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Wastewater Management in Developing Countries

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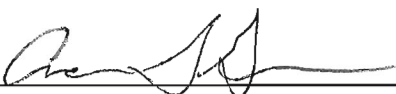
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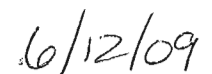
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“Maraming Salamat po sa inyong lahat”

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Chapter I | Introduction

CHAPTER I: INTRODUCTION

The lack of wastewater management and adequate infrastructure creates major health issues. It escalates the poverty level by causing disease, death and environmental instability, especially in developing countries such as Ethiopia and the Philippines. When a city lacks the basic infrastructure to support its community, health and environmental degradation occur including groundwater contamination for those who reside in the area. Lack of sufficient wastewater management has negative ripple effect in many area of community including human health.

This project will focus on two developing cities: Addis Ababa, Ethiopia and Makati, Philippines. The purpose of this project is to get a better understanding of the challenges and consequences these two developing countries are facing due to the lack of wastewater management. In order to do so, we will look at each

country and city's background information and identify the social, economical, political and environmental issues. We hope to offer potential solutions and an alternative through best practices from both countries as well as other resource materials. In addition, we will look at the similarities and differences between the two cities so we can evaluate the lessons learned from these two case studies. Ultimately, understanding and identifying successful and/or failed implementation methods helped us offer viable solutions not just for these two cities, but also for other developing countries. Lessons such as adequate government spending on infrastructure, public awareness, public and private partnership, effective policies, collaboration efforts and proactive leadership role are clear lessons learned in this study. Research Methodology for this project consists of books, scientific journals, personal interviews and internal research.

Chapter II | Addis Ababa, Ethiopia

CHAPTER II: ADDIS ABABA, ETHIOPIA

2.1. PRIMARY CONCERNS

In Ethiopia, malnutrition accounts for more than half of all deaths among children under the age of five (UNICEF, 2006). Studies indicate that three-fourths of children's health problems in Ethiopia are due to a lack of clean water and unsanitary wastewater management. Studies also show that only 11.5% of the population has access to sanitation facilities while 88.5% live without any adequate access to sanitation facilities (World Bank, 2005). By contrast, 30 percent of Kenyans, 60 percent of Ugandans, and 77 percent of Tanzanians have access to sanitation facilities (Kebbede, 2005). Ethiopia is home to more than 4 million orphans. The AIDS epidemic, poverty and lack of basic necessities are some of the major issues facing Ethiopia (UNICEF, 2006).

Founded in 1886, Addis Ababa (the name means new flower) is the capital city of Ethiopia. It is the largest capital

city in the world, which does not have a centralized sewage system. In 1886, Ethiopia's Emperor saw Addis Ababa as a great location for its potential expansion. It is surrounded by the Entoto, Yeka, and other mountain ranges. The city's sewage management system is about 60 years old with outdated technology. The existing wastewater sewer system is connected to the Kalitti treatment plant, which is located in the outskirts of the city. This system has a capacity to serve 200,000 people or 5 percent of the existing population (Muschalla, 2001). Since most toilets are not hooked up to the main sewer network, septic tanks, cesspools, and open waterways are used to discharge sludge (Kebbede, 2005). Most of the inhabitants use on-site sanitation systems such as pit-latrines. The various technologies used are not well maintained. It is estimated that within the city of Addis Ababa, about 30-40 percent of the waste is dumped on

underground or left in the street. Forbes magazine ranked this city as the world's sixth dirtiest city (Belaineh, 2008).

The lack of adequate sanitation facilities has major impacts on human health and the environment. These impacts have a ripple effect on developing countries such as Ethiopia. Disease, death, environmental degradation, poverty, and economic instability feed each other in a vicious cycle that is overwhelming or nearly impossible to overcome. To understand the cause and effect in a broader context and to explore solutions, the following subjects will receive a focus in their own chapters: history, demographics, environmental setting, economy, existing infrastructure, policies, challenges, constraints and solutions.

2.2. BACKGROUND

To understand the present circumstances, exploring the historical, demographic, and geographic setting is critical. Exploring these areas will give us background information and allow us to understand the issues facing the country in relation to wastewater management and infrastructure.

2.2.1 History

Ethiopia has existed for 2,000 years and is considered to be one of the oldest countries in the world. It is believed to be the origin of mankind where discovered bones date back to 3.2 million years ago. (U.S. Department of State & Bureau of Public Affairs, 2008). It is also one of the few countries in Africa that has not been colonized by outside rule. Ethnic war, poverty, lack of education, lack of true democracy, drought, and famine are some of the major issues that Ethiopia continues to struggle with. Ethiopia has had many forms of governments. In the last century, Ethiopia had a monarchy, a communist government, and is currently under a democratic republic. (Central

Intelligence Agency, 2008). Even though the current government is called democratic and has been in power for the last 15 years, it hasn't held fair elections and instead has forcefully remained in power. In addition, many affairs in Ethiopia are controlled by the government rather than the people. People do not have the freedom to express their concerns and freedom of speech does not exist in Ethiopia. Harassment and imprisonment are common for those who express their thoughts. Government controls the mass media airwaves (television and radios). Also newspaper agencies are threatened for speaking out about the existing government. Thus, the current government lacks true democracy.

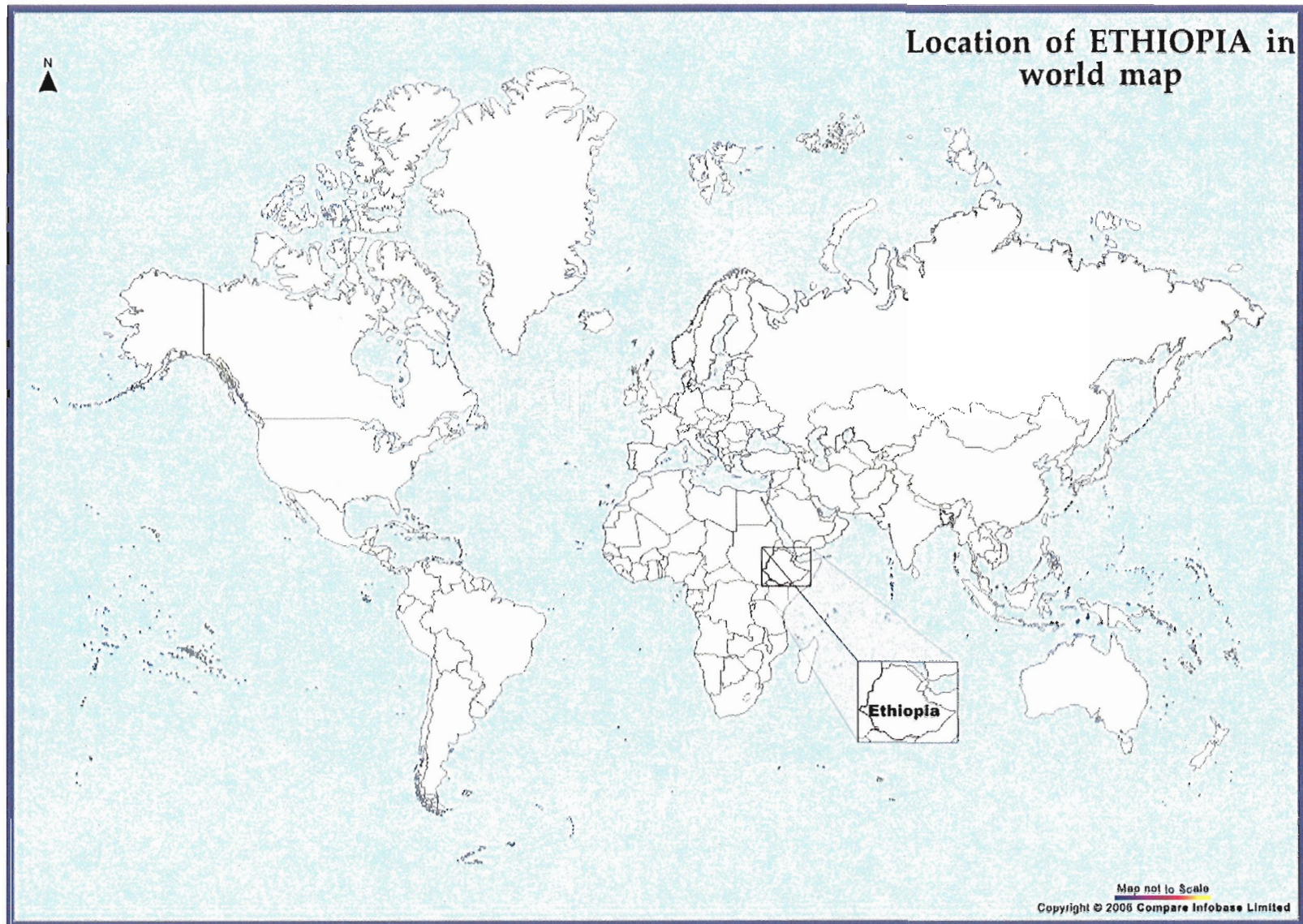


Figure 1 Location of Ethiopia in the World Map. [Source:www.mapsofworld.com]

2.2.2 Location

Ethiopia is located in the horn of East Africa and is bordered by Djibouti, Eritrea, Kenya, Somalia, and Sudan (see Figure 1). Ethiopia's total area is 1,127,127 sq. km, and 99 percent of the area is land while only 1% percent is water (U.S. Department of State & Bureau of Public Affairs, 2008). Addis Ababa is located in the center of Ethiopia (See Figure 2). It is a hub for major international organizations including the African Union and the United Nations Economic Commission, which hosts many international conferences. Thus, Addis Ababa is an important city to the international community.

Figure 2 This map shows the location of Addis Ababa in Ethiopia.
[Source: www.lib.utexas.edu/maps/ethiopia.html, 2008]]



2.2.3 Climate

Ethiopia is located in Africa's tropical zone, which consists of cool, temperate, and hot/moist climate conditions. Heavy rainfall occurs in most of the country during June, July, and August (See Table 1). The highest elevations get a second rainy season between December and February.

During the coldest season, month to month average temperature range between 43°F and 79°F (2005). Due to temperature variations between the desert and the Red Sea coastal area, extreme heat occurs during the summer season. (Central Intelligence Agency, 2008).

Table 1 Addis Ababa's Average Annual Climate

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Avg. Temperature	61	63	64	65	65	62	60	59	61	62	60	60
Avg. Max Temperature	73	76	75	76	76	72	68	68	70	71	72	72
Avg. Min Temperature	46	48	52	52	53	52	53	53	51	48	46	44
Avg. Rain Days	1	1	3	4	3	8	11	11	7	2	0	0
Avg. Snow Days	0	0	0	0	0	0	0	0	0	0	0	

Table shows the average climate for Addis Ababa based on 8 years of historical weather. [Source: <http://www.climate-zone.com>]

2.2.4 Demographics

According to the 2008 Central Statistical Agency of Ethiopia, the population of Ethiopia is estimated to be 82,544,840. Addis Ababa's population is 3,627,934 with 47% men and 52% women. Ethiopia is the second most populous country in Africa next to Nigeria. The population in Ethiopia is relatively young and the life expectancy is short; 98 percent of the population is under the age of 64, and the life expectancy age is only 52 for men and 57 for women. With impacts from the AIDS pandemic, life expectancy is expected to decrease.

Furthermore, the median age is 16.6 for men and 17.2 for women. Population growth can also be attributed to the country's high birth rate, which are 6.17 children born per woman. The population of Ethiopia has been growing at an annual rate of 3.2% percent. However, the population of Addis Ababa has been growing at a startling rate of 28 percent between the years of 1994-2007 (Kebbede, 2005).

This growth is mainly attributed to rapid rural to urban migration into Addis Ababa and natural growth. In most cases, Addis Ababa is an attractive destination for rural and small town migrants due to job opportunities. Rapid growth rates further deplete the already fragile infrastructure in the city. Moreover, Addis Ababa's



Figure 3 Overcrowding near a market called Merkato in Addis Ababa 2008. [Source: <http://www.amdg.ie/2008/11/18/richard-odwyer-in-addis-ababa/>]

population is expected to grow by 30 percent by 2025 (Kebbede, 2005).

It is estimated that Ethiopia has 1.5 million people infected with HIV. Other diseases such as food or waterborne diseases including hepatitis A and E, bacterial and protozoan diarrhea, respiratory disease, and animal borne diseases are some of the major diseases that affect the country. The Infant mortality rate in Ethiopia is considerably high at 90.24 deaths per 1,000 births compared to the U.S. at 6.3 per 1,000. Ethiopia ranks globally 15th in infant mortality. There is also a lack of adequate education, which further hinders the people of Ethiopia to better their environment; currently the literacy rate is only 35.5% (Central Intelligence Agency, 2008).

Addis Ababa's population has been growing at an alarming rate and the city government continues to struggle to meet the demand of the growing population. As the city works to meet the basic needs of the population with limited resources by providing clean water, health services,

and infrastructure, the lack of wastewater management continues to be a major issue and hindrance to public health. In addition, existing resources are being strained beyond their capacities, which further exacerbate public health. All the statistics listed above including rapid population growth, major diseases, health issues, low literacy rate, and limited resources pose a major predicament to the city.

Ethiopia is home to a diverse ethnicities and religions. Studies show that more than 77 languages are found in Ethiopia. The following table shows the different ethnicities and religions in Addis Ababa and Ethiopia (see Tables 2 & 3).

Table 2 Ethnicity in Addis Ababa and Ethiopia

ETHNICITY IN ADDIS ABABA	
Amhara	47.5%
Oromo	19.5%
Gurage	16.3%
Tigray	6.2%
Others	10.9%

[Source: Central Statistical Agency of Ethiopia, 2008]

ETHNICITY IN ETHIOPIA	
Amhara	30.1%
Oromo	32.1%
Gurage	4.3%
Tigray	6.2%
Others	27.0%

[Source: Central Statistical Agency of Ethiopia, 2008]

Table 3 Different Religion in Addis Ababa and Ethiopia

RELIGION IN ADDIS ABABA	
Orthodox Christians	74.7%
Muslim	16.2%
Protestant	7.8%
Catholics	0.5%
Others	0.8%

Source: (Central Statistical Agency of Ethiopia, 2008)

RELIGION IN ETHIOPIA	
Orthodox Christians	50.6%
Muslim	32.8%
Protestant	10.2%
Catholics	4.6%
Others	1.8%

[Source: Central Statistical Agency of Ethiopia, 2008]

POPULATION	
Ethiopia	82,544,840
Addis Ababa	3,627,934

[Source: Central Statistical Agency of Ethiopia, 2008]

2.3. ECONOMY

To build infrastructure and provide basic services, resources are needed. This chapter will explore the state of the economy, which will help us understand existing conditions of the economy.

Ethiopia has an estimated average per capita annual income of just \$220 a year. It is estimated that 39% of the population lives in poverty. (Central Intelligence Agency, 2008) Lack of safe drinking water, sanitation facilities, healthcare, education, and poverty continue to be major obstacles in Ethiopia. (Central Intelligence Agency, 2008). Ethiopia's economy relies heavily on agriculture, which accounts for 80 percent of the labor force. However, agriculture only account for 3% of the labor force in Addis Ababa. In Addis Ababa, manufacturing, trade and commerce are the two largest employers (The Federal Democratic Republic of Ethiopia-Addis Ababa City Council, 2007).

Ethiopia's major export crop is coffee, which accounts for 35% of the country's exchange earnings (Belaineh, 2008).

The following table shows the distribution of the major industry sectors in Addis Ababa (see Table 4).

Table 4 Addis Ababa Major Industry Sector

INDUSTRY	NUMBER	PERCENT
Trade and commerce	119,197	22.6%
Manufacturing and industry	113,977	21.6%
Home makers of different variety	80,391	15.3%
Civil administration	71,186	13.5%
Transport and communication	50,538	9.6%
Education, health and social services	42,514	8.1%
Hotel and catering services	32,685	6.2%
Agriculture	16,602	3.1%

[Source: The Federal Democratic Republic of Ethiopia-Addis Ababa City Council, 2007]

In the last several decades, the country's economy suffered from the consequences of government control and restrictive measures against private entrepreneurship (Kebbede, 2005). Furthermore, the effect of war has been one of the most negative and devastating impacts for the economy in Ethiopia. The war between Ethiopia and Eritrea, which won independence in 1993, has setback both countries. Both countries spent their limited resources on weapons rather than building their countries. According to a study done by the Ethiopian Economic Policy Research Institute, it is estimated that the border war cost Ethiopia nearly three billion dollars. This has further exacerbated the poverty in Ethiopia (Ford, 2003).

Another economic concern along this war is the loss of functioning ports in Assab and Massawa near the Red sea. Consequently, Ethiopia's inability to import and export food becomes another economic impediment (Ford, 2003). Investment in better irrigation infrastructure and technology is one way to improve the agricultural sector, which accounts for a majority of the country's economy. Unless measures are taken to improve the condition of agriculture so rural population can be self-sufficient, the rural-urban migration will continue to occur in cities and towns that are already suffering shortages of public facilities (Kebbede, 2005).

2.4. CHALLENGES AND CONSTRAINTS

Addis Ababa is surrounded by a series of mountains that receive intense rainfall between June and August. This rainfall produces high sediment runoff from the mountains. As a result, the city's drainage system is frequently clogged with debris and sediment. Furthermore, when flooding occurs, wastewater and other waste matter mix with sediment runoff into the local rivers exposing people to major health threats.

In the last 15 years, Addis Ababa has been changing and growing into a metropolitan city. The city has become a boomtown with many new roads and upgrades, new modern buildings, high-rise condominiums, and businesses. However, many new housing units are being sold to the public without any toilets or kitchens. In many cases, it is unknown whether new buildings have been properly connected to a sewer system. Rapid growth, due mainly to rural-urban migration, has created challenges for the city. The government is trying to meet housing

demand by building homes at a faster rate. However, due to the lack of adequate infrastructure and public amenities, the city is unable to provide sanitation services. Health and environmental hazards create a vicious cycle, which further deteriorates the city. In most developing countries, users pay for water supply and sewer services. However, in Addis Ababa, service fees don't generate enough funds to cover costs let alone improve or meet the demand of a rapidly growing population.

2.4.1 Water supply

Ethiopia has the largest water sources in Africa next to the Democratic Republic of Congo. Ethiopia has eight major rivers, eleven freshwater lakes, nine saline lakes, and four crater lakes. (Kebbede, 2005). It is estimated that Ethiopia receives 1.3 trillion cubic meters of annual rainfall.

Ethiopia has great sources of fresh water and ground water. However, the lack of adequate water storage infrastructure, inadequate cost recovery plans, poor water

quality due to contamination, lack of skill and human power, and community involvement ranks Ethiopia as one of the countries in Africa with the lowest access to safe drinking water.

The Nile River, which is the longest river in the world, originates in Ethiopia and Eritrea. However, most of this needed water is used by Egypt. Egypt has taken control of this river via a series of international agreements (*Ford, 2003*). The lack of adequate water makes it that much more important to have an adequate sanitation system. With proper wastewater treatment, water can be recycled and re-used for landscape irrigation, cooling processes, and enhancement of wetlands and riparian habitats. This would help relieve the shortage of water, preserve existing resources, protect ecosystems, reduce and prevent pollution discharges into rivers and oceans.

2.4.2 Policy

The Federal government has policies to deal with urban decay and environmental issues, but the lack of enforcement, financial support, and the inability to translate policies into practices makes the government ineffective. Since the country and the city lack basic infrastructure such as water sanitation, drainage, roads, public transportation networks, parks, recreational facilities, and other public amenities, it is difficult to enforce any rules. As the population continues to grow at a rapid rate, the problem is expected to get worse unless the government partners with or allows the private sector to provide environmental service such as wastewater management and solid waste collection. Neighborhood groups can share the responsibilities in sanitation management with local government support. Citizen participation improves the quality of the environment and also helps reduce the cost (*Kebbede, 2005*).

2.5. INFRASTRUCTURES AND MANAGEMENT

The government manages most of the city's infrastructure including wastewater management. Ethiopia lacks major infrastructure such as roads, transportation systems, and especially water-based infrastructure. This makes it very difficult for the country to meet the needs of the growing population with an outdated infrastructure (Ford, 2003).

The existing wastewater sewer system is connected to the Kalitti treatment plant, which is located on the outskirts of the city. This system has a capacity to serve 200,000 or 5% of Addis Ababa's population (Muschalla, 2001). However, currently only 1,600 households and institutions are connected. Supposedly, more homes and establishment could be connected to the existing sewer system, but a lot of private households don't use flush toilets and cannot afford to change their sanitary equipment (Muschalla, 2001). In addition, most of the toilets are not hooked up to the main sewer network. Instead, septic tanks, cesspools,

and open waterways are used to discharge sludge (Kebbede, 2005; also see Table 5).

Table 5 Addis Ababa's Toilet Facility Usage

TOILET FACILITY	PERCENT USAGE
Flush Toilet	11%
Pit Latrine	73.3%
None	16%

[Source: Kebbede, 2005]

The Addis Ababa Water and Sewer Authority (AAWSA) manages both drinking water and wastewater. This agency is not an autonomous entity. It cannot fix or impose taxes to improve services (Pieter van Dijk, 2006). Taxes are important sources of revenue that allow such an agency to provide adequate services and meet the needs of the community. Successful utility agencies are able to increase taxes to pay for costs and meet the needs of their customers. However, Addis Ababa's Water and Sewerage

Authority depends on the municipality and foreign donors for financial investment (Pieter van Dijk, 2006).

Study shows that 175,000 residents use septic tanks, 1.5 million residents share dry pit latrines, and 700,000 have no access to any kind of facility at all. (Pieter van Dijk, 2006). The municipal government has not been able to

service the existing sanitation system much less add new facilities. In addition, progress in the last decades has been made in providing clean drinking water. However, very little has been done to improve sanitation services.

Chapter III | Makati, Philippines

CHAPTER III: MAKATI, PHILIPPINES

3.1. BACKGROUND

With Philippines being surrounded by mostly water, water has been the most precious and most valuable resource in this country. However, the increasing problem of water pollution not just affects the environment but also the economy and the health of the people. According to the Philippine Environmental Management Bureau, “domestic wastewater is the principal cause of organic pollution (with 48%) on all of the water bodies in the Philippines, and in relation to this, thirty-one percent (31%) of illnesses in the country are attributed to polluted water” (2004). Therefore, managing wastewater is an integral part in restoring clean water and preventing pollution on its existing water bodies. This section will look in depth about how the case study city, Makati, Philippines, provides and manages its wastewater and what are the factors that affects the better provision of it. This section will examine how the City of Makati correlates to the National

Government of the Philippines thru its physical conditions such as geography, climate and demographics; existing wastewater facility and management in Makati; and the constraints and challenges it faces.

3.1.1 Country: *Philippines*

Location and Geography

The Philippines is located in Southeastern Asia. It is an archipelago consisting of 7, 107 islands (see Figure 4). Along with the total number of its islands, Philippines is subdivided by its three prominent big islands, which are: Luzon (Northern), Visayas (Central), and Mindanao (Southern). It is located between latitude 4°23'N and 21°25'N and longitude 112°E and 127°E, near the equator. This location explains many of the variations in topographic, climatic and vegetational conditions in the country (Philippine Government, 2008).

Physical Map of the World, April 2007

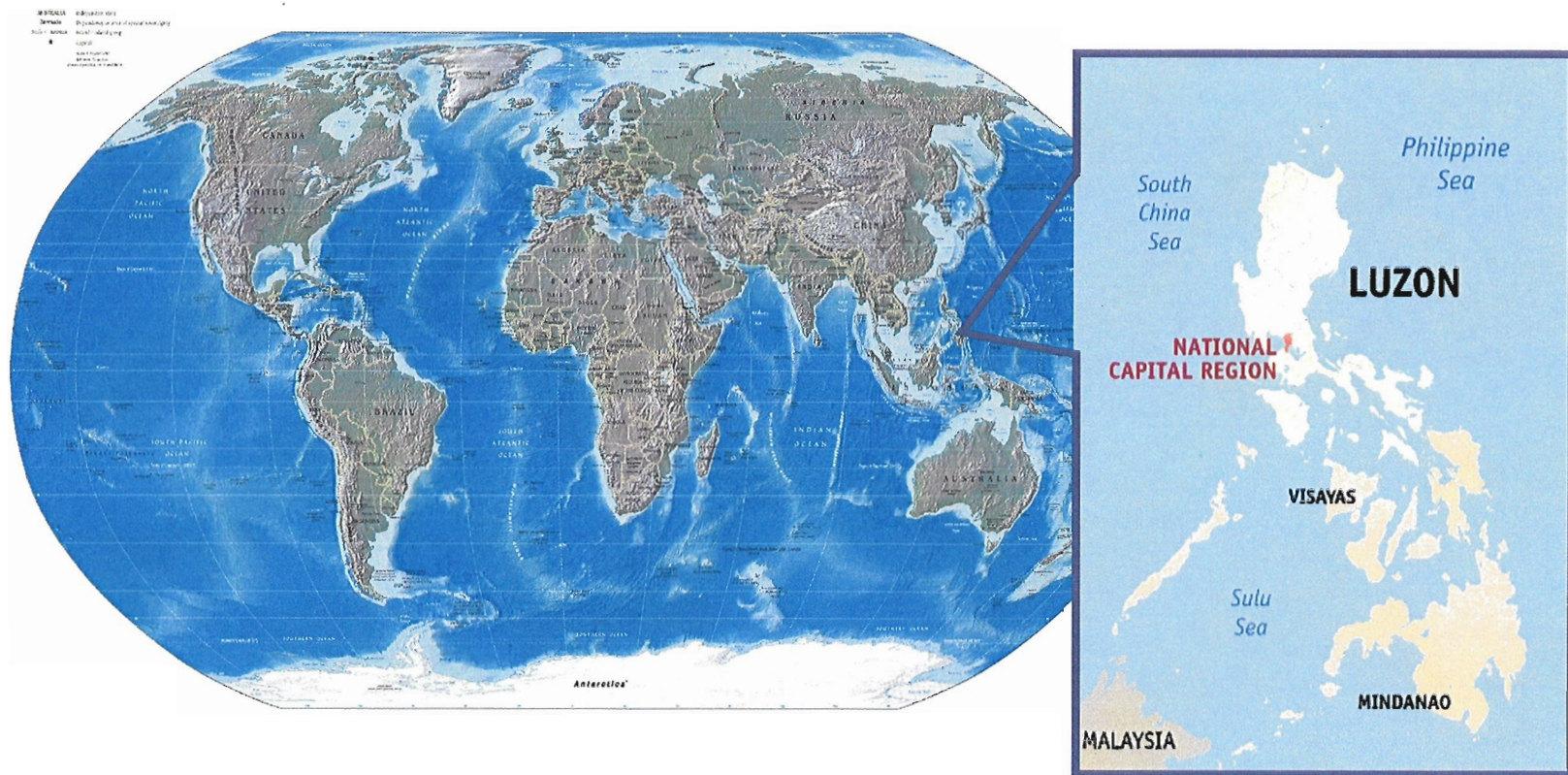


Figure 4 Philippines is located in South East Asia near and near the equator. [Source: Learn NC.com, 2007]

The Philippines is entirely surrounded and divided by water. Three prominent bodies of water surrounding Philippines are the Pacific Ocean on the east, the South China Sea on the west and north, and the Celebes Sea on the south. The Philippines measure about 1,850 kilometers (1,149.5 miles), starting from the point near the southern tip of Taiwan and ending close to northern Borneo. Its breadth is about 965 kilometers (599.6 miles) with a coastline that totals 17,500 km (10,874 miles).

The Philippines lies in the Pacific Ring of Fire, an area encircling the Pacific Ocean wherein frequent earthquakes and active volcanoes occur. This accounts for the Philippines topographic characteristics of “alluvial plains, rolling hills, and high mountains” mostly seen in two of its biggest islands: Luzon and Mindanao (Philippine Government, 2008, paragraph 4). Luzon consists of the highlands and sierras, while Mindanao has the highest mountain in the country, Mt. Apo. These two bigger islands also include rainforest habitats, rich in plant and animal biodiversity that serve as home to some of the



Figure 5 National Capital Region also known as Metro Manila. The most urbanized area in the Philippines. It consists of 16 cities and 1 municipality (Pateros). [Source: Makati Socioeconomic Profile, 2003, p. 4]

endangered species such as the Monkey-eating eagle and the Tamaraw (dwarf buffalo). Visayas is a cluster of islands connecting Luzon and Mindanao. The topography of the smaller islands is mountainous in the interior and surrounded by low flatlands on its coastal rim.

Currently, the City of Manila is the nation's capital, which is located in the heart of Luzon. Fifteen (15) cities and one municipality surround the City of Manila (see Figure 5). These cities and municipality comprise the Philippines' National Capital Region (NCR), also known as Metropolitan Manila or Metro Manila. NCR is the metropolitan region in the Philippines where almost all of the national government offices are located. NCR is situated in the eastern coast of Manila Bay and at the mouth of the Pasig River, sprawled over an area of 626 square kilometers (Philippine Government, 2008).

In Philippines, the national government is divided into regions. Regions are usually composed of provinces, cities, and municipalities. A province is considered as "the largest

unit in the political structure of the Philippines" (National Statistical Coordination Board, 2009). Among all of the other regions in the Philippines, NCR is the only region that is comprised of cities and municipalities, and is not subdivided into provinces. It is the most western influenced urban area and the most densely populated region in the country.

Climate

The location of the Philippines near the equator provides it with a tropical climate with relatively high temperatures, high humidity and abundant rainfall according to the Philippine Atmospheric Geophysical and Astronomical Services Administration [PAGASA] (2004). There are two major seasons throughout the year: the wet or rainy season from June to November and the dry season, which can also be subdivided into the cool, dry season from December to February, and the hot, dry season from March to May. In addition, typhoons frequently pass in a northwesterly direction thru Philippines especially during the wet and rainy season that greatly influences the

weather conditions of the Philippines. It provides great amount of rainfall, humidity, and cloudiness. As a result, typhoons are one of the natural hazards that impacts Philippines with floods, destruction of crops, lost of homes, and sometimes death (Library of Congress, 1991).

Temperature in Manila ranges from 21°C (69.8°F) to 32°C (89.6°F) with a 27°C (80.6°F) average. The coolest month is January and the warmest is May. Both temperature and humidity levels reach the maximum during the months of March to May (PAGASA, 2004). Also, some of the most colorful festivals are held during these months because of the hot dry summer season.

Demographics:

Similar to other Asian countries, the Philippines continues to grow. Between 2000 and 2007, Philippines had a growth rate of 2.04 % with a total number of 76, 504, 077 people in year 2000 to 88, 574, 614 people in 2007 (National Statistics Office, 2008). There is almost and equal division of male and female in the total population with 50.4% male and 49.6% female (see Table 6). The

birth rate is equivalent to 26.42 births per one thousand people and the death rate is significantly low, which is 5.15 deaths per one thousand people. The median age of the population is 22.3 years old, with 21.8 for Male and 22.8 for Female. This means that the population of the Philippines becomes younger and there are a great number of working population to sustain the country.

Although the population of Philippines relatively increases, there are also a large number of Filipinos working and migrating to other countries. These Filipinos are called the “Overseas Filipino Workers” (OFW) that adds to the total number of Filipinos in the country. The OFW’s helps contribute an additional income for the country and increases its economic status.

The average family (household) income of Filipinos in year 2000 was 144,039 pesos or 3, 600 dollars a year.

However, the average family (household) expenditure is 118,002 pesos or 2,950 dollars a year (Urban Development Department, 2000). Thus, this means that most Filipinos

allot their expenditures for essentials and save most of their money for future needs. The segregated islands of Philippines resulted into more than 500 different dialects spoken in the entire country. Within these dialects, eight (8) are considered to be the major dialects widely spoken in the country (see Figure 6). However, there are two official language used in Philippines: Filipino and English. Filipino is considered as the national language of the Philippines, while English is considered as a secondary language used in higher education, government, and

commerce (Nolasco, 2007). The Filipino language is actually derived from one of the widest spoken dialect, Tagalog and with some loaned words from Spanish, Chinese, English and Arab language (Ardnt, Stebner, & Stebner, n.d.). English became a secondary language in the Philippines due to the American occupation after the end of the Spanish colonialism in Philippines. Most Filipinos know two or more languages or dialects and English and Filipino are the languages that Filipinos from different regions use to communicate

Table 6 Philippines Population by Age Structure and Sex, 2000

AGE GROUP	TOTAL # OF BOTH SEXES	NUMBER OF MALE	PERCENT OF MALE	NUMBER OF FEMALE	PERCENT OF FEMALE
0 - 4 years	9,669,502	4,951,932	51.2	4,717,570	48.8
5 - 9 years	9,694,781	4,962,013	51.2	4,732,768	48.8
10 - 14 years	8,949,614	4,541,197	50.7	4,408,417	49.3
15 - 19 years	8,017,298	4,017,830	50.1	3,999,468	49.9
20 - 24 years	7,069,403	3,522,518	49.8	3,546,885	50.2
25 - 29 years	6,071,089	3,053,616	50.3	3,017,473	49.7
30 - 34 years	5,546,294	2,804,522	50.6	2,741,772	49.4
35 - 39 years	4,901,023	2,496,821	50.9	2,404,202	49.1
40 - 44 years	4,163,494	2,120,314	50.9	2,043,180	49.1
45 - 49 years	3,330,054	1,696,712	51.0	1,633,342	49.0
50 - 54 years	2,622,316	1,318,632	50.3	1,303,684	49.7
55 - 59 years	1,903,649	943,133	49.5	960,516	50.5
60 - 64 years	1,633,150	786,137	48.1	847,013	51.9
65 - 69 years	1,138,843	533,469	46.8	605,374	53.2
70 - 74 years	797,970	361,614	45.3	436,356	54.7
75 - 79 years	505,356	218,622	43.3	286,734	56.7
80 and over	490,241	195,185	39.8	295,056	60
Total Population	76,504,077	38,524,267	50.4	37,979,810	49.6

Sexes of the population in Philippines are almost equally divided into 50.4% males and 49.6% females. [Source: National Statistics Office, 2000]

3.1.2 City: *Makati*

Location and Geography

The City of Makati is bounded on the north by the Pasig River facing the City of Mandaluyong, on the east by the Municipality of Pateros, on the northwest by the City of Manila, and on the south and southwest by the City of Pasay (see Figure 7). It is one of the sixteen (16) cities of the National Capital Region (NCR). In Philippines, cities in the NCR are divided into political districts. The smallest unit of government called “barangay” subdivides each district.

The City of Makati is divided into two (2) political districts: District I that comprise of 20 northwestern barangays; and District II that comprise of 13 southeastern barangays. Both the largest and smallest barangay are located in District I. Barangay Forbes Park has an area of 2.5266 sq. km. (624.3 acres) and Barangay Kasilawan with only 0.0922 sq. km (22.78 acres).

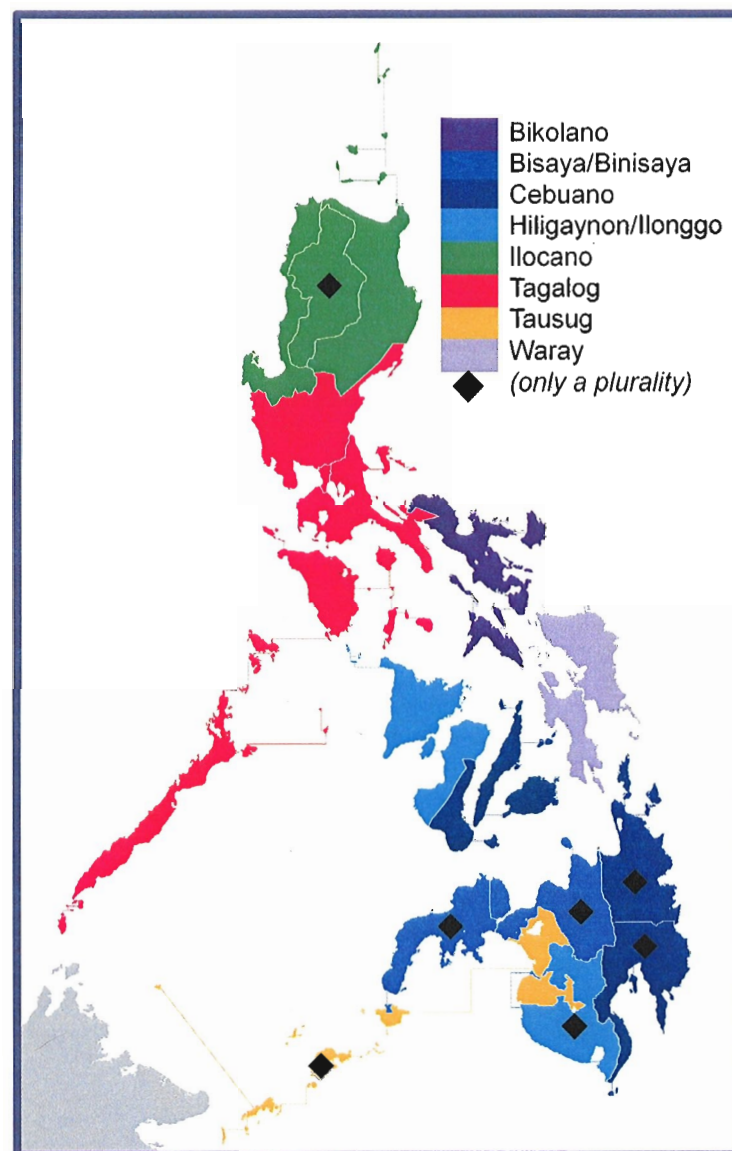


Figure 6 Eight distinctive major dialects spoken in Philippines.
[Source: Rubino, 2008]



Figure 7 Location of Makati City in Metro Manila.
[Source: Wikipedia.com]

Makati has a total land area of 27.36 square kilometers (6,706.8 acres). It constitutes 4.3 percent of NCR's total

land area, and is bigger than the neighboring cities of Pasay and Mandaluyong. The City is mostly composed of flatlands and some high slopes ranging from 3%-12% on its eastern part.

Makati Demographics

Although the population in the entire National Capital Region (NCR or Metro Manila) continues to increase because of the ongoing migration of rural people into the metropolitan area, the City of Makati is one of the cities whose population growth decreased between 1995 and 2000 and slowly increased from 2000 to 2007. The population of the entire NCR has a growth rate of 2.11 % from a total population of 9,932,560 in year 2000 to 11,553,427 in year 2007 (City Government of Makati, 2007; NSO, 2008). Makati's population ranks only with a 4.73% share of the total population among the cities and municipalities in the NCR on year 2000. There was a 2.6% decrease in Makati City's population from 484,176 in 1995 to 471,379 in 2000 according to the City of Makati Census of Population and Housing. Therefore, Makati's annual

population growth rate from 1995 to 2000 is only -0.5% (see Figure 8). However, the number of households on

year 2000 increased by 3,059 or 3.0% more than the 1995 figure of 100,922 households

Makati City Population and Growth Rate, 1995-2000

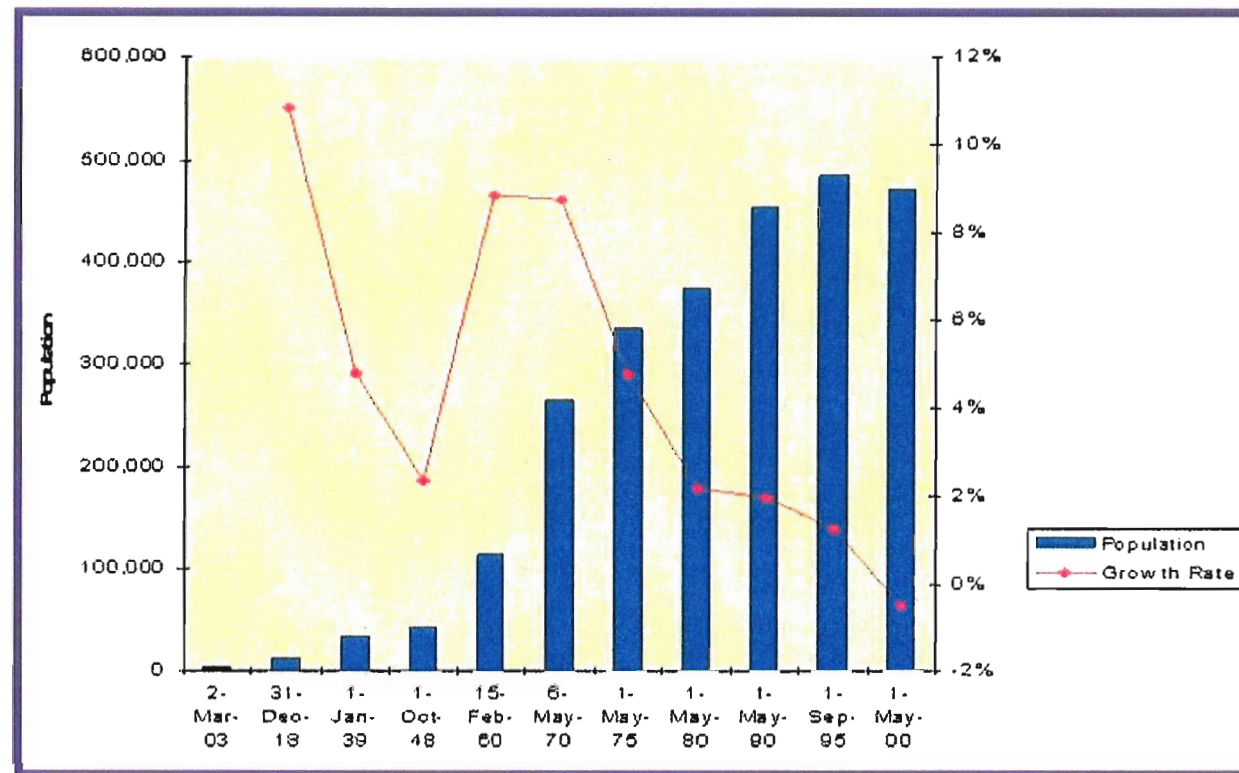


Figure 8 Makati City's population continues to increase while its growth rate decreases between 1903-2000.

[Source: Makati Socio Economic Profile, 2003, p. 43]

Makati's population by age structure shows that the young population belonging to the 0-14 age group comprises 29% of the total population. About 67% are in the economically productive age group 15-64, while those over 65 years of

age constitute 4%. By sex structure, 52% of the city's populations are females. Sex ratio is 0.92%, which means that there are 92 males for every 100 females.

Table 7 Makati Population by Age Group and Sex, 2000

AGE GROUP	TOTAL # OF BOTH SEXES	NUMBER OF MALE	PERCENT OF MALE	NUMBER OF FEMALE	PERCENT OF FEMALE
0 - 4 years	52,405	27,001	51.5	25,404	48.4
5 - 9 years	43,615	22,332	51.2	21,283	48.8
10 - 14 years	40,214	20,162	50.1	20,052	49.9
15 - 19 years	44,239	20,114	45.5	24,125	54.5
20 - 24 years	52,072	23,042	44.3	29,030	55.7
25 - 29 years	49,548	22,979	46.4	26,569	53.6
30 - 34 years	42,506	20,421	48.0	22,085	52.0
35 - 39 years	36,304	17,627	48.6	18,677	51.4
40 - 44 years	30,941	15,040	48.6	15,901	51.4
45 - 49 years	23,679	11,524	48.7	12,155	51.3
50 - 54 years	18,929	9,509	50.2	9,420	49.8
55 - 59 years	10,860	5,226	48.1	5,634	51.9
60 - 64 years	9,013	4,023	44.6	4,990	55.4
65 - 69 years	6,773	2,953	43.6	3,820	56.4
70 - 74 years	4,916	2,366	48.1	2,550	51.9
75 - 79 years	2,838	1,214	42.8	1,624	57.2
80 and over	1,123	360	32.1	763	67.9
Total Population	471,379	226,422	48.0	244,957	52.0

[Source: National Statistics Office, 2000]

Also, from year 2000-2007, the Makati City's population again continued to increase by 444,867 in 2000 to 510,383 in 2007 with an overall growth rate of 1.91 % between these years. Perhaps one of the reasons why the population again begun to slowly increase is because of the ongoing housing projects and conversion of some Makati government property into housing and commercial development. These projects continue to attract not just people from the rural areas to reside in Makati but also other foreign investors or "balikbayan OFW's" (Overseas Filipino Workers who goes back to Philippines).

Since Makati City is a central hub for commercial businesses and its Central Business District (CBD) is considered as the Financial District of the Philippines, there is large difference in its daytime and nighttime population (see Table 8). There are more people coming into the city during daytime to do business in both retail and trade in terms of domestic and international matters (City Government of Makati, 2003). Therefore, there is a large amount of people using the services and utilities provided by the City. This also adds pressure and density to the existing capacity of available utilities and infrastructures of the City.

Table 8 Makati City Daytime/Nighttime Population, 1995

AREA	NIGHTTIME POPULATION	DAY/NIGHT POPULATION FACTOR	PLUS/MINUS	ESTIMATES DAYTIME POPULATION
Within EDSA*	257,000	1.9	490,000	747,000
Outside EDSA*	226,000	0.9	-23,000	203,000
Total Population	483,000			950,000

There are a huge influx people in the CDB along the Epifanio de los Santos Avenue (EDSA). [Source: Makati Socio Economic Profile, 2003, p. 52]

3.2. CURRENT WASTEWATER TREATMENT

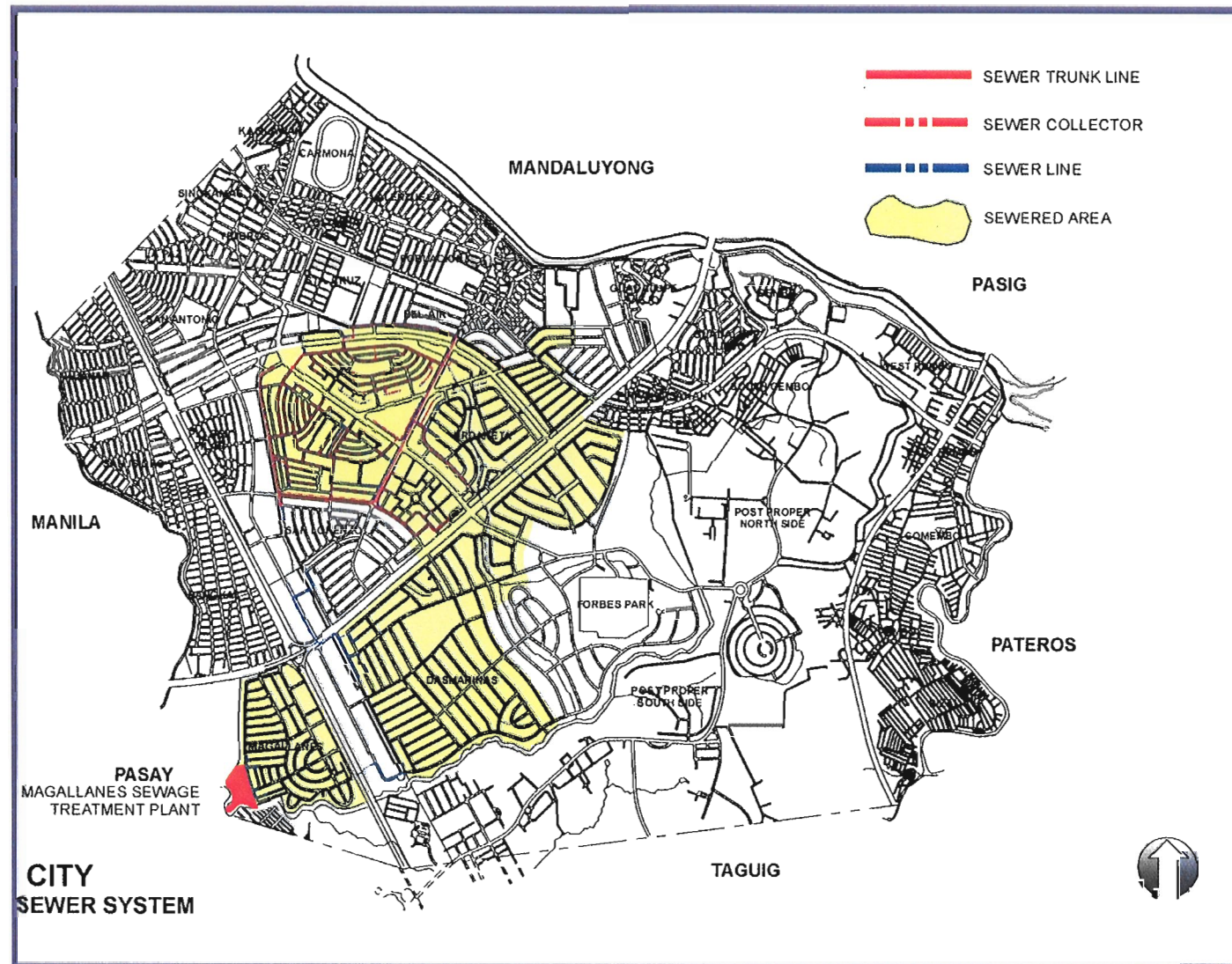


Figure 9 The 10% area in Makati with sewer connection is located in the CBD and some residential area. [Source: UDD, Makati CLUP, 2000, scale: nts]

3.2.1 Infrastructure

According to the Draft Report Sanitation in Makati, only 10% of households connect to a sewerage system (see Figure 9). This includes the six residential villages and the Central Business District (CBD) of Makati. The centralized sewerage system treatment plant is located in Magallanes Village, also known as the Makati South Sewer Treatment Plant (MSSTP) or the Ayala Sewerage Treatment Plant (see Figure 10 & 11).

Currently, there are three wastewater treatment plants in the City of Makati. Makati South Sewer Treatment Plant (MSSTP) is the largest wastewater treatment plant in Makati City (see Table 9). It was also the first wastewater treatment plant in Philippines that was built in 1964 (Engr. Cunnanan, Personal Interview, 2008). The other two are portable STP according to Engineer Tagle, Chief Sanitary/Plumbing Engineer for the City of Makati and Kathleen Almonte, Planning Officer of the Department of Environmental Services for the City of Makati (Engr. Tagle, Personal Interview, 2008; Almonte, Personal Interview, 2008). The two portable STP's are currently located at the



*Figure 10 & 11 Makati South Sewer Treatment Plant, the first centralized wastewater facility in the Philippines
[Source: Feliciano, 2008]*

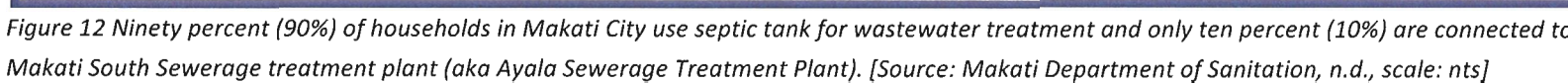
new low-cost housing units for low-income families in Guadalupe BLISS on Guadalupe Nuevo and at the Makati Pabahay on Barangay Rizal (Makati Department of Sanitation, 2008). The portable STP only serves the community or housing units that are within the housing complex. However, both Engr. Tagle and Almonte were

not able to further explain if these “portable STP” are movable or just an on-site non-permanent STP. Thus, further information is needed to know the feasibility and performance of these portable STP in order to see its effectiveness in low-cost housings or low-income communities.

Table 9 Wastewater Treatment Plant Volume per day

LOCATION	LITERS PER DAY
Makati South STP	40 million
Guadalupe BLISS Portable STP	850, 000
Makati Pabahay Portable STP	600, 000

Makati South STP is the biggest and only permanent wastewater treatment facility in Makati serving only 10% for the population. The other two STP are portable STP serving the new low-income housing projects in Guadalupe BLISS & Makati Pabahay. [Source: Makati Department of Sanitation, 2008.]



The other 90% of households in the City of Makati use individual septic tanks for sewage disposal, which are connected to storm drains that lead directly to more than 30 esteros, streams, and the three major rivers in Metro Manila: Paranaque River, Tenejeros-Tullahan River, and the Pasig River (see Figure 12). The Makati Comprehensive Land Use Plan (CLUP) lists four types of drainage systems in the city: open canal, concrete canal, concrete hollow

block walling, reinforced concrete covered pipe, and box culvert. Therefore, domestic and industrial wastewater is discharged into storm drains that eventually reach the waterways such as rivers and creeks (Urban Development Department, 2000). This not well-treated wastewater that directly proceeds to the rivers and creeks in Makati causes pollution that can be hazardous to health and can contaminate ground water.

Table 10 City of Makati's Number of Households in Occupied Housing Units, By Type of Toilet Facility, 2000

TYPE OF WASTEWATER FACILITY	NUMBER OF HOUSEHOLDS	PERCENT
Water-sealed, Sewer/Septic Tank, Used Exclusively by Households	76,841	73.90
Water-sealed, Sewer/Septic Tank, Shared with other Households	18,426	17.72
Water-sealed, Other Depository, Shared Exclusively by Households	3,752	3.61
Water-sealed, Other Depository, Shared with Other Households	2,560	2.46
Closed Pit	488	0.47
Open Pit	418	0.40
Others (Pail Systems, etc.)	596	0.57
None	900	0.87
Total	103,981	100.0

[Source: NSO, UDD, Makati CLUP, 2000]

According to the Makati Urban Development Department, of the 103,981 households in the City only 73% have an access to their own water-sealed, sewer/septic tank facility, while 17.72% shares with other household and the rest uses other types of toilet facilities such as water sealed, other depositories, and a closed and open pit toilet facility (see Table 10). However, even though more than

90% of households have access to sanitary toilets, this number fluctuated from 92.50-97.70% between 2000-2006 due to do the year-to-year proliferation of informal settlers according to the Makati Department of Sanitation, (see Table 11). Therefore, there is still a need to provide proper toilet facilities in the City and at the same time a need for addressing the social issues of informal settling.

Table 11 Year 2000-2006 Number of Households with Access to Sanitary Toilets

YEAR	PERCENT OF HOUSEHOLDS WITH ACCESS TO SANITARY TOILETS	PERCENT INCREASE/DECREASE
2000	97.70	
2003	92.50	(5.32)
2004	94.60	2.27
2005	95.30	0.74
2006	96.49	1.25

[Source: NSO; Makati Health Department; Makati Department of Sanitation, n.d.]

3.2.2 Management

The Department of Environment and Natural Resources (DENR), located in Metro Manila, has the primary responsibility of providing, constructing and implementing the Clean Water Act of 2004 in the Philippines. However, the DENR coordinates with the National Water Resources Board (NWRB) in managing the overall water quality in Philippines. DENR also collaborates with different government agencies to implement the Act. Collaborative agencies include the Department of Health, Department of Public Works and Highways and the Local Government Unit (LGU) from each city to implement the Clean Water Act in addressing domestic wastewater (Environmental Management Bureau of the Philippines, 2004). Hence, to better implement the Clean Water Act, a collaboration of all stakeholders must be included.

Water supply and wastewater management services are provided in Makati City by the NCR (also known as Metro Manila) regional government agency called Metropolitan

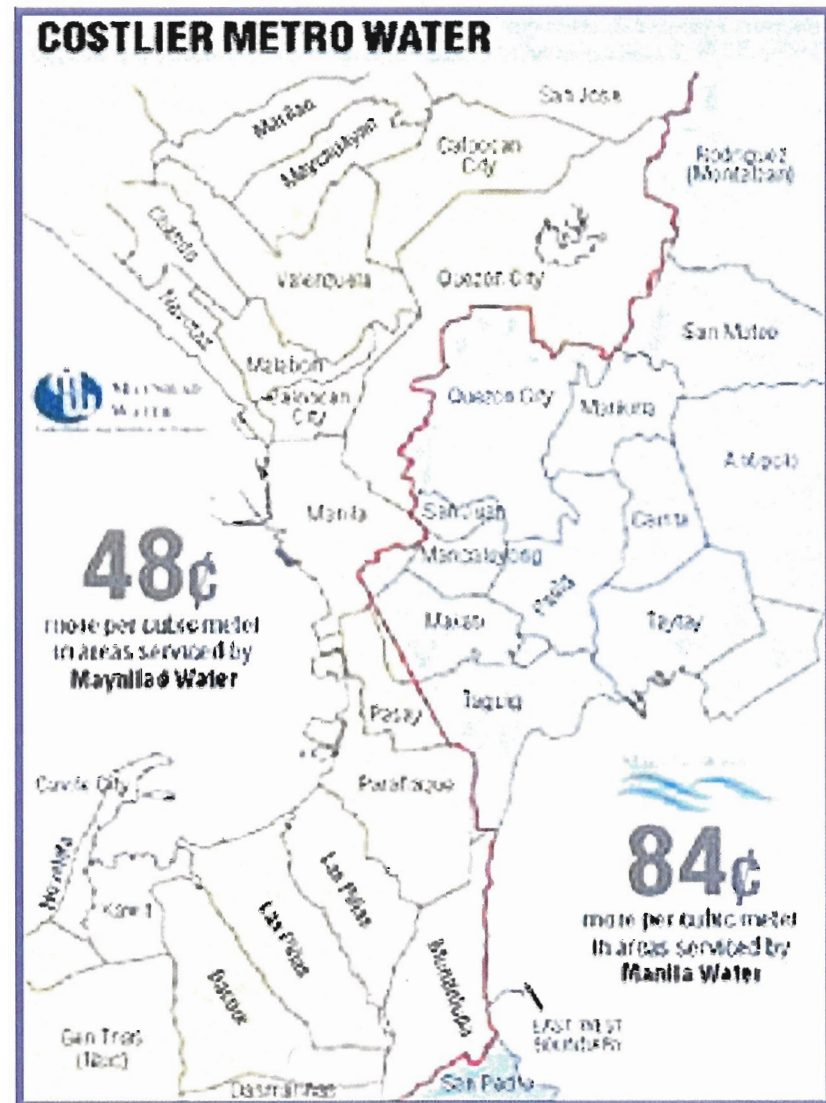


Figure 13 Both of the private water company operates in the City of Makati. Also, the East Zone water district has a costlier rate in its services. [Source: Inquirer.net, n.d.]

Waterworks and Sewerage System (MWSS) through two private concessionaires/company, the Maynilad Water Services, Inc. (MWSI) and Manila Water Company (MWC) according to Engr. Cunanan & Engr. Tagle (Engr. Tagle, personal interview, 2008; Engr. Cunanan, personal interview; 2008).

MWSS granted the contract to the private sector because of the National Water Crisis Act of 1995. This came about from an inability of MWSS to provide ample water and wastewater services to the public it served. This mandated the MWSS to enter into an arrangement with the private sector to help them in the operation and management of the MWSS facilities due to financial and operational hardships. According to MWSS, they "believed that the private sector would have more financing resources and expertise necessary to provide universal coverage of 24 hour supply of potable water in Metro Manila" (MWSS, 2008). Therefore, MWSS's inability to expand and provide adequate service for the growing population of the Metropolitan Manila also led to privatization. The private

companies divided the operation and management of the facilities where Maynilad Water Services, Inc. (MWSI) manages the west zone district of Metro Manila and Manila Water Company (MWC) manages the east zone district (see Figure 13). Makati City is one of the cities in Metro Manila that is included in both the two water districts and company.

It seems that there are too many agencies governing and handling the wastewater management in the Metropolitan Manila. In the City of Makati, there are three agencies handling the sewerage treatment and management. This seems to be more complicated and hard to monitor because each agency may have a different kind of treatment and management. This also generates confusion and difficulty when necessary to find out what and whom you should contact if you are a resident who needs services.

Because a larger part of the City is under the management of the Manila Water Company and Maynilad Water

Company manages the rest, there may be disparities in rates and services. In addition, areas under the management of Maynilad Water may be neglected by the

local government unit due to the tendency of prioritizing and focusing on the Manila Water, which services an area including Makati's Central Business District

3.3. CHALLENGES AND CONSTRAINTS

To greater understand the different factors affecting the needs and provisions of proper wastewater management in the Philippines, this chapter will identify the different issues, challenges, and needs in terms of social structure, economic, and political aspects of Makati City. Information presented in this chapter is derived from the Philippine National and local government documents, personal interviews, official websites, and written books. Personal experiences and observations by the author (Florigna Feliciano) during her stay in the Philippines are also included in writing this chapter. The author was born and raised in Makati, Philippines and lived there for almost twenty years.

3.3.1 *Social*

The social structure of any project site is an integral part in identifying what is needed to properly manage wastewater. Knowing the social aspects of your project site is a crucial part of being able to know the necessary

steps you need to take and consider in making changes that may have an effect on the customs and social life of the people residing in and affected by your project site. Two of the most pressing social issues affecting the provision and management of wastewater are overcrowding and the continued increase of informal settling in urban areas. Generally in the Philippines, many families live together in a small house/area, and such living arrangements are due to the family-centered cultural activities shared by many Filipinos. Perhaps, a more poignant reason is that many Filipinos are financially burdened/economically less fortunate so families are required to pool their resources together for survival. Another possible reason can be the lack of government-mandated standards for housing density; each household tends to be twice the number of the American average household size of two to three persons (NSO, 2000; US Census Bureau, 2000; Fulton, 2005).

Overcrowding is detrimental to the sewage system and the quality of its service because the increase in wastewater may reach beyond the designed capacity level of the system. The unknown increased density of overcrowding would require more maintenance thereby increasing the cost to provide the exact or larger capacity for the sewage system. In most cases, areas where informal housing (squatter areas) exists are more prone to overcrowding, which potentially results in water quality issues and safety issues. Since there are no specific planning codes or ordinances regarding household size and density that are recognized and implemented in the Philippines, overcrowding continues to happen. Also contributing to overcrowding is the culture in the Philippines, which emphasizes and values the family. Families often stay together, living together even if the children are already married. If the children already have a family, the parents are welcome to stay in the household as they get older. This is because part of the Filipino culture is to take care of each other. Parents provide for their children and educate them as they grow up. As the

children mature and parents get older, the grown-up children take care of their aged parents. In addition, some Filipino families also allow extended family to be a part of their household (Shead, 2001). All in all, due to this social and cultural trait, households tend to overcrowd, therefore threatening the wastewater management systems and water quality within that area.

The growing population of Makati is quite alarming. Huge numbers of people from the provinces migrate to Metro Manila, which includes the city of Makati. Migration of poor rural people into the urban area such as the NCR (Metro Manila) causes increased population density and an increased number of informal settlements. As a result, cities and existing informal settlements (squatters' area) within it become denser.

Informal settlements, also known as squatter's areas, are houses illegally built on private property, in the public right-of-way, or other land areas. Many of the informal settlers are people from the provinces or rural regions

who migrate to Metropolitan Manila to find better economic opportunities. If people from the rural areas do not find an affordable place to live, they illegally settle on private property vacant lots, areas adjacent to railroad tracks, under a bridge, or right next to a river or estero. In some circumstances, other Filipinos become informal settlers due to losing their homes from catastrophic events such as a fire or typhoon. Others may have also lost their homes due to debt or financial crisis.

Informal settling is one of the most pressing challenges in the management of sewerage in Metro Manila particularly in nearby rivers

and esteros (creeks) in Makati (Engr. Tagle, personal interview, 2008). Informal settling near rivers and esteros has been a primary concern in wastewater management because waste is dumped directly into the river without proper filtering or treatment (see Figure 14). This affects the health and quality of the rivers, esteros, and watershed in the whole region. Ultimately, this is a big liability for the government and the city in particular,

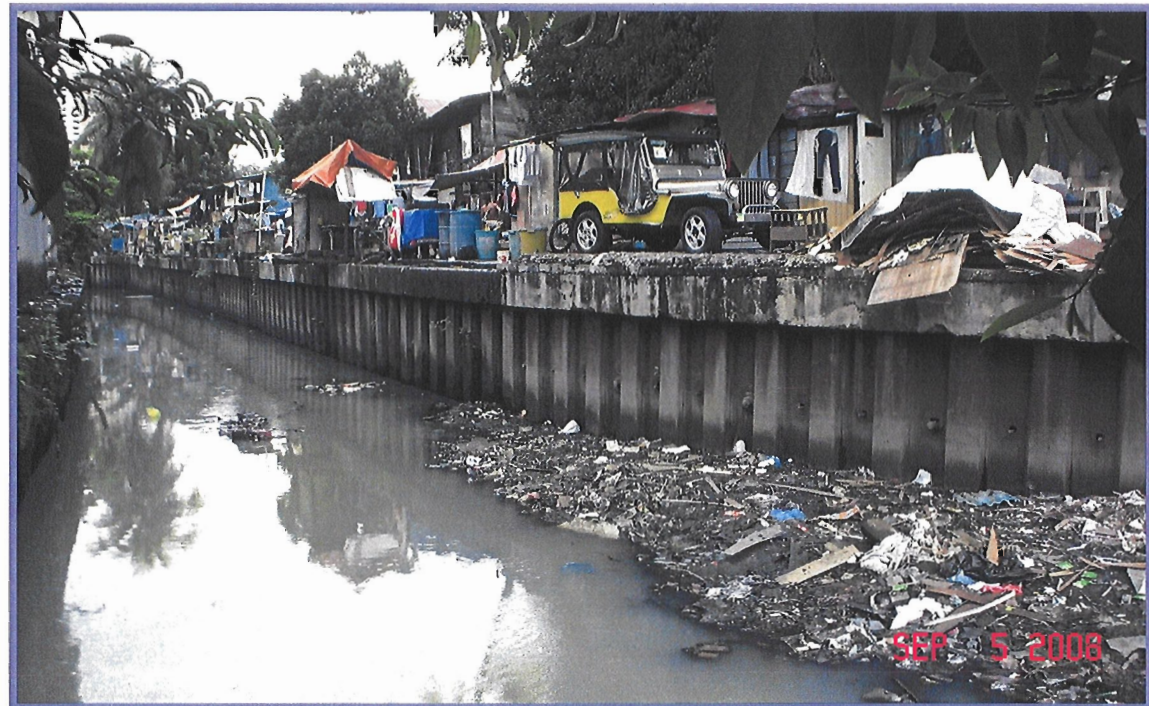


Figure 14 Informal Settlers on the Estero Tripa De Galina, Palanan, Makati City directly dispose of their waste into the creek.
[Source: Feliciano, 2008]

because informal settlements become an environmental and health hazard. The government therefore needs to find decent and permanent places for the squatters to live.

In the City of Makati, the population growth may have slowed down due to some people migrating or working in other countries to provide financial support and a better

life for their family. But as new construction of high-rise mixed-use buildings continues, it is expected that the population and the number of households will increase in the next few years (Urban Development Department, 2000). Therefore, how the city will be able to effectively monitor and manage wastewater should be thoroughly investigated.

3.3.2. *Economic*

Money can be the main driving force in whether or not a country/city can provide better services and infrastructure for a community. One of the strategies that the Philippine government has used to bring in money or improve the country's economic status is to allow private partnership, industrialization, and the promotion of Overseas Filipino Workers [OFW] (Abinales & Amoroso, 2005, p.244).

Privatization of infrastructures has been a growing trend in the Philippines due to financial problems and government mismanagement (Rosenthal, 2001). Maintenance of highways and toll operations are now under private sector control. Utilities such as energy, water supply and sewerage are also under the management of the private sector, which are typically big Filipino corporations with joint ventures with foreign companies. During the administration of President Corazon Aquino from 1986-1992, the Electric Company became the first government utility service company to be privatized. The success of these privatizations can be attributed to the fact that the

Aquino administration also opened up a new bond or connection to foreign investors in the Philippines. Due to the success of privatizations that occurred Aquino's administration, the succeeding president, Fidel Ramos (1992-1998) continued to include/allow participation of private companies in most of Philippines' infrastructures to greater extend the services in the entire nation and to help improve the economy of the Philippines (Abinales & Amoroso, 2005, p. 244-245; Rosenthal, 2001). In relation to this, Metro Manila's private concession agreement allowed sixty percent (60%) of the equity on both of the two water companies to remain in Filipino ownerships and only forty percent goes to the it's partnered foreign investor (MWSS, 2008).

The OFW's are considered to be one of the most important assets of the Philippine economy. This is because OFW's "brings in dollars" in the country. According to the 2006 Philippine Socioeconomic Report,

OFW remittances also contributed a lot of financial gain and boosted-up the Gross Domestic Product (GDP) of the Philippines (Philippine National Economic and Development Authority, 2007, p. 5). OFW's bring in not just money but also additional new business, jobs and investments in the Philippines. Therefore, the government's investment on promoting overseas contract jobs and including English as the second national language in the Philippines and being fluent at it, gave Filipinos the advantage in getting a job in overseas.

One of the cities that benefit from the aforementioned privatization and industrialization in the Philippines is the City of Makati. This is because Makati is home to 88 embassies and consulates, 11 international organizations, and 3, 443 banks and finance-related institutions (City Government of Makati, 2007). Therefore, Makati City gains more incentives, profits and revenue due to the

increase in commercial businesses in the city. According to the 2003 Socio-Economic Report of Makati, the City had Php 5,850 million pesos (\$14,625) in 2002 and Php 6,609



Figure 15. The residential district of Makati (Barangay Poblacion & Barangay Bel-Air) with a background of the Central Business District of Makati, the economic force of the City. [Source: Feliciano, 2008]

million pesos (\$16,523) total income and most of it are coming from city licenses and real property taxes (SER Makati City, 2003). Because of its good financial history, support and the large number of business owners located in the city (due to the Central Business District, see Figure 15), Makati has more financial support/funds that can be allotted to the services it provides and therefore benefits the low-income residents in the City. However, this can be a problem for other cities in Philippines that do not have the same fortunate situation as Makati City. How can other cities that do not have a wealthy business district do to attract more investors and supporters to receive more revenues for the services it needs to provide its residents such as better wastewater infrastructure and services?

3.3.3. Political/ Policy & Environment

On March 22, 2004, a Clean Water Act was enacted in the Philippines due to the concern about the ongoing (and worsening) problems of water quality in the different bodies of water in the Philippines. World Bank stated that:

"Philippines is the second to the lowest in sewer connections among major cities in Asia" (Environmental Management Bureau of the Philippines, 2004). This is also one of the reasons why 31% of all illnesses in the Philippines are caused by polluted water (Environmental Management Bureau of the Philippines, 2004). The poor sewer connections and the lack of proper treatment of wastewater affect the watersheds and drinking water in the Philippines. Issues with drinking water negatively affecting one's health can be very common occurrences in most urban areas, especially those that do not have adequate wastewater treatment and facility.

In the City of Makati, most of these problems in wastewater pollution come from illegal dumping and the problems with informal housing. As mentioned earlier, the disposal of domestic and industrial wastes into the storm drains leading to the rivers and creeks causes more pollution and water borne diseases that mostly affects children. Also, with the poor management and illiteracy of most Filipinos about the maintenance of their septic tanks

(decentralized wastewater facility), leakage and pollution in the immediate areas and leakage/seepage to the groundwater of septic tank contents are not uncommon.

However, with the help of the Clean Water Act, priority was given to wastewater and to having infrastructures that will provide proper wastewater treatment and services. According to Melody Aguiba, author of the “Water Infrastructure: A Dire Need”, the Clean Water Act “mandated the planning of a sewerage and septage in a national aim to treat pollution causing water before it is thrown off the environment and before it contaminates groundwater and further amplifies the problem of clean water depletion”.

As planners, we need to get involved in the planning for areas that can serve as centralized or decentralized wastewater facilities. According to Wayne Feiden and Eric

Winkler, authors of the Planning Issues for On-site and Decentralized Wastewater Treatment: “Planners are involved with the wastewater planning by being involved in the decentralized sewage facility management, and land-use and capital planning” (2006). Therefore we need to be involved, in the global aspect of wastewater management to help maintain not just the welfare of the system, but also to maintain the welfare of the world. We have to be involved right now because as we all know everything is connected. If we do not help these developing countries with their environmental issues and just think of our own, then later on, we will pay for the consequences of not helping their community, in cleaning, maintaining, and restoring some of the good quality environment that can still be saved.

Chapter IV | Analysis of Findings

CHAPTER IV: ANALYSIS OF FINDINGS

Our case studies focused on wastewater management in two developing countries: Makati, Philippines and Addis Ababa, Ethiopia. The purpose of this project is to understand the challenges these two developing countries are facing due to the lack of wastewater management, consequences of this lack of management, and to offer potential solutions and alternatives. To have a better understanding of the subject, we looked at the demographics, environmental setting, economy, existing infrastructure, policies, and challenges and constraints for

both cities. This chapter will be looking at the similarities and differences between the two cities as well as lessons learned. Ultimately, understanding and identifying successful and/or failed implementation methods would help us offer viable solutions not just for these two cities, but for other developing countries as well. Lessons such as adequate government spending on infrastructure, public awareness, public and private partnership, effective policies, collaboration efforts, and proactive leadership role are clear lessons learned in this study.

4.1 SIMILARITIES AND DIFFERENCES

Both countries face similar challenges including overcrowding, lack of adequate public amenities, public health issues, environmental degradation, and poverty.

Also, rural-urban migration and rapid population growth creates overcrowding and informal settling.

The over usage of public infrastructure exacerbates existing conditions and creates environmental hazards such as leaking pipes, water contamination, and health concerns. In Ethiopia, 75 percent of illnesses affecting children are caused by waterborne disease (see Figure 16), while in the Philippines, over 31 percent of overall illnesses are caused by waterborne disease (Environmental Management Bureau of the Philippines, 2004).

Furthermore, informal settlement is a primary concern for both cities. People who migrate from the rural area to the city in search of a better life and employment opportunities and city residents who

are unable to find affordable housing are forced to become illegal settlers by dwelling in parts of the city illegally. Thus, solving the issue of illegal settling has been



Figure 16 Children exposed to polluted waterways are prone to waterborne disease. [Source: Manila Water, 2008.

<http://www.scribd.com/doc/6956050/UP22Sept08>]

an overwhelming challenge for both cities.

Both cities have a limited connection to a sewerage system that accommodates only a few of its most privileged population. In addition, Makati City also services new high-density housing developments and most of the high-income community in the City. In Addis Ababa, services are provided only to those who can afford to pay for a connection to the sewer system. Although there are options for more residents in Addis Ababa to connect to the sewer line, many residents cannot afford to add a sewer connection due to the additional

cost of changing their home into a flush toilet system (see Figure 17). In most cases, both cities have sewage disposal through individual septic tanks, cesspools and dumping into open waterways (Makati Department of Sanitation, 2008, p.3; Urban Development Department, 2000, p.24). Therefore, only those who can afford to pay for the additional construction of a sewer line have a connection to a sewerage system (Muschalla, 2001).



Figure 17 Slum homes hanging on a polluted riverbank in Addis Ababa.

[Source: Addis Ababa, 2008.

<http://abandoned-orphaned.typepad.com/>]

Looking at the demographics of both cities, Addis Ababa is a much bigger city in size and population than Makati. Addis Ababa has also been experiencing much more rapid population growth than Makati. The management of water and sewerage also differs between Addis Ababa and Makati City. Addis Ababa's water and sewerage systems is managed and regulated by one government entity called Addis Ababa Water and Sewerage Authority (AAWSA). Whereas in Makati, water and sewerage are under the management of a regional government agency, Manila Water Sewerage (MWSS) and two private companies under the concession of MWSS. The two private companies: Manila Water Company Inc. (MWCI) and Maynilad Water Company (MWC) provide services while MWSS regulates the service standards (Urban Development Department, 2000; MWSS, 2008). There is an insufficient provision of wastewater services in Addis Ababa because of the lack of adequate infrastructure, funding, dependence on the municipality and foreign

donations for financial investments. Also, most of the priorities and funds are allocated for provision of clean water in Addis Ababa, rather of allocating the money for wastewater treatment infrastructures. (Pieter van Dijk, 2006).

Both Makati City and Addis Ababa face a number of the limiting factors in providing adequate wastewater services including:

- Limited manpower and capacity on policy and enforcement
- Lack of infrastructure such as septic tanks and proper public toilets in high-density areas and among informal settlements
- Limited funds from donors and lack of coordination in allocating these funds. (Department of Sanitation, 2008; Binay, 2007)

In addition, Makati city struggle with lack of available land areas to construct additional needed wastewater treatment and sewerage facilities

To a large extent, both cities use other ways of sewage disposal such as septic tanks serviced by the existing Water and Sewerage Service Company. In Addis Ababa, sludge from the septic tanks is collected by Addis Ababa Water and Sewerage Authority. However, due to the rapid population growth, the city does not have enough manpower and trucks to regulate and de-sludge all septic tanks. Some Addis Ababa residents resort to a private truck company in order to de-sludge their septic tanks. This becomes a major problem in Addis Ababa because of improper withdrawal, disposal and treatment of wastewater; this can pollute the waterways and ground water and create public health issues. Also, residents would have to take the burden of finding affordable and adequate services to do the work when government is unable to meet their needs. They may not always succeed;

if this happens, the end result is more environmental decay.

Makati City used to be in the same position as Addis Ababa, where issues such as lack of funding and inadequate water and wastewater services were one of the major issues the city faced. It still faces the same challenges. However, due to the passage of the Water Crisis Act and Clean Water Act by the Federal Government in 1997, all government-operated facilities for water and wastewater management in the country were forced to transfer under the management of private companies. The private companies were able to provide much more efficient service and better coverage than the government agency. Now the government agency, MWSS, only regulates the service standards and provides raw water for the private companies. It regulates both of the private companies by monitoring activities such as each company's compliance of service performance obligations, customer service, water and sewerage rates. (MWSS, 2008) Thus, MWSS monitors and sets service standards to

ensure that the private companies provide adequate services, coverage, and fair price rates.

4.2 LESSONS LEARNED: ADDIS ABABA, ETHIOPIA

4.2.1. *Insufficient government spending on infrastructure*

In the case of Addis Ababa, overcrowding is a major issue that contributes to the decay of human health conditions. To reduce rural-urban migration, strengthening the farming industry in rural areas, which accounts for 80 percent of Ethiopia's economy is critical. Studies show that African and Latin American countries have much lower government infrastructure spending than Asian countries. Currently, the government of Ethiopia spends less than 3.7% of its total expenditure on country's infrastructure (Fan, 2008). Since people go to the city to find better job opportunities, government funded efforts to create an improved irrigation system, advanced farming technology, and greater educational opportunities for the farming communities will allow these communities to become more self-sufficient. If there are more employment

opportunities and strong efforts by the government to enhance living standards in rural areas, people will be less likely to migrate to the city. This would lighten the burden on the city's fragile infrastructure and would free up resources so the city can provide adequate services. Even more, this would also strengthen the rural economy and create more self-sufficient population.

4.2.2. *Inadequate wastewater infrastructure*

The government can solve two problems by having adequate wastewater management. The lack of adequate water makes it that much more important to have an adequate sanitation system. With proper wastewater treatment water can be recycled and re-used for landscape irrigation, cooling processes, and enhance wetland and riparian habitats. This would help relieve the shortage of water, preserve existing resources, protect

ecosystems, and reduce and prevent pollutant discharge to rivers and oceans. Ethiopia has the second largest water sources in Africa; however, it does not have means or the technology to use or distribute this needed water. So having adequate infrastructure will allow the country to use its resources.

4.2.3. Government alone is incapable of providing adequate service.

Government should share responsibility with the private sector. So as seen in Addis Ababa, government alone is incapable of providing sanitation service, and is unable to meet the need to the growing demand. Government agency needs to partner with private company to provide effective service.

Unlike Addis Ababa, which is exclusively managed by government, Makati city is a good example of successful

private and public partnership that provides effective sanitation service. By allowing private sectors to be service providers in relation to wastewater management, the government is in a better position to improve the welfare of the community in relation to adequate sanitation service and human health. The government should also oversee the process and make sure that services are provided ethically.

It is also important to have a service that is self-sufficient. One of the concerns with privatization is overcharging and under serving those with low-income. However, as long as the government oversees and regulates these private service providers, and enforces fair and affordable services, privatization and partnership between public and private agencies can be a great solution for developing countries to improve public service.

4.2.4 Lack of community awareness and public participation:

In Addis Ababa, the community is not an active participant in their own community. People are not educated about human health and of the threats of an unhealthy environment. The government has no outlet for public participation. Government should partner with the community to not only raise public awareness about the importance of a healthy environment, but also to teach and empower people to share the responsibility along with

the government, non-profit, and private agencies.

Individual people have great sources of power; they can educate their community about health and safety in relation to wastewater management; they can take leadership and ownership roles in how waste is managed in their neighborhood. Residents can participate and work to improve the condition of their neighborhood. They would be more effective, as they would be the best advocates to what they need; it would cost less and would empower people who live in the community

4.3 LESSONS LEARNED: MAKATI CITY, PHILIPPINES

4.3.1. *Proactive Leader*

In the City of Makati, the local government has been an active player in improving its overall sanitation facilities. The Mayor of Makati, Jejomar Binay is proactive in supporting new ideas and technological advances. According to the Makati Gov. News Portal: “The Makati City Mayor urged Manila Water to fast track the rollout of its ‘Patubig sa Barangay’ projects (Water for Barangay) and identify a pilot area for the construction of urban poor sanitation projects” (City Government of Makati, 2003). In order to help resolve the social problems of illegal settlements that accompany sanitation issues, the Mayor of Makati founded a housing project to provide low-cost housing with proper facilities such as an on-site STP (City Government of Makati, 2003). Therefore, Binay proactively collaborates with the private companies and MWSS regarding the sanitation needs of Makati to help

expedite the services it can offer. Having a strong and active leader helps accelerate the progress.

4.3.2. *Public-Private Partnership*

Makati South Sewer Treatment Plant was the first and largest sewer treatment plant in the Philippines, which was located in a high-income neighborhood of Makati (Tagle, personal interview, 2008). Previously, the Makati South Sewer Treatment Plant was exclusively operated by a different private company that was not affiliated with the regional government agency. The previous privately ran sewage facility was exclusively used to service those neighborhoods that could afford the services, while the poorer neighborhoods suffered with a poorly run and ineffective government facility. After merging the government facilities with the privately owned and operated plant becomes the Makati South Sewage Treatment Plant, both flourished and grew to become an

effective facility. It is a successful and efficient company that now provides ample services to the whole community, including the poor. The Makati South Sewer Treatment Plant also has become a pioneer and great example for the surrounding region to follow.

What worked well in the establishment of the Makati South Sewer Treatment Plant is that a private company that is self-sufficient managed it. As any private company, it provided service and collected revenue from the service it provided. This strategy attracted developers to invest in this infrastructure and it became the pilot sewer treatment plant for the entire country. However, due to the high construction cost, additional funding may be needed to implement similar facilities. Having this type of strategy helped Makati City and the entire Philippine government to test different types of wastewater facility, treatment, and management. Lastly, having wealthy residents that can afford the service may also have played a role in initiating a wastewater treatment facility and now

attracts pilot programs that will benefit to serve those of medium to low-income households.

4.3.3. Collaboration with different agencies

The local government in Makati collaborated with different departments and sectors of the federal government. For example, it worked in partnership with the Philippine Department of Environment and Natural Resources (DENR) to create its first Environmental Impact Assessment. It did so by creating workshops for all stakeholders and identifying all the major environmental issues in the City (Santos, n.d.). It also recommended policies that would restore and protect public safety and the environment.

4.3.4. Effective Policy

In contrast to Addis Ababa, the city of Makati has been successful and effective in wastewater management. The implementation of the Clean Water Act in 2004 and the commitment to resolve the existing environmental and

health issues related to poor wastewater treatment was an important step the government took. The federal and local government also imposed stricter environmental policies in relation to wastewater management.

The Environmental Impact Assessment played an important role in the amending of some of the proposed policies for Makati city. It also initiated a Sanitation Plan for the Sanitation Department of Makati City that aims to

provide 100% sewer and sanitation services by year 2022 (Department of Sanitation, 2008). The Sanitation Plan proposes to formulate a 10 year Strategic Plan that would achieve the main goal of the Sanitation Plan. This plan aims to educate the community about the risk of improper maintenance and the importance of adequate wastewater management. Lastly, the plan also aims to provide better services by looking at long-term solutions for the community.

Chapter V | Conclusion

CHAPTER V: CONCLUSION

The objective of this paper is to conduct a case study on two cities from two developing countries with a lack of wastewater management. We looked at the existing infrastructure, demographics, political, and economic aspects as well as the challenges and constraints that each city faced. We focused on the sources of the problem and attempted to offer solutions. Even more, by comparing and contrasting the two cities, we aim to find common solutions that would be relevant to other developing countries.

We found that the following proposed solutions are most likely to be relevant in other developing countries: increased government spending, address the need for affordable housing, allow public amenities to be managed by private and public partnerships, promote public education and awareness, and promote sustainable practices. In addition, studies show that decentralized wastewater treatment systems are more affordable

because it uses natural processes that can be an effective solution for a city like Addis Ababa and Makati.

The similarities between the two cities are that they both faced overcrowding, inadequate public amenities, environmental degradation, public health issues, poverty, and lack of adequate wastewater management. All these issues are linked to one another. For example overcrowding creates overconsumption of public amenities, and the deterioration of existing public infrastructure creates environmental contamination that affects public health. This cycle keeps a community in impoverished conditions. So unless all these issues are addressed, the matter perpetuates further.

The difference between the two cities is that Makati City has a smaller population, a static population growth trend, a progressive public policy, and a successful joint private and public wastewater management program. In contrast,

Addis Ababa is both larger in area and population than Makati City. For instance, since population is growing at more rapid rate, all wastewater management is managed by ineffective public policies. Addis Ababa faces a greater challenge than Makati City because the population continues to grow at a fast rate and the gap between

demand and supply of adequate infrastructure and effective public policy is widening at a rapid rate. The city is already in a very fragile state and near the breaking point. So if adequate solutions are not implemented soon, problems will overwhelm the city.

5.1 INCREASING GOVERNMENT SPENDING

The government must take a proactive role in the fight against poverty. One of the ways to do this is by increasing government spending on agriculture, infrastructure, and education. Increasing government spending and putting effective policies in place is the first step to reducing poverty.

Studies have shown that investment in agriculture and infrastructure has the largest return on GDP growth and on poverty reduction (Fan, 2008). The government needs to invest in infrastructure, agriculture, and education to reduce poverty. One of the main issues Addis Ababa is facing with wastewater management is the lack of adequate infrastructure and lack of public awareness. Investment on improving and adding new infrastructure such as road will help improve services. In addition, the government should reduce spending on defense and excessive expenditures on fertilizers and pesticides. It

should instead focus on production improving investments such as agricultural research and development (Fan, 2008).

Studies also show that government-spending trends are much higher in Asian countries than in any other developing regions such as Africa and Latin America (Fad 2008). This can be why Makati City has a much better infrastructure system than Addis Ababa. For Ethiopia and other African countries, government spending grew at a slow rate between 1980 and 2002. This is also apparent in Ethiopia where only 3.7 percent of government expenditures go to the agricultural sector, which accounts for most of the country's economy. Agriculture is 80% of Ethiopia's economy, thus, expenditures on agriculture should increase. Investment in agriculture will promote economic growth, increasing the country's annual growth rate and reducing poverty.

5.2 ADDRESSING ISSUE OF ILLEGAL SETTLERS

People who migrate to the city and settle illegally contribute to the decay of the environment. Illegal settlers come to the city to find work and better opportunities. Even though their living conditions are horrific, the city might offer better opportunities than rural areas. Both Addis Ababa and Makati faces overcrowding which mainly stems from major rural to urban migration. Investment in the agricultural sector will allow the rural population to become self sufficient with a sustained livelihood in agriculture. Food production would increase and reduce

the rural to urban migration. However, most urban populations who are unable to find affordable housing will also join the illegal settlers unless the government takes a proactive role in providing affordable housing. If the housing issue is not addressed vigorously, poverty levels will continue to increase. The government should improve residential land development to meet current and future housing needs. It should also provide long-term mortgage loans to help low-income families find affordable housing (Kebbede, 2005).

5.3 PRIVATE AND PUBLIC PARTNERSHIP

In Addis Ababa, the research shows that the government alone is not able to provide adequate service. Only 60% of waste is serviced by the municipal dumpsite (Kebbede, 2005). The municipal waste management system is not able to meet the demand of the growing population. The existing infrastructure lacks the proper technology to meet the needs of the existing population. It is clear that urban

municipalities in Addis Ababa alone cannot provide all public services. Thus, it is critical that partnerships with the private sector be developed. In Makati City, service provided by private-public partnership is much more effective than government efforts alone. Addis Ababa's government needs allow private companies to provide urban environmental services including sanitation services.

However, local government must take a supervisory role and make sure that effective regulations maintain quality

service and reasonable prices are in place for the private sector to operate.

5.4 PROMOTION OF PUBLIC AWARENESS

Urban environmental improvement requires the active involvement of a community. Government should educate and encourage residents to get involved and to share the responsibility in the management of their community or city. Local residents can organize and tackle environmental issue including sanitation management, garbage collection, and community cleanup (Kebbede, 2005).

Citizen participation empowers residents to take actions when needed, which also improves the quality of the environment. The public needs to be educated about the importance of a healthy environment and the need for proper waste management via the mass media, schools, community associations, and various organizations. The public should be educated about sustainable practices including waste reduction, recycling, and reuse.

5.5 APPLYING SUSTAINABLE PRACTICES

With limited resources, sustainable practices are critical for developing countries. Sustainable practices including recycling treated water for landscape irrigation, and enhancing wetland and riparian environments. Having a proper wastewater treatment plant not only addresses the need for adequate sanitation services but also helps preserve water resources and prevents or reduces

pollutant discharges to rivers, oceans and, the overall ecosystem.

In addition, developing countries can benefit by adapting decentralized wastewater treatment plants, which is much cheaper and requires less network sewer pumping. It can be an effective and affordable solution for developing

countries by targeting a specific area. Most often, having a centralized wastewater treatment plant requires an expansive network to facilitate the entire city. For example, the city of Curitiba in Southern Brazil, which has a population of 2 million, implemented decentralized wastewater treatment plants and yielded a 40% cost savings compared to a single treatment plant (Mara, 2004). It is a mistake to assume that wastewater treatment technologies from industrialized countries provide the only solution for developing countries (Mara, 2004).

Since money is a major issue for developing countries, developing countries such as Ethiopia and Philippines with

warm or hot climates should use treatment procedures that rely on natural processes rather than those that are dependent on electricity or advanced technologies. Anaerobic and photosynthetic technologies such as anaerobic ponds, maturation ponds, and facultative methods are more effective and sustainable wastewater treatment options for developing countries. Even though such processes can be land intensive, wastewater treatment options, natural treatment processes are better options than conventional wastewater treatments that require major funds for operation and maintenance including electrical energy costs (Mara, 2004).

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