

# Management of the Urban Environment in Three Southeast Asian Coastal Metros: Bangkok, Manila and Jakarta

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## Abstract

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 interest, and in developing countries, where it has become increasingly an area of donor concern as well. As a field, it is more like planning or engineering rather than geography, economics or sociology; and it represents an integrated view of environmental problems at city, metro and increasingly, regional level. Such problems are multi-sectoral (e.g., manufacturing, services, household, etc.), multi-system (e.g., water supply, sanitation, transport, etc.), multi-level (central, regional, metro, local and community) and multi-actor (e.g., government, NGO, CBO and private). They require solutions of enormous complexity. Three different research projects of graduate students in urban planning at the University of Cincinnati led by the author have studied the environmental problems of the three largest metros in Southeast Asia: Jakarta, Bangkok and Manila, and suggested how they could be ameliorated somewhat if not solved. This paper compares the three approaches of the students to formulate a 5-year plan of solutions to the environmental problems and issues they faced rather than to be told how to solve them. This expanded their analytical skills and taught them how to utilize the limited knowledge and resources available to come up with implementable solutions for the benefit of the population of Bangkok, Jakarta or Metro Manila. They learned that such skills are transferable to other projects, 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.

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## Keywords

Urban Environmental Management, Metro, Southeast Asia, Developing Country, NGO

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## 1. Introduction

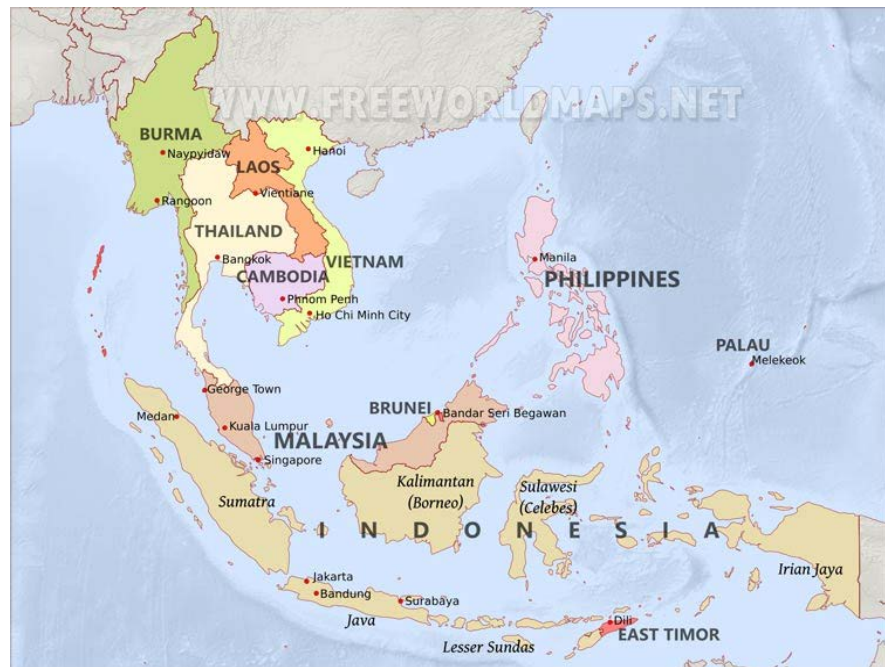
As is seen below, Jakarta, Manila and Bangkok are the three largest metropolitan areas in Southeast Asia. They are also among the largest metros in the world, are all the largest and most dynamic cities in important developing countries and are located close to each other geographically. However, although the largest metropolitan areas in Southeast Asia have many similarities, especially regarding their environmental problems (to be elaborated later), they have historical differences. Bangkok, for instance, as part of Thailand, was never colonized, while Manila was the largest city in the American dominated Philippines and Jakarta was the dominant urban area in the world's largest Dutch colony. They have political and demographic differences, and these are reflected in their government policies (Figure 1).

Three different research projects of graduate students in urban planning at the University of Cincinnati led by the author have studied the environmental problems of the three metros and suggested how they could be ameliorated somewhat if not solved. The most critical environmental problems fall in seven main areas, which were analyzed in detail for each metro. They are poverty alleviation, industry, energy, transportation, sewage and sanitation, water and finance. This paper compares the three approaches, and it was first presented to urban and regional planning graduate students and faculty members in a graduate class on urban and regional theory taught by Dr. Nicha Tantivess at Khon Kaen University in Thailand on 27 July 2023. The author is thankful for their comments and suggestions.

According to the Association of Southeast Asian Nations (ASEAN), these three metros are ranked accordingly:

<u>ASEAN Rank</u>	<u>World Rank</u>	<u>Urban Area</u>	<u>Area (km<sup>2</sup>)</u>	<u>Population</u>
1	2	Jakarta	3540	33,756,000
2	6	Manila	1873	24,922,000
3	16	Bangkok	3199	18,007,000

In addition, Demographia's "World Urban Areas" study, also finds that the most populous cities in Southeast Asia are Jakarta, Manila and Bangkok in that order. Demographia defines an urban area (urbanized area agglomeration or urban center) as a continuously built-up land mass of urban development that is within a labor market (metropolitan area) without regard to administrative boundaries (Source: "Demographia World Urban Areas", 14<sup>th</sup> Annual Edition (PDF). April 2019. Archived from the original (PDF) on 7 February 2020 Retrieved 10 June 2020).



**Figure 1.** Map of Southeast Asia. Source: <https://www.freeworldmaps.net/>.

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 interest, and in developing countries, where it has become increasingly an area of donor concern as well. As a field, it is more like planning or engineering rather than geography, economics or sociology; and it represents an integrated view of environmental problems at city, metro and increasingly, regional level. Such problems are multi-sectoral (e.g., manufacturing, services, household, etc.), multi-system (e.g., water supply, sanitation, transport, etc.), multi-level (central, regional, metro, local and community) and multi-actor (e.g., government, NGO, CBO and private). They require solutions of enormous complexity, and those professionals who coordinate the planning, implementation and management of the process must be able to communicate with specialists from many disciplines and professions (e.g., biology, chemistry, engineering, city planning, public administration, social sciences and law) (Edelman, Schuster, & Said, 2017).

This paper focuses on the practice of Urban Environmental Management in the three largest metropolitan areas of the most populous Southeast Asian developing countries of Indonesia, the Philippines and Thailand, which face more immediate problems than the developed world and have fewer resources to cope with them in a comprehensive manner.

## 2. Structure of Paper

Each of the three metros will be discussed separately to show clearly the environmental problems of each and how they have been approached. After the introduction, each metro section will discuss poverty alleviation, industry, energy,

transportation, sewage and sanitation, water and finance in constructing a 5-Year Environmental Plan for each metro using a real-world database and a limited budget. Final remarks will conclude the paper.

### 3. Bangkok

Bangkok is the political, economic and commercial capital, as well as the largest city, of Thailand. It is located on the delta of the Chao Phraya River, about 25 miles (40 km) from the Gulf of Thailand. It was formerly divided into two municipalities—Krung Thep on the east bank and Thon Buri on the west—connected by several bridges. In 1971, the two were united as a city-province with a single municipal government. In 1972, the city and the two surrounding provinces were merged into one province, called Krung Thep Maha Nakhon (Bangkok Metropolis) governed by the Bangkok Metropolitan Administration or BMA (Wikipedia, n.d.) (<https://en.wikipedia.org/wiki/Bangkok>). The metropolis is a bustling, crowded city, with temples, factories, shops and homes juxtaposed along its roads and canals. While it is also a major tourist destination, noted for fabulous cultural attractions and nightlife with a flourishing sex trade, it has severe environmental problems, which include air pollution from vehicle emissions, water pollution from organic and factory wastes, water scarcity, and hazardous waste disposal.

Furthermore, Bangkok's rapid growth coupled with little urban planning has resulted in a haphazard cityscape and inadequate infrastructure. Despite an extensive expressway network, an inadequate road network and substantial private car usage have led to chronic and crippling traffic congestion, which caused severe air pollution in the 1990s. The city has since turned to public transport in an attempt to solve the problem, operating five rapid transit lines and building other public transit, but congestion still remains a widespread issue in that limited space, a persistent increase in the number of vehicles, inconsistent traffic flow, and uncertain travel time are all dominant factors of daily life in Bangkok. Bangkok also faces long-term environmental threats such as sea level rise due to climate change and subsidence, the latter of which is a major concern (Wikipedia, n.d.) (<http://www.en.wikipedia.org/wiki/Bangkok>).

#### 3.1. Poverty Alleviation

In Thailand, the effects of the economy have drastically changed the way of life for all of those who reside there. The steady reduction of poverty in the country from the 1960s until 1997 was primarily gained through economic growth led by industrialization, the emergence of export growth and increased foreign investment. This led Thailand to create high interest and fixed currency exchange rates to continue to attract outside investors. A sudden rush of money to and investment in Thailand created a boom for the economy, but soon that all came crashing down. The effect was economic decline. Thailand had its exchange rates plummet, and the Thai currency (baht) lost much of its value, which caused the

poverty rate to increase to 65% after the crash and brought about a time of hardship (Ibid.).

Between 2015 and 2018, the poverty rate fluctuated. In 2015, the poverty rate was 7.2% (5.2 million), and, approaching 2018, the rate rose to 9.8% (6.8 million) (<https://www.macrotrends.net/countries/THA/thailand/poverty-rate>, Thailand Poverty Rate 1981-2021 (2021)). The amount of people living below the poverty line before 2018 decreased drastically due to Thailand's economic growth and government aid programs. However, an economic slowdown, technological problems, and a trade war resulted in a considerable number of people residing below the poverty line once again. This widespread poverty increase spread over the entirety of Thailand, and 61 out of 77 provinces were thrown into impoverished situations (Limited, 2020).

There are a total of 579,630 people living in Bangkok's slums, accounting for 29% of the city's population. The slums are subject to "socio-economic vulnerability, limited access to social welfare and public facilities, poor housing, unsafe and overcrowded neighborhoods, risky and/or polluted environments (Global Times, 2021)". These areas are tight quarters of housing that are filled with people, and there is little to no social distancing.

Khlong Toey is the largest populated slum in Bangkok and also the most destitute. With a population of over 100,000, the people that live there are struggling. Khlong Toey is a highly overpopulated area that consists of families of up to 10 living in one small living space. Within such a small space, there is no chance of social distancing.

Due to economic growth from 1977-1997, non-governmental organizations (NGOs) were created, and, by the year 1989, there were over 12,000 NGOs operating in Thailand, with 44% dedicating their work to social/economic development and welfare (Asian Development Bank, 2021). These non-governmental organizations then gave way to civil society organizations in the 1990s due to the economic growth Thailand was experiencing. These Civil Society Organizations grew to meet the many needs of the poor who weren't located in the city center (Ibid.).

In order to expand government social and economic safety nets to include everyone, a 4-phase plan can be implemented (Edelman, 2022).

- Phase 1: As previously mentioned, the first step in extending a government safety net starts with registering those living in slums on government websites, so every person is accounted for by the government.
- Phase 2: Here, labor protection is extended to those who are in the informal sector and don't have a contractual obligation to a company. This can be broken down into further sub phases:
  - Phase 2.2: Subcontracted workers.
  - Phase 2.3: Self-employed/small businesses.
  - Phase 2.4: Daily hires.
- Phase 3: Informal and contracted hires must have a legal system and contractual paperwork that considers them as working members of society so

government health policies can then apply to them.

- Phase 4: This phase includes the implementation of a public works program where informal workers can aid in the construction of new housing in slum communities.

Nevertheless, as cities adapt to the new realities that they are faced with, one constant that is present is the need for continued economic growth. This is also true for Bangkok in that continued economic expansion offers a means of relative improvement for the overall general economy. It also offers opportunities for the economic advancement of citizens who live in and reside around Khlong Toey. Nevertheless, similar to other communities, there are costs associated with new development, with one of them being the gentrification of a community due to the new development. With the process in its current form, substantial amounts of housing units will be vacated and require residents to find alternative housing opportunities or take cash compensation to move elsewhere (Chandran, 2021). While economic growth must continue for an urban environment to succeed and grow, it must work in tandem with the protection of the existing residents' interests in the community.

### 3.2. Industry

Bangkok is the location of the main port of Thailand, making it an integral part of the economy of the country. Wholesale and retail trade is the largest sector in Bangkok's economy, accounting for 24% of Bangkok's gross provincial product. It is followed by manufacturing (14.3%); real estate, renting and business activities (12.4%); transport and communications (11%); and financial intermediation (11.1%). Tourism is also a major source of revenue in Bangkok (The World Bank, n.d.).

The Bangkok metro alone accounts for 48.4% of Thailand's service sector, which in turn constitutes 49% of Thailand's GDP (Ministry of Information and Communication Technology, 2017). The service sector is defined as anything having to do with retail trade, tourism, education, social services, government, etc. Bangkok's service sector accounts for roughly half of the 2.3 million establishments in Thailand, as of 2012. This means that there are approximately 480,000 establishments in Bangkok devoted to the service industry (Ibid.). As of 2012 roughly 1.7 million people were employed in the service industry in Bangkok.

The manufacturing industry in Bangkok is made up of the production of building materials, food processing, textiles, the assembly of electronic equipment, and automotive assembly (Ibid.). Thailand's textile industry consists of over 2000 businesses, most of which are in or around Bangkok (Mordor Intelligence, 2021). The country is known all over the world for its silk production. It is also doing well in eco-friendly dyeing and printing services. The textile industry employs over 200,000 people. Overall, the manufacturing industry in Bangkok is a crucial part of Thailand's economy.

In the last 40 years, Thailand has made great strides in economic development, becoming an upper middle-income country. According to the World Bank, Thailand's economy grew at an average yearly rate of 7.5% from 1960 to 1996. The economy grew at a rate of 5% per year from 1999 to 2005 after the Asian Financial Crisis. Millions of new jobs were created from this economic growth. Even more recently, economic growth has slowed from 4.2% in 2018 to 2.4% in 2019. The root cause of slowing economic growth was less demand for exports due to US-China trade tensions and a drought which impacted agricultural production.

The COVID-19 pandemic has only exacerbated the economic growth problems of Thailand. Economic growth went down 6.1% in 2020 due to changes in trade and tourism, supply chain issues, and less domestic consumption. The World Bank says that the export of goods has provided substantial support to the economy, driven by recovering global demand for automotive parts, electronics, machinery, and agricultural products. The recovery ramped up in 2022.

Policymakers in Thailand also decided it was necessary to digitize Thailand in order to propel the country to the next level. Thailand 4.0 is the plan for the future that policymakers came up with (Ministry of Foreign Affairs Thailand, n.d.). Thailand 4.0 is a 20-year plan for Thailand that was launched in 2016. According to a statement from the Royal Thai Embassy in Washington D.C., "Thailand 4.0 is designed to promote and support innovation, creativity, research and development, higher technologies and green technologies." The goal is to digitize the country and graduate from middle income to a high-income country (Ibid.). Thailand 4.0 refers to a method to generate a transformation from primarily machine manufacturing to digital manufacturing (Puriwat & Tripopsakul, 2020). To aid in implementing the Thailand 4.0 policy, policies focus on the semiconductor and automotive production industries within this plan.

### 3.3. Energy

Well over 15 million people live and work in Bangkok (Pakarnseree et al., 2018). As the capital of Thailand and centrally located, the Bangkok metro is the heart of the country's industry, commerce, manufacturing, construction, and economy (Arifwidodo & Chandrasiri, 2015). These factors have led to rapid industrialization and urbanization due to the influx of people coming to the capital city. The people of Bangkok place a major significance on entertainment. The city has a high concentration of recreational establishments, neon lighting, and flashy displays. This increases energy consumption and pollution. Energy efficiency is a major concern that needs to be addressed. More sustainable housing and adaptations to the planning of the city can help to mitigate Bangkok's energy needs (Arifwidodo & Chandrasiri, 2015).

Urbanization has had a huge impact on the environment in Bangkok. The development of the city's roads and buildings has reduced the number of trees and

amount of vegetation in the area. Temperatures in Bangkok have risen as a result of urbanization. The tall buildings trap heat, lights are used at all hours of the day, and motor vehicles are the most common form of transportation. Air conditioning and fuel use have increased because of this. Air conditioning, used to make high temperatures more comfortable, makes up the largest percentage of energy use (60%) in Bangkok. Each of these factors, along with industry, manufacturing, and population growth have had a negative impact on the environment in Bangkok. Air pollution, water pollution, and land subsidence have increased along with a temperature difference of seven degrees Celsius higher than that of rural areas (Arifwido & Chandrasiri, 2015).

In order for a country to develop and flourish, adequate energy resources are required. Thailand has scarce conventional energy resources; therefore, it looks to imports as an alternative. Thailand as a whole requires energy to supply and meet its domestic demand, which is at odds with its population growth, urban growth and economic expansion (Ministry of Energy, 2015). Energy utilization climbs every year with a large portion consisting of imported energy. Since 1995, the overall import of commercial energy has accounted for over 50% of the combined supply. Is also foreseen to grow since nonrenewable resources such as gas and oil reserves are being depleted at alarming rates. Therefore, since the majority of energy consumption and imports are fossil-based, an issue arises with environmental protection because there is a surge of greenhouse gas emissions (GHG). Residents of Thailand have a negative view of the use of fossil fuels such as coal, which has sparked protests across the country at coal-fired power plants. To address these concerns, Thailand set a renewable energy goal of 30% of total energy use by 2036 in the Alternative Energy Development Plan or AEDP 2015. The intentions are to vary energy sources and diminish environmental pollution rates.

According to Open Gov Asia, Thailand currently generates around 12% of its energy from sustainable sources, and Thailand's government hopes to increase this to 37% by 2036. There are different methods that can be used to help reach this goal, but most of the research conducted on energy solutions for Bangkok consists of investing in renewable energy and overall moving to more environmentally friendly ways to bring energy to the city.

Solar Power is an energy solution that is renewable and environmentally friendly. It is obtained through the energy of the sun's rays and can be as simple as a single panel on a residence or an entire energy farm of dozens, or even hundreds, of panels. Thailand as a whole already leads East Asia in solar power development so expanding this further in Bangkok makes sense.

Another solution is the creation of more waste-to-energy plants in Bangkok. Waste-to-energy plants focus on burning municipal solid waste to produce steam that is used for the production of electricity, which is fed to the power grid, and heat. This solution not only produces renewable energy, but also helps dispose of Bangkok's overflowing waste by repurposing much of the waste cur-



rently sitting on the streets of the city.

The high costs of creating plants like this one are not the only potential drawback of this solution. A large factor in whether or not the process will work as imagined is the state of the waste being incinerated. There needs to be a certain level of consistency and quality that is hard to receive when it is coming from different people and businesses. With this solution, knowledge and information about what waste can and cannot be disposed of with the intent of creating energy would need to be thoroughly understood across the city. Distributing this information is a major communication task. Furthermore, it would be wise to create positions in which people or machines sort the waste before it goes to the dump, thereby ensuring it meets the quality needed.

A third solution is hydropower. Currently, hydropower is the largest form of renewable energy in Thailand, where there are 26 hydroelectric dams and plans for more. An advantage of hydropower as a form of renewable energy is that power is produced without using much land. The Electricity Generation Authority of Thailand (EGAT) is currently working on what will be one of the world's largest hydro-solar plants when it is completed. EGAT then plans to replicate this project with eight other dams (Reuters, 2021). After researching and studying different approaches to clean and renewable energy sources in Bangkok, solar power was found to be one of the most viable options based on available land, resources, and budget constraints. All of the solutions studied have their own pros and cons; however, solar power was eventually chosen as the best method via investment and implementation of a new solar farm project as part of a 5-year plan to benefit Bangkok. The waste-to-energy method, although a viable option and useful in the sense that it also starts to tackle a waste issue in Bangkok, was too costly and came with too many outside factors that may hinder the process. The extra steps needed to educate the general public on proper waste disposal methods and the need to motivate an entire population to do so make this a less desirable option. Hydropower, on the other hand, also proves itself a viable option, but comes with environmental concerns regarding the amount of carbon dioxide and methane that would be released. Hydropower also comes with concerns regarding water levels as it runs the risk of starting droughts, as well as harming the fish and other life existing in the bodies of water in which these plants are located (Conserve Energy Future <http://www.conserve-energy-future.com>).

Ultimately solar power stands out as the most logical as it does not rely on external factors such as waste disposal, education, and water levels, as well as requiring lower costs than the other options studied.

### 3.4. Transportation

What was once a quiet and relatively small community has grown to be the complete opposite. During the year 1782 when Bangkok became the capital of Thailand, the city had a population of approximately 400,000. The city was once solely based on water travel, and canal systems existed for some time, until they later declined due to the creation of roads necessary for automobiles.

Today, the six districts of Bangkok encompass 7785 square kilometers (Oxford Business Group, 2017) with a population of 17.5 million. The city's population has increased immensely over time and, with this, so has the need for transit, both public and private, leading to the enormous increase in vehicles. Limited space, inconsistent traffic flow, uncertain travel time, high congestion levels, and air pollution are all associated with the transportation in Bangkok. Citizens are influenced by the quality of the environment they live in on a daily basis. A major problem with transportation is the fact that vehicles are the main source of air pollutants. With more automobiles than ever, according to WHO, Bangkok's air pollution is more than double the amount that is recommended or expected (IQAir, 2021). In 2020, Thailand was ranked 34th in the world for poor air quality. Although people can still get around and carry on with their daily activities, the city has consistently stayed near the top of the list of cities with polluted air. Although some measures have been taken to improve this situation, more action needs to be taken. More than just day-to-day life has been impacted for the citizens of Bangkok by problems of air pollution and congestion. Bangkok's pollution has also resulted in roughly 8000 deaths and US\$3,100,000,000 of damage to the economy in 2021 alone. Public health and the overall quality of life have been impacted tremendously by transportation as well. The more that the city's inhabitants can make the environment in which they live in more eco-friendly, the closer Bangkok will be to solving its overall transit problems.

Congestion levels are closely related to pollution levels, and air pollution and congestion within Bangkok remain extreme problems that need continual attention. Congestion in this city has started to improve slowly in recent years, but it remains a problem that has a long way to go before being solved. Increased travel time results from this congestion in Bangkok.

The evolution of this city over the years has led to a strong need for improvements in transportation. Not only is travel a fundamental aspect of living in Bangkok, but the resources for the different modes of transportation are just as essential. Bangkok faces inconsistent and problematic traffic flow daily. In the past, tactics such as building more roads have attempted to improve the transportation in Bangkok. However, as elsewhere, this has only brought more vehicles to the streets, thereby eventually worsening traffic congestion and air pollution. Thus, all groups within Thailand should continue to work at responding to the transit issues at hand as the unresolved issues of transportation have influenced the emotional, physical, and mental well-being of Bangkok's citizens. Sustaining transit systems throughout the area is important in keeping the city stable and healthy.

Bangkok has been working to eliminate the issues of air pollution and congestion in transportation in numerous ways over the past few years, including a high-speed rail project, The Gold Line, Bang Sue Grand Station and electric vehicles. As Thailand moves in a more transportation-friendly direction, plans to not only build a third international airport, but also make a switch from the Euro IV to Euro V petrol standard by 2023 are in the works.

### 3.5. Sewage and Sanitation

With 2604 km of canals weaving through the city (Wancharoen, 2019), the Gulf of Thailand to the southwest border, and a densely populated cityscape, Bangkok is a vibrant metro surrounded by natural beauty. The expansive waterways and dense population, however, create a challenging situation for sewage and sanitation management. Inadequate wastewater management for the population of Bangkok results in much of the wastewater being untreated (Pollution Control Department, 2022). In addition, people living in areas that do not receive adequate municipal solid waste collection, or simply reside near the waterways, use the canals as a dump for their solid waste (Johnson & Trang, 2019). This improper dumping leads to environmental pollution that is harmful to residents of Bangkok and the environment. Though the Bangkok city government, sometimes in partnership with the private sector, has intervened to confront these challenges with expanded wastewater treatment and municipal solid waste collection, further intervention is necessary to address fully the needs of Bangkok's residents and the natural environment.

The indiscriminate disposal of wastewater has been and continues to create huge problems in Bangkok. The increasing population and rising industrialization have outstripped the pace of environmental protection and preservation in the city. Wastewater generation is largely from households, commercial and industrial activities, as well as agricultural practices, which have significantly led to a decline in the quality of the environment (Pollution Control Department, 2022). The majority of the wastes generated are untreated and are usually disposed of through sewers that are directly connected with canals and rivers and, as a result, create issues of pollution, contraction of diseases, and, consequently, deteriorate the quality of life of the people of Bangkok.

The rising rates of wastewater-generated and its uncontrolled disposal have resulted in the contamination of rivers and the deterioration of the quality of groundwater with salinity, coliform bacteria, and other organic compounds, which both serve as water sources to some households in Bangkok as well as other surrounding communities (Polprasert, 2007).

This high population and busy tourist culture produce significant solid waste. In 2020, The Bangkok Metropolitan Administration (BMA) collected 3.34 tons of household hazardous waste, 43.24 tons of infectious waste, and 9519 tons of municipal solid waste (MSW) per day (The Department of Environment, Bangkok Metropolitan Administration, 2021). Industrial waste is required by law to be managed separately by the industries responsible for the waste production, according to the Notification of Ministry of Industry Re: Industrial Waste Disposal B.E. 2548 (Thailand Ministry of Industry, 2005).

Waste production declined overall during the COVID-19 pandemic, resulting in fewer total tons collected from 2019 to 2020. Infectious waste decreased by 11.65% during the height of the pandemic in February-May 2020 compared to 2019 due to fewer residents seeking medical care outside of COVID-19 compli-

cations (Ibid.). MSW declined by 1045 tons per day compared to 2019 due to significantly fewer tourists and many unregistered residents moving back to their hometowns outside of Bangkok. Plastic waste, however, notably increased as residents used more takeout containers and home deliveries as a result of COVID-19 prevention measures. In April of 2020, the proportion of plastic waste increased to 36.6% of the total waste, a 16.59% increase from 2019. This proportion fell by 15% after the relaxation of Covid prevention measures but remained notably higher than 2019 levels. Food waste remained the highest proportion of MSW in 2020, totaling 45.41% (The Department of Environment, Bangkok Metropolitan Administration, 2021). Solid waste collection in Bangkok involves stakeholders from the formal public and private sectors, as well as an essential contribution from the informal sector. The Department of the Environment of the BMA is the primary public entity in charge of solid waste collection.

The informal sector plays an essential role in Bangkok's waste management. Only 8% of the population separates their waste, and there is no formal recycling system (Archer & Adelina, 2021). All waste separation and recycling are sorted by informal waste collectors and sold to waste dealers, commonly referred to as junk shops. BMA garbage collectors serve as formal/informal workers hired by the BMA, but they also sort the waste they collect from households and sell valuable recyclables to waste dealers for an extra 150 - 200 baht in profit (Johnson & Trang, 2019).

The population of Bangkok is estimated to grow rapidly by 2050, as would the growth of the wastewater that would be generated. An increasing population would lead to a significant rise in the volume of wastewater as well as the demand for quality water. A needs assessment conducted revealed that the current treatment capacity in Bangkok is stagnating and, as a result, contributes to the poor management of wastewater generated. In this respect, it is crucial to address the capacity and coverage needs of the city of Bangkok to meet the rising rate of wastewater generation. Feasibility studies are required to determine the viability and efficiency of projects to inform operational, technical, legal, and resource allocation decisions. In the final year of the plan period, a feasibility study would be conducted to assess the current and future situations of wastewater generation and management in Bangkok.

The current low source separation rate of 8% in Bangkok results in challenges in the Bangkok MSW stream (Archer & Adelina, 2021). Low waste separation rates lead to unnecessary disposal costs and environmental pollution (Sukholthaman & Sharp, 2016). Furthermore, a lack of source separation contaminates valuable recyclables that can otherwise be kept out of the waste stream and generate income for informal waste collectors who sell them to waste dealers (Nguyen & Nitivattananon, 2019).

Given the challenges that result from the lack of waste separation and the benefits that result from it for the environment, the BMA's spending, and the increase in informal waste collector income, a city-wide source separation pro-

gram is needed. Furthermore, Thailand is in the top five countries for marine plastic pollution (WOIMA Corporation, 2021) and has named plastic reduction as a priority in its 3R strategy and Roadmap on Plastic Waste Management (2018-2030) (The Department of Environment, Bangkok Metropolitan Administration, 2021).

Finally, there are numerous businesses developing plastic alternatives (Stone, 2018). A particularly promising option for Bangkok is packaging made from seaweed. An Indonesian company called Evoware uses locally produced seaweed to create biodegradable packaging at lower costs than plastic (Ibid.). A similar business model or other plastic alternatives could be developed in Bangkok. Local businesses developing alternative packaging to plastics would have the dual benefit of reducing plastic waste and providing employment directly through the business and through work in seaweed agriculture.

### 3.6. Water

In contrast to a lot of cities, Bangkok did not initially have paved roads and walkways, and the main means of transportation were waterways. “The river, (Chao Phraya), helped the city of Ayutthaya become an international trading hub, and the country started to build relationships with the merchants from around the world who visited (Iverson, 2017).” Most of these merchants came from China, Spain, the Netherlands and France. The waterways in Bangkok have been the heart of Bangkok’s needs and history. Bangkok’s earliest settlers chose to settle here because of its location. The river made the land fertile for farming and it was filled with fish. Due to this, Bangkok expanded into what it is today, with “more than 50,000 people still [using] its ferries every day”, (Bangkok River) with the Chao Phraya River being the most important waterway (Iverson, 2017).

Bangkok is a port city located in the north of the Gulf of Thailand. Water is a huge part of what makes Bangkok the bustling and successful city it is today. The location of the city is ideal for trade and transportation, being on the Gulf of Thailand and located on a major river, the Chao Phraya. The river flows south into the Gulf of Thailand and is over 225 miles long. The canals, or khlongs, use the river as a source of water. The river is very important in the transportation of goods such as teak and rice.

The primary source of drinking water comes from surface and ground water. The water in Bangkok is cleaned and purified in plants and, in theory, should be safe to drink. The problem comes when it leaves the treatment plants and goes into aging lead water pipes. This then affects the quality of the tap water and causes a strong chlorine smell. It is recommended for citizens and tourists to drink only from bottled water. The basin of the Chao Phraya is the largest in Thailand, it drains roughly 30% of the country. The water has been polluted and is no longer drinkable for many reasons. Chemicals used in farming and agriculture, industrial waste, and untreated sewage flow are just a few factors that pollute the waterways of Bangkok (Thelwell, 2019).

For years the canals have been used as a source for drainage, and because of that, they are now filled with wastewater. A Greenpeace study shows high levels of toxic chemicals in the canals. There is evidence of heavy metals, hormone-disrupting chemicals, and human carcinogens in the water. The wildlife is dying, and the fish caught must be cleaned and tested for disease before being cooked (Ibid.).

Bangkok is very exposed to the elements with no natural protection. The city's location is perfectly located for flooding. It is located close to the Gulf of Thailand and is on top of the Chao Phraya River. The sinking of the city is happening fast due to the marshy land and the weight of urbanization along with the uncontrolled use of groundwater. Bangkok is slowly sinking at a steady rate of 10 cm annually. Due to raising seas levels and climate change some experts say that Bangkok is at risk of sinking in 15 - 20 years (The ASEAN Post Team, 2019).

The city of Bangkok, and most cities around the world, use lead piping as their main means of distribution from the water treatment center to the tap water from people's sinks at home. Most residents and tourists are aware of Bangkok's water situation, which can affect tourists' desire to travel there, and can be fearful for the residents. However, "Thailand has been verified as clean by World Health Organization standards since 1999. That means the water is just as clean as water coming out of the valve in Los Angeles, London or Stockholm" (Tap Safe and Tap Source <https://mytapscore.com>). If the water is clean when it leaves the water treatment center, but not clean when it gets to the population, there could only be one reason why the water gets contaminated: the lead-piping (Water Doctor, 2020).

Since it is now well known that lead piping is harmful, people stopped installing it. Now, plumbers install PVC piping. PVC piping is lightweight, flexible, safe, flame resistant, and has a high design versatility (Think Pipes, n.d.; PVC4Pipes, 2021). PVC is made up of a thermoplastic polymer (plastic and vinyl) and is inexpensive. Countries across the world are turning to PVC piping to enable consumers to have safe drinking water. PVC piping is easier to work with and easier to install than lead piping (Adarsh, 2021). Due to this, it is proposed here to replace all the lead piping in Bangkok with PVC to eliminate consumers' risk of illness and contamination. Using PVC piping instead of lead is better for the environment as well.

All the districts in Bangkok, except Pathumthani, Samutprakarn, and Nonthaburi, contain lead piping. The challenge is to replace these lead pipes with PVC piping efficiently without disrupting the history, community, or tourism within the city. Replacing all the lead pipes will not just cost a lot, but it will also take a long time. One must consider and evaluate all districts and distinguish which ones should go first and how long each district would take. As a result, a district that has elements found throughout Bangkok has been chosen for the pilot study to determine the unknowns of replacing piping and help to develop a system to do so.

### 3.7. Finance

The City of Bangkok is the thriving economic and commercial hub of Thailand. Over the 20th century, Thailand's capital has developed to become a central trade and manufacturing hub for the country. The highly developed system of canals, roadways, and port facilities has allowed for the concentration of economic activity that has only accelerated with globalization and the technological advancements of the 21st century. Thailand has set an ambitious goal of becoming a high-income country by 2037 through its Vision 4.0 outlined in the 20-year national strategy (Organization for Economic Cooperation and Development, 2021). Thailand, and Bangkok in particular, have been focusing on green development strategies, and have put green growth as a priority for new and future development projects (Ibid.). This focus on green growth, along with the need to meet the United Nations Sustainable Development Goals (United Nations, 2015) informs the direction of the project proposals outlined above.

The finance team for the Bangkok metro researched the available funding sources for development projects in Thailand, with a focus on Bangkok. The team evaluated the Bangkok budget, multilateral investment banks, Official Development Assistance (ODA), and Foreign Direct Investment (FDI) to locate the key domestic and international sources of funding. It also looked at ongoing projects in each sector of the Bangkok research to understand better which sectors Thailand and international banks are prioritizing for development funding. The finance team used this research to inform each project sector of funding availability and funding sources. It collaborated with the following sector teams for Bangkok on a 5-year funding plan (2022-2026): Poverty Alleviation, Industry, Energy, Transportation, Sewage and Sanitation, and Water.

Through collaboration, the finance team developed a budget for each project that would be feasible to implement for Bangkok. The global pandemic has added a layer of uncertainty to the finance team's research of available funding. However, the careful disbursement of stimulus packages, as well as a US\$1.5 billion loan from the Asian Development Bank (Asian Development Bank, 2021), have helped to buffer Thailand from the worst economic effects of the COVID-19 pandemic. While the pandemic hit Thailand's tourism industry hard, there is hope that the economy will begin to rebound with the country having reopened again to vaccinated tourists from 60 countries (Khernamnuoy & Silver, 2021). The finance team researched all reasonable funding options, including Bangkok budget projections and estimated new funding for each sector, key Foreign Direct Investment partners, multilateral development bank loans, top Official Development Assistance partners, and special funds, trusts, and facilities that provide sector-specific lending. Thailand is considered a middle-income country, with a Gross National Income (GNI) of US\$490 billion, and a GNI per capita of US\$7100 (Foreignassistance.gov, 2021). As a middle-income country, Thailand becomes ineligible for much development assistance in the form of grants; therefore, most international development funding is provided in the form of

concessional or non-concessional loans, technical assistance, or joint research partnerships.

Along with funding research, the finance team evaluated the requirements of the various funding sources, as well as the requirements of Thailand's 20-Year National Strategy, to ensure that each sector's project goals were in alignment with the goals of the strategy. The United Nations Sustainable Development Goals (SDGs) were also considered, as most multilateral development banks and ODA partners require that projects meet SDG requirements. Each project proposal was evaluated for whether the project met several of the UN SDGs, as well as the goals of the 20-Year National Strategy. Research was also conducted to ensure that comparable projects have been funded at a similar scale and at similar cost in Thailand or other middle-income countries (United Nations, 2021).

Aside from the Asian Financial Crisis in the 1990s and the current economic crisis caused by the pandemic, Thailand has long had a strong economy favorable to foreign investment and development, and after a thorough review of proposed projects by each sector for the 5-year environmental management period of 2022-2026, the finance group has concluded that all seven sectors will be funded either at full or partial capacity. The team concludes that there will be sufficient funding sources available through both foreign and direct investment, Multilateral Development Bank sources, top donor countries and sovereign/non-sovereign funds to support implementation of projects proposed by poverty alleviation, transportation, energy, and water sectoral teams. Lastly, the finance team assessed the scale of projects proposed by the sewage/sanitation and industry sectors, advising that these sectors revise the scope of the proposed projects in order to be financially viable in relation to the availability of funding during the 5-year planning period. Therefore, the projects for all seven sectors of this study presented in this paper reflect the analysis of the finance team and are projected to be fully funded (World Bank Group, 2021).

### 3.8. Conclusion

The intent Bangkok research for this paper was to summarize the results of a project to bring the contemporary thinking and practice of Urban Environmental Management to the solution of real problems to the Bangkok metro, best known outside of the region as a fascinating city for tourists with ornate shrines, a vibrant street life, and fabulous food. The boat filled Chao Phraya River feeds its network of canals, flowing past the Rattanakosin royal district, home to the opulent Grand Palace and its sacred Wat Phra Kaew Temple. Nearby is Wat Pho Temple with an enormous reclining Buddha and, on the opposite shore, Wat Arun Temple with its steep steps and Khmer-style spire (<https://www.britannica.com/place/Bangkok>). Despite its breathtaking sites, it is a city plagued by numerous serious environmental problems.

The objective here, as for the later studies of Manila and Jakarta, was to replicate as much as possible the conditions under which a team of expatriate consultants would operate in this context so that a class of graduate urban and re-



gional planning students could develop ideas and procedures that fit the circumstances they would likely confront as professional planners working on such projects in developing countries for international development banks, multilateral donors in the United Nations system, as well as the numerous bilateral donors of the developed countries (Edelman, 2020). Consulting firms operating internationally on projects for these institutions, agencies and countries come not only from the donor countries of the United States, Australia and Europe, but increasingly from countries such as Brazil, India, China and Korea as well, and the staffs of experts they provide often come from a number of the countries named (Edelman, 2014; Edelman, 2018).

In this working environment, it was instructive for the students to formulate a 5-year plan of solutions to the environmental problems and issues they faced rather than be told how to deal with them (Edelman, 2021). This expanded their analytical skills and taught them how to utilize the limited knowledge and resources available to come up with implementable solutions for the benefit of the people of Bangkok. They learned that such skills are transferable to other projects, and they gained a greater appreciation of the skill set that they are developing as planners (Edelman, 2016). 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 (Edelman, 2015). Consequently, the project summarized here, as well as those for Manila and Jakarta, has attempted not only to expand the education of graduate students, but also to provide a meaningful contribution to planning pedagogy (Edelman, 2019; Edelman, 2022).

#### 4. Jakarta

Jakarta is the political, economic and commercial capital, as well as the largest city, of the world's 4<sup>th</sup> most populous country. With an estimated 2019 population of 269.54 million (World Population Review—Indonesia, 2019) scattered over more than 17,000 islands and forming over 300 ethnic groups speaking over 700 regional languages, it is the world's largest majority Moslem (87%) country and is extremely complex. Jakarta is a global city with one of the fastest growing economies in the world. It also has severe environmental problems.

Consequently, the second research project for a Southeast Asian metro at the University of Cincinnati was for Jakarta, Indonesia. The mixed class of eighteen domestic and international students operated as did the researchers for Bangkok in seven collaborative sector-level working groups or teams preparing a 5-year environmental plan for Metropolitan Jakarta, Indonesia, utilizing a real-world database and a limited budget (Edelman, 2020). Jakarta is the political, economic and commercial capital, as well as the largest city, of the world's 4<sup>th</sup> most populous country. With an estimated 2019 population of 269.54 million (World Population Review—Indonesia, 2020) scattered over more than 17,000 islands and forming over 300 ethnic groups speaking over 700 regional languages, it is the world's largest majority Moslem (87%) country and is extremely complex.

Jakarta is a global city with one of the fastest growing economies in the world. It also has severe environmental problems. The seven teams were once again poverty alleviation, industry, transportation, 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.

**The metropolitan area of Jakarta** called Jabodetabek (for the initials of the cities of Jakarta, Bogor, Depok, Tangerang and Bekasi) **is the 2nd most populous urban area in the world** (*World Population Review—Jakarta, 2020*) after the Pearl River Delta in China (made up of the cities of Shenzhen, Guangzhou, Foshan, Dongguan and others). The city of Jakarta proper has a very high population density of 14,464 people per square kilometer (37,460/square miles), while the metro area has a density of 4383 people/square kilometer (11,353/square mile) (*Ibid.*; (*Scruggs, 2020*)).

Although most of Jakarta's population is native to the island of Java, the population of the city is quite diverse in Indonesian terms. This includes the highest number of overseas Chinese in Indonesia and a diverse population from the island of Sumatra. Islam is by far the most common religion in Jakarta, accounting for almost 86% of the population according to data from the 2010 Census. This is followed by Protestantism (7.5%), Buddhism (3.3%), Catholicism (3.15%), Hinduism (0.21%) and Confucianism (0.06%) (*Ibid.*).

Jakarta is now becoming resource-starved by its ever-growing population. The city (formerly Batavia) was designed to handle 800,000 people when founded by the Dutch, although it is now home to up to 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. By 2020, the population of Greater Jakarta grew to 35 million, with mass migration that has further worsened the problems for residents, including poor sanitation, a lack of housing and inadequate transportation. The population of the city grew to 16 million during the same period (*United Nations, 2020*).

Indonesia is the largest economy of ASEAN, and Jakarta is the economic nerve center of the Indonesian archipelago. The city generated about one-sixth of Indonesian GDP in 2008 (Huang & Bocci, 2009), and Jakarta's nominal GDP was US \$483.8 billion in 2016, which is about 17.5% of Indonesia's GDP (*BPS, 2016*). According to the Japan Center for Economic Research, GRP per capita of Jakarta will be ranked at 28th place among the 77 cities in 2030 rising from 41st place in 2015, the largest in Southeast Asia (*Nekkei Asian Review, 2018*).

Jakarta's economy depends highly on manufacturing and service sectors such as banking, trading 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 located in the city. Most of the State-owned Enterprises (SOEs) of Indonesia have their head offices in the city as do major Indonesian conglomerates.

#### 4.1. Poverty Alleviation

In Indonesia, people live below the poverty line when their average spending is Rp 401,220 (US \$27.72) a month, or around Rp 11,000 (US \$0.76) a day. In the capital of Jakarta, the numbers are slightly higher: people are living in poverty when they spend Rp 578,000 per month (US \$39.93) or Rp 19,000 (US \$1.31) a day. In comparison, the US poverty line income is US \$2145 or less per month (Renaldi, 2018). The statistics show that the official poverty line is much too low, and it does not represent accurately the truth of how many citizens are struggling financially to live. A researcher from the Institute for Development Economics and Finance (INDEF), Bhima Yudhistira, argues that the poverty data are not enough to explain the reality because instead of measuring income, they only measure household spending (Ibid.). As many as 68 million people are just above, and are at high risk of falling below, the poverty line. 25% of Indonesians will suffer from poverty at least once in a 3-year period. In fact, many families continuously fall in and out of poverty (Renaldi, 2018).

In reality, roughly half of Jakarta is composed of slums. 118 out of 267 sub-districts of the city contain slums, based on the research done by the Agrarian and Spatial Planning Ministry and the National Land Agency working with The World Bank (The Jakarta Post, 2019). Specifically, 445 neighborhoods, known as Rukun Warga (RW) in the Indonesian governmental 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 (The Jakarta Post, 2019) (Figure 2).



**Figure 2.** Slum and high-rise buildings standing side by side. Source: Kompasiana.com, 2016.

They are highly prone to flooding. Flooding is Jakarta's never-ending problem and once again devastating flooding over New Year's Eve and New Year's Day 2020. The Jakarta Post reported Jakarta experienced on New Year's Eve, "... its worst rainfall in over a decade, with heavy rain pouring over the city nonstop until... morning, causing severe flooding in the capital and its satellite cities on the first day of 2020. resulting floods inundated the sinking city, leaving dozens dead and thousands homeless. In 2002 as well, the city was hit by a major flood causing total direct and indirect damage of Rp 5.4 trillion (almost US \$386 million) and Rp 4.5 trillion (almost US \$321 million) respectively (Caljouw et al., 2005). Floods in Jakarta are caused by heavy rains, water runoff from unplanned urban construction and expansion, and the city's geographical features (Octavianti & Charles, 2018).

Just as with other types of disaster, floods in Jakarta hit lower and lower-middle income groups harder as they cope with major physical and economic losses. For Jakarta's urban poor, disaster means increasing risk for the already difficult life they have. Floods take away their limited assets, sometimes the basic assets necessary to generate income (The World Bank, 2016). As a result, they cannot work and earn money, their children cannot go to school or study properly in the temporary camps for flood victims, and they are at risk of getting serious diseases. Flooding can take away the time, energy, resources and chances to improve their livelihoods or catch up with the economy. Their children's education will be affected, and this cycle is repeated.

Indonesia's fast-growing economy apparently favors those of the upper middle class. The poor struggle, and that inequality has been a growing concern. Based on these findings, this study determined that poverty alleviation projects should also promote decreasing inequality. This involves providing opportunities for education, chances to generate higher income and stronger resilience to financial shocks.

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.). For Jakarta, a project that is divided into different phases over the 5-year planning period is proposed. In summary, this project will run for the least amount of time possible, i.e., it is expected to be completed in a one-year period.

Another major issue in the slums of Jakarta is safety. The slums are constructed right next to and on top of each other. Andy Brown, a writer for UNICEF, was in Jakarta to help the UNICEF Indonesian office with digital communications, blogging and online video. He recounted his experience in a blog for UNICEF.

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 alleys extremely narrow, the inhabitants of the slums rely on neon tubes and bare 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 Rp 1000.

To combat these issues immediately in order to improve living standards as quickly and easily as possible; a plan is proposed here to create modular housing. Modular homes are small, individual buildings that can be prefabricated in a factory as one unit. In this specific program, the modular houses 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 flood and have increased sanitation issues from the trash in the river. Concurrent with 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. People literally rely on each other for survival. They may be hesitant to move out of the slums and into a high rise because that perceived lifestyle is a drastic change and not for everyone. Keeping this in mind, the idea of community and communal space will be at the forefront of the design for the high rise.

Jakarta is a very densely populated city. 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. There is not much, if any, existing land that can be built upon to expand the perimeters of the city. However, a slim high-rise apartment building can fit into the skyline. As mentioned earlier, moving from life in the slums to city life in a high rise may be intimidating, but the high rise will reflect slum life as closely as possible for those who seek that. Revolving around community space, people will still have the sense of belonging and plenty of opportunity for interaction.

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 cannot get positions such as office security guards, janitors or drivers with higher monthly paychecks than at home since they do not have identity cards. They would also most likely not have a high school diploma. Rural immigrants with limited skills and a poor educational background have few choices when coming to Jakarta. 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 only 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 ([International Labor Organization, n.d.](#)). In Jakarta, there are approximately 150,000 street vendors with daily transactions totaling Rp 225 billion (US \$20.1 million) ([The Jakarta Post, 2019](#)). 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.

As one of the solutions, a project is proposed for business and skills training, as well as savings group activity, with the purpose of increasing the opportunity for people to generate income and prepare them to cope with external shocks. This program is primarily targeted at slum dwellers and vendors located near Jakarta's Central Business District, as they already have a market presence. Their small businesses include food shops or *warung*, motorbike washing, and other small stalls, or walking vendors selling snacks, cigarettes, soft drinks or hot drinks. The fundamental goal is to create a stronger financial capacity for the slum dwellers so that they are eventually able to afford a unit at the government subsidized affordable housing and move out from their makeshift illegal houses.

As much as Jakarta and its people need the informal sector, they have always had a love-hate relationship. Regrettably, the informal sector takes up space on streets, sidewalks, parks and intersections, often, if not always, creating traffic congestion that results in environmental degradation. Therefore, it is clearly necessary to provide affordable goods and services for the urban population, especially the middle-income population; regulate street vendors in order to avoid misuse of other public amenities; and promote the economic development of the lower income population through a regulated business framework.

In order to answer this challenge, skywalks are recommended as the last project for poverty alleviation. A skywalk was first introduced by Ridwan Kamil, former mayor of Bandung, a city 180 km southwest of Jakarta. 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 *Teras 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 ([The Jakarta Post, 2017](#)) (**Figure 3**). For this project, it is proposed to construct skywalks that will connect the CBD and nearby commuter train stations. This idea is inspired by the



**Figure 3.** *Teras Cihampelas* skywalk in Bandung. Source: ([Kompas.com, 2017](#)).

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 (ITDP, 2017).

Creating skywalks will be a solution to land scarcity and high prices in the city center. More importantly, the skywalks will be designed to accommodate street vendors, providing them with venues for business and customers who are daily commuters. They will be located near offices and be close enough for workers to access during lunchtime. To put it differently, skywalks will provide space for community engagement and productivity (Nabilah, 2018).

## 4.2. 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, both then and now, was used as a major port for the lush island of Java. The Dutch used the land to extract coffee, tea, spices, rubber, palm oil and other “cash crop” products for the European continent. Jakarta became the economic center of the nation (Widodo, 2006).

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. This 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 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.)

As of 2019, Indonesia was ranked 73rd on The World Bank’s Ease of Doing Business Index. The World Bank ranks countries on the business-friendliness of regulations. This index provides objective measures of business regulations and their enforcement. Indonesia’s ranking is low, when compared to other countries in the region. For comparison, Singapore is ranked 2nd, Malaysia is 12th, and Thailand is 21st. The only country in the region with a worse ranking is the Philippines, which is ranked 95th (The World Bank, 2016).

As one of the world’s largest nations by population, Indonesia belongs to many international organizations. It is a member of ASEAN (Association of Southeast Asian Nations), and Jakarta hosts its Secretariat. Membership in ASEAN allows Indonesia to participate in free-trade agreements with neighboring countries, and visa-free travel within the region. Indonesia is currently the only Southeast Asian nation that is a member of the G20. This membership gives the country an advantageous position with trade partners such as the EU, India and China.

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. And 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 2024 relocation of government functions from Jakarta to a newly constructed capital in East Kalimantan on the island of Borneo.

The relocation 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 capacity from 5 million twenty-foot equivalent units to 18 million units. This expansion will work as a catalyst and help Indonesia's economy 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 is projected to keep improving until 2025, at which point the window to take advantage of this dividend will slowly start to close (Hayes & Setyonaluri, 2015). 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 comparative 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* initiative as noted above.

Developing the niche-products the manufacturing sector needs is dependent upon the individual industries and companies themselves. The Indonesian Government, however, must develop a better understanding of what the manufacturing sector requires. Currently, a lack of knowledge at the governmental level of what manufacturing needs is holding the sector back. The government should hold Industry Summits to learn more about specific challenges the sector faces. There is opportunity for collaboration between government and industry, but a mutual understanding must exist first. The second priority of 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 113 million skilled workers (Arbi, 2019). 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.

Development Program (PDEP) in order to strengthen polytechnic education in Indonesia. It 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, seek more aid from Canada, and allot a larger percentage of the state's budget to the PDEP. 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.

The combined pressure from employers seeking more workers and students seeking education would provide an incentive to the private sector to create new

polytechnic and vocational schools. In order to take advantage of this fully, the PDEP should encourage new and existing polytechnic and vocational schools to deliver quality training and education through the establishment of new grant and scholarship programs from the Ministry of Research Technology and Higher Education.

Indonesia has the potential and desire to move towards a more advanced economy. As economies develop, *an important transition is from primary and secondary sectors 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. This 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 rate of 7.1% (Aisyah, 2019). The Trade Ministry's Director General for International Trade Negotiations, Iman Pambagyo, has emphasized the importance of the service sector to the Indonesian economy. He has stated that when economies develop further, the role of the service sector becomes more important, especially with Indonesia moving towards the *Making Indonesia 4.0 initiative* (Ibid). When compared to developed countries, Indonesia has a low share of employment in services. According to the World Bank, high income countries have an average of 75% employment in the service sector. Middle income countries, such as Indonesia, have a service sector employment average of 46%, with upper middle-income countries averaging 52% (The World Bank, 2019). In order to support the growth of the service sector, Indonesia should focus on increasing trade within that sector, increase support for the sector through policy, continue to reduce barriers to doing business, and enhance online government services. Much of the responsibility for growth falls on the service sector itself. The role of the Indonesian Government should be to facilitate and support the service sector, while allowing the private sector to innovate and add value to the economy.

Increasing trade within the service sector is also a marked priority of ASEAN. By increasing trade, value can be added, and gaps in Indonesia's current service sector can be filled. The current gaps are partially a result of a lack of skills needed for a 21st century economy. Most of the trade within the Indonesian service sector comes from domestic trade and demand. Currently, less than a quarter of the value added to exports from services comes from abroad. Comparatively, in the neighboring countries of Thailand and Malaysia, almost half of value added from exports comes from services (Damuri, 2016).

### 4.3. 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 (Leung,

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's 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 transport 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 nodes, 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 four major transit systems in place, TransJakarta BRT, Jakarta MRT and two commuter rail lines, including the KRL. 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 (ITDP, 2019).

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 the 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.

It is clear that Jakarta has a lot of different transportation modes and initiatives. All these initiatives can be utilized to realize the potential of all these travel modes, thus, potentially alleviating significantly the congestion in Jakarta. 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 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 as 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 (Urs, 2019). 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 (Gojek, 2010). 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.

With declining investment in transportation since the 1997 Asian Financial Crisis, Jakarta faces many issues regarding an efficient transportation network in the future. Its greatest priority is to address the immense congestion and the major gridlock that plagues greater Jakarta. With five high-volume public transportation systems, the capital has the basic infrastructure in place to combat these issues. None of these respective systems has adequate connectivity to the others. As a result, TransJakarta is a critical network in this respect. The

BRT's dedicated lanes need to be reinforced to improve the mobility and efficiency of the network. Integration is critical, not only between the major transit networks, but between private and personal vehicles such as motorbikes or cars. Potential partnerships between Gojek, Grab and the transportation department should be studied, and it could prove to be integral to connecting the different transportation modes. There are also far too few bike lanes in Jakarta for the present demand. Research needs to continue to be conducted to make sure every rupiah is spent efficiently. As Jakarta's population rises, the citizens need to realize their own potential for making decisions and making their voices heard.

#### 4.4. 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 culmination of other renewable energy sources (Hasan et al., 2012).

State-owned enterprises (SOEs) play a key role in the Indonesian energy sector. They function as corporations but are simultaneously charged with mandates to work toward the goals and needs of the state (Ibid.). One such company is PLN, PT Perusahaan Listrik Negara. It is the only state-owned power company in Indonesia and the country's only fully integrated power utility company (Ibid.). There are other state-owned companies for the different non-renewable and renewable resources such as PT Pertamina, PT Perusahaan Gas Negara (PGN), PT Pertamina Geothermal Energy (PGE) and PT Geo Dipa Energi (GDE).

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 country and Jakarta specifically. In fact, Indonesia saw a 5.2% increase in total carbon emissions in 2018. 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 hold 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.

According to a recent report published by the National Energy Council (*Dewan Energi, 2019*), Indonesia is facing three major challenges to improve its energy system, infrastructure and planning. First, it is challenging to align national targets and international objectives for improvement in energy efficiency. The second major challenge is implementing clean stove technology and reducing traditional biomass consumption without creating further dependency on fossil fuels. This is especially a concern in rural areas on the outskirts of Jakarta with few alternatives and limited access to cleaner, safer technology. The third challenge facing Indonesia is the inconsistency in quantitative methods and indicators across all agencies and organizations establishing energy objectives. The primary objectives of the projects proposed here are intended to surmount these challenges.

The three projects proposed are 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 the 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.

Improving Energy Education is a short-term project that is easily implemented and can be completed over a relatively short period of time. Partnerships are an important aspect of improving energy education. A partnership with commercial banks to educate them on the benefits of renewable energy sends a clear message to a broad audience that renewable energy will receive long-term, stable policy support. Having fiscal support for the financing of renewable energy projects is the largest barrier to geothermal exploration and energy growth. Educating banks on the long-term returns possible within this sector could garner a great deal of support.

On a larger scale, 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 is raising a great deal of awareness before any further outreach, but there is a great opportunity to tap into this crisis and share a different path 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 (Tharakan, 2015). Increasing the use of biogas produced from palm oil mill effluent is cost-competitive, and it avoids the methane emissions produced by unused biogas (IRENA, 2017).

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 resource is 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 (Fan & Nam, 2018). 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.

#### 4.5. Water

Jakarta is one of the most densely populated cities in the world (Chaudhuri, 2018). However, 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 addition, Jakarta has an extensive system of canals and seawalls, as the city is a coastal city that is located along Jakarta Bay in the

Java Sea. As a coastal city, Jakarta also 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 (Simon, 2019). However, when considering as well the increased urbanization and population growth that affect Jakarta and many other density 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 (Simon, 2019). In fact, *Jakarta is reportedly the fastest sinking city in the world* (Rosane, 2019).

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 (Garschagen, Surtiari, & Harb, 2018). About 40% of Jakarta's area, especially in North Jakarta, is below sea level (Luo et al., 2019).

For Jakarta, there is no single solution to the water related problems, and, as the problems are interrelated, solutions should be interrelated. Some problems seem to be *wicked*, i.e., if a solution is adopted, it might be solved by creating another problem. For example, rapid urbanization/development is one of the critical causes of land subsidence, but, to reduce the rate of land subsidence, it is assumed that the Indonesian Government would not adopt a policy to control urbanization because it would substantially reduce the economic growth of the country.

All the water related risks discussed here, along with other issues facing a rapidly growing metropolis and capital city of a developing country of Southeast Asia, have influenced the Indonesian Government to accept the escape policy of Capital Relocation. On 27 August 2019, Kate Lyons of The Guardian (Lyons, 2019) reported that President Joko Widodo announced that the national capital will move from Jakarta, on the island of Java, to the province of East Kalimantan, on Borneo. What is critical to remember, however, is that Capital Relocation



will not solve all the problems of Jakarta, especially its water problems. It might slow the rate of land subsidence, but there will still be subsidence, and the sea level will continue to rise. It might reduce the gap between the supply and demand of drinking water, but a gap will nevertheless remain.

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. The project has already been designed by a consortium of Dutch and Indonesian planning consultancies, sponsored mainly by the Dutch Government. It would consist of a 25 km long sea dike, and a bay enclosed by the dike would be converted into a water reservoir, which would be below sea level due to extensive water pumping from the reservoir into the sea. In addition, the plan also includes upgrading and expanding existing flood protection measures like retention reservoirs, drainage canals, coastal dams, etc. Within the reservoir, the project includes massive land reclamation for a new CBD and residential area, with a new harbor and airport to attract an additional 650,000 people and provide 350,000 jobs.

Although the Government of Indonesia is confident about this ambitious US \$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 of 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 source(s) 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. It is assumed that even after Capital Relocation, Jakarta's growth will continue, but at a slower rate, so problems with water will continue in the future. It would, therefore, be wise to think of alternative sources of water. Since Jakarta has an average annual precipitation of 1755 mm ([climatemps.com](https://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.

There are different statistics about how much water demand is satisfied by the

supply of water from utility companies in Jakarta. For example, one study finds the figure to be 60.6% (Sari & Suhendri 2018), while another asserts it is around 40% (The World Bank, 2017). Whichever is correct, it is obvious that there is a very large gap between supply and demand. Rainwater harvesting could significantly supplement supply. Theoretically, it is possible to collect almost 100% of the need if all the households in Jakarta could catch all of their rooftop water (Sari & Suhendri, 2018). So, rainwater harvesting, a simple technology and comparatively cheap to install and operate, offers the possibility to bring revolutionary change to the water crisis of Jakarta if it is successfully installed and operated throughout all suitable areas of the city. While an individual system might not be a problem in rural Indonesia where houses are separate from one another, in Jakarta, it is preferable to install communal systems based on clusters of houses, especially in low-income areas. Therefore, 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 scaled up.

Grey water, constituting 50% to 80% of total household wastewater, represents the largest part of the wastewater from households, offices and schools (Firdayati et al., 2015). 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 supply and dramatically reduce the wastewater discharged into rivers by a large amount. For grey water 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 need; second, simple recycling is cheap and easy to maintain; third, people's perception might be negative about drinking recycled water directly.

As presented 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, and the government decided that it would be easier to just pack up and create a new capital city, as well as 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 10 million residents of Jakarta.

#### **4.6. 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 (IRIN News, 2015), while waterways are filled with trash and blackwater from pollutants. The unsuitable management of sewage and sanitation poses a serious

health threat to the millions of people that call the city home.

Much of the sewage management within Jakarta is privatized due to the absence of a comprehensive city-wide sewage system. Most residents own a septic tank system, which only focuses on collecting sewage from that property. These systems require regular maintenance for properly emptying and disposing of waste and can, often do, overflow. While there are some small-scale communal sewage treatment facilities in neighborhoods, there are not nearly enough to deal with the local need. The city of Jakarta, and Indonesia as a whole, has tried to establish solutions to this problem, one of which was to create a citywide sewage system costing upwards of US \$4 billion. The cost to develop the system is relatively reasonable; however, having to tamper with and/or remove the existing underground infrastructure is extremely expensive, which is why this system has been delayed for well over a decade. Along with this, there is also the issue of convincing residents to help pay for the service. 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 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 seem to always 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.

Nevertheless, there are a number of projects that could be useful here. One is already in use at a 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 (Oliver, 2012) (Figure 4).

It could be possible to obtain grants from countries that want to invest in sanitation management, to expand this program. If it were available on a larger scale, it could greatly reduce wastewater being leaked into groundwater or dumped illegally, as well as improve the overall health of residents. Ideally, the



**Figure 4.** Three-wheeled sludge cart. Source: (Dillian, 2012).

government would work together with a manufacturer to create the carts, securing them at a fair price, and the government would sell them to private operators by issuing small business loans and also mandating that sludge be disposed of at proper waste disposal sites.

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 a point of being able to be released back into waterways with less pollution; it is known as grey water (The Jakarta Post, 2015). 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.

A new environmental awareness program will increase awareness of the growing solid waste problem by first designing an environmental curriculum for elementary schools. Countless studies have shown that children are better able to accept new knowledge and build a new behavioral model. There would also be homework assignments given to complete with students' parents, hence promoting environmental awareness through children. An environmental poster printed by the local government will be given to every community, similar to the ongoing local government trash sorting campaign.

The current recycling system, 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 recycle bin. The value is then calculated and sent to their own account after the collection of the trash. This 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](http://jpninfo.com), n.d.).

According to the List of Cities Screened for Support under the Government of Indonesia's The Improvement of Solid Waste Management to Support Regional and Metropolitan Cities Plan (ISWMP), all of Jakarta's landfills will reach capacity 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, anaerobic digesters and mechanical biological treatment (MBT). Along with this will be the redevelopment of existing final disposal sites that will be converted to the newer more efficient technology systems (Ibid).

The purpose of this section has been to highlight the current problems facing Jakarta in terms of its sewage and sanitation. The metro does want to resolve these issues, but it lacks the practical creation and management skills needed. Moreover, the existing built environment is a major obstacle to development. Using smaller scale projects that have little effect on the existing built infrastructure could be the key to solving these issues, allowing for the city to develop more reliable ways to dispose of sewage and solid waste so that Jakarta can become a safe and sanitary place for everyone to live.

#### **4.7. Finance**

Indonesia is 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 ([The World Bank, 2019](#)). Despite having 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 5-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 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 that 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. Never-

theless, 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 United Nations and the Millennium 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 Française de Développement (AFD), and the United States Agency for International Development (USAID, 2015).

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.

## 5. Manila

Metropolitan Manila, commonly known as Metro Manila, the National Capital Region (NCR) of the Philippines, is the seat of government and the most populous region of the country. It is composed of Manila, Quezon City, which is the capital city of the country, the Municipality of Pateros, and the cities of Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Marikina, Mutinlupa, Navotas, Parañaque, Pasay, Pasig, San Juan, Taguig and Valenzuela, or 17 in all (Philippine Statistics Authority, 2010).

The region is the center of culture, economy, education and government of the Philippines. NCR is one of 12 defined metropolitan areas in the country according to the National Economic and Development Authority (NEDA, 2007). As a global city, Metro Manila exerts a significant impact on commerce, finance, media, art, fashion, research, technology, education and entertainment, not only in the Philippines, but internationally. It is the home to all the consulates and embassies in the Philippines, thereby making it the center of international diplomacy in the country.

Its economic power makes the region the country's premier center for finance and commerce. Metro Manila accounts for 37.2% of the gross domestic product

(GDP) of the Philippines <http://Interaksyon.com> (2015).

Like many developing countries, the Philippines are experiencing rapid urbanization. This is accompanied by several challenges that require managing its urban environment. Moreover, this rapid urbanization has not generated the accompanying prosperity that characterizes countries like China, India, Thailand and Vietnam (Steele et al., 2014). Rather, the Philippines is facing issues with poverty, transportation, industry, sewage and sanitation, water supply and financing urban development as the country grows and urbanizes. At the national and local levels, different efforts have been attempted to manage these urban environmental difficulties; yet the urban challenges remain daunting.

### 5.1. Poverty Alleviation

In creating an environmental plan for an urban area, especially in a developing country, it is important to consider all actors in the city and how they use their environment. Often, low-income city dwellers are underrepresented in plans and city institutions. However, it would be remiss not to consider this population in Metro Manila as 3.9% of Metro Manila's population is considered to be living in poverty (The Borgen Project, 2013). Since the late 1980s, the Philippines have experienced rapid population growth and slow per capita economic growth, although the latter has increased much more rapidly in recent years. These factors, combined with ineffective trickle-down economic policies and the lack of robust social programs to address the poor, have led to high levels of income inequality (Buentjen, 2011). This disparity is seen blatantly in Metro Manila.

In order to address this disparity, the National Economic and Development Authority of the Philippines created the Philippine Development Plan 2011-2016 in 2011. The plan's priorities lie in inclusive economic growth and improvements in government transparency (NEDA, 2011). This plan, known as the government's social contract with the Filipino people, sets a vision for development and poverty alleviation programming in the whole of the country. While powerful in creating a unified message, the plan does little to focus on specific issues of urban poverty in Metro Manila and, therefore, has not created sustainable programs to address the inequality. In Metro Manila, three priority problem areas were identified by the poverty alleviation team: 1) housing conditions in the informal settlements; 2) access to clean water; 3) lack of job security in the informal sector. These are treated below.

#### *Problem: Housing Conditions in Informal Settlements*

Philippine urbanization has a distinct hierarchy of settlements. The Metro Manila landscape is characterized by high rises of moderate- and high-income citizens and the informal slum settlements of those citizens living in poverty. The settlement hierarchy is very evident with a high concentration of population in a few urban centers. Deprivation in Metro Manila is income-based, as noted, and infrastructure-based. The region has been unprepared for the rapid rate and high level of urbanization that have exerted tremendous pressure on the metro's infrastructure and basic services. This lack of access to infrastructure and basic



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services has led to the growth of unregulated settlements or slums. The Philippine government has tolerated the growth of slums since the housing market has not been able to keep pace with urban housing demand, especially in Metro Manila (World Bank, 2011a).

Metro Manila, like other megacities in developing countries, has been experiencing rapid urban growth, high population densities, increasing poverty and an escalation of land prices. These forces have led to a critical shortage of affordable land for housing, leaving the majority of the urban poor to live under a constant threat of eviction in unauthorized settlements (Porio, 2011). These forces have largely contributed to the proliferation of urban poor communities in the metropolis. Tenure insecurity creates cycles of vulnerability, which are magnified in settlements prone to natural disasters.

*Solution: Land Titling for Slum Dwelling Security*

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Deprivation in Metro Manila is income-based, as noted, and infrastructure-based. The region has been unprepared for the rapid rate and high level of urbanization that has exerted tremendous pressure on the megacity's infrastructure and basic services. This lack of access to infrastructure and basic services has led to the growth of unregulated settlements or slums. The Philippine government has tolerated the growth of slums since the housing market has not been able to keep pace with urban housing demand, especially in Metro Manila (World Bank, 2011b).

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*Solution: Land Titling for Slum Dwelling Security*

This project would be in partnership with USAID, the US Agency for International Development. USAID has been able to implement a similar project in Tanzania that kicked off in 2014. This approach uses mobile technology for land mapping. The "app" approach combines relatively inexpensive and readily available mobile technologies (e.g., GPS/GNSS-enabled smart phones and tablets) with broadly participatory crowd-sourced data collection methods in underserved settings. The approach would train local community members to use technology developed for this purpose to gather land rights and tenure information (USAID, 2014).

An application with the ability to run on any smart device would be developed with the aim of creating a participatory approach for capturing land rights information, as well as providing a low-cost methodology for quickly building a reliable database of land rights claims. A smart phone or handset device would be needed for the mapping. Land tenure is a major issue in Metro Manila; therefore, it would be important for informal settlement dwellers to be educated on the importance of land titling, rather than staying in poor and unstable conditions.

This application might be particularly helpful to the Government of the Philippines as an alternative to more traditional, and costlier, land administration interventions. Formal land administration systems in the Philippines have generally not met the need for accessible, cost effective and appropriately nuanced land registration. As a result, large majorities of informal settlements live without formalized rights to land and other valuable resources. This lack of documentation constrains the ability of individuals and communities to develop a sense of belonging, resulting in deprived accommodation and social instabilities among poor citizens in Metro Manila. Thus, this app would increase land tenure security for slum dwellers.

*Problem: Inadequate Housing and Slum Proliferation*

The major issue with poor housing and slums is related to the growing number of urban residents and how housing and infrastructure services can be financed for future urban generations. Upgrading housing and slums can be complex and unclear, because several interrelated components, including physical and social environments, must be addressed that entail significantly different financial consequences: a) infrastructure components like housing, water, sanitation, roads and footpaths, storm water drainage, lighting or public phones; b) service components like waste collection, schools, medical centers; c) other services such as community buildings, public spaces, and peace building and poverty reduction programs. Informal settlements are unplanned, densely populated, and neglected parts of cities where living conditions are extremely poor (Sticzay & Koch, 2015). Much of the housing stock in these informal settlements is inadequate and unsafe; therefore, physical improvements to housing are needed, in partnership with community building. The process of slum upgrading involves the improvement of both physical and social environments. Projects show that tri-sector partnerships, including the state, private and nonprofit sectors, have to cooperate in order to manage effectively a slum upgrading program. Even though the enumerated parties show commitment, the urgent needs of individual slum dwellers and local communities also have to be considered. In order to make slum upgrading successful in the long term, enduring and strategic planning must be addressed in all financial, institutional and regulatory decisions (Programa Vivenda, 2015).

Living in bad environments deprives people of a quality of life enabling them to have better incomes and gainful employment. In particular, poor environments lower the physical and mental health of households, which adversely af-

fects productivity, lowers the performance of children in schools and increases vulnerability to crime and violence (World Bank, 2011c). As relocation is not always the favored alternative, slum upgrading and improving the informal housing stock represent viable approaches. That is especially true when considering that poor families living in Metro Manila often use their own savings, as well as their own labor, for the construction and refurbishment of their houses. Nevertheless, poor families need to be enabled to help themselves.

*Solution: Slum Upgrading Program*

The project proposed here, the Slum Upgrading Project (SUP), is an initiative of private investors, international aid organizations, and local authorities with the aim of creating small offices that would be installed in the informal settlement areas. Slum upgrading projects are very popular in São Paulo, Brazil. Projects like “Programa Vivenda” have already helped around 100 informal settlements across the deprived areas of the city with the refurbishment of units according to their necessity and priority. With economic support and an affordable payback period, this is an excellent alternative for the slum dwellers of Metro Manila to improve their living conditions. These offices would offer to the community credit line facilitation with a maximum cap of \$5000 per household to upgrade living conditions, with a payback expectation of 10 years. The office units would consist of a team of young architects, engineers and professionals in the construction field, who would execute the upgrading quickly and effectively in the informal settlements. At the same time, training for the participants would be offered to improve construction techniques and generate economic growth inside the informal settlement areas.

The offices would be built of sustainable materials in a strategic location that would be easily accessible to the participants. In the office, there would be one architect and one engineer, who would lead the office, with two assistants and one administrative person. The project would focus on the areas of Metro Manila with the highest number of informal settlements. Offices would be built in the following cities: Pasay City, City of Muntinlupa and Mandaluyong City (Nakamura, 2009). The implementation of the project would take ten years with the objective of building five offices that would assist and support the local community.

*Problem: Limited Access to Clean Water*

People living in slums have limited access to potable water for a variety of reasons, including poor infrastructure and polluted water sources. In order to meet basic needs of the slum dwellers and prevent water-borne illnesses, it is important to provide a low-cost option to allow them access to clean water.

*Solution: Clay Water Filters for Clean Water Access*

Providing water infrastructure to informal settlements faces many challenges and is very expensive. In order to provide a quick solution to the problem at hand and prevent illness, providing filters as a way to treat water is the best route. A US-based non-profit called Potters for Peace has pioneered a model of making and distributing low-cost ceramic clay water filters. They reject the “hand-out” model and instead opt to engage community members. They assist

communities in making small production and distribution facilities. The Potters for Peace model is so successful because it not only provides a means to get clean water, but it also provides economic development for neighborhoods. Using locally sourced clay, and training community members to construct the water filters, ensures that it is a low-cost and sustainable method. These clay filters have been used widely throughout South America and other parts of the developing world. Collaboration with Potters for Peace would be necessary in implementing this project, as it would provide the support and knowledge to develop and establish this project in the Philippines.

#### *Poverty and the Informal Sector*

A survey to identify citizens' pressing concerns in Metro Manila found that low-income residents identified lack of job security and insufficient financial resources as top concerns (Illy, 1986). Lack of job security and lack of access to capital are rampant among low-income populations, many of whom participate in the informal work sector. In depressed settlements, 16% define their work status as unregistered, 18.6% consider themselves part of the informal economy, 39% are unemployed and 16.7% work part-time (Ragragio, 2003). Many poor individuals fluctuate between various job statuses. The informal sector consists of, but is not limited to, vending, domestic housework, construction work, handcrafting and self-employment. Throughout the past few decades, street vendors have been viewed as a menace to the urban landscape by the government. Historically, government programs focused on relocating and criminalizing informal sector workers, rather than addressing the problem through structural changes (Illy, 1986). In recent years, the government has passed legislation, such as the "Magna Carta for Workers in the Informal Economy (2013)" and House Bill 968, "An Act Providing for the Security and Protection of Vendors in the Workplace and for Other Purposes (2012)" that have, in theory, provided for the security of informal sector workers. These acts provided guidance on including the informal sector in the policy formation process on the local government level; however, they have not been adopted by many local governmental units (LGUs). To ensure job security in the informal sector, policies created at the national level need to be implemented at the local government level. In order to have these policies enacted by LGUs, advocacy efforts are needed. There is a great representational gap that exists among participants in the informal economy. Due to this gap, it is difficult for the informal sector workers to advocate for their protection, for access to capital, for training programs and for other social services (Ragragio, 2003).

#### *Solution: Department of Labor and Employment Program for Informal Sector Workers: An Evaluation and Plan*

The verbiage surrounding the informal work sector has improved considerably during the last decade with legislation such as the "Magna Carta for Workers in the Informal Economy (2013)" and House Bill 968, "An Act Providing for the Security and Protection of Vendors in the Workplace and for Other Purposes (2012)." However, this legislation has had little effect on the ground.

The Department of Labor and Employment (DOLE) has been a key participant in designing initiatives to support the informal economy and protect workers (Casanova-Dorotan, 2010). In 2007, DOLE, in partnership with the local governmental units (LGUs), UNDP and the International Labor Organization (ILO), implemented Unlad Kabuhayan Programme Laban sa Kahirapan (DOLE, 2007).

The Department of Labor and Employment (DOLE) *Worktrep* program aimed to bring together members of the informal economy and representatives from LGUs to collaborate and improve the socio-economic status of the informal sector (IS) workers. Worktrep is an acronym for “work-entrepreneur”. DOLE relies heavily on LGUs as the program implementing partners. In order to attract and train them to participate in the Worktreps program, DOLE provides capability-building training and an orientation to introduce the LGU workers to the program (Guidelines for the Implementation of the DOLE Worktrep Program, 2007).

The LGUs are tasked with implementing four primary services, according to DOLE: 1) training services that cover production and business management skills, as well as occupational safety, preventive health practices and confidence building; 2) assistance to allow IS workers to access the market, credit and technology; 3) access to the government’s insurance schemes for health and social protections; 4) the provision of networking services allowing IS workers to obtain representation in government and create linkages with private sector partners (Ibid.).

The Worktrep program is a novel initiative that focuses on two important aspects of engaging the informal sector workers: capacity and financial skills building and ability to organize, advocate, and work with the LGUs. Although the program was introduced in 2007, there is little literature on the success, challenges or outcomes of the implementation. With that fact in mind, a program evaluation is necessary to study the outcomes and determine the direction of the program going forward.

The Organization for Economic Co-operation and Development’s Development Assistance Committee established Principles for Evaluation of Development Assistance (OECD, 2015). These principles guide an evaluation process of development programs and include themes such as relevance, effectiveness, efficiency, impact and sustainability. Each theme contains guiding questions to use in the investigation. In order to implement this project, an outside strategic planning and evaluation consulting firm would be hired by DOLE. Using an outside firm would increase transparency and ensure unbiased results. Once the program evaluation is complete, employees at DOLE and representatives from all of the LGUs should work to identify any major changes needed to make the program more effective to implement further as the second edition of Worktreps. It is anticipated that the evaluation process would take approximately one to one and a half years. The strategic analysis and planning for the second edition of Worktreps would take one year and would be followed by a pilot project and

then full implementation.

*Problem: Gender and the Informal Sector*

Women constitute over half of the informal economy in Metro Manila (Fria-neza, 2012). It has been stressed in the successful development of a country, women are often relegated to the informal economy due to cultural constructs that require them to complete household responsibilities and stifle their chances of obtaining a high level of education. As a result, the informal economy provides an opportunity for women to work around their family obligations in low-skill jobs (Moser & McIlwaine, 1997). Many of these women take advantage of their situation by establishing home-based enterprises as well. However, they are the most vulnerable population within the informal sector economy, and many lack the ability to access credit or start-up capital (Bonnin, 2004).

*Solution: Village Savings and Loan Associations (VSLAs) for Women's Economic Empowerment*

Women in the informal economy face challenges and unequal opportunity, leaving them more vulnerable than their male counterparts. Based on this knowledge, it is critical that Metro Manila focus on engaging women in the informal sector work force and providing them with the financial and social capital to participate actively in the sector, advocate for themselves and learn additional skills. Microfinance institutions have been operating around the world, providing low interest loans to low- and moderate-income individuals. This model has been very successful, as is evident with the Grameen Foundation, which has worked extensively in Bangladesh, India and other developing countries around the world to bring people out of poverty (Grameen Foundation, 2013). However, many microfinance institutions (MFIs) are more suited to catering to those individuals who already own small businesses and those who have basic education and knowledge about lending. MFIs also only provide credit to their clients, whereas many poor people need access to more than just credit; i.e., they need to have the ability to save (VSL Associates, 2015).

A new model of microfinance that includes this savings component was pioneered by the international non-profit CARE in 2000. This model is known as the Village Savings and Loans Association program or VSLA, for short (Hendricks & Chidiac, 2011). The VSLA model was created to fill the gap between services being offered by microfinance institutions and the very poor. Through creating groups of VSLAs, poor people have access to save a minimal amount each week and then apply for loans from the association's bank. Lauren Hendricks, the Executive Director of Access Africa, a CARE Initiative, explains that VSLA participants saved 10 cents each week and were able to borrow \$5. In the second year, the participants would have worked up to saving around \$1 to \$2 a week with the ability to borrow \$30 to \$40 (Ibid.). In that sense, the VSLAs provide a launching platform for individuals to start saving and receiving loans to prepare them for a formalized microfinance system in a year or two. As a result, VLSAs are a strong approach to engaging women in the informal economy and empowering them socially and economically.

## 5.2. Industry

### *Existing Economic Conditions*

For most of its history, agriculture has been the main industry in the Philippines, and this is true in all seventeen regions of the country. After food products and food processing, mining is the second major industry. With regard to manufacturing, electronics are the most exported, but also the most imported, products in the country. In December 2014, 49.5% of the total exports of the month were from this sector. Minerals and machinery are other major imports of the country (Economy of the Philippines, 2015).

Between 1960 and 2012, the Philippines experienced a steady decline in the share of agriculture in total output and employment. "In other developing countries, the decline in the share of agriculture is typically picked up by the industrial sector. In the case of the Philippines, this was picked up by the services sector." According to the CIA's World Factbook (Central Intelligence Agency, 2015), in 2011, more than half of the economy was based on the services sector. The agriculture sector had 33% and the manufacturing sector had a 15% share. In 2012, services accounted for 57.1% of GDP, compared to 31.1% for industry and 11.8% for agriculture. In the same year, 52.5% of the labor force was employed in services, 15.4% in industry, and 32.2% in agriculture. The importance of the services sector is also reflected in the external (balance of payments) accounts of the Philippines, which show a deficit on the trade in goods account and a surplus on the trade in services account (Lee, 2014).

The Philippine government provides incentives for private institutions to encourage public-private partnerships for financing construction, operation and maintenance of public infrastructure, and development projects. Despite the restrictions that the country's 1987 Constitution and other laws set for foreign ownership, the government is encouraging foreign interests to "invest in the country with the businesses that improve employment opportunities, develop productivity of the sources, heighten the value and volume of the exports and provide opportunities for the future developments in the economy (Central Intelligence Agency, 2015)." The top trading partners of the Philippines are Japan, the US, China Hong Kong and Singapore (Philippines, 2015). Since the Philippines is experiencing growth in some of its industrial sectors and turning into an investment hub for the region, there are multiple stakeholders, development companies and banks from these countries that are willing to invest in Philippine industry.

Metro Manila, as the capital of the country, is the most significant metropolitan region in the Philippines. Due to the very centralized economy of the country, most of the businesses and major companies are located here. This investment focus on Metro Manila provides the NCR with most of the country's infrastructure required by businesses and, therefore, reduces the cost of doing business there. Compared to the rest of the country, Metro Manila has a lower percentage of manufacturing and higher percentages of tourism, business, finance and transportation in its shares of output by industry. The trade and tourism

industry, with a 31.4% share, is the most important industry of the NCR. Business and finance, with 28.6%, and local/non-market, with 15.6% follow (*Economy of the Philippines, 2015*).

With the above-mentioned strengths and opportunities that the Philippines have for industrial investment, there are some weakness and threats in this sector as well. “The Executive Opinion survey, conducted annually by the World Economic Forum, considered corruption as the most severe impediment to business in the country in 2014 (17.6% of respondents), followed by inadequate infrastructure supply (15.9%), tax regulations (13.3%) and inefficient government bureaucracy (12.6%).” From the environmental view, pollution, especially in the largest cities such as Metro Manila, is the main problem of Philippine industry. Unemployment and population growth are other major issues. Metro Manila is the city with the densest population, and a considerable number of people seek better job opportunities in the capital. However, employment in the NCR has increased by only 5% from 2009 to 2014 (*Brookings Institution, 2015*).

#### *Economic Outlook*

Due to the constant recent increases in private consumption improvement in exports and a stable investment climate in the Philippines, the country’s economy has expanded. With a lower employment rate, modest inflation and overseas Philippine remittances, there has been growth in GDP. The average annual rate of growth is 1% and is projected to grow by more than 4% per year over the long-term based on projections of the National Economic and Development Authority (NEDA) of the Philippines. However, this strong GDP increase assumes a fixed annual population growth rate of 1.89% (*NEDA, 2014*).

The economy of the Philippines is doing quite well when compared to its neighbors. Indonesia, with an annual GDP growth rate of 6.3%, is the only one experiencing better progress. Malaysia’s growth is at a rate much the same as the Philippines, and Thailand, with a 2.4% annual increase in GDP, is growing more slowly (*Oxford Business Group, 2015*). The industry and services sectors, like the other parts of the economy, are continuing to grow. However, this growth needs to be sustained. The international market for the Philippines in the rapidly growing economy of East Asia is a key point in its improvement. Innovation in industry and services with the creation of new products linking different sectors, as well as optimizing productivity, innovative strategies and policies are some factors that can have a great impact in the growth of these sectors (*NEDA, 2014*).

There is evidence to support the statement that, “of all sectors, the BPO (Business Process Outsourcing) industry tops the list for size and growth trajectory, providing employment opportunities and encouraging foreign investments into the country (*Manila Bulletin, 2015*); also see **Figure 1**.” This follows the shift to service-based industry in the economy of the country. Currently, there are more than one million employees in BPO and related IT sectors in the Philippines. With the rapid growth of these sectors, the World Bank projects up to \$55 billion USD total income by 2020 and the addition of 1.5 million new jobs. Compounded by additional favorable conditions such as a significant skilled



young population and lower labor costs compared to the rest of East Asia, there is a positive outlook here, as well as incentives for more investment, and, therefore, growth in these sectors (Romualdez, 2015). For Filipinos, the higher salaries from working in call centers make these positions desirable, even with the difficulties that may arise because of nighttime working hours and the accompanying necessary changes in lifestyle.

#### *The Rise of the Business Process Outsourcing Sector*

Business Process Outsourcing (BPO) involves contracting a third-party provider to execute specific business services such as back-of-office operations. The first BPO call center in the Philippines began serving foreign customers in 1997. It was preceded, and partly made possible by, the deregulation of the telecommunications industry in 1995. The Philippines garnered 6% of the global BPO market in 2007, and it climbed to 10% in 2012 (Deloitte, 2014). The largest BPO customer-base is comprised of companies that are based in the United States, including Accenture (\$648.6 million USD) Convergys (\$396.6 million USD) and JPMorgan Chase Bank N.A. Philippine Global Service Center (\$160.8 million USD) (Newsbytes, 2014).

The success of this sector in the Philippines can be attributed to the hospitable nature of Filipinos, which translates into excellent customer service; its cultural affinity with the US, which results in the acquaintance with and usage of American English and idioms, and, finally, a highly educated workforce that has the aptitude to function in domains like information technology, finance and animation.

A federal investment of \$30.6 million USD over 8 years (2006 to 2014) financed the business skills training for call center employees (Lee, 2014). In acknowledgement of the dependent relationship between exceptional English skills and the success of BPO endeavors, the government also led an initiative to institute the National Proficiency Exam in order to ensure that teachers are proficient and can instruct those who are potential BPO employees in that language.

The federal government has redirected its support, including funding and marketing efforts, to grow the industry in “Next Wave Cities (NWCs)” such as Baguio City, Davao City and Dumaguete. NWCs are cities located outside of Metro Manila that have experienced significant economic growth and have been identified as having the capacity to sustain and amplify those gains for the overall advancement of the country. This approach reflects the federal government’s strategic priority to disperse wealth and job opportunities beyond the NRC proper. Mature and startup BPO companies alike are gradually relocating due to “the rising cost of rent, manpower, and power-generation (in Manila) (Ibid.)”.

Disinvestment on the part of the federal government is not a sign that the market is cooling in Metro Manila. In fact, as of 2014, Metro Manila has become the second largest destination for companies seeking BPO services. As a proven vehicle for economic success, the position of BPO enterprises in the region’s job creation agenda should be reinforced. Metro Manila is the market leader and, therefore, has the clout and experience to expand the breadth of its BPO services

into new categories like health care.

#### *Priorities*

Manila's main industrial initiative for the next five years, then, should be to implement the following projects in order to reinforce the city as a BPO:

- Establish a call center in Mandaluyong near its network of universities and technical schools,
- Offer job training for new and current employees,
- Secure Aetna or Anthem as a BPO client,
- Perform a study to determine the viability of medical tourism in Manila, and
- Develop a superblock in the south to serve as the hub for expansion into health care BPO's.

### **5.3. Transportation**

#### *History and Context*

Serving the largest urban population in the country, the Metro Manila transportation system faces the difficult challenge of connecting its 17 local government units (LGU). At present, those connections comprise two LRT lines, one MRT line, an extensive system of local roads and highways for private automobiles, tricycles, jeepneys, buses, bicycles, pedicabs, ferries and pedestrian routes. Road transportation mobilizes 98% of vehicle passenger traffic in the Philippines (Asian Development Bank, 2012a), and its overall dominance in Metro Manila makes it the sector in which changes and improvements will have the greatest impact in the region.

The population and economic growth that Metro Manila has experienced during the last few decades has resulted in accelerated automobile ownership and, with this, increases in congestion (Asian Development Bank, 2012a), pollution (Robles, 2012) and costly commute times. An Asian Development Bank report estimates 4.6% of GDP losses in congestion (Asian Development Bank, 2012a; Buco & Buco Jr., 2009; Robles, 2012), and traffic accidents (Flor & Javier, n.d.). As of 2007, the leading form of motor vehicles registered in the country was Motorcycles and Tricycles, which constituted approximately 48% of all registered motorized vehicles, followed by Utility Vehicles (including jeepneys), which were approximately 29%, Automobiles being 14%, Sports Utility Vehicles accounting for 3%, Buses 0.5%, and Trailers accounting for 0.4% of all registered motorized vehicles in the country (Ibid.).

The issues related to motorized vehicles are expected to escalate if a change in the current transportation system does not occur. The Philippines Land Transportation Office reported that the number of vehicle registrations has been growing at a rate of 6% per year (World Bank, 2011a). Furthermore, population growth in Metro Manila over recent decades has been rapidly forming a belt-like corridor surrounding the city center (Murakami & Palijon, 2005), calling for more efficient, sustainable, and health-conscious means to connect inner-metropolitan populations in a way that does not further threaten public health or cause more

degradation to the environment (as the proliferation of subdivision construction is contributing to land degradation and flooding as discussed by (Murakami & Palijon, 2005)).

The focus of the national government for the transportation sector has been influenced by the major decentralization process marking recent decades (Porio, 2012). This decentralization has resulted in the devolution of power and service-provision from the national government to the local government units (LGUs), which has placed communities closer to their authorities, but also strengthened political elites and corruption. Furthermore, this has left some LGUs unequipped and unprepared to undertake transportation planning roles that require greater (regional) vision, coordination and funding. The weak local management of transportation planning efforts has contributed to deficiencies in the disbursement of infrastructure funds, leaving 44% of the Department of Public Works and Highways (DPWH) available budget unused in 2007, despite the substantial demands for projects addressing transportation issues (Asian Development Bank, 2012a). The decentralization process has also placed emphasis on distributing national infrastructure efforts more evenly throughout the archipelago, which has translated into efforts to build more highways and national roads with a goal to pave all national roads by 2016. The ambitious undertaking of consolidating a road network linking vast amounts of unconnected land has removed the focus from resolving the complex transportation problems of Metro Manila. This is visible by looking at the regional breakdown of DPWH funds dedicated to infrastructure for fiscal year 2015, which allocated 8.8% of its \$4.5 billion USD budget to the National Capital Region as opposed to other regions requiring more complex projects and receiving from 18% to 29.3% of the DPWH funds (DPWH, 2015) (see **Figure 2**). The reduced presence of national funds and challenged local management of transportation initiatives has resulted in the greater presence of privately led projects initiated through unsolicited proposals to LGU's and also via public private partnerships (Asian Development Bank, 2012b). Also, the strong foreign investment led transportation infrastructure culture that predominated in the Philippines in the 1990's is still significant (Donaldson et al., 1997), in addition to foreign aid having been added to the mix of non-national government funding for transportation projects in the region.

The fast population growth, weak, underfunded and disconnected local-level transportation planning, plus the disproportionately car-focused transportation vision have left the fastest growing region of the country, Metro Manila, with a transportation system unable to keep up with the demand of its growing population and 3 million daily commuters (Robles, 2012). Furthermore, the proposed solution by the national government, reflected by the large percentage of spending for highways-63% of the FY 2015 budget to construct more highways, is a key contributor, rather than a solution to these problems.

The current LRT and MRT lines are positioned to serve mid- and long-distance trips but are extremely over capacity with more than 450,000 passengers a day utilizing a system designed only for 350,000, even with capacities recently ex-

panded (Manila Capacity Expanded, 2007). Despite the additions of planned rail extensions for Line 4 and Line 6 of the existing rail system, as well as the Manila-Calabarzon Express line (MCX), the majority of the city's congestion issues lie in the number of motor vehicles flooding the road infrastructure of the region. Furthermore, the lack of efficient and well-defined collective transportation means to cover short to mid-distance trips results in people taking recourse to unsustainable, inefficient and polluting car or jeepney trips or further adding to over-capacity problems in the major rail systems.

#### *Solutions*

Upon analysis of the issues, the transportation proposal consists of three main initiatives:

- Short-Term Initiative-Consisting of 5 years. In this phase the focus is on the most prevalent modes of transportation in the region: jeepneys and tricycles. Due to the cultural and economic significance of these vehicles, their general form and function would be preserved, but these vehicles would transition away from diesel engines towards electric models. This would help reduce the nation's reliance on foreign fuel and have the greatest impact within a short period of time (Figure 5).
- Mid-Term Initiative-Consisting of 5 years, this phase would consist of an ongoing long-term social program focused on educating young adults, teenagers and children about sustainable means of transportation and encouraging a cycling culture. This would be accomplished through the media, school programs and leisure activities. Metro Manila is already experiencing a congestion crisis, and demographic trends show that children and teenagers are the largest demographic population groups. As these large groups reach adulthood, the impact of their prevalent choices for transportation modes will be profoundly meaningful, either further exacerbating the current transportation sector problems to unprecedented levels or helping transition the region into more sustainable transportation networks.



**Figure 5.** The Filipino Jeepney (2016). Source: <https://en.m.wikipedia.org/wiki/Jeepney/>.

- Long-Term Initiative-Consisting of 15 years, in this phase, the creation of inter-LGU non-motorized or low impact motorized transportation networks to facilitate short trips is proposed. Cycling, e-tricycles, and walking have been selected as the main modes of transportation for these corridors. The plan is to identify existing narrow paths that permeate the urban fabric, and which already serve as non-motorized transportation pathways. These corridors display vibrant mixes of uses, and investments formalizing them into green paths would encourage non-motorized transportation.

This three-pronged strategy aims to address the main issue at stake: the fact that a car-oriented transportation system is a system not realistically sustainable for this region. The infrastructure that is needed to support a car-oriented system, based on extensive, sprawling urban development, is contradictory to the natural landscape of Metro Manila. Continuing current land development patterns is not possible due to the region's containment by water boundaries. Furthermore, the region is in constant need of natural water-absorption mechanisms to cope with frequent water accumulation events following heavy precipitation patterns of the area. In addition, the density that Metro Manila exhibits would make it unsustainable for everyone to drive a car. The inefficiencies of the massive demand for parking that this would generate would result in a substantial burden on land that the region cannot accommodate.

#### 5.4. Energy

##### *Political Characteristics*

MERALCO, Manila's energy distributor, does not have a good relationship with the public amid several legal battles, accusations of corruption, bribes and money laundering. While MERALCO will finance and operate two brand-new 400-megawatt generators in Jurong Industrial Estate, Singapore (*The Manila Times*, 2014), many are wondering why they did not build these plants in the Philippines. MERALCO is profiting from denying an increase in capacity and supply, charging higher and higher prices for electricity (and much more than what is being charged in Singapore); "...something must be terribly wrong here when our biggest utility firm, which controls 60 percent of the electricity market, chooses to invest billions of pesos outside the country, which has been capital deficient (*The Manila Times*, 2014)." Strain among the different political families also affects the energy industry. In 1986, President Corazon Aquino refused to operate a large nuclear power plant that had been built in Bataan because it was constructed by the Marcos administration (*Pascual*, 2013). Officials have said that the reason for closing the plant was its proximity to an inactive volcano and nearby fault line. However, the International Atomic Energy Agency has inspected the plant twice and cleared it for operation. Although these safety concerns were highlighted, "the plant was built to withstand an Earthquake of an Intensity 8 on the Richter Scale, as well as built at 18 meters above sea level to be sufficiently protected against storm damage like tidal waves and tsunamis (*Na-*

tional Power Corporation, 2014).” The current president, Benigno Aquino III, who is the son of Corazon Aquino, has little interest in reopening the plant.

#### *Socio-Cultural Characteristics*

Socio-cultural characteristics can strongly affect people’s energy consumption behavior. Power structures (relations among people), status and social belonging can help explain certain attitudes toward consumption (Sahakian, 2011). In Metro Manila, air-conditioning use and private car ownership are very desirable as status symbols. Only the affluent can afford to have air-conditioning or a car, which are energy intensive. Approximately 67% of people in the Philippines use energy for cooling. However, only 9% of people own air-conditioning, with the vast majority using electric fans (Ibid.). Globalization also affects social perception around energy consumption. Many Filipino return migrants especially see air-conditioning as a status symbol and put units specifically in front of their houses for people to see. In addition, following western fashion trends is important even when it comes to fall and winter clothing. There is also little use of passive or natural ventilation in built spaces because many people want western style architecture. Not only is this type of architecture not appropriate for the climate, but traditional structures are well ventilated and use natural light. While the Philippines has been greatly influenced by the American environmental movement, there has been less consumer activism (Ibid.).

#### *Physical and Geographical Characteristics*

The Philippines is an archipelago of 7107 islands. They are mostly mountainous with varying amounts of coastal lowlands. Metro Manila is in one of these low-lying areas between Manila Bay and Laguna de Bay. The total range of elevation in the Philippines is 9700 ft. (2954 m.), while land use is primarily agricultural (41%) and secondarily forest (25.9%).

The climate is tropical and maritime. There are relatively high temperatures throughout the year, high humidity, and large amounts of precipitation. The average annual temperature is approximately 80°F (26.6°C). The temperature fluctuates slightly. In January, the coldest month, the average temperature is around 78°F (25.5°C), while in the warmest month, May, the average temperature is 83°F (28.3°C). The monthly average for relative humidity ranges from 71% to 85% depending on the month. Rainfall is the single most important climatic factor in the Philippines. Depending on the region, the average annual rainfall could be between 38 inches (965 mm) or 160 inches (4064 mm). The Philippines is subject to monsoonal seasons. Therefore, there are two seasons: wet and dry. The wet season occurs from June to November, and the dry occurs from December to May (PAGASA, 2015).

An important geographical feature of the Philippines is that it is on the “ring of fire.” This causes issues associated with tectonic activity, including earthquakes, volcanic activity and eruptions, lahars (mud flows) and landslides. There are currently 53 active volcanoes throughout the Philippines (Discovery, 2013). The climate and tectonic activity of the Philippines have allowed it to build ex-

tensive hydroelectric and geothermal facilities; hence, their importance to the energy sector.

#### *Environmental Characteristics*

The Philippine Development Plan 2011-2016 includes an Environmental Framework. The framework includes 3 goals: improved conservation, protection and rehabilitation of natural resources; improved environmental quality for a cleaner and healthier environment, and enhanced resilience of natural systems and improved adaptive capacities of human communities to cope with environmental hazards including climate related risks. The second goal is the one that is most connected to energy use in Metro Manila; it includes the measure to “reduce air pollution in Metro Manila and other major urban centers including the promotion and use of clean fuel and indigenous resources to the fullest as sources of clean energy (NEDA, 2011).”

Another measure to combat energy related environmental issues is to “develop and replicate low-cost technologies to optimize the recycling, reuse, and recovery of solid waste, including the conversion of residual organic materials into clean renewable energy (Ibid.).” Moreover, “the continually increasing demands for food, energy, and other goods, coupled with rapid development have put much stress on the natural environment resulting in the destabilization of ecosystems, destruction of natural habitats, and an alarming rate of biodiversity loss (Ibid.).”

Metro Manila contains the chief port of the Philippines, Manila Bay, which is rimmed by “heavy industries, refineries, and a power plant in Bataan, while Metro Manila is highly urbanized with light and heavy industries and factories located in various parts of the metropolis. Due to rapid development and increased demand, Manila Bay and other urban esteros (estuaries) have been deemed eutrophic and unfit for human activity. Industries in the region contribute greatly to air and water pollution, which “significantly contributes to episodic hypoxic conditions in bay waters, toxic algal blooms, and suspended materials in water columns.” The Pasig River watershed, which divides the NCR into Northern and Southern districts, is highly inhabited and highly polluted. The dumping of wastewater and garbage from industries, households and slums contribute to this. Metro Manila produces 8000 tons of garbage per day, and only 70% is collected; what is not collected goes into the waterways (NEDA, 2011). The cost of medical treatment and loss of income from water-borne diseases totals approximately \$141 million USD per year. Traffic congestion and unsustainable fueling methods contribute to about 80% of urban air pollution, air quality issues, and smog. As of 2011, the total suspended particulates in Metro Manila were 166 Mg/Ncm, which was 84% above the standard 90 Mg/Ncm as determined by the World Health Organization (WHO) (Paje, 2011). Due to the high rate of fossil fuel use, Metro Manila emits high rates of CO<sub>2</sub>. It is projected that in 2020, the region will emit 23.5 million metric tons of electricity alone (Ajero, 2000).

This does not account for any emissions from transportation, which make up the bulk of carbon emissions. The import of coal and oil for energy use also contributes significantly to environmental difficulties. The transport of coal and oil has contributed to small spills and water pollution, while the actual conversion of the minerals into energy greatly contributes to air pollution, the degradation of landscapes and ecosystems, surface and ground water pollution from combustion waste, sludge, and acid mine drainage, and the obvious and well-known contribution to global warming. Because most energy in Metro Manila is produced from coal, there are serious implications to the environmental sustainability of the region. Potential areas of clean and sustainable energy investment include bioenergy, solar and wind energy, geothermal energy and hydropower.

#### *Issues*

##### *Issues with Public Distrust*

Issues of the public's distrust in the country's government and sole energy provider, MERALCO, are present and increasing. Growing distrust in the energy sector comes on the heels of the announcement of MERALCO's involvement in the development of two generators in Singapore, even though MERALCO officials have been quoted as saying Manila's energy supply problems are due to a lack of generators (*The Manila Times*, 2014). There has also been involvement of the provider in lawsuits for suspected money laundering and bribery. Electricity charges (per kWh) often change month to month. Some citizens are quoted as saying "This MERALCO Corporation is run by a bunch of dummies; make that rich dummies," and "These are the killers of Philippine progress, sabotaging the economy (*The Philippine Star*, 2015)." MERALCO has been accused of catering to specific people (those with high economic and/or political standing). This is a problem for low- and middle-income citizens with no money or political pull. Their needs often go ignored, adding to their troubles and disparities, and confirming the corruption that goes on in this sector. In fact, the Philippines ranked 85th out of 175 countries in the Corruption Perception Index in 2014 with a score of 38 out of 100 (0 being highly corrupt and 100 being very clean) (*Transparency International*, 2014). The country is improving though; it ranked 94<sup>th</sup> in 2013.

##### *Issues with Capacity*

Metro Manila has had issues with meeting capacity in the past leading to brownouts and blackouts. Brownouts could last for 10 hours or more in 1992. Demand exceeded the system's capacity by almost 50%. This had a huge impact on industrial and commercial enterprises in Metro Manila. The loss was calculated to be approximately \$1.6 billion USD in 1992 (*Mouton*, 2015). While the number and frequency of outages has declined since the privatization of the sector, capacity is still a major concern. The demand for electricity increases as the population of the region grows, both from natural growth and immigration. There are also efforts to provide access to electricity for everyone. According to the Manila Observatory, the energy consumption of Metro Manila was 14,924,617 MWh in 2000 (*Ajero*, 2000). Using a geometric model, energy consumption was



projected to be around 21, 500,000 MWh in 2020. This is a 44% increase in consumption (Ibid.).

As of 2012, the installed capacity on the island of Luzon was 11,739 MW, and the dependable capacity was 10,824 MW. To meet current and future energy demands, there are plans to install 6819 MW between 2013 and 2020 (Petilla, 2013). Unfortunately, just over 50% of these projects are dependent on coal, and another 37% are dependent on natural gas. Metro Manila's reliance on coal is expected to increase significantly.

This could cause issues of national security as the region becomes more dependent upon foreign coal. The Philippines do have some coal reserves, potentially 746 million metric tons; however, a large portion is under the Philippine Sea, and extraction in general could be difficult and costly (DOE, 2008). As of 2007, imported coal made up 10% of the energy mix, and local coal less than 5%.

A separate but important issue is fuel used in low-income households. In 2004, 36% of the urban poor were using kerosene as their primary fuel type (Lumampao, 2004). They purchase kerosene because they can buy it in small amounts; however, it is expensive when purchased in this way, which means that they are paying a premium for their energy.

#### *Issues with Access*

The Philippines has a very high cost of electricity. Currently the rate is around P10.52 or \$0.22 USD per kWh, which is twice as high as some states in the US. The rates are so high that some people either cannot afford electricity or spend most of their income on it. According to MERALCO, the high rates are caused by three issues: lack of government subsidies, the high cost of supply (fossil fuels), and geo-graphic challenges (MERALCO, 2015). In the past, MERALCO has faced issues with providing electricity access to all people. It had a lifeline subsidy scheme, which used money from other customers to provide discounted rates based on usage (Mouton, 2015). This lifeline also covered loss from people pilfering electricity, tampering with meters and not paying their bills (Ibid.). MERALCO has employed several additional methods, including putting meters on telephone poles and requesting people to turn in pilferers, that have reduced their non-technical losses (Ibid.). Even though there has been a decline in the number of non-technical losses, the rate of electricity loss is still extremely high. This leads to many people not having access to electricity.

#### *Objectives*

The issues and problems faced by the energy sector in Metro Manila are extremely diverse. In an attempt to address as many different types of issues as possible, four objectives were developed:

- To encourage education about energy and consumption;
- To support energy related research;
- To help increase current energy capacity through renewable sources;
- To address issues of access to electricity.

#### *Solutions*

Solutions to energy related issues were generated in relation to the four objec-

tives. Solutions focus on promoting energy related education and job growth, identifying energy sources within the Philippines, including renewables, reducing the demand and consumption of energy, and helping disenfranchised groups gain access to electricity. In this section the full range of projects is explored with the intention of selecting a few to develop further.

#### *Research*

Many opportunities presented themselves and were considered as strategies to meet the first and second objectives. Some promising ones included funding research on renewable energies that were possible to harness, researching and developing a system based on the Environmental Protection Agency (EPA)'s Environmental Management System (EMS), deciding whether or not to implement regulations or just have companies set their own goals should an EMS be created, establishing a home energy audit program and home energy efficiency research and information team, and researching a way to implement a public/private partnership that would consult and recommend solutions to private renewables companies. Plans to address and decrease brownouts and blackouts due to lack of maintenance, insufficient supply, and weather-related damage were also considered.

The Philippine government has also passed several bills and issued a number of executive orders to support research concerning energy efficiency and alternative energies. Senate Bill No. 1602 is "an act to support the research and development of new industrial processes and technologies that optimize energy efficiency and environmental performance, utilize diverse sources of energy (Reyes, 2013)." One solution would be using funds to support renewable energy research. Also, providing funds for this type of research sends a strong message that renewables are an important issue.

#### *Education*

Many of Metro Manila's most talented and educated workers leave the Philippines to study and work abroad. The pay is higher, the conditions are better, and more opportunities are available to them overseas. Providing a way for these advanced skills to be obtained and for workers to stay in the NCR would not only benefit the energy sector but the region as a whole. Therefore, education is one of the most important objectives that were selected. Because of the unprecedented need for educated workers and for individuals to understand energy consumption and use, educational programs considered included investing in training and education for technical professionals, providing a way for students to intern or participate in a work study/co-op, and providing scholarships, first and foremost, to promote equity and provide the opportunity for higher education in engineering or other appropriate fields. The hope is to select candidates of diverse socio-economic backgrounds and give them the opportunity to enter the energy field. There is also a need for consumer education about their energy habits and how they can reduce energy consumption at home. There are many different factors that influence people's consumption patterns, and it is hard to address all of them. However, if people could be approached directly and edu-

cated on energy efficiency, then not only could they have lower energy bills, but energy use during peak hours could also be reduced.

#### *Increasing Capacity*

One of the goals of the Department of Energy (DOE) is to “switch from fossil fuel-based technologies to renewable energy technologies in power generation... (DOE, 2008).” The DOE wants to increase the amount of renewable energy in the mix to 50% by 2030 (Dancel, 2015). Different renewable and alternative energy projects considered include solar panels and solar water heaters, wind turbines, geothermal for electricity generation, hydroelectric, hydrogen fueled cars and public transportation, bio-digesters, landfill gas collection, nuclear, natural gas, gravity powered lighting and micro-movement generators. A range of projects has been considered from the small human scale to the large energy mix scale. The goal is to identify projects that could be implemented at different scales and with different end users in mind.

### **5.5. Water**

The water sector in Metro Manila faces challenges not unlike those of other developing countries: unreliable access to potable water at affordable rates. This is compounded by a rapidly growing urban population, many of whom occupy informal settlements without a household, pipe borne supply. The NCR is the most densely populated region in the Philippines with 18165.1 persons/km<sup>2</sup> spread over an administrative land area of 636 km<sup>2</sup> (Asian Development Bank, 2014b). This scenario describes a metropolitan population suffering from constant water insecurity.

Prior to 1997, Metro Manila’s water was supplied by the Metropolitan Waterworks and Sewerage System (MWSS), a subsidiary of the Department of Public Works and Highways. This public agency had a record of poor service and mounting levels of debt in the hundreds of millions of dollars. Until 1997, MWSS only served two-thirds of the Metro Manila population or 6.3 million persons. The remaining 3.3 million lacked connections to a pipe-borne supply and were forced to source water elsewhere. Privatization was viewed as a viable solution, and, in 1997, was implemented employing a con-cession model whereby the Metro Manila region was split into west and east service areas to be managed by two separate concessionaires until the year 2022. The Concession Agreement obligations were to treat and distribute drinking water and to manage bill collection and sanitation/sewerage services.

#### *Major Problems*

These include

- Non-Revenue Drinking Water. This is non-billed water due to leakage, theft or mismanagement. This stands at 29.4% under the privatized Mayniland Water Services Inc. (MWSI).
- Rapid Urbanization. With the over three-quarters of the national population projected to live in urban areas by 2030, the challenges of urbanization will undoubtedly be amplified in this region (Ibid.).

- **Affordability.** To ensure that operations can continue sustainably, water service providers must charge tariffs allowing them to recover their investments, which include government-regulated profits. The cost of water is heavily subsidized with the poorest customers paying approximately 24% of the cost of connection. The Philippines has the significant intra-urban inequality and associated high levels of poverty (Asian Development Bank, 2014a). This means that its most vulnerable inhabitants are not truly able to afford water or other basic urban services. Furthermore, water service providers are unable to maintain or increase service coverage without a tariff-paying customer base from which to recoup their costs.
- **Potable Water in Illegal Settlements** To ensure that operations can continue sustainably, water service providers must charge tariffs allowing them to recover their investments, which include government-regulated profits. The cost of water is heavily subsidized with the poorest customers paying approximately 24% of the cost of connection. The Philippines has the significant intra-urban inequality and associated high levels of poverty (Asian Development Bank, 2014b). This means that its most vulnerable inhabitants are not truly able to afford water or other basic urban services. Furthermore, water service providers are unable to maintain or increase service coverage without a tariff-paying customer base from which to recoup their costs.
- **Flooding/Natural Disasters.** There are six to seven typhoons every year in Metro Manila, which cause major flooding. Destructive earthquakes and tsunamis are natural disasters Metro Manila is also prone to, and they can cause extensive amounts of flooding (Central Intelligence Agency, 2015). The effect of this flooding is compounded by the extreme pollution in the city. This includes trash blocking drainage systems as well as clogging waterways. Additionally, illegal settlements along flood plains and waterways reduce the capability for drainage during floods (Environment and Natural Disasters, n.d.).

#### *Solutions*

A wide variety of solutions are recommended here. These include projects for institutional capacity strengthening, an initiative by MWCI to increase water access for the poor and low-income communities, waterway rehabilitation, stabilization ponds to treat polluted water from Metro Manila, constructed wetlands to improve water quality, a polluter pays program for industrial waste in rivers and a natural disaster resilience plan.

### **5.6. Sewage and Sanitation**

Metro Manila is arguably the most densely populated city in the world, and like many other densely populated areas with insufficient regulation, there are associated consequences. In this megacity, a significant amount of pollution is created through industrial waste, automobile emissions and open dumpsites (ADB, 2013). Improper waste disposal methods also play a critical role in pollution in the region, and lead to abysmal sanitary conditions.

Metro Manila “generates about 7000 metric tons of solid waste daily, with a daily waste generation of 0.66 kg per capita per day (Bernardo, 2008; Storey, 2012).” Moreover, Emy Aguinaldo, the executive director of the National Solid Waste Management Commission—as quoted in the *Philippine Daily Inquirer*—asserts a single resident of Metro Manila produces a quantity of daily waste around 130% higher than the global average of 0.3 kg per person per day (Alave, 2011). Considering this, the amount of waste generated is beyond the capacity of what Metro Manila can manage to dispose of efficiently. Only 85% of the waste is collected, while the remaining 15% is typically left on the streets or dumped in waterways (Bernardo, 2008). This has resulted in several rivers in the region becoming biologically dead—most notably the Pasig River.

One of the main issues with waste management in Metro Manila is the shared perspective of who is held accountable. About 69% of the population believes the government is responsible for garbage collection and disposal (Ibid.). This belief has proven to be problematic for the region. Moreover, with the closure of two dumping sites, Carmona Landfill and San Mateo, in the late 1990s and early 2000s (Storey, 2012), in conjunction with inadequate capacity at other sites, a serious insufficiency in adequate dumping sites has also contributed significantly to the waste disposal problems throughout Metro Manila (Bernardo, 2008).

#### *Current Conditions in Manila*

##### *Sanitation*

Inadequate sanitation threatens the welfare of Filipinos and essentially the Philippine economy. In Metro Manila, many of the health problems experienced by residents are linked to poor sanitation. In 2004, it was reported that, “twenty-five Filipinos die of diarrhea every day and sanitation-related epidemics have broken out over the last few years in low-income communities (ADB, 2013).” The outbreak of sanitation related epidemics is likely. The Philippines Environment Monitor reported in 2007 that a significant amount of the surface water in most large urban centers consists of rivers that pose a public health risk (class C standard or below) (Asian Development Bank, 2013). Additionally, the “coli-form bacteria found in all rivers in Manila exceeded Department of Environment and Natural Resources (DENR) standards, in some cases by several orders of magnitude (Ibid.).”

In 2004, the Philippines Clean Water Act (RA 9275) was passed. This act provides a comprehensive and integrated approach to addressing the intertwined issues related to the quality of water, sanitation and pollution. RA 9275 refutes the previous notions and former policies that sanitation is the responsibility of individual households (ADB, 2013). By changing sanitation policies, the government now has a shared responsibility in ensuring and protecting water quality, sanitation, and the control and prevention of pollution. Guaranteeing the adequate provision of municipal sanitation systems would be most achievable when looked at as a group effort. Both individual households, or the Filipino public, and the LGU’s must work together in order to solve their sanitation problems. RA 9275 will supplement other laws and policies in the Philippines

such as, but not limited to, the Sanitation Code (PD 856) of the Metropolitan Waterworks and Sewerage System (MWSS).

#### *Solid Waste*

The composition of waste generated in Metro Manila is highly biodegradable. In fact, around 50% of waste is decomposable matter such as kitchen and food waste. The other types of waste include PET bottles, metals, papers, wood, animal carcasses, cans, boxes/cartons, glass bottles, yard and garden wastes, and cellophane and plastics. This illustrates that enforced composting, recycling, and waste segregation methods would be viable solutions for Metro Manila's waste management problems. As the population continues to grow rapidly, so will the amount of waste generated. This heightens the importance of reinforcing existing legislation. Not only are collection services becoming less proficient, but due to growing public opposition, distrust, and malapropos siting and management, treatment and disposal facilities are facing closure. Therefore, the importance of enforcing regulation on both the government and community levels in order to alleviate the waste problems seen in the NCR cannot be stressed enough.

#### *Proposed Projects*

##### *Environmental Education (EE) Program*

An EE program is a hands-on opportunity to provide children and adults with the tools and skills needed to care for and investigate their own environments. Participants would also learn how to make informed and intelligent decisions regarding the methods to take care of their environment(s). Additionally, an EE program teaches children and adults to take shared responsibility in the condition of their environs. In Metro Manila, there is a shared perspective that the government is responsible for the welfare of the environment. Because of this, many residents are not doing their part in mitigating the issues surrounding the management of solid waste in their communities.

An MSWD program is a mandated educational program in which children and adults separate their solid waste into recyclable and non-recyclable categories. This program could be implemented with any EE program but differs from environmental education because it would focus solely on the issues surrounding solid waste, the lack of its management in Metro Manila, and the importance of separating and disposing of waste.

Metro Manila produces an average of 8700 tons of garbage daily of which over 2000 tons are biodegradable household waste. There is a need to learn how garbage in Metro Manila can be recycled and transformed into reusable items. Each household would be responsible for separating its trash and waste. It would also be given recycling bins that would be picked up on a bi-weekly basis. Furthermore, this program would be useful in lowering the unemployment rate as it would provide employment opportunities. Barangay (i.e., local) governments would be held responsible for the construction, implementation, and follow through of any MS program, and there would be fines for non-compliance. In the case of Metro Manila, sustainability projects would be employed to conserve the natural resources of local communities. Sustainability projects include both

urban farming and composting.

## 5.7. Finance

### *The Problem*

Many obstacles to development, and to eradicating the significant issues of poverty, sewage, corrupt governance, damage done by natural disasters, and more, as explained thoroughly by each of the preceding sectoral teams. There has been strong economic growth over the past decade, and gross domestic product continues to increase each year. However, the finance sector of the country continues to falter, due to a “perception of heightened instability, low investor confidence, and inefficiencies arising out of structural impediments” (Asian Development Bank, 2015). Furthermore, unemployment and underemployment continue to be major issues, as well as overseas and vulnerable employment, and the stagnant performance of the industry sector. Therefore, in the Philippine Development Plan 2011-2016, the development goals outlined include high sustained and inclusive growth, an increase in professional opportunities and higher quality of life for the citizens, the development of worldclass transportation (for both people and goods), environmentally friendly use of the land, socially responsible property rights and effective and transparent governance (NEDA, 2011). Clearly, government officials in Metro Manila know what its problems are and are making strides to solve them. Thus, the Government of the Philippines has specified certain amounts of its budget to go towards each of these priorities. The donor countries and foreign investors, too, provide money for specific sectors. Each of the sources was analyzed in order to estimate the funds.

### *The Process*

The process that the finance team followed in determining the amount of available funding for each sector is detailed below, broken into the previously mentioned three sources of financing: foreign direct investment, foreign aid and the government budget.

### *The Government Budget*

The government budget is comprised of both tax revenue and Gross Domestic Product (GDP). Therefore, in approaching the amount of funds available from this source, the finance team analyzed the proposed budget report by the Department of Budget and Management for 2016 for all of the Philippines. The team looked into how much money is available totally, and then broke it down into how much is available for each sector from which Metro Manila would draw. Again, these amounts will be detailed shortly.

### *Analysis of the Sources of Funding*

#### *Governmental Income*

The government budget is comprised of both tax revenue and Gross Domestic Product (GDP). Therefore, in approaching the amount of funds available from this source, the finance team analyzed the proposed budget report by the Department of Budget and Management for 2016 for all of the Philippines. This

was the most recent data available at the time the Philippines study was completed. The team looked into how much money is available totally, and then broke it down into how much is available for each sector from which Metro Manila would draw. Again, these amounts will be detailed shortly. However, it was observed that the Metro Manila government receives more income each year due to increases in GDP and tax revenue, but its share of the national total is assumed to remain constant at the historical figure of 86.5%.

According to the Department of Budget and Management (DBM), for 2016, the Government of the Philippines will have a total budget of \$64.04 billion USD. The government will spend 36.8% of the budget for social services, 27.6% on economic services, and 14.0% for debt burden. However, DBM estimates that debt payments will decrease more each year, so there will be additional available funding in the budget for both social and economic services (DBM, 2015).

The budget is divided into two parts: the department budgets, which are provided to 34 government agencies and the special purpose fund (SPF), which is an additional budget from other resources for specific purposes. The finance team selected the departments that related to this environmental plan for Metro Manila and estimated the amount of government support for 2016 to 2020.

#### *Foreign Aid*

The countries and multilateral institutions currently giving the most funding to the Philippines are, in order by amount, Japan, China, the World Bank, the Asian Development Bank, the United States and Korea (Troilo, 2011). Of importance, however, is that there are certain sectors in which these countries and institutions have particular interest, due mostly to concerns with economic development, and maintaining peace and stability in the region.

#### *Private Investment*

The private sector plays a large role in economic development in the Philippines. Many public services are run by private companies. The government highly encourages foreign investment, as it creates more employment opportunities, by having established a free-trade area and providing sufficient infrastructure services (Bangko Sentral ng Pilipinas, 2015). The country also has much potential due to its location (as it is considered to be a gateway to Asia), workers who speak English well and a stable democratic government. In analyzing the possibility of receiving funds from the private sector, the finance team had to identify the investors both in the Philippines and from foreign countries. By examining the list of investment banks, the team was able to gather information about foreign investors in the Philippines and statistical data on investment in Metro Manila.

#### *Investment Banks*

According to data from the Bangko Sentral ng Pilipinas, or the Central Bank of the Philippines, there are eleven local banks and fourteen foreign banks in the Philippines. There is also a local bank, “the Metro Bank,” that provides the loans for government agencies and public service companies by through support from the Development Bank of Singapore and Tokai Tokyo Financial Holding from



Japan. Furthermore, there are also seven foreign banks that provide loans for large-scale development projects (Bangko Sentral ng Pilipinas, 2013).

#### *Foreign Investment*

According to the Philippines National Economic and Development Authority, there are six major trading partners of the Philippines: Japan, China, USA, Hong Kong, Singapore and Korea. In the Philippines, foreign investors are allowed to own 100% of their firms, except for some business areas that are reserved for Filipinos or allow foreigners only to own some part of the firms (NEDA, 2011). Of all industry in the Philippines, 36% is owned by foreign investors, with the rest owned by local investors. Manufacturing and energy services are the sectors with the largest amount of investment.

## **6. Conclusions to the Paper**

The intent of this project was to bring the contemporary thinking and practice of Urban Environmental Management to the solution of real problems in a major city in a developing country of Southeast Asia. Three metros were studied by three separate groups of graduate students in the School of Planning at the University of Cincinnati in separate years. The exercise, then, was to replicate as much as possible the conditions under which a team of expatriate consultants would operate in this context so that they could develop solutions that fit the circumstances they would likely find as professional planners working on such projects for international development banks (e.g., the World Bank, the Asian Development Bank, the Inter-American Development Bank or the African Development Bank), multilateral donors in the United Nations system such as the United Nations Development Program, or the numerous bilateral donors of the developed countries, which are primarily known by the alphabet soup of their initials.

Major donor countries include the United States, Japan, Canada, Australia, United Kingdom, Germany, France, the Netherlands, Switzerland, Sweden, Denmark, Norway, Finland, Italy, Belgium and Spain. Consulting firms operating internationally on projects these institutions and countries fund come not only from the donor countries named, but increasingly from countries such as Brazil and India as well, and the staffs of experts they provide often come from a number of the countries named (Edelman, 2014).

In this working environment, it was instructive for the students to formulate a 5-year plan of solutions to the environmental problems and issues they faced rather than to be told how to solve them. This expanded their analytical skills and taught them how to utilize the limited knowledge and resources available to come up with implementable solutions for the benefit of the population of Metro Manila, Bangkok or Jakarta. They learned that such skills are transferable to other projects, 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 (Edelman, 2015).

## Conflicts of Interest

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

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