modes due to their popularity. To attract Gojek to such a project, a Public-Private Partnership (PPP) between the government and Gojek needs to be negotiated. This needs to include the places where Gojek drivers need to be in order to drop off the passengers without causing congestion on the streets, so the design of the location should be appropriate.

2.4. Energy

Following the country's economic crisis in 1998 in the wake of the Asian Financial Crisis of 1997, Indonesia saw dynamic changes in its energy sector. The government prioritized energy security through diversification of its energy resources. Jakarta's energy production today relies on a mix of five primary energy sources: crude oil, natural gas, coal, hydropower and a cumulation of other renewable energy sources.

Indonesians are now becoming increasingly concerned with access to energy and electricity at the rate of a more developed country. BP reports that primary energy demand in Jakarta increased by 4.9% in 2018, up from the 10-year average of 2.8% (BP, 2019). This puts ever more pressure on the power companies to provide more stable sources of power and an increasingly developed grid. As a result, most of this new power has been generated with the cheap, government subsidized resources of coal and gas. This is reflected in the 19% growth in coal production experienced nationally throughout 2018, and the 45% incremental increase in primary power consumption supported by gas (Ibid.).

The increase in fossil fuel use is having negative environmental effects on the entire county. In fact, Indonesia and Jakarta specifically saw a 5.2% increase in total carbon emissions in 1918. In Jakarta, this growth has manifested itself in increasingly dangerous smog events. Throughout the first half of 2019, the city went through a period of particularly terrible air quality that influenced a citizen lawsuit against the government, which they held responsible for the pollution. Nevertheless, in 2018 Indonesia saw a staggering 81% increase in biofuel production, demonstrating the regional demand for this source of energy (BP, 2019). The

power of social change is profound, and demand for cleaner energy sources allows for a move towards renewable energy plants and green energy technology.

Three projects are here: Improving Energy Education, Cleaner Household Stoves, and Tapping the Geothermal Potential. While each project is effective on its own, they are most impactful if implemented collectively.

Indonesia's rank as a primary global exporter of energy products indicates its need to increase consumption of domestic energy resources, ideally renewable sources. *With 40% of the world's geothermal reserves*, Indonesia's greatest renewable potential is just below the surface. However, the process of sourcing geothermal energy is time-intensive and costly; therefore, the project for Tapping Geothermal Potential has the lowest priority of those proposed. It may be years before the public experiences any benefit. For this reason, small-scale sustainability interventions are also necessary to reduce quickly non-renewable consumption. Given that *most households rely on coal and wood-burning stoves for fuel*, the Cleaner Household Stoves project is the most direct and effective method of small-scale intervention. The lack of data, education and support for renewable energy highlights the socio-cultural shift necessary to ensure the success of these proposed projects and of any sustainability-related intervention. Education—and the grassroots support it garners—is the most important aspect to address as it is critical to the success of all other projects. For this reason, the Improving Energy Education project is given the highest priority.

This program is focused on spreading awareness to the general population of Jakarta about the benefits of adopting a cleaner energy mix. The residents of the city are already seeing the negative effects of their coal-powered plants in the poor air quality they experience. This raises a great deal of awareness before any further outreach, but there is a great opportunity to tap into this area moving forward. For this, most of the improving energy education budget is allocated to a social media campaign.

In Indonesia, households using traditional, inefficient stoves typically burn biomass that emits health-damaging pollutants into household environments, most directly affecting women and children. Since the 1970s, various groups have tried to introduce cleaner cooking technology in Indonesia, but their efforts lacked consistent funding and institutional support.

This medium-term project involves the conversion of biomass stoves into cleaner and more efficient biogas stoves. Many households have been shifting to modern cooking fuels and technology, but about 40% of households still rely on traditional biomass material (mainly wood) for cooking (Apex Consulting Group, 2013). This translates to about 24.5 million households throughout all of Indonesia. One of the main reasons for promoting clean stove technology is because the current method of cooking with biomass stoves produces unhealthy indoor pollution. Indonesia has high potential for biofuel, particularly given the country's status as the largest producer of palm oil. Increasing the use of biogas produced from palm oil mill effluent is cost-competitive, and it avoids the methane emis-

sions produced by unused biogas.

Tapping Indonesia's enormous geothermal potential is a long-term project that requires at least six years of implementation to be fully operational. Geothermal power plant projects require high upfront investment due to the various studies and exploration needed in order to find a viable active geothermal source. Geothermal energy has attractive operating costs, given that the renewable resources are freely available in the ground. However, the high exploration and construction costs make geothermal energy a risky investment, and private companies are reluctant to develop it. Moreover, as it takes five to seven years to begin operations, revenues are slow to materialize. Additionally, geothermal exploration comes with a high risk due to the lack of clear data about geothermal sources in Indonesia. This proposed geothermal plant project aims to expand the geothermal data in the region around Jakarta to create a basis of information for future geothermal plants. The hope is that by establishing a database with geological data, the costs of building future geothermal plants can be reduced as the need for preliminary studies, exploration drilling and feasibility studies will no longer be needed.

2.5. Water

Many water amenities such as new water connections, water wells, and more are too expensive and unaffordable to millions of low-income families (water.org. n.d.) in Jakarta. In addition, as the city is a coastal city located along Jakarta Bay in the Java Sea, and it faces many of the challenges and problems that other coastal cities around the world must deal with, i.e., flooding and sinking. These problems can be traced back in many ways to climate change. However, when considering the increased urbanization and population growth as well that affect Jakarta and many other densely populated cities, it is clear that this also leads to the inability of large areas to absorb rainfall due to ever increasing impermeable surfaces (Chaudhuri, 2018).

The city's subsidence, though partly due to climate change, is a consequence of groundwater extraction that is taking place throughout the vast urban agglomeration of *Jabodetabek*, with its 30 million inhabitants, and Jakarta at its center. Groundwater extraction is one of the cheapest ways for people to get access to clean water, so residents and industries have been extracting from and draining aquifers, often illegally, to the point where the city has sunk well below sea level. Models predict that by 2050, 95% of North Jakarta could be submerged. In fact, *Jakarta is reportedly the fastest sinking city in the world*.

Approximately 75% of the citizens of Jakarta rely on groundwater, even though there are studies that show 90% of the water is contaminated with bacteria. Only around 50% of the city's population has access to clean piped water, while the others, mostly low-income households, do not have clean water access, so they wash their clothes and bathe in murky grey water. This leads many of these lower income households to spend money, not only on clean water from vendors, but

to gain access to water through extracting groundwater and by other methods (Ann, 2015).

Moreover, along with land subsidence and sea level rise, existing elevation, high rainfall and low drainage capacity all together make Jakarta one of the highest flood risk cities in the world. About 40% of Jakarta's area, especially in North Jakarta, is below sea level.

In addition, the Indonesian Government adopted the National Capital Integrated Coastal Development Masterplan (NCICD) in 2014, which was an expansion of the Jakarta Coastal Defense Strategy. The main idea of the plan is to construct a *giant sea wall* (also known as the Great Garuda Project) to block Jakarta Bay from the sea. Although the Government of Indonesia is confident about this ambitious $40 billion, 30-year project, many Indonesians, especially in the coastal region of Jakarta, are concerned about the negative impacts of the project. The embankment might cause severe environmental degradation, including damage to local fisheries.

What is stressed here, however, is that a comprehensive approach is needed to solve the water problems of Jakarta. As was discussed earlier, the problems are interrelated, and it is necessary to identify the causes and effects of the problems. It is evident that the solution to one problem might solve other problems, and in many cases, it is also true that it might create new problems or intensify other problems instead of solving them.

The three major problems related to water in Jakarta are sinking/flooding, water pollution and scarcity of water supply/drinking water. As the problems are interconnected, if the problem of drinking water/water supply can be solved using surface water, or some other alternative sources of water other than ground water, it will reduce significantly ground water abstraction. As a result, land subsidence would be slower, which could be a significant improvement for solving the sinking/flooding problem. Since Jakarta has an average annual precipitation of 1755 mm (climatemps.com., n.d.), rainwater harvesting could be a good option for an alternative source of water. Grey water recycling could be another alternative source of water, which could save up to 70% of domestic water use.

However, rainwater harvesting could significantly supplement supply. Theoretically, it is possible to collect almost 100% of the need if all households in Jakarta could catch all of their rooftop water. So, rainwater harvesting, a simple technology and comparatively cheap to install and operate, offers the possibility of bringing revolutionary change to the water crisis of Jakarta if it is successfully installed and operated throughout all suitable areas of the city. It is proposed that in the 5-year duration foreseen for the environmental plan for Jakarta 73 communal systems be installed, which could later be sealed up.

Grey water, contributing 50% to 80% of total household wastewater, represents the largest part of the wastewater from households, offices and schools. Much like rainwater harvesting, grey water recycling could be a potential cheap source of alternative water in Jakarta. It can significantly supplement the existing water sup-

ply and dramatically reduce the wastewater discharged into rivers by a large amount. For greywater recycling, a simple system is proposed, which will produce water that can be used for all household activities except drinking. There are a number of reasons behind this; first, a separate small filter can be used for drinking water, so there is no logic to make all water drinkable using expensive technology as drinking water makes up less than 5% of total domestic needs; second, simple recycling is cheap and easy to maintain; third, people's perception might be negative about drinking recycled water directly.

As proposed here, one can see that there is no easy fix for the water crisis that Jakarta is facing. The problems surrounding water have been ignored and left unchecked for too long. The government has decided to implement gigantic projects, such as the updated seawall that will cost billions of dollars and take years to complete. Instead, the proposed projects in this section are directed to help the current residents in the city who presently have limited or no access to clean water. These projects are simple and cheap, but very effective, and they could help provide clean water access to all 11 million plus residents of Jakarta.

2.6. Sewage and Sanitation

The Jakarta metro is facing an issue that afflicts many developing countries, that of proper sewerage and sanitation services. Bacterial infections, such as E coli, run rampant and cause approximately 50,000 deaths in Indonesia annually, while waterways are filled with trash and sanitation poses a serious health threat to the millions of people who call the city home.

Much of the sewage management within Jakarta is privatized due to the absence of a city-wide sewage system. Most of the residents own a septic tank system, which only focuses on collecting sewage from the property. These systems require regular maintenance for properly emptying and disposing of waste and can, and often do, overflow. Most residents would rather use their own private system and hire cheap labor to remove the sewage regardless of whether after it is removed, there is no proper disposal.

The sanitation issue falls under the proper management of human generated solid waste and its impact on the health of natural resources. The images that are typically associated with Jakarta are the rivers filled with plastic bags, bottles, containers, clothing and paper products. These items always seem to find their way into a body of water, a landfill mountain, or onto factory floors close to active fires. There is both a lack of a proper method to dispose of trash, as well as the inadequate knowledge of residents on how to make changes to do so, as this has become an accustomed way of life.

The city's sewage and sanitation dilemmas follow the same pattern as in many other developing countries. There have been efforts made through various programs to alleviate the problems, but none have made a substantial enough difference or have the required reach. This section proposes various projects that can begin a pattern of success in this regard for the people of Jakarta.

There are a number of projects that could be useful here. One is already in use at small scale in Jakarta. The issue with many septic tanks is that they are not accessible via sludge trucks, as the tanks are too large to navigate the narrow streets of low-income neighborhoods. It began as the PUSH project created by the Mercy Corps, which was a preliminary study phase, from which the RW Siaga Plus was developed, which designed the carts and funding mechanism. Funded by Coca Cola and USAID and coordinated with the local Ministry of Health, the project has created access for more than 9000 individuals and 1800 households. It has also encouraged district health offices to educate their communities.

The city of Jakarta has attempted to create a large-scale sewage system that would serve large portions of the population. However, this idea has been delayed for over a decade due to the cost of disrupting existing infrastructure. While the idea of using sludge carts could aid in resolving parts of this issue over time, there exists the problem of removing the human waste and making the water safe enough to be discharged back into the environment. The neighborhood of Malkaskai is one of the few that has found a solution to this issue by having a communal, small scale, wastewater filtration system. It uses a system that allows 500 households to dispose of wastewater properly and have it cleaned to the point of being able to be released back into waterways with less pollution. It if known as grey water. A system of anaerobic and aerobic digesters is used to clean the water, and each has a different process as well as implementation cost, but is relatively affordable in comparison to the large-scale system Jakarta has been attempting to implement over the past decade.

Both systems have their strengths and weaknesses but still offer the same result of diluting blackwater sewage into a safer form of grey water. This grey water can then be released back into the environment, allowing natural processes to finish the purification as it seeps back into the water table. This process then allows the water to return to underground aquifers, allowing for underground wells to be recharged over a span of time.

The current recycling program, Trash Bank, should also be improved. It is slow and inefficient. This project would be an upgraded system with each community having a series of marked garbage bins to allow the self-service recycling of material. After self-assisted or manual weighing, citizens put waste in the corresponding recycling bin. The value is then calculated and sent to their own account after collecting the trash. The project will also incorporate social media apps, allowing users to see real-time deposits in their accounts from recycling, stimulating users to improve their initiative. At the same time, a reward system can be implemented for communities with higher recycling rates and increase the recycling intention of surrounding communities (jpninfo.com, n.d.).

According to the List of Cities Screened for Support under the Government of Indonesia's Improvement of Solid Waste Management to Support Regional and Metropolitan Cities Plan (ISWMP), all of Jakarta's landfills will have reached ca-

pacity by 2025. This project will establish new final disposal sites, located far from the central district, with new sanitary landfill technologies. Some of these technologies may be leachate treatment facilities, anerobic digesters and mechanical biological treatment (MBT). Along with this effort will be the redevelopment of existing final disposal sites that will be converted to newer, more efficient technology systems (Ibid.).

2.7. Finance

As the world's fourth most populous nation, and the world's tenth largest economy in terms of purchasing power parity, the nation has had impressive economic growth since overcoming the Asian Financial Crisis of the late 1990s. The country's GDP per capita has steadily risen, from US $823 in 2000 to US $3932 in 2018. Despite this substantial growth, poverty remains a serious problem. Indonesia currently has a GNI per capita of US $2611, more than 120 million Indonesians (over half of the population) live on less than US $2 a day (Dugay, 2012). That said, Jakarta, Indonesia is the center of roughly one-fourth of Indonesia's trade and services and two-thirds of its banking and financial sectors.

The objective of the finance section of this project to develop an environmental plan for Jakarta has been to research and examine the internal and external sources of funding for Indonesia in general, but for Jakarta in particular. Sources of this revenue include the overall government budget, foreign direct investment and foreign aid. From that, it was determined how much funding was potentially available for the proposed projects in the city. Each of the sector teams for poverty alleviation, industry, transportation, energy, water, and sewage and solid waste proposed their list of potential projects and estimated how much funding Jakarta would need for the projects to be implemented successfully over the five-year planning period. The finance team then determined the money that would be available for each potential project by looking at the amount allocated to each sector through the three sources of funding mentioned above.

In approaching the amount of funds available from this source, the proposed budget report of the Department of Budget and Management for 2019 for Jakarta was analyzed. When planning a project in Jakarta, one must recognize that the city has over 70 program categories that separate different budget categories for each fiscal year. Each of those categories has a specified amount of money allocated to be spent annually. That said, many of the program categories relate to each other, and can essentially be combined into one simple spending category. For instance, numerous categories relate to education in some way. When combining the budgets for those categories, the general category of "Education" is roughly 25% of the 2019 budget, and a major focus for funding projects moving forward. In addition, the 5-year performance indicator, also known as the Rencana Pembangunan Jangka Menengah Nasional (RPJMN), indicates that there is a major focus on solid waste management, flood mitigation and fire prevention. The reason why the RPJMN may focus so much on these areas is because

seasonal flooding has been a part of life in Jakarta since the seventeenth century.

Considering the government budget, Jakarta has yearly goals for how it operates. These goals include the Human Development Index, poverty rate, investment spending, and much more. This list gives a rough idea of what the government wants to achieve for the 2020 fiscal year. One key takeaway from the list is the fact that it intends to allocate over US $7 billion to investment spending. This amount, then, indicates the availability of funds to the city for that fiscal year. As mentioned previously, out of US $7 billion, the RPJMN-based focus could lead to more funds being spent on waste management, flood mitigation and fire prevention, rather than on education, health and some of the other top categories.

So, how does foreign direct investment benefit Indonesia, and Jakarta? Overall, Jakarta's government must look at its government budget line for each category and, also look at its RPJMN (5-year priority investment plan), to note what countries are investing in categories that best align with its future plans. Nevertheless, the investment and construction of a new school in Jakarta from Singapore may not bring in an abundance of profit for Jakarta itself, but it may give the city the opportunity to reallocate funds towards their 5-year Rencana Pembangunan Jangka Menengah Nasional (RPJMN), which places emphasis on solid waste management, flood mitigation and fire prevention.

In addition, Indonesia as a nation receives plenty of foreign aid from many different entities. Some of the top institutions giving the most to Indonesia are the Asian Development Bank, The World Bank, the Global Fund to Fight AIDS, the Unitd Nations and the Millenium Challenge Corporation. In addition, some of the bilateral donors that give foreign aid to Indonesia are the German Federal Ministry of Economic Cooperation and Development (BMZ), the Japan International Cooperation Agency (JICA), the Australian Agency for International Development (AusAID), Agence Francaise de Development (AFD), and (formerly) the United States Agency for International Development (USAID).

Overall, when looking at foreign aid, one must recognize the difference between it and foreign direct investment. Essentially, foreign direct investment refers to a source from another nation putting funds into Indonesia with the expectation it gets a return on that investment. As mentioned above, foreign direct investment can benefit Indonesia, and Jakarta especially, in terms of private sector projects. However, foreign aid that is sent to Indonesia is used to benefit Indonesia's people directly. If the World Bank allocates millions of dollars of foreign aid to Indonesia for the construction of a new school, with new books, equipment, etc., then Indonesia reaps direct benefits for those who attend the school and indirect benefits for the country through the additional productivity of the school's graduates.

3. Dhaka

In 2008, Dhaka celebrated 400 years as a municipality, and it is the center of po-

litical, 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 (Fang, 2014) (**Figure 4**).



Figure 4. Map of Bangladesh. This Photo by Unknown Author is licensed under CC BY-SA. Source: https://gl.wikipedia.org/wiki/Bangladesh.

3.1. 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, the 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.

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. 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) (**Figure 5**).



Figure 5. Traffic in Dhaka. This Photo by Unknown Author is licensed under CC BY-SA. Source: https://www.flickr.com/photos/joiseyshowaa/2402764792.

3.2. 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.

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.

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 have reached $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.

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.

3.3. Energy

Introduction

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 (The World Bank Annual Report, 2021). 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).

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 7,264 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). 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.

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, including buses, ferries, both public and private, trains and a subway, 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.

3.4. Transportation

Gridlock in Dhaka

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.

Congestion

The congestion problem in Dhaka is overwhelming with higher rates than any other country! This disparity is ascribed 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) (**Figure 6**).



Figure 6. Enormous traffic jam in Dhaka. This Photo by Unknown Author is licensed under CC BY-NC-ND. Source: https://urbanfailure.blogspot.com/2014/05/dhaka-most-densely-inhabited-megacity.html.

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 out-lined 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.

3.5. Solid Waste and Sewage

3.5.1. 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 co-ordination, 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.

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.

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 authorities indicate that the decaying mounds of waste are also breeding grounds for mosquitoes which contribute to vector-borne diseases in neighboring areas.

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.

Recommendations

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 reusable 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.

Establishment and Development of Micro-Enterprises in Waste Recovery and Recycling:

According to the World Bank (2020), 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.

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.

3.5.2. Sewage

Dhaka has experienced exponential growth over the past few decades, resulting in heightened demands on its sewage and wastewater management systems (World Bank, 2024). 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 with the rapid population growth, leaving significant gaps in coverage (World Bank, 2024). Currently, two major sewage treatment plants, Dasherkandi 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 Dasherkandi 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).

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 (Haq, 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.

Approximately 217 million cubic meters of wastewater are generated annually from dyeing and finishing processes (Ibid.). 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 by-products into local waterways (Hasan, 2023).

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.

Decentralized Wastewater Treatment Systems

This can potentially alleviate some of the burden on Dhaka's overstrained 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.

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).

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.

Finally, 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) are deeply connected to the improvements needed in Dhaka's waste management systems.

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 better water management, as outlined below.

3.6. Water Management

Background

As of 2024, its metropolitan population is estimated at approximately 23.9 million, reflecting a 3.13% increase from the previous year (Macrotrends 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 infrastruc-

tural 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.

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, Shita-Lakshya, Balu, Turag, and Dhal Eshwari. 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 Chitralekha Rivers, signifying severe ecological degradation (Nahar et al., 2014) leading to a crisis in water management and health issues.

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.

Major Challenges

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.

The socio-economic impact of water pollution in Dhaka is profound. Waterborne 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. Despite sustainable

urban policies, and robust legal frameworks, 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.

Proposed Solutions

To address these gaps, policy integration through a central regulatory authority is crucial to streamline water and environmental governance (Ahmed, 2014). 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.

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 unautheorized 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. And 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 pre-serving wetlands and the consequences of encroachments.

By integrating stricter legal provisions, robust enforcement mechanisms, and public engagement, Dhaka can effectively address encroachments, restore its natural ecosystems, and promote sustainable urban planning, drawing inspiration from India's success in tackling similar challenges.

3.7. Finance

3.7.1. Current Financial Status

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).

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, 2024).

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.

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%. 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.

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.

Budgeting

The Finance Minister of Bangladesh has unveiled the national budget for the fiscal year 2024-25 (with that for 2026-27 similarly allocated), 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 re-forms to stabilize the economy and boost growth.

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 (2024). 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 in-creasing 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.

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 socio-economic 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 figures, 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.

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 (Ibid.) 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.

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. 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 (ADB Factsheet. 2023).

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.

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 al-located €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.

3.7.2. Sector Finance Proposal

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.).

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 cur-rent 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.

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 re-source. Similarly, there are several funding allocations for quality education, Good Health & Well-being and Zero Hunger.

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.

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.

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.

Water

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 clean-er, 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.

4. Conclusion

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.

5. Final Remarks

Dhaka and Jakarta are important megacities, not only in South and Southeast Asia respectively, but in the world. They are unique in that they are the largest majority Moslem population cities and are growing rapidly, mostly in a hectic barely planned manner. Bangladesh and Indonesia have huge urban populations centered in these two cities, which will soon be the world's largest urban concentrations. They each have a rich cultural history and are the centers of all aspects of their national identity. The arts, cuisine, music, dance, fashion, education, and politics are at hand in these cities of more than 10 million inhabitants. They are emotionally rich and vibrant places to be.

However, as these studies demonstrate, they each have serious problems, many of which characterize both metropolises. Traffic congestion is remarkable. Twenty percent of the urban population live in grinding poverty. Clean water can be difficult to maintain, sewage is difficult to dispose of, and the cities are hard to move around in. Competition for food, transportation, educational opportunities and jobs is fierce. It is a tough life for most, and this article demonstrates the difficulties of life for most residents. Yet, they are willing to work hard to improve their family situations, and many succeed.

As the Introduction noted, this paper compares the approaches of graduate planning students to formulate a 5-year plan of solutions to the environmental problems and issues in the two critically important Moslem majority metropoles: Jakarta, Indonesia and Dhaka, Bangladesh. This expanded their analytical skills to determine implementable solutions for the benefit of the population of these culturally diverse cities bound together by the shared faith of Islam. The students gained a greater appreciation of the skill set that they are developing as planners. Bringing the reality of the developing world to the classroom and asking students to confront it gives them an appreciation of how difficult professional practice can be, which the study of theory alone does not. Thus, this project has attempted not only to expand the education of planning graduate students, but also to provide a meaningful contribution to planning pedagogy.

Conflicts of Interest

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

References

Adedipe, N. et al. (2005). Waste Management, Processing, and Detoxification. In K. Chopra et al (Eds.) *Ecosystems and Human Well-Being: Policy Responses* (Vol 3. pp. 313-334), Oisland Press.

Ahmed, I. (2014). Factors in Building Resilience in Urban Slums of Dhaka, Bangladesh. *Procedia Economics and Finance, 18,* 745-753. https://doi.org/10.1016/s2212-5671(14)00998-8

Ahsan, A., Alamgir, M., El-Sergany, M. M., Shams, S., Rowshon, M. K., & Daud, N. N. N. (2014). Assessment of Municipal Solid Waste Management System in a Developing Country. *Chinese Journal of Engineering, 2014,* 1-11. https://doi.org/10.1155/2014/561935

Ahsan, M. (2023). Exploring Urban Poverty in Bangladesh: Dynamics, Coping Strategies and Beyond. *Topkapı Sosyal Bilimler Dergisi, 2,* 91-114.

Aisyah, R. (2019). Indonesia's Services Sector Has Great Potential of-transformation-78905, Trade Ministry Says. *The Jakarta Post*.

Akther, H., & Ahmad, M. M. (2021). Livelihood under Stress: The Case of Urban Poor during and Post-Flood in Dhaka, Bangladesh. *The Geographical Journal, 187,* 186-199. https://doi.org/10.1111/geoj.12379

Alam, S. (2023). *Bangladesh Needs Up to US$1.71 Billion Annually until 2041 for 40% Renewable Energy Capacity*. https://ieefa.org/articles/bangladesh-needs-us171-billion-annually-until-2041-40-renewable-energy-capacity

Ann, C. (2015). Your Letters: Clean Water Problem in Jakarta. *The Jakarta Post*. https://www.thejakartapost.com/news/2015/03/04/your-letters-clean-water-problem-jakarta.html

Apex Consulting Group (2013). *The Case for Clean Biomass Cookstoves in Indonesia*.

Arbi, I. A. (2019). *Indonesia Focuses on Polytechnics amid Staggering Skills Gap*. https://www.thejakartapost.com/news/2019/01/04/indonesia-focuses-on-polytechnics-amid-staggering-skills-gap.html

Asia Link Business (n.d.). Doing Business Briefing: Indonesia. https://asialinkbusiness.com.au/indonesia/getting-started-in-indonesia/indonesias-economy?doNothing=1

Asian Development Bank (2019). *Policies to Support the Development of Indonesia's Manufacturing Sector during 2020-2024 A Joint ADB-BAPPENAS Report*. Asian Development Bank.

Badan Koordinasi Penanaman Modal (BKPM) (2019). *Making Indonesia 4.0: Indonesia's Strategy to Enter the 4th Generation of Industry Revolution*.

BP (2019). *Indonesia's Energy Market in 2019*. BP Statistical Review.

Brown, A. (2013). *The Dark of Day: Life in a Jakarta Urban Slum*. UNICEF Connect East Asia and Pacific. https://blogs.unicef.org/eastasia-pacific/the-dark-of-day-life-in-jakarta-urban-slum/

Business Sweden (2018). *Indonesian Priorities in Making Indonesia 4.0*.

Chaudhuri, E. (2018). Jakarta Sinking: How Subsidence Endangers Indonesia's Capital. *Harvard Political Review*.

Diaz, L. F. (2011). *The 3Rs as the Basis for Sustainable Waste Management: Moving Towards Zero Waste* (Presented at the Third Regional 3R Forum in Asia, Singapore).

Dugay, C. (2012). *Indonesia's Top 10 Donors: Responding to the Promise of Transfor-*

mation. Devex.

Economy of Bangladesh (2023). In Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/wiki/Economy_of_Bangladesh

Fang. L. (2014). *He Is a Journalist with Intercept, and His 2013 Reporting Covered Bangladesh's Garment Industry*.

Haq, M. (2022). Textile Industry and Water Pollution in Dhaka: Current Status and Impacts. *Bangladesh Journal of Environmental Science, 21,* 45-52.

Hasan, K. (2023). The Leather Tanning Industry's Impact on Water Pollution in Dhaka. *Journal of Hazardous Materials, 459,* Article 132293.

International Energy Agency (2022). *Domestic Energy Production, Bangladesh*. https://www.iea.org/countries/bangladesh/energy-mix

Khanom, S., Miller, F., & Suchet-Pearson, S. (2023). Dhaka: A City of Development and Deprivation for Environmentally Induced Migrants. In B. R. K. Sinha (Ed.), *Urban Dynamics, Environment and Health* (pp. 357-376). Springer. https://doi.org/10.1007/978-981-99-5744-6_15

Light Castle. (2022). *Bangladesh Donor Funding Outlook: Growing Economy & Evolving Development Landscape*. Light Castle Partners. https://lightcastlepartners.com/wp-content/uploads/2022/08/Bangladesh-Donor-Funding-Outlook.pdf

Macrotrends LLC (2024). *Bangladesh Trade to GDP Ratio 1960-2024*. https://www.macrotrends.net/global-metrics/countries/BGD/bangladesh/trade-gdp-ratio

Mahbub, T. (2024). Energy in Bangladesh: From Scarcity to Universal Access. *Energy Strategy Reviews, 54,* Article 101490. https://doi.org/10.1016/j.esr.2024.101490

Nahar, M. S., Zhang, J., Ueda, A., & Yoshihisa, F. (2014). Investigation of Severe Water Problem in Urban Areas of a Developing Country: The Case of Dhaka, Bangladesh. *Environmental Geochemistry and Health, 36,* 1079-1094. https://doi.org/10.1007/s10653-014-9616-5

OECD (n.d.). *Aid at a Glance Charts: Bangladesh*. https://www.oecd.org/dac/financing-sustainable-development/development-finance-data/aid-at-a-glance-bangladesh.htm

Rahman, M. (2023). Sedimentation Problems Caused by Ceramics Factories in Bangladesh. *Environmental Monitoring and Assessment, 195,* Article 546.

Rampley, C. P. N., Whitehead, P. G., Softley, L., Hossain, M. A., Jin, L., David, J. et al. (2020). River Toxicity Assessment Using Molecular Biosensors: Heavy Metal Contamination in the Turag-Balu-Buriganga River Systems, Dhaka, Bangladesh. *Science of The Total Environment, 703,* Article 134760. https://doi.org/10.1016/j.scitotenv.2019.134760

Rezaul Islam, M., Khan, N. A., Fahrudin, A., Islam, M. R., & Islam, A. K. M. M. (2020). Poverty and Social Inequality: Bangladesh Experience. In M. N. Momen, R. Baikady, C. Sheng Li, M. Basavaraj (Eds.), *Building Sustainable Communities* (pp. 425-451). Springer. https://doi.org/10.1007/978-981-15-2393-9_21

Shatil, A. (2023). *Renewing Bangladesh's Energy Transition*. East Asia Forum. https://eastasiaforum.org/2023/08/19/renewing-bangladeshs-energy-transition/

Sultana, S., Yasmin, H., & Chowdhury, A. H. (2022). Water Quality Assessment of the Buriganga River in Dhaka: Biological and Chemical Analysis. *Bangladesh Journal of Bioethics, 13,* 20-31.

TBS News (2023). *PM Hasina Inaugurates Dasherkandi Sewage Treatment Plant, Largest*

in South Asia. The Business Standard.

The World Bank Annual Report (2021) *From Crisis to Green, Resilient and Inclusive Recovery*.

Urme, S. A., Radia, M. A., Alam, R., Chowdhury, M. U., Hasan, S., Ahmed, S. et al. (2021). Dhaka Landfill Waste Practices: Addressing Urban Pollution and Health Hazards. *Buildings and Cities, 2,* 700-716. https://doi.org/10.5334/bc.108

VA Tech WABAG (2023). *Bangladesh PM Sheikh Hasina lays Foundation Stone for 200 MLD Pagla Energy Neutral Sewage Treatment Plant in Dhaka*.

World Bank (2020). *The Main focus for Bangladesh Was Responding to COVID-9 and Limiting Its Economic Impact*.

World Bank (2024). *Addressing Environmental Pollution Is Critical for Bangladesh's Growth and Development*. https://www.worldbank.org/en/news/press-release/2024/03/28/addressing-environmental-pollution-is-critical-for-bangladesh-s-growth-and-development

World Population Review (2024). *At This Time the Population of Bangladesh Was 177,818,044*. https://worldpopulationreview.com/countries/bangladesh

World Population Review (2026) https://worldpopulationreview.com/countries/indonesia

Yin, H., Islam, M. S., & Ju, M. (2021). Urban River Pollution in the Densely Populated City of Dhaka, Bangladesh: Big Picture and Rehabilitation Experience from Other Developing Countries. *Journal of Cleaner Production, 321,* Article 129040. https://doi.org/10.1016/j.jclepro.2021.129040

Websites

http://worldpopulationreview.com/world-cities/jakarta-population/, accessed 24 June 2019.

http://worldpopulationreview.com/countries/indonesia-population/, accessed 20 June 2019.

https://www.britannica.com/place/Jakarta, accessed 24 June 2019.

https://commodity.com/indonesia/, accessed 20 June 2019.

https://www.cia.gov/library/publications/the-world-factbook/geos/dr.html, accessed 20 June 2019.

https://www.dezeen.com/2019/05/01/indonesia-new-capital-city-jakarta-sinking/, accessed 20 June 2019.

https://www.ecowatch.com/indonesia-to-move-capital-jakarta-2636197365.html, accessed 24 June 2019.

https://www.ft.com/content/3f8f86ca-6af3-11e9-80c7-60ee53e6681d, accessed 24 June 2019.