

**WATER PRIVATIZATION IN METRO MANILA:  
ASSESSING THE STATE OF EQUITABLE WATER PROVISION**

by

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## **Abstract**

This dissertation extensively examines the Metro Manila water privatization, one of the largest and longest-running privatization programs in the world for a water utility. Regular performance assessments show significantly improved privatized water services since 1997, citing increased area coverage, with 24-hour supply of high pressure, good quality water. The dissertation takes performance assessment a step further by determining whether or not such services have been experienced by all consumers, particularly the urban poor. Scenarios where urban poor communities have not been able to benefit from improved water provision are identified through extensive analysis that foregrounds equity as a key parameter worthy of careful evaluation.

Evidence-based equity metrics show that access and affordability remain critical issues for impoverished communities, despite considerable improvements shown by traditional metrics. Connected urban poor households enjoy improved water services, but affordability is a major concern requiring a review of existing water tariff structures. With limited supply options and low bargaining power, unconnected urban poor households in southern peri-urban areas pay high prices for monthly water consumption that is below the minimum World Health Organization standard, posing health risks to individuals and communities alike. Informal settlements (squatter communities) in networked areas that are unable to get direct water service connections because of property rights issues, highly depend on community-based operators (supplied by the private concessionaires) to provide the last phase of water delivery.

This research offers key insights to better ensure that privatization programs benefit all households, regardless of socio-economic status. For Metro Manila, policies that may address

access and affordability concerns include water tariff reform, conversion guidelines for community water systems, service coverage formula revision, multilateral grants for new service connections of poor households, temporary distribution facilities for informal settlements, as well as new water sources and distribution systems for southern peri-urban communities. While performance assessments based on efficiency metrics offer a sense of the privatization program's achievements, assessments based on equity metrics presented in this dissertation provide a fuller appreciation of the degree to which all consumers benefit from improved water services.

## **Preface**

For this research, I was responsible for identifying the goals and parameters of the study as well as designing the methodology to achieve these goals. I also performed the necessary research activities, inclusive of data gathering, personal interviews, and site visits, during my 7-month field work in Metro Manila, Philippines. Moreover, I handled the processing and analysis of research data obtained from actual field work and other relevant sources. This research was conducted in accordance with the standards set by the UBC Behavioural Research Ethics Board, Certificate No. H12-03555.

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## List of Abbreviations

AB	Extremely Rich / Rich Socio-Economic Class
ADB	Asian Development Bank
ADR	Appropriate Discount Rate
AMRIS	Angat-Maasim River Irrigation System
BL	billion liters
BOT	Build-Operate-Transfer
C	Middle Class
CMS	cubic meters per second
D	Poor Socio-Economic Class
E	Extremely Poor Socio-Economic Class
GIS	Geographic Information System
GDP	Gross Domestic Product
GPOBA	Global Partnership on Output-Based Aid
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
K Water	Korea Water Resource Corporation
LGU	Local Government Unit
LMTP	La Mesa Water Treatment Plant
M	meters
MCM	million cubic meters
MDG	Millennium Development Goals
ML	million liters
MLD	million liters per day
MMWDS	Metro Manila Water Demand Study
MWD	Metropolitan Water District
MWCI	Manila Water Company, Inc.
MWSI	Maynilad Water Services, Inc.

MWSS	Metropolitan Waterworks and Sewerage System
MWSS RO	MWSS Regulatory Office
NAWASA	National Waterworks and Sewerage System
NEDA	National Economic and Development Authority
NGO	Non-Governmental Organization
NIA	National Irrigation System
NPC	National Power Corporation
NRW	Non-Revenue Water
OECD	Organisation for Economic Co-operation and Development
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services
PAWS	Public Assessment of Water Services
PPIAF	Public-Private Infrastructure Advisory Facility
PPCP	Public-Private-Community Partnership
PPP	Public-Private Partnership
PSA	Philippine Statistics Authority
PSALM	Power Sector Assets and Liabilities Management Corporation
SES	Social-Ecological Systems
SHS	Social-Hydrological Systems
SWS	Social Weather Stations
UK	United Kingdom
UN	United Nations
UN ESCAP	UN Economic and Social Commission for Asia and the Pacific
UN HABITAT	UN Human Settlements Programme
UP NEC	University of the Philippines National Engineering Center
US	United States
WGF	Water Governance Facility
WHO	World Health Organization
WHO/UNICEF JMP	WHO/UNICEF Joint Monitoring Program

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## **Dedication**

To the three special muses in my life – *Linda, Abbey* and *Mickey* –  
with so much love and gratitude...

## **Chapter 1: Introduction**

### **1.1 Lessons in Public Infrastructure Development: From Practice to Theory**

On September 9, 2010, newly elected President Benigno Simeon Aquino signed Executive Order No. 8, effectively reorganizing and renaming the Build-Operate-Transfer [BOT] Center as the Public-Private Partnership [PPP] Center of the Philippines. As part of the Philippine economic development agenda, the PPP program was instituted to help address the country's infrastructure gap, brought about by an infrastructure system that was aging and unable to meet the requirements of a rapidly growing population, coupled with government's limited fiscal capacity to support the necessary infrastructure investments (PPP Center, 2015, p.1). In 2014, the Philippines ranked 91<sup>st</sup> out of 144 countries in terms of over-all quality of infrastructure, among the lowest in the Asian region (Schwab, 2014, pp. 16-17). With infrastructure spending averaging merely 2.1% of GDP from 1980-2009 (Asian Development Bank, 2011), below the recommended benchmark of 5% of GDP (World Bank, 2005), the implementation of PPPs was seen as a viable option for building infrastructure that would improve the provision of basic services, thereby increasing the country's competitiveness in the global market (see PPP Center, 2015).

Just prior to the signing of Executive Order No. 8, I received an email from a high Philippine government official asking me if I would be interested in heading this new government agency. After several more emails and a couple of phone calls, I accepted the offer to become the first Executive Director of the PPP Center of the Philippines, leaving behind a quiet life in Vancouver, Canada. However, I decided to stay for only a year in order to re-organize the agency and reformat the program that allows the private sector to play a major role

in the country's infrastructure development. Another reason for my short stint in government was my doctoral program at the University of British Columbia which was slated to start the following year.

In hind sight, my participation in the Philippine infrastructure development program started some 20 years earlier. As an investment banker in the early 1990s, I was involved in power generating projects under the government's BOT program which were implemented in response to the power crisis prevailing at that time. Consistent with the government's privatization initiatives in the water sector around the mid-1990s, I handled the water business portfolio of a large Philippine infrastructure holding company. I submitted unsolicited BOT proposals for several water projects, managed the winning financial bid for one of the Metro Manila water privatization concessions, and operationalized the concession's long-term financial plan. After a concession was returned in 2004, I helped the Philippine government undertake the necessary capital restructuring, corporate rehabilitation and re-privatization of the said concession.

Over the course of my involvement in these infrastructure projects, both in the private and public sectors, I have always been searching for a more meaningful measure of success for a privatization/Public-Private Partnership program. These issues became more important to me when I headed the PPP Center, as I realized that projects of such nature and magnitude needed to be more inclusive and sustainable. The totality of my PhD education at the University of British Columbia (courses, lectures, literature review, presentations, discussions with thesis committee members, interactions with professors and fellow students) has led me towards certain notions of success. Aside from the usual measures of profitability and operational efficiency, I have come to realize that a water privatization's success may also be defined by the program's ability to

provide water for the poor households. Nevertheless, a key concern was how to properly assess these programs as regards their ability to address the water needs of the poor. On a broader scale, I ask: *How do we assess the state of equitable water provision?* Related to this, I ask the following sub-questions: *How do we define states of water inequity? How do they manifest across the urban waterscape and how do we measure them? What policies are needed to reduce if not eliminate the factors that propagate them?* My research addresses these concerns, using the concept of Social-Hydrological Systems [SHS] and developing a methodology for assessing the state of water provision across the various socio-economic classes. I use the Metro Manila water privatization as a case study, building on 18 years of program implementation and banking on an abundance of data available for research. I acknowledge that the relationships I have built over the years with officials of concerned government agencies as well as officers and staff of the private water concessionaires have facilitated access to resource persons and relevant documentation. Nonetheless, I would like to offer the assurance that I have taken an independent but fair approach towards the assessment of equity conditions related to water provision in Metro Manila. The research is guided by the notion that there must be a balance between operational efficiency that results in acceptable investment returns and equitable water provision that leads to improved water services for all consumers, particularly the urban poor.

## **1.2 Structure of the Dissertation**

This research undertakes a thorough analysis of the Metro Manila water privatization and offers policy recommendations to improve equity conditions throughout the entire water system. Please note that in drawing up these recommendations, I have always stayed within the bounds of the concession agreement signed by the government and the private concessionaires. With this

research, I offer alternative views on this privatization program based on a level of understanding acquired from actual participation in the program and reinforced by conceptual frameworks developed through academic study.

Chapter 2 opens with insights on the global water and sanitation conditions resulting from the implementation of the United Nations Millennium Development Goals, noting that the community of nations still needs to exert much effort to fully address the global requirements for these services. While the public sector still accounts for a major share of global water supply, water privatization is increasingly being seen as an alternative mode of water provision. The chapter analyzes Metro Manila's water privatization, against the backdrop of global water privatization results, after reviewing the broad political-economic and water governance aspects of Metro Manila. The chapter likewise examines the typical parameters used in assessing this privatization program, noting that while general results offer significant improvement in water services, there is need to evaluate consumers' experiences across all socio-economic classes. As segue to the next chapter, Chapter 2 introduces the concept of social and hydrological systems, a coupled consumer-technology approach to viewing and understanding complex water systems.

Chapter 3 discusses the nature of social and hydrological systems together with the external factors that affect, modify, and influence them. The chapter provides an extensive discussion on the Social-Hydrological Systems methodology, defining a set of select indicators to assess the level of services experienced by consumers across all socio-economic classes. Data and information for the Metro Manila water privatization are sourced from a third-party consumer survey of 53,773 respondents and actual field measurements made by the concessionaires. Findings arising from the SHS approach are guided by concepts obtained by a review of relevant literature and triangulated by information obtained from primary privatization

documents, personal interviews, and site visits. The chapter also identifies the need for a broader equity review of the Metro Manila water system to establish the rural-urban equity nexus, the linkage between rural equity conditions related to water allocation at the source and urban equity conditions related to domestic water provision in Metro Manila.

Chapter 4 presents the results of the SHS methodology that were used in assessing equity conditions related to water provision in Metro Manila. In general, access to private concessionaires' networks, through direct household connections, afford major conveniences related to water provision that households in non-networked areas are unable to experience. As such, a great majority of respondents in unconnected areas would like to avail of direct household connections to the concessionaires' networks. Aside from differences in quality of service, the state of access to the concessionaires' networks also bring about variations in consumption, pricing, household water expenditure, and affordability. Such variations bring about differences in the dynamics of daily water use between connected and unconnected households. Chapter 4 also describes the existing "North to South" water supply infrastructure of the Metro Manila water system, highlighting its influence on the progression of water service connections across the service areas of the concessionaires. Moreover, the chapter looks into third party water provision to informal settlers within areas covered by concessionaires' networks, such households being unable to get direct water service connections due to the absence of property rights. The chapter then unmask the many faces of water inequity across the Metro Manila waterscape, explaining the circumstances and conditions that propagate them.

Chapter 5 explores the rural-urban equity nexus of the Metro Manila water system (as part of the overall SHS framework), focusing on extremely dry weather periods when irrigation water supply is reallocated for urban water requirements. The chapter starts with a description of

the hydrology and physical structure of Angat Dam, the source of water supply for Metro Manila residents and farmers of nearby provinces, and then proceeds with a discussion of the dam's operating and governance protocols. Using official documents and related secondary sources of information, the chapter also examines the conflicting nature of water allocation and use of water from Angat Dam, highlighting the difficulties farmers experience during periods of drought. This chapter explains why only an equitable provision of urban water may be able to justify the relatively inequitable allocation of water supply during times of scarcity and difficulty, thereby stressing the importance of upstream-downstream linkages of complex water systems.

Chapter 6 discusses the policy recommendations to eliminate water inequity across the Metro Manila water system. Such policies include water tariff reform, review of existing guidelines for conversion of bulk customers, service coverage formula revision, multilateral grants for new service connection of poor households, temporary distribution facilities for informal settlements, and new water sources and distribution systems for southern peri-urban communities.

Chapter 7 provides a synopsis of the dissertation, identifies areas of further study, and presents the dissertation's contributions to policy and academic research.

## **Chapter 2: Rethinking Metro Manila Water**

### **2.1 Introduction**

While the global water and sanitation conditions have generally improved in accordance with the United Nations Millennium Development Goals, much still needs to be done to fully address global water and sanitation requirements, particularly in many parts of the developing world. For these countries, water privatization is increasingly viewed as an alternative to water provision by state agencies. Against the backdrop of similar programs around the world, this chapter probes into Metro Manila's water privatization, one of the largest and longest running privatization programs for a water utility (see Dumol, 2000). To fully contextualize this program relative to the socio-economic, political, and governance realities in the Philippines, the chapter offers insights on the political economy of Metro Manila, and the Philippines more broadly, and documents the history of its water provision and governance with particular focus on the past several decades. The customary scorecard used by observers of the program is then analyzed, noting that usual observations arising from the scorecard may not fully reflect the individual experience of each socio-economic class. Such a scorecard normally reports only general physical accomplishments (pre and post-privatization), such as those related to water service coverage, non-revenue water level, number of connections, water supply availability, water pressure, and water quality. The chapter suggests that the Metro Manila water privatization should also be examined based on the experience of its consumers (social component) in addition to the physical measurements obtained from the networks (hydrological component). This is a critical step in the pursuit of more equitable water governance, in addition to other goals such as efficiency that are often pursued as part of privatization agendas.

## **2.2 Water Privatization: An Alternative Mode of Water Provision for Developing Countries**

### **2.2.1 Still a Thirsty World**

In the year 2000, 189 United Nations [UN] member states adopted the Millennium Development Goals [MDG] for water and sanitation, seeking to reduce by half the number of people without sustainable access to safe drinking water and basic sanitation by the year 2015.<sup>1</sup> To meet these goals, the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation [WHO/UNICEF JMP] (2004, pp. 8-17), in its mid-term assessment report, stressed the need to provide access to water and sanitation for an additional 1.1 billion people and 2.6 billion people, respectively. This report estimates that 87% of the targeted population for water supply as well as 90% of the targeted population for sanitation live in two of the poorest regions in the world – Asia and sub-Saharan Africa (UN Millennium Project, 2005, p. 40).

The outcomes related to the UN Millennium Development Goals for water supply and sanitation can be characterized as a mixture of success and failure. At the end of the MDG program, the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (2015, pp. 6-11) announced that 2.6 billion people had gained access to improved drinking water sources from 1990 to 2015 (for a global total of 6.6 billion people), surpassing the MDG for drinking water. However, the report further states that progress has been uneven, with 663 million people (mostly, vulnerable and marginalized) still lacking access to such improved drinking water sources. Of this population, 319 million people (48%) and 260 million people

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<sup>1</sup> Although the MDGs were formulated in the year 2000, the year 1990 was set as the baseline for majority of the targets, including water and sanitation. Building on the momentum generated by the MDGs, the United Nations is working with governments, civil society, and other stakeholders to develop new sustainable development goals through an ambitious post-2015 development agenda (UN, 2015).

(20%) belong to sub-Saharan Africa and Southern Asian regions, respectively. Moreover, of the total number of people lacking access to improved water sources, about 79% live in rural areas and 23% still rely on surface water.

For sanitation targets, the 2015 WHO/UNICEF JMP report (pp. 12-16) states that an additional 2.1 billion people have gained access to improved sanitation facilities over the same period. Nonetheless, this translates only to 68% globally with improved sanitation facilities as of 2015, missing the MDG for sanitation by 9% or the equivalent of 700 million people. These results underscore the need for greater resolve and effort in meeting the sanitation targets, particularly in the rural areas where only 51% of the global rural population have access to improved facilities vis-à-vis 82% of the global urban population. Again, the majority of the population still without access to basic sanitation are found in sub-Saharan Africa and Southern Asia, where sanitation coverage is generally less than 50%. As of 2015, the WHO/UNICEF JMP report highlights that 2.4 billion people still do not have access to improved sanitation facilities, with an estimated 946 million people practicing open defecation.

### **2.2.2 The Privatization Option**

Given the current global water and sanitation conditions, more effort and resources are necessary to provide these services, with focus on the developing world. A big part of this responsibility still lies with the public sector which serves 95% of all the people with water supply, generally financing its operations by way of taxes, public borrowings, and user fees (Hall & Lobina, 2006, p.8). Yet, public sources of financing for developing countries, where improved water supply and sanitation services are most needed, are often limited and unable to support the necessary investments for the provision of these services. Kikeri and Nellis (2004, p. 87) note

that state enterprises, specifically those in developing countries, have historically not performed well, registering losses of up to 5% - 6% of their GDPs. Kikeri and Nellis (2004) attribute such losses to the inefficiency, overstaffing, and tariff levels set below the actual cost of service provision. In addition, Bakker (2007) points out that revenues of municipal water systems are usually not ring-fenced, but commonly used by local governments to fund unrelated municipal programs, other than those required for operational and capital improvements. In part, the reasons for these are political in nature as they relate to popularity and electoral votes for incumbent and aspiring government officials. Moreover, there is a general acknowledgement that poor governance and weak institutions in the developing world hamper the ability of the public sector to expand the water system and provide high quality of service (see Bakker, Kooy, Shiofani, & Martijn, 2008; Prasad, 2006; and Parker & Kirkpatrick, 2005).

In the 1990s, many emerging economies implemented water privatization programs to reduce fiscal burden on government with respect to water infrastructure development as well as increase sector efficiency through the entry of private capital and private firms (Araral, 2009). Aside from these usual notions on water privatization, there were hopes that such programs would also lead to increased water connections for poor households (see Bakker et al., 2008). The push towards water privatization in the developing world was further advocated by international lending agencies and development organizations in lieu of developmental finance programs that were previously implemented to address the water needs of these countries (Gleick, Wolff, Chalecki, & Reyes, 2002). Harvey (2007), Goldman (2007), and Harris (2013) reveal that the World Bank and the International Monetary Fund required developing countries (especially the most indebted ones) to pursue privatization as a condition for the grant of structural adjustment loans. Sponsored by the World Bank and the International Monetary Fund,

such loans required developing countries to undertake structural adjustment of their economies by removing excessive government control and promoting market competition (see World Health Organization, 2015). Further, Goldman (2007) discloses that the World Bank and its affiliated transnational policy networks (Global Water Partnership, the World Water Council, and the World Commission on Water for the 21<sup>st</sup> Century) pushed hard for the privatization agenda through international water conferences and training programs, policy papers, and global water experts. Goldman (2000, p. 789) reveals that the World Bank Institute has trained more than 9,000 professionals from 90 countries on the topic of water privatization, with such training programs resulting in water management policy reforms for most of these countries.

### **2.2.3 Global Water Privatization Experience**

A study conducted by Marin (2009 pp. 6-7) covering the period from 1990 to 2007 showed that more than 260 privatization contracts were awarded for the provision of water and sanitation services in the developing world. Of 65 countries that engaged private sector participation in the water sector, about 41 countries still had active contracts by 2007, with 160 million people being served by private water firms. For countries where privatization contracts were terminated early (mostly in Africa and Latin America) or not renewed upon expiration, 45 million people reverted back to public water provision. Marin (2009, p. 1) declares that only about 7% of the current urban population in the developing world get their water from private service providers. In addition, Hall, Lobina and Terhorst (2013, p. 194) note the resurgence of public sector delivery of municipal services in Europe, the most notable of which is the re-municipalization of water services in Paris, the headquarters of Veolia and Suez, the two largest water multinationals in the world. The subsidiaries of these two multinationals had provided

water services in Paris for a period of 25 years before the city took over the municipal water operations in 2010 (Hall et al., 2013, p. 194).

The privatization experience of the developing world has been uneven and difficult at times. Hall and Lobina (2006, pp. 17-29) say that projects used as examples of successes in sub-Saharan Africa, particularly those in Senegal and Cote d'Ivoire, were basically lease contracts, requiring the state to make the necessary investments. In fact, about 80% of all the concession and lease contracts in this region have already been terminated or are under dispute. Hall and Lobina (2006, pp. 29-34) further reveal that there were 15 privatization concessions and over 30 bulk water supply agreements signed in East Asia. Outside of China, only six water concessions covered water distribution to residential areas, with four of these concessions operating in Jakarta, Indonesia and Metro Manila, Philippines. Of these six concessions, one has already been terminated while three others have experienced serious problems in meeting service and investment targets.

Similar trends were observed in Latin America. While the region was initially perceived as an attractive investment destination for multinational companies (because of the region's middle income countries and growing middle classes), most of the water concessions have already been terminated or not renewed as a result of popular resistance and the crippling effects of the global economic crises (Hall & Lobina, 2006, pp. 34-37). In the post-privatization era of Latin America, several countries have pursued constitutional amendments effecting a ban on water privatization, acknowledging the human right to water, providing for the water needs of the environment, and adopting an allocation scheme that effectively reduces emphasis on productive uses (Harris & Roa-Garcia, 2013).

#### **2.2.4 Track Records: Efficiency and Equity**

As previously stated, private sector participation in the water sector was initially seen as a way of increasing operational efficiencies of water systems. However, there is no clear indication that private water firms perform more efficiently than public sector providers, given differing claims by privatization supporters and critics alike. According to Marin (2009), the performance of private firms in 65 water privatization projects reviewed by the World Bank was generally satisfactory, with high marks for operational efficiency and service quality. Kikeri and Nellis (2004) cite several privatization assessment studies (i.e. Boubakri & Cossette, 1998; D'Souza, Nash, & Megginson, 2000; La Porta & Lopez-de-Silanes, 1997; Macedo, 2000; Megginson, Nash & van Randerborgh, 1994; Megginson & Netter, 2001) showing improved operational performance and higher returns for private owners, particularly for middle and high income countries. On the other hand, Bakker et al. (2008) disclose that certain performance reviews (i.e. Bayliss, 2003; Braadbaart, 2002; Estache & Rossi, 2002; Hunt & Lynk, 1995; Lobina & Hall, 2000) indicate that there is no relationship between efficiency and ownership (whether public or private) of water utilities, while Araral (2009) states that efficiency claims for privatized water services are ambiguous based on numerous case studies and econometric analyses (i.e. Bitrán & Villanueva, 2003; Estache, Perelman, & Trujillo, 2005; Kirkpatrick, Parker, & Zhang, 2004; Motta & Moreira, 2006; Perard, 2007; Wilner & Parker, 2007). Hall and Lobina (2006) also point out that there is no evidence to show that a private sector operator is more efficient and effective than its public sector counterpart, but the net effect of water privatization is a reduction in both private and multilateral funding for the water sector in the developing world.

In addition to the debate on improved efficiencies with private water provision, there is also continuing debate as to whether or not water privatization benefits the poor. Some literature

suggest that the poor do derive benefits (e.g. Asian Development Bank, 2004a; Estache, Gomez-Lobo, & Leipziger, 2001; Franceys & Jacobs, 2008; International Finance Corporation [IFC], 2010; Kikeri & Nellis, 2004; Marin, 2009) citing increased access to safe and higher quality water and in some cases, even lower tariffs. Others maintain that the poor are particularly disadvantaged in a privatization schema (e.g. Araral, 2009; Bakker, 2003; Bakker, 2007; Bakker, 2010; Bakker et al., 2008; Budds & McGranahan, 2003; Buenaventura & Palattao, 2004; Castro, 2007; Hall & Lobina, 2007; Laquian & Argo, 2004; Mehta, 2000; Prasad, 2006; Swyngedouw, 2005) as marginalized consumers are usually the last to get connected to the system, if at all. To the extent that private water firms are incentivized to connect middle and high income households first, poor households that are not connected to water networks still have to purchase water from informal vendors, paying as much as 10 to 100 times more than households with network connections (Bakker et al, 2008, p.1903; Budds and McGranahan, 2003, p. 98). Thus, rich households connected to the networks pay lower tariffs and spend less on their water needs, as a % of income, than unconnected poor households. For poor households that are able to get connected to the networks, Prasad (2006) suggests that many case studies have shown water tariffs increasing after privatization, exacerbating the problems of inequality between these households vis-à-vis those that can afford the higher tariffs. According to Castro (2007), even the World Bank acknowledges that universal coverage is possible only with a strong public sector support, given the private sector's inability to serve impoverished communities. The Asian Development Bank (2008a) also places much responsibility on the state for the program's success, citing the need to establish an environment that promotes competition, effective regulation, good governance, and the rule of law. Related to this, private water firms admit that they can only operate under circumstances that ensure adequate returns on their investments,

which is normally not the case for developing countries, particularly as regards water provision to poor households (Castro, 2007; Budds & McGranahan, 2003).

### **2.2.5 Water Privatization as a Development Policy Option**

In discussing the global water privatization experience, it is not my intention to take sides on the public-private provision debate or to bring this debate to the forefront. Rather, I have taken the view that privatization<sup>2</sup> is a policy option available for emerging economies as regards the provision of basic services, provided such a program is designed to benefit everyone and national interest so prescribes its implementation. Further, there is no universal strategy for privatization (Prasad, 2006) as its implementation will depend on socio-economic, political, governance and technological considerations that are unique for each country implementing the program. Thus, to fully understand any water privatization program, there is a need to examine these factors according to country-specific conditions. For Metro Manila's water privatization, I look more closely into these factors in the succeeding sections.

Certain quarters have raised the issue that water should be seen as a common good, thus, promoting the provision of water services by the community in lieu of private and public water operators (see Bakker, 2010; Mehta, 2000). In general, community water provision may come in the form of Public-Private-Community Partnerships or community-based private service water providers such as informal water vendors and community business partnerships (Bakker, 2010, p. 162). Mehta (1999, 2000) states that community management of natural resources, such as

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<sup>2</sup> For the purpose of this research, private sector participation will refer to the provision of public infrastructure and/or public services by the private sector either through privatization or Public-Private Partnerships. "Privatization" will generally refer to the first wave of private sector participation, while "PPP" will refer to current arrangements between the government and the private sector for the latter to build public infrastructure and/or deliver public services. Both privatization and PPP have been implemented through various contractual arrangements such as Build-Operate-Transfer, Build-Own-Operate, Build-Transfer-Operate, Build-Lease-Transfer and other formats for private sector participation.

water, tend to be conflict-ridden and exclusive, often characterized by difficulties related to the establishment of community control systems as well as decisions on equity and sustainability. Additionally, Bakker (2008, 2010) suggests that common-pool resource management works well for rural areas due to their well-defined geographical boundaries, low levels of mobility, and high degrees of social capital as opposed to urban areas where water supply is provided through large-scale, cross-boundary hydraulic networks. In Metro Manila, community water provision is still prevalent in areas where private concessionaires' networks are not yet in place as well as in informal settlements that are already within the scope of these networks. While not the intention of the privatization program, this water provision scheme has become an alternative means of water supply for households that are currently not being served by the concessionaires. Chapter 4, which discusses prevailing scenarios related to Metro Manila's water provision, provides more details on this matter.

As regards the supply of water to the poor, institutional and governance issues should take precedence over the relative merits of the type of water provision currently in place. A major concern is how to effectively reach these populations, regardless of the specific mode of provision. In this regard, I stress that water governance (a recurring theme in my research) should be a key issue, with focus on equitable access to water for all consumers, increased water use efficiency, better provision for ecosystem needs, and involvement of the necessary parties in decision making. For this dissertation, I adhere to the Water Governance Facility's [WGF]<sup>3</sup> (2016) definition of water governance as the "political, social, economic, and administrative systems in place that influence water's use and management." Essentially, water governance

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<sup>3</sup> The Water Governance Facility is a collaboration between the United Nations Development Programme and the Stockholm International Water Institute, dealing with knowledge and capacity development related to such thematic areas as integrated water resources management, transboundary waters, water supply and sanitation, gender equality, water integrity, and climate change adaptation (WGF, 2016).

addresses the issues on “who gets what water, when and how, who has the right to water and related services, and their benefits” (WGF, 2016). Governance failures provide disincentives for water utilities to connect poor households, and conversely, for poor households to connect to the water networks (Bakker et al., 2008). As such, water utilities, whether public or private sector operated, should have clear guidelines for equitable water provision, with incentives for ensuring access to impoverished households as well as penalties for not meeting equity targets. In addition to sufficiently addressing efficiency and equity concerns, the regulatory environment must promote the concepts of transparency, accountability, and participation (Bakker et al., 2008; Gleick et al., 2002; Parker & Kirkpatrick, 2005).

### **2.3 Understanding the Metro Manila Water Privatization**

This research undertakes a broad and in-depth study of the privatization of the Metropolitan Waterworks and Sewerage System [MWSS], also referred to as the Metro Manila<sup>4</sup> water privatization in this dissertation. Considered as one of the largest and longest running water privatization programs in the world (see Dumol, 2000), this privatization was implemented to address the problems of low service coverage, low water pressure, high losses due to leaks and pilferages, and insufficient water supply (Dumol, 2000; IFC, 2010). Going into its nineteenth year of implementation, the MWSS privatization makes an excellent case study and laboratory for investigating the state of water provision in one of the most densely populated cities in the world.

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<sup>4</sup> Unless otherwise stated, “Metro Manila” will refer to the service area of MWSS which includes the entire National Capital Region, Rizal province, and parts of Cavite province.

## **2.3.1 A Tale of Two Concessionaires**

### **2.3.1.1 Awarding the Concessions**

Towards the end of the twentieth century, the Philippines, like many emerging economies, embraced a development strategy promoting the privatization of vital public infrastructure systems. The country's initial foray into the privatization agenda focused on the power and water sectors, with privatization being seen as a solution to prevailing energy and power crises. Such privatization decisions were in line with observations made by Bakker (2010) and Harris (2013) that crises, whether attributed to biophysical scarcity or poor governance, were often used as justification for enhanced private sector participation in the provision of these services. In preparation for privatized services, the government enacted several laws such as the Electric Power Crisis Act, the Build-Operate-Transfer Law, and the National Water Crisis Act (see Fabella, 2011) that provided political and legal bases for these programs as well as frameworks to expedite their implementation.

On February 21, 1997,<sup>5</sup> MWSS awarded operating concessions for the East and West Zones to two successful private sector bidders (Dumol, 2000). Before privatization, only 67% of the 10.9 million residents in the service area of MWSS were connected to the water system. Of those connected to the MWSS network, water supply was available for only 17 hours per day. Due to leakage and pilferage, system losses were also very high, estimated at a level of 58% (ADB, 1997, p.6). Compared to select water utilities in the region (as shown in Table 1), MWSS was performing below par, making it a good candidate for privatization.

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<sup>5</sup> The entire privatization process, from invitation to award, was completed in 6 months. See Fabella (2011) for a complete discussion on the timeline for the MWSS privatization.

**Table 1. Pre-Privatization: MWSS Operating Performance vis-à-vis Select Water Utilities**

City	Coverage (%)	NRW* (%)	Water Availability (hours)	Staff/1,000 Connections Ratio
Manila	67	58	17	9.8
Bangkok	82	38	24	4.6
Hong Kong	100	36	24	2.8
Kuala Lumpur	100	36	24	1.1
Singapore	100	7	24	2.0
Seoul	100	35	24	2.3
Shanghai	100	14	24	6.1

\* Non-Revenue Water [NRW] – system water loss due to leakage and pilferage

Table developed by Author (2015) using data from ADB (1997). Prior to privatization, MWSS was performing below par compared to other Asian water utilities.

Four international consortia, comprised of the most diversified Philippine conglomerates and the largest global water companies, joined the bidding for two water concessions in Metro Manila (Rivera, 2004, p. 11):

- Benpres Holdings Corporation - Lyonnaise des Eaux
- Ayala Corporation - North West Water
- Aboitiz Holdings Corporation – Compagnie General des Eaux
- Metro Pacific Corporation – Anglian Water International

Offering the lowest water tariffs, the east concession was awarded to Manila Water Corporation, Inc. [MWCI] whose shareholders included Ayala Corporation, Bechtel Corporation and United Utilities Ltd. (mother company of North West Water).<sup>6</sup> At the same time, the west concession was awarded to Maynilad Water Services, Inc. [MWSI], a consortium of two large infrastructure holding companies comprised of Benpres Holdings Corporation and Lyonnaise des Eaux (Dumol, 2000, p. 84). In 1997, the two local sponsors, Ayala Corporation and Benpres Holdings Corporation, were Philippine holding companies with business interests in property

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<sup>6</sup> While Bechtel has divested of its ownership in MWCI, new corporate entities have invested in the company. Likewise, the company has undertaken a public offering of its shares (see Rivera, 2005).

development, banking and financial services, electronics, and telecoms. During that time, Benpres Holdings Corporation also had major interests in power and generation. The international partner for the east zone, North West Water, was a UK-based water and sewerage company operating in the Manchester area while that for west zone, Lyonnaise des Eaux, was a leading French conglomerate in the field of environmental services (Rivera, 2004, p. 11).

Through the west and east concessions, the Metropolitan Waterworks and Sewerage System is currently responsible for providing water supply and sewerage services to approximately 16 million residents of 37 cities and municipalities within greater Metropolitan Manila (MWSS, 2012a, p. 25). About 97% of its water supply comes from the Angat Dam, located in the nearby province of Bulacan, while the balance is sourced from deep wells within Metro Manila (MWSS, 2013a, p. 22). The Metro Manila water system (Figure 1) has six water treatment plants (see MWSI, 2012a p. 2-9; MWCI, 2015a, p. 1) and an underground network of pipes covering more than 10,000 kilometers (see MWSS, 2012a, p.7).

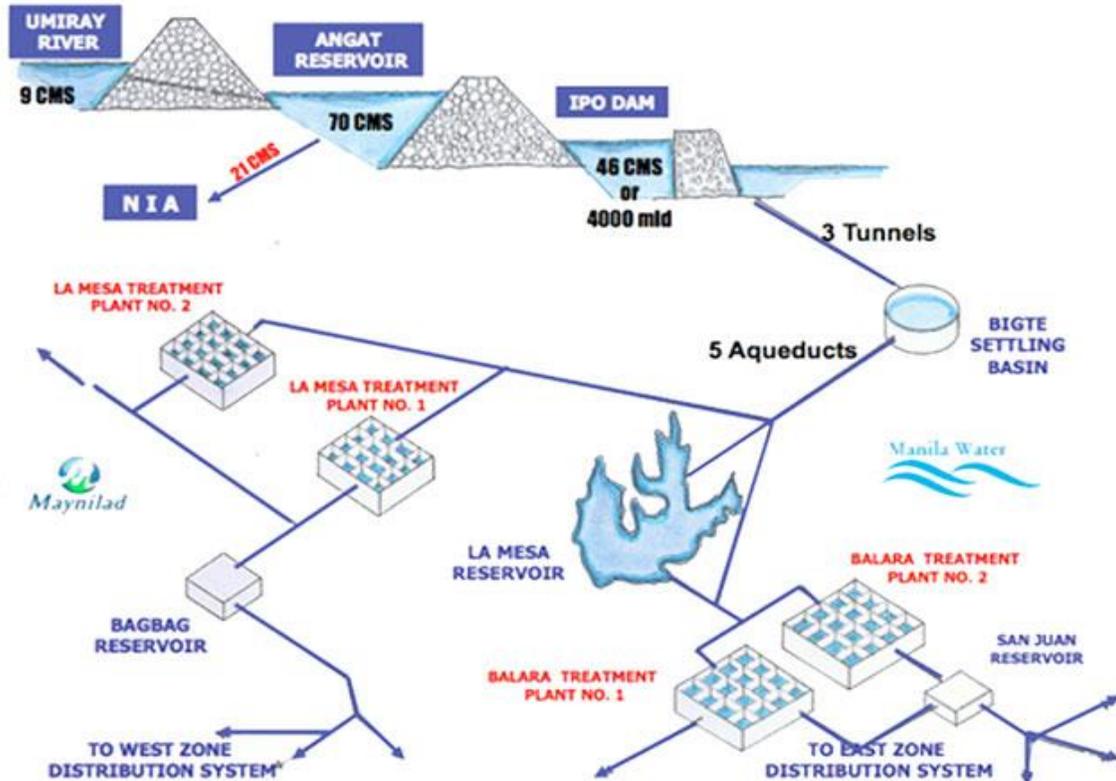
The concession agreements<sup>7</sup> (MWSS, 1997a, 1997b) signed by MWSS and the two private concessionaires granted the latter parties the sole right to manage, operate, repair, and install all assets necessary to provide water and sewerage services in their respective areas of operation. The private concessionaires were also allowed to bill the consumers directly and collect payments for these services. Legal titles to all properties, plants and equipment contributed by the private companies to the existing MWSS system during the concession period remain with the concessionaires until expiration of the contract in 2022. Thereafter, all titles, rights and interests in those assets automatically vest in MWSS. The concession period was extended by another 15 years during the second rate-rebasing exercise conducted in 2007 by the

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<sup>7</sup> Contractual arrangements and obligations are the same for the two concession agreements.

MWSS RO (MWSS, 2009), and as such, the new expiry date for both concessions has been reset to 2037.

**Figure 1. Schematic Diagram of the Metro Manila Water System**



Source: Metropolitan Waterworks and Sewerage System (2014a). The MWSS Water System. Quezon City: Metropolitan Waterworks and Sewerage System. *(Reproduced with permission)* The MWSS privatization program created two separate water concessions for the east and west zones.

### 2.3.1.2 Growing Pains

With the completion of the privatization process, Metro Manila’s residents had high expectations from the private water firms, owned by large local and foreign conglomerates with

much experience operating utility companies, which would now be responsible for their domestic water supply and sanitation requirements. However, barely a year into the program, the Asian financial crisis and the El Niño event would affect the operations and cash flows of the two private water concessionaires, most especially Maynilad Water Services, Inc., the west zone service provider. The Asian financial crisis in 1997 caused a 62% devaluation of the Philippine peso against the US dollar (see Alburo, 1999, p. 446) while the El Niño event in 1998 resulted in a 65% reduction in water supply from Angat Dam (Rivera, 2014 p. 24).

The Asian financial crisis affected the concessionaires' payments of Concession Fees to MWSS, such fees basically mirroring the debt service payments of MWSS' foreign-denominated loans with the Asian Development Bank, the World Bank, the Japanese Export Import Bank, and a few other bilateral agencies. The concession agreements (MWSS, 1997a, 1997b, p. 28) state that the west concessionaire (MWSI) would cover 90% of MWSS' debt service payments, an amount equivalent to US\$800 million at commencement date, while the balance of 10% (US\$90 million) would be shouldered by the east concessionaire (MWCI). The severe devaluation of the Philippine peso against the US dollar required the concessionaires to make larger concession fee payments in Philippine currency which they had to source from revenues of their local water operations. To make matters worse, the El Niño phenomenon in 1998 reduced the available water supply to the metropolis by 65%, (David, 2000, p. 20), significantly reducing the revenue generating capability of the concessionaires. Though there was a price adjustment mechanism available to recover losses from these two unforeseen events, the price adjustment formula computed the recovery of these losses over the life of the concession. As such, the additional cash flow from the price increase would not immediately cover the financial impacts of these events, requiring the concessionaires to borrow money or inject additional equity into the

company in order to meet their cash flow requirements. Because of the higher Concession Fee payments for the west concession, MWSI's financial viability suffered more than that of MWCI, as a result of these two extraordinary events.

Following the collapse of loan negotiations with a syndicate of international lenders, MWSI applied for a new water tariff in 2001 that would result in a faster recovery of foreign exchange losses. The government acceded to this request by signing Amendment 1 of the Concession Agreement, on the condition that MWSI would continue paying the Concession Fees (MWSI, 2006, pp. 10-11). Note that whatever new terms were provided to MWSI were also necessarily accorded to MWCI. Notwithstanding the signing of Amendment 1, MWSI still failed to pay the Concession Fees. In January 2002, a rate rebasing exercise was conducted by the MWSS Regulatory Office for a 5-year tariff rate adjustment, as provided for in the contract. Disputing the rate adjustment being offered by the government, MWSI filed a Notice of Early Termination against MWSS in December 2002. In November 2003, an international arbitration panel ruled that neither party was in default of the concession agreement and as such, neither could call for an early termination. However, the panel ruled that the MWSI was obligated to pay the Concession Fees (MWSI, 2006, p. 11).

A week after the international arbitration panel came out with its decision, MWSI filed a petition in court for rehabilitation, declaring that it could no longer service its outstanding obligations of US\$325 million. Extensive negotiations were then entered into by the government and the MWSI shareholders and creditors, which resulted to a revised rehabilitation plan. This plan included a Debt and Capital Restructuring Agreement providing for the write-off of the owners' equity, new subscriptions by the government and the foreign shareholder resulting in an 84% government ownership, and a debt restructuring program. The agreement also allowed the

government to assign its subscription rights to the company's new capital stock, provided that the assignee will assume all obligations and undertakings of MWSS (MWSI, 2006, p13).

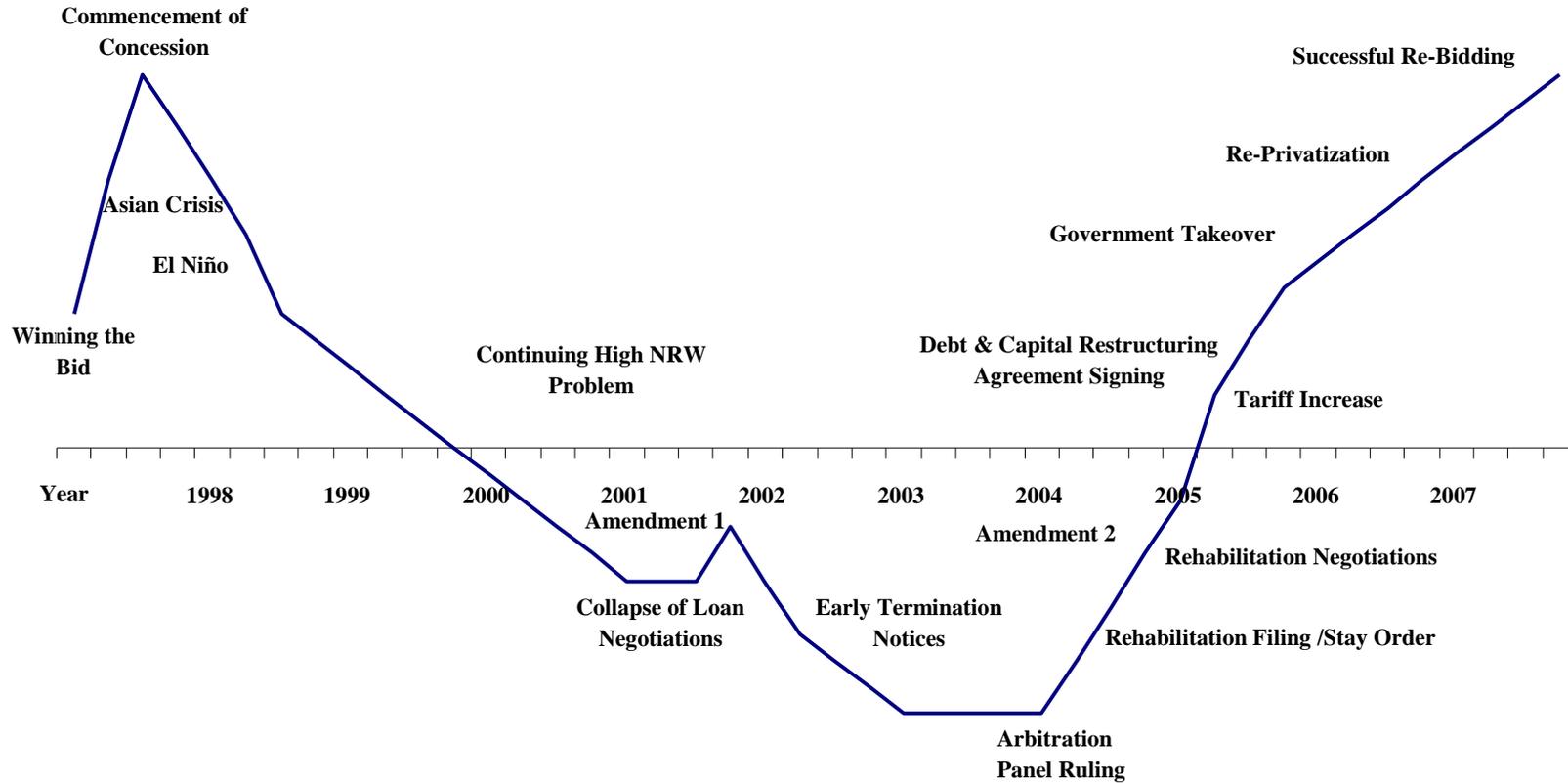
Following the international auction held by government in 2006, the consortium of DMCI Holdings, Inc. and Metro Pacific Investments (local infrastructure conglomerates) acquired 84% ownership of MWSI with a winning bid of over US\$500 Million (Asian Development Bank, 2008b), thus completing the re-privatization of MWSS' west zone. A timeline of events for the west concession is illustrated in Figure 2.

This dissertation does not suggest that the Asian financial crisis and the El Niño event were the only factors that pushed the original owners of MWSI to return the west concession to the Philippine government. While the company was unable to prevent these events from happening, other factors, normally within management's control and sphere of influence, may have likewise contributed to MWSI's losses of ₱8.3 billion (US\$147.5 million)<sup>8</sup> over seven years of operation (see SyCip Gorres Velayo & Co., 2005, p. 6). Some of these contributory factors may relate to operational and management concerns, such as the inability to reduce non-revenue water, meet operating and capital budgets, cultivate a merit-based culture, and promote stable boardroom politics. It remains uncertain though whether or not MWSI's original owners could have considerably reduce the financial damage brought about by the Asian financial crisis and the El Niño occurrence had they been able to address these operational and management concerns. Moreover, it is also uncertain whether or not fundamental ideological issues may have prevented such a partnership from succeeding. I explore these issues further in a later section of the chapter.

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<sup>8</sup> Unless otherwise stated, all ₱ to US\$ exchange rates used in the dissertation will be based on the average rates reported by the *Bangko Sentral ng Pilipinas* [Philippine Central Bank] (2015) for the years under consideration.

**Figure 2. Timeline of Events for the West Concession**



Major events chart drawn by Author (2015) using information from MWSI (2006). The chart presents the important events for the west concession, from initial bidding for the concession in 1997 to its return by the original concessionaires and ultimately, its successful re-privatization in 2007. Peaks and valleys represent high and low points in the timeline of the west concession, as determined by the author.

The twin effects of the Asian financial crisis and the El Niño phenomenon within the first year of the concession were not as severe for MWCI, the east zone operator for MWSS, as they were for MWSI. A ₱1.00 devaluation against the US dollar meant ₱800 million worth of additional Concession Fee payments for MWSI compared to only ₱10 million for MWCI. Moreover, the west zone had a 119-year old water system in the City of Manila which supplied about 19% of the MWSI's population (MWSI, 2006, p. 67), at an average Non-Revenue Water<sup>9</sup> [NRW] level of 71% (MWSI, 2006, p. 63), the highest level among the different cities and municipalities covered by the west concession. To make matters worse, the existing network design at that time required MWSI to supply water to its southern service areas through the Manila water distribution system. Supplying water to the southernmost areas through the Manila system meant losing much water before it reached its destination.

That the Asian financial crisis and the El Niño phenomenon had little effect on MWCI should not belittle the fact that the company was at a more advanced stage, compared to MWSI, in addressing major issues that usually accompany public to private transformation scenarios. With the award of the concessions, both private water firms also took over government personnel who were previously involved in MWSS operations. In his book entitled "Tap Secrets: The Manila Water Story", MWCI senior officer Virgilio Rivera (2014, pp. 1-2) credits the company's achievements to hard work and commitment of its workforce whose transformation from being "reactive and complacent" to "proactive and responsible" has also transformed a lagging water utility to a "world class water and wastewater service organization." While the west concession was being re-privatized in 2006, MWCI was already reporting investments of ₱23 billion (US\$475 million) for network expansion, NRW reduction and water quality improvement. In

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<sup>9</sup> Non-Revenue Water is the amount of water in the system that is lost by way of pilferage (commercial loss) and leakage (physical loss).

nine years of operation, they had installed 1,877 km of new pipes, more than doubled the number of service connections to 909,000 households, and increased billed water volume to 992 million liters per day. Furthermore, 24-hour water supply was made available to 98% of the households they serve; NRW level was reduced to a mere 30%, less than half the original level; and water quality exceeded the 95% target compliance of the Philippine drinking water standards (Rangan, Wheeler, & Comeault, 2007, p. 6).

With a better understanding of the Metro Manila water supply and sanitation requirements, MWCI joined the bidding for the re-privatization of the west concession, which was eventually won by the DMCI-Metro Pacific consortium. Since taking over, the new owners of MWSI have poured in the much needed investments to meet their service target requirements. Eight years after the re-privatization of the west concession, how have both concessionaires performed? For a better appreciation of their performance, I present their 2013 operational results using the general scorecard used by observers of the program.

### **2.3.1.3 Keeping Score**

If the bases of the private sector's performance are the scorecards commonly used by the state, private concessionaires, and multilateral agencies, then the likely conclusion is that significant improvements in water provision have been attained (see Fabella, 2011; IFC, 2010; MWSS RO, 2004; Wolf, 2007, Wu & Malaluan, 2008). Independent of any other performance assessment framework, the results provided by the scorecard (Table 2) show that the concessionaires have performed relatively well. Despite an increase in water supply of only 48%, the private firms have been able to serve twice as many consumers after taking over the concessions, mainly through network expansion and operational improvements, particularly in

the area of non-revenue water reduction. A great majority of the served population now enjoys 24 hours of good quality water at a pressure of 7 psi<sup>10</sup>.

**Table 2. Privatization Scorecard**

Service Indicators	1997 <sup>a</sup>	2013			% Inc. / (Dec.)
	Pre-Privatization	MWSI <sup>b</sup>	MWCI <sup>c</sup>	Combined <sup>*</sup>	
Population Served <sup>d</sup> (Millions)	7.3	8.6	6.3	14.9	104%
Water Supply <sup>e</sup> (Million Liters/Day)	2,800	2,515	1,632	4,147	48%
Non-Revenue Water	58%	35%	12%	26%	(32%)
Water Coverage <sup>**</sup>	67%	97% <sup>f</sup> /90% <sup>d</sup>	99% <sup>g</sup> /92% <sup>d</sup>	98%/91%	31%/24%
24-Hour Availability	67%	98%	100%	99%	32%
Water Pressure (@ 7 psi)		100%	99%	100%	
Water Quality		100%	100%	100%	

\* Author's estimates

\*\* As a % of population served

Table developed by Author (2015) using data from <sup>a</sup>MWSS RO (2004); <sup>b</sup>MWSI (2014a); <sup>c</sup>MWCI (2014a); <sup>d</sup>MWSS RO (2013c); <sup>e</sup>MWSS (2012a); <sup>f</sup>MWSS RO (2013a); <sup>g</sup>MWSS RO (2013b). Regular performance scorecard shows generally improved services provided by the concessionaires in terms of NRW levels, water supply availability, water pressure, and water quality.

While the scorecard presents a very good picture of the water privatization, there is still further need to determine whether or not such progress has been equitably shared and experienced by all consumers. Of major interest are details of how poor households have fared in relation to other socio-economic classes. Understanding the diffusion of consumer welfare across

<sup>10</sup> The original concession agreements called for water pressure of 16 psi (MWSS, 1997a, 1997b), but this requirement was relaxed to 7 psi until 2016, upon which time the concessionaires will be required to supply water at the original pressure of 16 psi (MWSI Officer, Personal Interview, August 1, 2014).

the socio-economic spectrum is of great importance to Philippine policy makers as it helps address complaints of Non-Governmental Organizations and consumer groups regarding difficulties still experienced by urban poor consumers. These groups assert that water is only available for those who can afford to pay, and as such, the program excludes majority of the people who are poor, whom they say should be the main beneficiaries of the program (IBON Foundation, 2012; Freedom from Debt Coalition, 2006; Water for the People Network, 2002; NGO officials, Personal Interviews, November 25, 2014, December 1, 2014).

Recognizing both sides of the privatization issue, the research identifies and investigates possible scenarios that are unfavorable to Metro Manila's impoverished communities under the current privatization scheme and recommends policies to address these scenarios. Before doing so, I examine first the political and economic factors and forces that have transformed Metro Manila into the country's primate city and review the history of its water governance. These background information offer a better understanding of Metro Manila's water privatization program and provide critical insights that help inform policy on how to better serve the urban poor communities.

## **2.3.2 Insights on the Political Economy of Metro Manila**

### **2.3.2.1 Metro Manila's Political-Economic Foundations**

As in most developing countries, Philippine urbanization is characterized by the predominance of a primate city vis-à-vis a multitude of smaller cities, with the former hosting majority of the country's urban population; the bulk of business and industry; major government, academic, and cultural institutions; as well as key transportation and communication facilities.

Usually, the rest of the country remains rural and agricultural, and the growth of the city is achieved by integrating adjacent agricultural areas into the urban landscape. Compared to the urbanization experience of developed countries where urbanism becomes the prevailing culture in the cities, the increased rural-urban migration in cities of the developing world has resulted in more ruralisation of the cities, thus blurring the distinction between rural and urban (Caoli, 1988). Such is specifically true for slums and squatter communities in general, which Laquian (1969, p. xix) describes as “rurban” human settlements where social norms and behavioral patterns of both urban and rural areas exist, helping ease the transition from traditional to modern way of life for people in these communities.

Before the arrival of the Spanish colonizers in 1571, the patterns of Philippine political, social, and economic life were decentralized among various barangays, which are communities comprised of thirty to one hundred families generally related to each other by blood, marriage or dependency (Stanley, 1974, p. 4). At that time, Manila, like any other barangay, was ruled under a paternalistic system by chieftains who looked after the welfare of their subjects in return for paid tribute and rendered services, particularly in times of war. By co-opting these local leaders, the Spaniards were able to subjugate the local inhabitants as they had previously done in Latin American countries (Laquian, 2002). Located at the center of the Philippine archipelago, Manila became the colonial capital from where the Spanish colonizers transformed the political, economic, cultural, and religious landscapes of Philippine society. From Manila, these colonizers were able to set up a centralized administration system for the entire country, getting help as well from the missionaries who set out to Christianize the rest of the population (Caoli, 1988; Stanley, 1974). Aside from being the focal point of political and religious administration, Manila also served as the entrepot in the galleon trade with Acapulco for Mexican silver and Chinese

merchandise during the first two centuries of Spanish rule. After the galleon trade ended in the early 19<sup>th</sup> century, Manila was opened to world trade, supplying commodities such as sugar, coconut oil and copra to more developed countries and at the same time, accessing manufactured goods for local requirements (Doeppers, 1984). Increased foreign trade led to the establishment of industrial firms in Manila and its suburbs and stimulated agricultural development in the surrounding regions. An unfortunate consequence arising from increased agricultural production for export was the increased private ownership of land by fewer individuals resulting in large numbers of landless sharecroppers and agricultural laborers. By the second half of the 19<sup>th</sup> century, Manila was the commercial, financial, and communications center of the Philippines, thus cementing its role as the country's primate city (Caoili, 1988). Under Spanish rule, Manila developed into an enclave community where the Spaniards lived in the walled city of Intramuros; the rich merchants, comprised mostly of Chinese inhabitants, in Binondo across the Pasig River; and the native Filipinos, in the nearby villages and suburbs (see Laquian, 2002).

Following a successful revolution against Spain in 1898, the Philippines did not immediately gain its independence but was subsequently colonized by the United States of America, the country's ally in the said war against Spain. American colonialism in the Philippines introduced universal public education, democratic ideals and institutions, and the amenities of modern living (Caoli, 1988; Stanley, 1974). The American colonizers also organized a popularly elected local government system as well as a national legislature where the Filipinos were gradually allowed to participate in the governance of their own affairs. Despite the introduction of democratic ideals and institutions, the Americans left unaltered the uneven socio-economic structure that had prevailed under many centuries of Spanish rule (Caoili, 1988). Several historians, political scientists and other academic writers (e.g. Anderson, 1988;

Constantino, 1975; Hutchcroft, 2000; McAndrew, 1994; McCoy, 1993; Putzel, 1992; Wurfel, 1988), analyzing the impact of Spanish and American colonialism on land ownership patterns, document that agricultural commercialization during the Spanish occupation had created an elite base of landowners with tremendous economic influence throughout the country. They argue that American colonizers were able to partner with this elite class by providing the latter with political power at all levels of government. As such, the modern Philippine state was largely borne out of a compromise between the American colonial masters and the willing Filipino elite, as part of the U.S. policy of benevolent assimilation in the Philippines. Essentially, U.S. colonialism in the Philippines was one of oligarch building rather than of state building, as the country's oligarchy was able to take control of the central government and the enrichment opportunities that came with political power (Hutchcroft, 1998; McCoy, 1989, 1993; McCoy & de Jesus, 1982).

When the Americans granted independence to the Philippines in 1946, the oligarchy had already entrenched itself and legitimized its political and economic clout through the electoral process. The Philippines emerged as “a state that was largely a captive of this powerful class of big landlords and what would later develop as highly protected business sector engaged in import substituting manufacturing.” (Rivera, 1996, p.5). The particularistic activities of a powerful oligarchy affected the ability of the government to formulate a sound economic development policy. Hutchcroft (1998, p. 234) refers to this form of rent extraction as “booty capitalism,” where a “powerful oligarchic business class extracts privileges from a largely incoherent bureaucracy.” After attaining independence, the country continued its cultural and economic reliance on the United States (Laquian, 2002). The Philippine economy was dependent on agricultural exports to the United States and, at the same time, imports of manufactured goods

from the latter. Hence, it was in the best interest of the Filipino ruling elite, the large landowners, to continue the country's dependence on the United States (Constantino & Constantino, 1978). After independence, the patrimonial features of governance became stronger due to the diversification of oligarchic business interests (beyond agriculture) into commerce, manufacturing, and finance which required more access to the state apparatus for the creation of wealth; a greater need to have personal contacts to enter the bureaucracy rather than one's own qualifications; and the increased presence of national institutions in local areas that further strengthened the oligarch's powerbase (Hutchcroft, 1991, 1998).

In September 1972, President Ferdinand Marcos declared martial law to create what he referred to as a "New Society" to replace the old one, which he said catered only to oligarchic interests through the manipulation of political leadership, the perpetuation of populist and individualist politics, and the creation of an economic gap between the rich and the poor (Caoili, 1998, pp.150-151). Yet, according to Hutchcroft (1991, p. 415), martial law was really an attempt by President Marcos to "centralize a largely decentralized polity and thereby undercut competing centers of power." Hence, particularistic intentions still prevailed, but the major difference was that only one person was appropriating wealth from the state machinery (at a much larger proportion) for his own private interest as well as those of his cronies (Hutchcroft, 1991). In a study entitled "Who Controls the Philippine Economy: Some Need Not Try as Hard as Others", Doherty (1982, p. 32) declares that only 81 individuals controlled 453 of the largest Philippine companies during the martial law regime. Though the traditional elites were able to co-exist and survive, only a few select individuals connected to the First Couple by familial relation or political affiliation, were able to accumulate tremendous wealth under this regime.

In February 1986, the Marcos presidency was overthrown by a popular people power movement that installed Corazon Aquino as the country's new president, becoming a democratic icon as the Philippines returned from authoritarian rule to democracy. However, the country's return to a democratic order was difficult given that the rules of governance continued to favor only the privileged minority, with the restoration of an elite class that previously flourished in such an order. Compounding the problem was the return to a political patronage system that was based on convenience and personal gain as well as the resurgence of old local clans and their private armies (Rivera, 1996; Hutchcroft, 2008). The succeeding presidency of Fidel Ramos in 1992 sought to achieve newly industrialized country status for the Philippines by the end of the twentieth century through the introduction of bold economic reforms. President Ramos' administration attacked the cartels and monopolies established by major oligarchic family corporations and implemented policies promoting economic liberalization, privatization<sup>11</sup>, and infrastructure development (Hutchcroft, 1998; Rivera, 1996). Hutchcroft (p. 245) describes the liberal reform agenda of the Ramos presidency as a mixed advocacy of a strong state which resists oligarchic dominance and learn from neighboring countries that have attained newly industrialized country status, and a minimalist state which limits state regulation and promote market-oriented solutions.

In 1998, Joseph Ejercito Estrada was elected as the 13<sup>th</sup> president of the Philippine republic based on a campaign promise that he would empower and uplift the lives of the poor and underprivileged, noting that the country's governance had always favored the traditional elites and their political allies (Laquian & Laquian, 1998, p.304). Yet, in less than a thousand days in office, President Estrada would be impeached because of his alleged involvement in

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<sup>11</sup> It was during the Ramos presidency that power and water privatization projects were implemented to address the country's prevailing power and water crises.

large scale graft and corruption. With the possibility of his acquittal, a second people power movement transpired and ousted Estrada from the presidency (Laquian & Laquian, 2002). Then Vice President Gloria Macapagal Arroyo assumed the presidency to serve Estrada's remaining term and was elected to serve another six years as the country's chief executive. Arroyo held one of the longest tenures in the Philippine presidency, second only to Marcos who extended his stay through the imposition of martial law. Despite this longevity, the Arroyo administration had difficulty gaining political legitimacy, spending most of her presidency facing several crises that included corruption and bribery scandals, military and urban poor uprisings, alleged rigging of national elections, and impeachment attempts. She used the vast powers of the presidency to keep her post, unconcerned about their effects on the country's already fragile political foundations (Hutchcroft, 2008).

Given the supposedly on-going capture of the state by the elite and their rent-seeking actions, is it necessary to cut back the role of government and allow the market to take over most of the former's functions, particularly in the provision of basic services? Hutchcroft (1998) seems to suggest so, based on what he perceives as the economic success of the market-oriented, outward-looking policy framework implemented during the Ramos presidency, which included the liberalization of trade, foreign exchange, and foreign investment, as well as the privatization of major state corporations.<sup>12</sup> He says that a program of liberalization<sup>13</sup> may be able to unsettle the old patterns of entrepreneurial behavior that is based on special privileges, re-orient the established oligarchic business class, as well as develop a new breed of entrepreneurs.

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<sup>12</sup> The Philippine government implemented the Metro Manila water privatization during the Ramos presidency.

<sup>13</sup> Also referred to as Neoliberalism, liberalism or liberalization supports the notion of a minimalist state that espouses individual liberty, usually in the form of free markets, free trade, and private property rights. This ideology strongly promotes privatization, deregulation, international trade, globalization and competition (see Harvey, 2005; Thorsen, 2010; Yergin & Stanislaw, 1998).

Nevertheless, Hutchcroft (1998) admits that this may be possible only if the state is able to establish stronger and more predictable political, administrative, and judicial institutions. Rivera (1996) also makes a case for market-oriented reforms by saying that the Ramos administration pursued economic liberalization to pry open the highly protected and oligopolized economic sectors. Nonetheless, he cautions government to constantly be alert and cognizant of the danger of producing new monopolists and oligopolists when pursuing such programs. Whether or not a program of liberalization does indeed reduce state capture by the country's elite remains to be seen and should be the subject of further research. What is more important is to determine if the implementation of such programs, particularly privatization/PPP programs, has been beneficial to the Filipino people from both efficiency and equity viewpoints, given government's renewed effort to use these programs to develop the country's public infrastructure. It is in this light that I examine the water privatization in Metro Manila, focusing not only on its scope, magnitude, and longevity but also on its impact and influence on the government's overall policy on privatization/PPPs.

#### **2.3.2.2 Metro Manila: Its National Significance**

As the economic engine, social center, and political capital of the Philippines (Laquian, 2002), Metro Manila will always be at the forefront of the country's political economy and governance. Today, Metro Manila<sup>14</sup> (also known as the National Capital Region) has officially grown into 17 cities and municipalities with a population of 11.9 million, occupying 636 square kilometers of territory (Philippine Statistics Authority, 2015). In reality, its urban field includes 35 adjacent local government units spread over a land area covering 1,681 square kilometers

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<sup>14</sup> As mentioned earlier, Metro Manila, in the context of MWSS' service area, includes the National Capital Region and select cities/municipalities of the Rizal and Cavite provinces.

(Laquian, 2008, p. 4, 2002, p. 76). As the primate city for more than four centuries, the state has always prioritized Metro Manila for the implementation of major government programs, using the results in Metro Manila as the bell weather for success or failure of national policies supporting these programs. The Metro Manila water privatization is a key example of this practice, and renowned Philippine economist, Fabella (2011) considers it as one of the few successful structural reforms in recent history – a “tectonic shift in the boundary between the state and the market in the Philippines.” Yegin and Stanislaw (1998, p. 374) describe the general movement of the boundary towards the market during these early years of privatization as “transferring control of the commanding heights from the traditional state apparatus to the dispersed intelligence of the market.” Nevertheless, despite some common features, each country’s move to the market will vary according to its political and economic history and its assessment of the national interest (Yegin and Stanislaw, 1998). This is in agreement to Harris and Roa’s (2013) observation (following Brenner, Peck, and Theodore, 2010) that the global Neoliberal experiences have been variegated, being historically and geographically specific to each country.

The MWSS privatization was implemented during the Ramos presidency in the 1990s, when the Philippine government was seriously hooked on the privatization schema, exerting major efforts to deregulate oil, transportation, communications, and other industries. Fabella (2011) notes that during this time, the Washington Consensus<sup>15</sup> had pushed for state disengagement from economic activities where the market has shown better competence or conversely, where the state has demonstrated its inability to achieve the desired results. Fabella

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<sup>15</sup> Coined by John Williamson in 1990 to describe a set of 10 Neoliberal policies imposed by Washington-based financial institutions on crisis-ridden developing countries (Center for International Development at Harvard University, 2013)

(2011, p.65) makes an interesting observation though, stating that the seeds of privatization may have been sown earlier during the Corazon Aquino presidency, when the government privatized by outright sale 122 government-owned and controlled corporations and enacted a law that allowed private sector participation in Philippine infrastructure projects. Such corporations were either originally set up by the government or taken over from the private sector during the martial law regime, a number of which were bankrupt firms set up by the business cronies of Marcos and were beneficiaries of large loans guaranteed by state financial institutions (Rivera, 1996). More than eighteen years into Metro Manila's water privatization, the Philippine government has again embarked on an extensive PPP program for major public infrastructure systems (e.g. roads, railways, airports, seaports, and water systems). Specifically, Executive Order No. 8 issued by the current Philippine government explicitly stipulates the need to fast track the implementation of PPP programs and projects, a cornerstone strategy of the national development plan for infrastructure development and economic growth. As a benchmark for new PPP projects, the MWSS water privatization offers many lessons that may help improve the implementation and regulation of these projects. Considering that a thorough understanding of this water privatization program is essential for effective policy making, I also review the transformations related to water governance in Metro Manila to complement the discussions on the broader political and economic considerations of this privatization program.

### **2.3.3 A History of Water Governance in Metro Manila**

Following Bakker's (2003, p. 337) lead that a water network is an "artefact of urbanization," the water system of Metro Manila may be perceived as an urban monument of previous policies and decisions made by both state and non-state actors with regard to the

provision of water services. The notion that water systems represent past technical, socio-economic, and political decisions of operators and policy makers stems from linked concepts associated with social and hydrological systems, a topic that will be explored at length in the next chapter. Essentially, a historical perspective of Metro Manila's water provision and governance allows for better appreciation of the design, construction and operation of its built environment, as well as the water practices and concerns of its consumers. In this regard, I present a detailed history of water governance in Metro Manila, noting several transformations over the last 137 years. A summary of the governance and policy reforms that have transpired during this period is presented in Table 3.

#### **2.3.3.1 Pre-Start-Up Phase (1690 – 1877)**

During the early years of the Spanish occupation, Manila residents collected water from nearby streams, aside from rainwater and water from surface wells, which they stored in jars and loaded into small boats. In 1690, Father Juan Peguero, a Dominican friar, developed a crude distribution network composed of an open aqueduct and a small navigable canal to deliver water coming from a spring behind the San Juan Del Monte monastery. Covering a limited area, residents had to walk long distances just to reach the different watering points of the system. In 1743, Francisco Carriedo Y Peredo, a retired Captain-General, bequeathed 10,000 pesos to the City of Manila to serve as the nucleus of a fund to be used for the construction of a public water supply system for the city (Metropolitan Water District [MWD], 1940, p. 19).

#### **2.3.3.2 Start-Up Phase (1878 – 1918)**

About 135 years (from 1743 to 1878) would lapse before the city government was able to accumulate enough funds from the donation and interest income to build the water supply system

for the City of Manila. Known as the Carriedo Waterworks, the oldest water system in Asia was built at a cost of 745,509 pesos and was capable of supplying 16 million liters of water per day to 300,000 residents (MWD, 1940, p. 20; MWSS, 2013b, p.1). Water from the Marikina River<sup>16</sup> was pumped to a reservoir in San Juan which then flowed by gravity to Manila. This underground reservoir consisting of interconnected galleries of solid adobe blocks lined with tile still continues to draw interest from engineers because of its unique design. The supply capacity of the system was increased to 92 million liters per day after the completion of the Wawa Dam and the 224-million liter reservoir in San Juan in 1909 (MWSS, 2013b, p.1).

### **2.3.3.3 Stabilization Phase (1919 – 1954)**

Through Act No. 2832, the Metropolitan Water District was created in 1919 to provide adequate water supply and sewerage services to the City of Manila and 14 adjoining municipalities of the Rizal Province, acquiring the Carriedo Waterworks in the process (MWD, 1940, p. 21). Between 1924 and 1944, MWD was able to tap a larger source of water supply, the Angat River<sup>17</sup>, through the Angat-Novaliches System which consisted of the Ipo Dam and its major conveyances, the 36-billion liter Novaliches raw water impounding facility, the new 40-million liter San Juan treated water reservoir, and the Balara Filtration Plant. The post war era, a period of economic expansion and population growth, created a higher demand for water. This prompted the construction of additional raw water aqueducts, expansion of the Balara plant, and installation of new storage reservoirs and distribution mains (MWSS, 2013b, p. 1).

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<sup>16</sup> Marikina River runs through the service area of MWSS but is currently no longer used as a source of drinking water as it is highly polluted.

<sup>17</sup> Angat River is located in Bulacan, a province adjacent to Metro Manila. It supplies water for power generation, rural irrigation, and drinking water for Metro Manila.

#### **2.3.3.4 National Coverage Phase (1955 – 1970)**

In 1955, the Philippine Congress passed Republic Act No. 1383 creating the National Waterworks and Sewerage System [NAWASA], a national agency that would be responsible for the provision of water supply and sewerage services for the entire country, taking over MWD and all the water systems operated by the local governments. Anticipating the water supply needs of a rapidly increasing Metro Manila population, NAWASA signed an agreement with the National Power Corporation in 1962 for the supply of 2 billion liters<sup>18</sup> of water per day, to be made available upon full completion of the proposed Angat Multi-Purpose Dam (MWSS, 2013b, p. 1). In preparation for an increased supply of water, NAWASA borrowed US\$20.2 million from the International Bank for Reconstruction and Development [IBRD or the World Bank] to further increase the conveyance capacities of its water network and the treatment capacity of its Balara plant (MWSS, 2013b, p.2).

#### **2.3.3.5 Metro Manila Coverage Phase (1971 – 1997)**

In 1971, the Philippine Congress passed another law, Republic Act No. 6234, dissolving NAWASA. This Act created the Metropolitan Waterworks and Sewerage System to service the water and sewerage needs of greater Metro Manila and returned the municipal water systems to the local government units. From congressional records, it appears that the centralization and decentralization of water services were envisioned at the time of their implementation, as solutions to the same problems: operational inefficiency, mismanagement, and rent seeking practices by certain officials of the agency. Moving into the 1980s, MWSS initiated projects to reduce the high levels of non-revenue water, rehabilitate the small sewerage system in central

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<sup>18</sup> 2 billion liters is equivalent to 2 million cubic meters as 1 cubic meter is equal to 1,000 liters

Manila, and build the first La Mesa water treatment plant<sup>19</sup> with a capacity of 1.5 billion liters per day. Further, MWSS started the Umiray-Angat Transbasin Project in 1991 to increase water supply by an additional 800 million liters per day (MWSS, 2012b, p. 19, 2013b, p. 3).

#### **2.3.3.6 Privatization Phase (1997 – Present)**

In July 1997, the Philippine government privatized the operations of MWSS, characterized by high levels of non-revenue water, low water pressure, and intermittent supply of water (see MWSS Regulatory Office, 2004). Coupled with low tariffs, cash flows from operations were very minimal, necessitating extensive borrowings and government support to maintain and expand the system. The decision to privatize was reinforced by the success of a similar program in the power sector plus the strong push by IFC<sup>20</sup> and multinational water companies (see Dumol, 2000). This was at a time when developing countries were being required to privatize their public utilities as part of their structural adjustment programs and developmental loans (see Harvey, 2007; Goldman, 2007).

#### **2.3.3.7 Water Security Phase (2011-Present)**

“How can a transformation of the perception of something as plain, everyday water into what E. Weiss calls a resource on *intergenerational equity* be effected? How does an agency like MWSS make that bold shift of its appreciation of its charter from traditional water distribution to being *Prime Mover and Guardian of Water Security for Mega Manila?*”

- Metro Manila Waterworks & Sewerage System

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<sup>19</sup> The La Mesa Water Treatment Plant 1 (LMTP1) is the largest water treatment plant in Asia and the fourth largest in the world. A second water treatment plant (LMTP2) with a capacity of 900 million liters per day was completed in 1995 (MWSI, 2012b, pp. 19-20).

<sup>20</sup> IFC was the privatization advisor of MWSS (see IFC, 1996).

To answer these two critical questions, MWSS (2013a, p. 1) developed a Water Security Legacy Plan promoting the concept of water as a “critical-to-life resource” that must be valued by all Filipinos. Stressing the importance of this resource to human life, the plan reminds and serves notice to the consumers, the private concessionaires, and the government itself that water is not a “disposable commodity.” Under this new paradigm, MWSS hopes to effect positive changes towards its use, delivery and management, and regulation. The plan focuses on the following legacy areas:

- Water resources and infrastructure development, management and protection
- Water distribution efficiency
- Sewerage and sanitation compliance
- Water rates review and rationalization
- Organizational excellence
- Partnership development
- Communications and knowledge management

Covered by the first three legacy areas, the effective and efficient delivery of water from source to tap has become a priority for MWSS, especially in the light of climate change. In this regard, MWSS has identified the need to be more actively involved in the management of the Angat Multi-Purpose Dam and its watershed. As asset manager of the downstream facilities, MWSS will ensure that the maintenance of existing facilities as well as the construction of new ones conform to the standards and compliance targets set forth in the concession agreement. In compliance with the fourth legacy area, MWSS will make sure that water tariff levels are set in accordance with actual accomplishments and future plans of the concessionaires, as vetted by the MWSS Regulatory Office. The last three legacy areas recognize the need for the organization to build capacity for its human resources through actual work learning or outside training, the ultimate goal of which is a level of expertise in the field of water security.

**Table 3. The Transforming Nature of Water Governance in Metro Manila**

Period	Government Agency	Purpose	Population	Capacity (MLD)	Facilities
1878 – 1918	Carriedo Waterworks	Start Up	300,000 (1878)	16	Pre-1908: Manila water supply system; water from Marikina River
				92	1908-1924: Wawa Dam, Santolan pumping station; San Juan reservoir (224 ML)
1919 – 1954	Metropolitan Water District (Act No. 2832)	Stabilization	913,000 (1939) 1,600,000 (1948)	470	Angat-Novaliches System (tapping Angat River) consisting of Ipo Dam, Ipo-Bicti tunnel, Novaliches reservoir (36 BL); Novaliches-Balara aqueduct, Balara filtration plant, new San Juan reservoir (40ML)
1955 – 1970	National Waterworks & Sewerage Authority (Republic Act No. 1338)	National Coverage	2,500,000 (1960)	1,600	New Angat multi-purpose dam; larger Ipo-Bicti tunnel; additional Bicti-Novaliches aqueducts; additional capacity for Balara plant; new San Juan reservoirs; extension of distribution mains
1971 – 1997	Metropolitan Waterworks and Sewerage System (Republic Act No. 6234)	Metro Manila Coverage	8,000,000 (1994)	2,700	First La Mesa treatment plant; new pumping stations; rehabilitation of water network, rehabilitation of Central Manila sewerage system
1997 – Present	Metropolitan Waterworks and Sewerage System	Privatization	16,000,000 (2014)	4,000	Umiray-Angat tunnel; second La Mesa treatment plant; smaller treatment plants along Laguna de Bay; rehabilitation of existing network plus expansion into unserved neighborhoods
2011 – Present	(With a Regulatory Office created under its charter )	Water Security Legacy	16,000,000 (2014)	4,000	Major projects: Bulacan Bulk Water Supply Project & New Centennial Water Supply Project

Note: MLD – million liters per day; ML – million liters; BL – billion liters

Table developed by Author (2015) using data/information from MWD (1940); MWSS (2012a, 2013b). Over the years, Metro Manila’s water governance has undergone several transformations: single city to multi-city service coverage; local agency vis-à-vis national agency jurisdiction; and public to private water provision.

## **2.4 Rethinking Metro Manila's Water Privatization**

### **2.4.1 Towards a Political-Economic Perspective**

As previously mentioned, structural adjustment loan programs imposed by the World Bank and the International Monetary Fund on developing countries helped accelerate and broaden the implementation of water privatization (see Harvey, 2007; Goldman, 2007; Harris, 2013). By Rivera's (1996) and Hutchcroft's (1998) accounts though, the Philippines, during the Ramos presidency in the 1990s, was a willing partner for privatization and other programs of liberalization. Aside from the oft-used reasons, Hutchcroft (1998) suggests that the government adapted this market-oriented, outward looking policy framework to counter what he terms as "booty capitalism," the extraction of privileges from the state by the oligarchic business class. Whether or not booty capitalism can be tamed by market forces, particularly those coming from international shores, is a subject that needs further study and deliberation. However, I would like to offer certain insights on this issue in relation to the Metro Manila water privatization.

Privatization is one of the programs of liberalization (also termed contemporarily as Neoliberalism), a loosely organized set of political and economic beliefs working under the proposition that the sole purpose of the state is to promote individual liberty, usually in the form of free markets, free trade, and private property rights. The Neoliberal ideology espouses minimum state intervention arising from the belief that the market is more efficient than the state, and that powerful interests usually influence state interventions for their own interests. Neoliberalism strongly promotes privatization, deregulation and competition in the belief that these programs will result in increased productivity and efficiency, eliminate bureaucracy,

reduce costs, and improve the quality of products and services. (see Harvey, 2005; Thorsen, 2010; Yegin & Stanislaw, 1998).

Bakker (2010, p. 92-93) points out that while private sector participation in the global water sector grew tremendously in the early 1990s, the number of private sector contracts had already declined by the end of that decade. This trend was in part structural, resulting from the Asian, Russian, and Argentine financial crises as well as the bursting of the high-tech bubble that significantly reduced foreign direct investment flows to emerging economies. After 2000, cancellations for all utility sectors increased, the highest rate of which was observed in the water sector, a reflection of its high investment-high risk nature. Moreover, private companies moved away from long-term concession agreements, which were the mode of privatization projects in the 1990s, and veered towards shorter, lower-risk contracts, such as management contracts, that required little or no investment. Bakker (2010) also notes that public protests significantly raised the level of political risks to private companies by posing serious challenge on their legitimacy to the public, and in certain instances, playing a major role in the cancellation of their contracts.

For many privatization programs, direct state intervention was necessary to correct market failures, as regards the production of desired goods and services, in order to keep these programs afloat (see Feigenbaum and Henig, 1997). Gleick et al. (2002) point out that countries with weak public sectors which had performed badly in the provision of water services are also most likely to encounter problems related to the regulatory aspects of water privatization. Essentially, weak governance and state institutions have made developing countries vulnerable to the pitfalls of privatization. One such pitfall is the regulatory capture by large foreign water firms whose financial and technical resources have allowed them to negotiate contracts with the state, often to their advantage. In the long-run, the absence of a level playing field between the state

and the multinational water companies has commonly resulted in non-renewal of the contract upon its expiry or its cancellation through government action or public protest and political demonstrations, as in the case of Cochabamba, Bolivia and Tucuman, Argentina (see Gleick et al., 2002 for more discussions on the failed privatization programs in these two areas).

From a political-economic perspective, there are two possible worst case scenarios with respect to the participation of multinational water companies in a Philippine water privatization program, or any PPP program for the matter. Weak governance and regulatory institutions that are unable to prevent the regulatory capture by foreign water firms would result in a privatization program that not only fails to address the particularistic efforts of the oligarchic business class but, in effect, also substitutes rent-seeking by multinationals over local oligarchs. This is particularly true under a partnership between a local business elite and a large water transnational company where the former brings to the table its knowledge of the local business environment and its contacts in the bureaucracy while the latter, supposedly the technology and best practices in the delivery of water services. Such was the form of partnership required to qualify and thus, be given a chance to bid during the MWSS privatization process. Under a weak regulatory environment, this working arrangement would be worse than one involving only pure local business elites. Such a scenario would result in transnational outflow of local wealth and decisions being made from offices thousands of miles away, regarding such critical local issues as who gets water and how much these consumers should pay (see Swyngedouw, 2005 on the overhaul of power relationships between different privatization actors). Allowing this type of arrangement to prevail in privatization projects of government would be akin to subjecting the Filipino people to another form of colonialism, albeit that of the economic variety.

Under a scenario where a local business elite and a foreign water firm again form a partnership, but their business interests in the water concession do not align, there is a great possibility that this arrangement would lead to poor operating performance and continuing financial losses. Eventually, the local and foreign sponsors may decide to dissolve the partnership and even return the concession to the government. Though purely a conjectural exercise, this may have been one of the scenarios prevailing at the time the original sponsors returned the west water concession to the Philippine government.

I bring out these two possible scenarios to highlight the need for well-studied privatization/PPP objectives and guidelines, concession contracts and service targets, coupled with effective implementation, monitoring and performance assessment programs. State intervention may be necessary at different stages of a privatization/PPP program, requiring government personnel to have the much needed skills for policy formulation, contract preparation and implementation, regulation, and arbitration. For privatized water services, I stress the need for strong regulatory and oversight agencies (see Gleick et al., 2002), following the disclosure of Casarin, Delfino, & Delfino (2007) that the failure of many water concessions may be traced to weak regulatory agencies that were unable to prevent the opportunistic behavior of the private service providers, as well as the interference of government officials and politicians in the utility's operations and management. Aside from the establishment of clear and effective regulations, Casarin et al. (2007) emphasize the importance of obtaining information regarding the water firms' operations in order to prevent information asymmetry which may lead to regulatory capture by their private operators. In addition to these operational results, I also would like to highlight the importance of gathering consumer feedback related to their lived experiences under a privatization scenario. Consumer feedback is a critical component of this

research and plays an important role in assessing concessionaires' performance with respect to equitable water provision in Metro Manila. I discuss this further in the next chapter.

#### **2.4.2 Towards a Water Governance Perspective**

Over the last century, the physical and political boundaries of water provision in Metro Manila were redefined by the state at different periods of time. Starting as a local network constructed with donated funds, the city's water system continued to develop as the boundaries of Metropolitan Manila expanded. Through legislative initiatives, the water system was centralized under a national agency, and then devolved to a government corporation within a span of only 16 years. After 25 years, there was a shift towards privatization in the hope that the private sector would succeed where previous government agencies had failed, in terms of providing better water and sanitation services to the consumers. While Metro Manila's water privatization is touted as one of the biggest of such programs in the world, the issue of whether or not this privatization has been successful, and in what specific ways, requires further investigation. If success were measured in terms of physical accomplishment and longevity of contract, then there are indications that the Metro Manila water privatization may have achieved some measure of success.

In 2006, Hall and Lobina (2006, p. 37) recognized that the Metro Manila and Jakarta water privatizations contributed the most number of new connections across all privatization programs in the developing world. While acknowledging that these two privatization programs were able to increase the number of new connections, Hall and Lobina also state that this was possible only after a renegotiation of the contracts as the private companies failed to meet the required investment levels. Several years later, Hall (2010, p. 1) would report of the dreadful

performance of the Jakarta water privatization: service coverage at 43% (lowest in Asia); supply duration at around 17 hours per day; non-revenue water at more than 50%; highest water tariff in the region; and very low water quality. On the other hand, in Metro Manila, the two concessionaires have installed a total of 1.29 million additional connections from 1997 to 2014 (computed from IFC, 1996, p. 1; MWCI, 2014b; MWSI, 2014b; Table 2). Given these developments in Metro Manila and Jakarta, Metro Manila's water privatization may have connected the most number of households compared to other similar programs in the developing world. While many water privatization programs have either been terminated at an early stage or not renewed upon contract expiry (see Gleick et al, 2002; Hall & Lobina, 2006; Castro, 2007; Marin, 2009), the Metro Manila program has been operating for the last 18 years (with a 15-year extension already granted), a remarkable feat in the global water privatization portfolio. In some ways, such longevity is also a testament to the effectiveness of the concession agreement binding both state and private actors. Despite the initial failure by an original private concessionaire, the concession agreement has allowed the Philippine government to secure a replacement operator in the west zone that has made notable progress in improving operating efficiencies. In addition, the private concessionaires have been expanding their operations locally and in other Asian countries, with MWCI operating 4 other local water systems and 3 water projects in Vietnam (MWCI, 2014b) and MWSI obtaining 5 water contracts in the Philippines (Villanueva & Valencia, 2014).

As of 2013, the two private water concessionaires have invested nearly US\$2.3 billion (based on data from MWCI, 2012a, p. 58; MWCI, 2014d, p. 15; Soriano, 2013, p. 29; MWSI, 2015a) since commencement of the program in 1997. As seen in Table 2, overall water service has significantly improved under the two concessionaires. Nonetheless, a major complaint

against the privatization program is the high price of water (Freedom from Debt Coalition, 2009; IBON Foundation Inc., 2012), considering that 2014 water tariffs have substantially increased (in real terms) by 342% and 618%<sup>21</sup> for the West Zone and East Zone, respectively, since commencement of privatization (see MWSS, 2014b for tariff history). Given this scenario, how do existing tariff levels affect the different socio-economic classes' ability to pay? What major factors influence water expenditures and how do these influences vary across socio-economic classes? Though combined water service coverage has reached 87%, on a much larger consumer base, what is the experience of roughly 2.4 million people<sup>22</sup> who are not connected to the concessionaires' networks? How have impoverished households fared as regards water services, in comparison to other socio-economic classes? Where do these communities source their water requirements and how much of their household incomes do they spend on their water needs?

To answer all these questions, MWSS needs to address the bigger issue related to its current performance assessment methodology. MWSS must ask: What parameters and assessment methodology should it implement to ensure that it is able to meet its goal of providing equitable access to clean and affordable water as expressed by its mission statement? To answer these queries, this research engages the concept of social and hydrological systems, with the former encompassing the water users and the latter embodying the natural and built environments of the water system. Viewing water as a "critical-to-life resource," MWSS has recently acknowledged the importance of water security for Mega Manila, committing itself to the implementation of a holistic and sustainable approach to water delivery, management and use (MWSS, 2012a, p. 1). Water security, as defined by Grey et al. (2013), is the provision of an

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<sup>21</sup> In nominal terms (with inflation), water tariffs for the west and east zones have increased by 552% and 829%, respectively, as of 2014.

<sup>22</sup> This figure was based on the MWSS RO service coverage estimates and the population served by the concessionaires.

acceptable quantity and quality of water that is necessary for health, livelihoods, ecosystems, and production, while acknowledging the existence of an acceptable level of risks to the socio-economic and ecological systems in the provision of such water. In pursuing such an ideal, MWSS must address fundamental issues related to the socio-economic, political and technological aspects of the water system, generally ascribed to its social and hydrological systems. Hydrological parameters (such as rainfall level, stream flow, reservoir levels, water production volumes, network flow, water pressure, supply availability, water quality) are generally easy to measure. Parameters pertaining to the human component are equally important, though generally difficult to identify and, even more, to measure. Of special interest for the research will be to measure the success of the water provision from the viewpoints of equity and social welfare.

Water is a highly politicized resource, and oftentimes, the continuity of programs in this sector is determined by the election results. The implementation of a water security legacy plan by MWSS is an attempt to ensure the stability of Metro Manila's water sector by institutionalizing its long-term programs for both hard and soft infrastructure. As institutionalization is a difficult process, MWSS will need to provide continuing support and intervention for its privatization program, within the bounds of the concession agreements it had signed with the concessionaires, and at a level that has been properly ascertained. In order to do so, MWSS will need a performance assessment framework that balances the interests of consumers and private water operators, one that ensures the attainment of equity with improved efficiency. In the absence of such a regulatory tool, MWSS may provide too much support for the concessionaires without the benefits of increased household connections, improved service, and affordable tariffs for all consumers. Additionally, the importance of this assessment

framework should be taken in the light of new water projects the private concessionaires are acquiring, both locally and overseas (see MWCI, 2014b; Villanueva & Valencia, 2014). If properly enforced, policies that promote equitable benefits for all consumers will become part of their operating process and practices. With much optimism, consumers in other water concessions, whether within or outside the Philippines, would be able to benefit as well.

Much attention has been given to the provision of water supply, but there have been relatively few activities for sewerage service. Conspicuously absent from the privatization scorecard is the extent of sewerage service coverage which both concessionaires are aptly responsible for. It should be mentioned that the sewerage service targets have been pushed significantly back during the 2008 rate rebasing exercise and the 2009 term extension agreement (see MWSS, 2009). Despite the softening of sewerage targets, both concessionaires have fallen short of these targets by 3 to 4 percentage points as of 2011 (MWSS, 2012a, p. 33). For Metro Manila, the combined coverage of the two concessionaires is only about 10%, a slight increase of 3 percentage points since the start of privatization (see MWSS, 2012a, p. 33; MWSS RO, 2004, p. 14). A reflection of the global results on the MDG for sanitation, the existing sewerage service coverage in Metro Manila illustrates that the concessionaires are still a long way from meeting the urban sanitation requirements. Because capital investments for sewerage is higher than those for water supply, it is more difficult to get the consumers to pay for sewerage services. In this regard, MWSS may have to extend more support and intervention for sewerage services vis-à-vis those already provided for water supply, possibly by way of subsidies, direct funding, or tariff increases. Again, how does MWSS determine the proper level of sponsorship it must provide to the concessionaires concerning the provision of sewerage services? The research advocates that

the level of state support should be based on the level of services provided to the most vulnerable of all consumers, the impoverished households.

While I acknowledge that Metro Manila's sanitation conditions are equally important, I do not tackle in this dissertation the performance assessment for sanitation and sewerage services provision. Nevertheless, I am confident that the SHS methodology that I have developed for this research, which deals with water provision, is also suitable for assessing equity conditions related to urban sanitation. As sewerage targets start ramping up in 2016 (MWSS, 2012a, p. 33), I am hopeful that the SHS approach will be accepted by MWSS as a valuable assessment framework, once they are able to comprehend its underlying concepts and see the performance assessment results for water provision.

## **2.5 Conclusion**

In 1997, the Philippine government implemented a landmark water privatization program, handing over to the private sector the responsibility for providing water services in Metro Manila. Having tried several public sector provision programs in the past, the Philippine government, a willing partner for market-oriented reforms, saw privatization as a way of improving water provision for the country's primate city. Almost nineteen years into the program, two private concessionaires have invested nearly US\$2.3 billion to achieve conditions of increased water service coverage, low non-revenue water levels, and continuous supply of good quality water. Yet, NGOs and consumer groups are still voicing out their concerns about the urban poor's inability to access and afford water supply, particularly as nominal values of water tariffs have increased by more than 500%. It is in this light that I examine privatization experiences of households across the different socio-economic classes and assess these

experiences using a new policy norm, that of water inequity. I do so using the concept of social and hydrological systems, which I comprehensively discuss in the succeeding chapter.

## **Chapter 3: Methodology - Assessing the State of Equitable Water Provision in Metro Manila**

### **3.1 Introduction**

This chapter defines complex water systems in terms of their social and hydrological components and discusses their nature as well as the external factors that influence them. The chapter then presents a methodology to examine the equity dimensions of current water provision in Metro Manila using information obtained from the consumers (social system) and the natural and built environments (hydrological system). This framework utilizes a set of select indicators (i.e. service coverage, water pressure, water quality, water supply availability, and affordability) to assess the state of urban water inequity, conditions when poor households experience lower levels of water service or are unable to afford them compared to their more affluent counterparts. In assessing equity conditions related to urban water provision, the chapter suggests a broader equity review for the Metro Manila water system, noting the existence of a rural-urban equity nexus arising from contested water supply allocations for rural farmers and urban consumers during periods of severe water scarcity.

### **3.2 Social-Hydrological Systems**

Water is the lifeblood of the hydro-social cycle, defined by Bakker (2003, p. 337) as “a complex network of pipes, water law, meters, quality standards, garden hoses, consumers, leaking taps, as well as rainfall, evaporation, and runoff.” Yet, the water flow is as much dependent on institutions and practices as it is on the hydrological cycle (Bakker, 2003). This reinforces La Porte’s (1994) notion that institutional or social aspects of technology are equally important as its physical and economic attributes. La Porte (p. 271) also states that technological

systems are networks of social and organizational relationships, with technology intrinsically a part of the human process. Hence, network measurements do not only provide information on the physical attributes of the water system, but they also represent the interlocking effects of consumer habits, management strategies, institutional governance, politics, and economic policies.

The city's water system can be seen as “an artefact of its hydro-social cycle, influenced by social, technical, and economic practices of previous generations” (Bakker, 2003, p. 337). Urban water systems in the developed world represent many phases of industrialization and corporatization of water management. For cities in the developing world, the urban waterscape is not homogenous, often characterized by many alternative service delivery mechanisms (see Bakker, 2003). Water systems are thus embodiments of the social, economic, technical, and ecological footprints arising from successive generations of governance, political ideologies, operations, and investments. To understand their state of interlocking operations means understanding the hydro-social cycle and inner workings of their social and hydrological natures.

This research develops a holistic approach to better understand the complex processes and relationships between the social and hydrological components of a water system. Building on the Social-Ecological Systems [SES] paradigm (as discussed in the works of Adger, 2006; Cumming et al., 2005; Folke, 2006; Ostrom, 2007, 2009; Reynolds et al., 2007), the research acknowledges the complex and interlinked nature of Social-Hydrological Systems, with interactions that are continuous, non-linear and varying across temporal and spatial scales. The SHS framework is also guided by Liu et al.'s (2007) statement on the need to identify and understand the processes linking human and biophysical systems as well as the reciprocal effects resulting from their interactions.

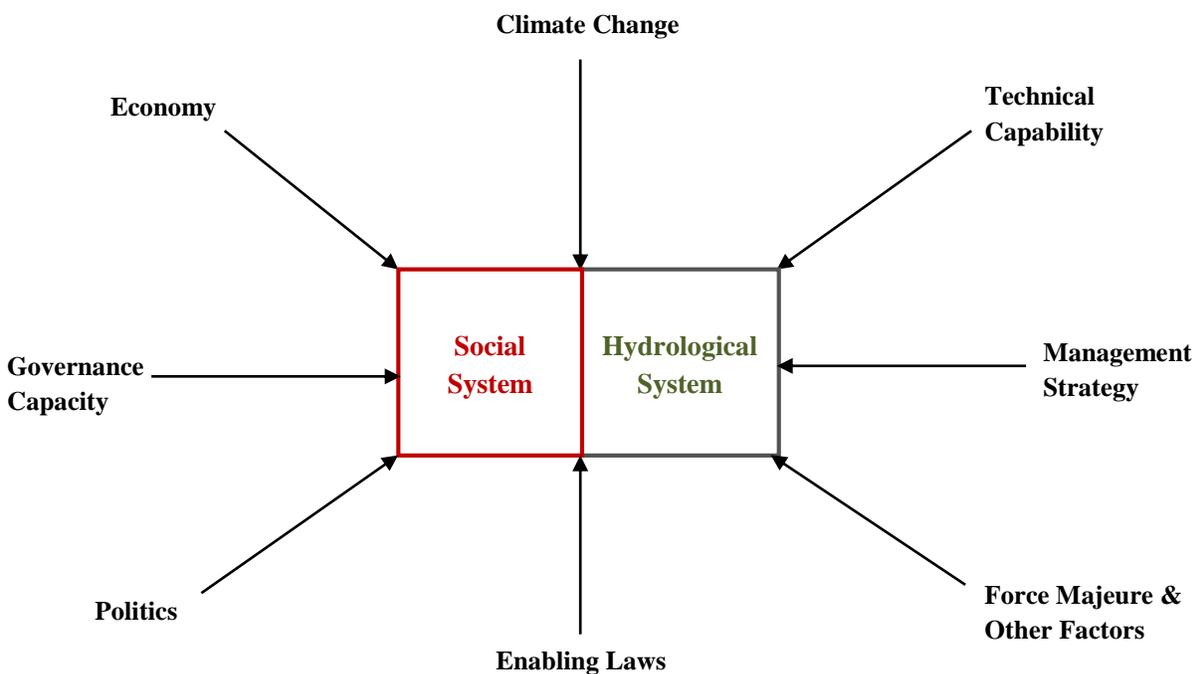
The SHS framework that I use in this research differs from the socio-hydrology concept developed by Sivapalan, Savenije, and Blöschl (2012), despite similar core principles that view humans as part of the water cycle. Sivapalan et al. (2012, p. 1272) describe the latter as “a new interdisciplinary but quantitative science of people and water, with the ambition to make predictions of water cycle dynamics” to support sustainable water management. Socio-hydrology, a branch of the hydrologic science, explores the dynamics and co-evolution of coupled human-water systems through quantitative means in order to test hypotheses, model the systems, and predict their future states (Sivapalan et al., 2012). Most of its applications involve modeling interactions and feedback between human and natural systems for effective decision making related to water resource management (see Blair & Buytaert, 2016; Liu, Tian, Lin, Sivapalan, 2015; Sivapalan, 2015).

For this research, I use the Social-Hydrological Systems framework (as shown in Figure 3) to assess the state of equitable water provision across the Metro Manila waterscape. Contextually, the social component encompasses the consumers, their consumption requirements, traditions, practices, and habits. The hydrological component embodies the natural and built environments that produce, process, and distribute water, inclusive of the water reservoir, bulk water conveyance system, water treatment plants, treated water distribution networks, pumps, and meters. Kaika’s (2005) notion that underground network of pipes connecting water reservoirs to homes are symbols of the interlinked systems of humanity and nature, lends further support on the need for a combined social and hydrological natures approach when analyzing water systems.

Coupled SHS are affected, shaped, and modified by the governance capacity of state agencies, technical capability and management strategy of water operators, enabling laws and

regulations, politics, climate change, economic conditions, and other influences (see Figure 3). Water governance requires the institution of a mix of influences that increase the ability of social and hydrological systems to mitigate and/or adapt to conditions that stress or adversely affect their capability to function effectively. Whether public or private provision of water service, these influences leave imprints on the social and hydrological systems that are distinct for each and every water system. Water governance also requires effective assessment programs and feedback mechanisms to ensure that both systems work towards policy directions set by the state.

**Figure 3. The Social-Hydrological Systems Framework**



SHS framework diagram drawn by Author (2015). An understanding of complex water systems requires an understanding of the hydro-social cycle and the inner workings of their social and hydrological natures.

The state takes on very important roles in water provision; aside from being policy maker, the state acts as service provider for public sector provision or regulator for private water

provision. While water governance may differ for these two modes of provision, the underlying requirements are the same. The state needs to strengthen institutions and implement informed policy decisions to ensure the delivery of water for all users. For public water systems, the line separating the roles of provider and regulator is often blurred, with informal relationships and common staff performing both functions. In addition, public water utilities in developing countries are normally characterized by their inability to operate efficiently and their failure to recover the full cost of water provision (see Kikeri & Nellis, 2004; Bakker 2007), resulting in losses and poor delivery of water services. As previously noted, a common response of the state to problems of weak governance and inefficient operations is to privatize public utilities (see Bakker, 2007). However, governments implementing water privatization projects face certain challenges arising from the natural monopoly character of water, weak regulatory environment, legal issues on private provision of public infrastructure, and opportunistic behavior of the private entities involved. This shift from an approach that had previously emphasized public infrastructure provision has placed increasing demand on the public sector to build capacity to meet these challenges.

After privatization, the state takes on new functions, basically transitioning from service provider to regulator. More often than not, the state moves from one form of intervention to another to be able to correct market failures that are intrinsic in natural monopolies (see Feigenbaum & Henig, 1997). Many developing countries lack legislation that effectively regulates against monopolistic behavior (Parker & Kirkpatrick, 2005). For privatized water systems, the absence of a competent and effective regulatory institution has led to opportunistic and purely profit seeking motives by private operators, eventually resulting in many contract renegotiations (see Casarin et al., 2007). Ultimately, failed renegotiations end up in litigation,

arbitration and government takeover. Thus, a weak regulatory regime may cause a failure of privatization and create a situation which returns the operation of the water system to the government. Essentially, the state must also be able to institute a regulatory environment that adequately balances the interests of both consumers and private service providers. Towards this end, the SHS framework helps calibrate and foreground equity and efficiency issues that regulators and policy makers normally deal with.

As earlier stated, water systems are defined by a set of influences that affect and even modify their social and hydrological systems. Hence, the provision of universal service varies from country to country, oftentimes dependent on the level of economic development, culture and norms, and institutional governance (Franceys & Gerlach, 2009). The proportion of people with access to clean water supply increases with economic development as measured by per capita GDP, though the relationship is not linear but logarithmic, implying that very large investments are necessary to deliver this service to underserved populations (Prasad, 2006). This usually takes a very long time to happen as verified by a study made by Franceys & Gerlach (2009, pp. 460-461) for a secondary European city, where universal service coverage was only attained more than a century after networked water supply was introduced, with an accelerated pace occurring only after a significant increase in per capita GDP. As such, developed countries, having invested much in the necessary infrastructure, have been relatively successful in the provision of universal access to water vis-à-vis the track records of countries from the developing world. Similarly, privatization objectives also may vary depending on the country's level of economic development. According to Parker & Kirkpatrick (2005), a primary objective of developed economies in implementing privatization is to increase economic efficiency; and while the same is true for developing economies, the latter also use this program in the hope of

reducing poverty and promoting sustainable economic growth. In the Philippine context, privatization/PPP programs were implemented to develop the necessary public infrastructure that would make the country an attractive investment destination (see PPP Center, 2015). Likewise, the implementation of such programs is also intended to create jobs related to the construction and operation of public infrastructure that otherwise would not be available. Noting that the mix and scale of external factors that influence water systems are unique for each country, the implementation of the SHS framework will therefore require strategies, policies and modes of action that are adapted to its social, natural and built environments.

### **3.3 Balancing Efficiency and Equity Concerns**

Previous research assessing the performance of water utilities focused on measuring productivity and efficiency levels. With concentration on the operational aspects of water utilities, the results of these studies tend to offer a limited view of the overall performance of municipal and urban water systems. Mbuvi, De Witte, and Perelman (2011) evaluated the performance of water utilities, mostly public, in 21 African countries using measures of efficiency and effectiveness (the ability to provide universal coverage of quality and reliable water supply), concluding that these utilities were more technically inefficient than ineffective. Corton and Berg's (2009) study on the efficiency of water service providers in six Central American countries, using total productivity indices and benchmarking techniques, was hampered by the absence of data due to limited record keeping and fragmented service provision in the region. Abbot, Cohen, and Wang's (2012) assessment of state-owned water and wastewater firms in six major Australian cities, using number of connections and reductions in water leakages and sewerage overflows as measures of efficiency, revealed signs of productivity

growth in some cities, albeit relatively slow and only during the initial phase of the study period. From a study of 122 public and private water utilities across the Netherlands, England and Wales, Australia, Portugal, and Belgium, De Witte and Marques (2010) established that providing clear and well-structured incentives increase the volume of water supply and the number of new connections. Without competitive markets, benchmarking also increase efficiency by creating competition by comparison (De Witte & Marques, 2010).

Prasad (2006) acknowledges that some studies show improved profitability and operating efficiency by privatized water systems. However, Prasad (2006) declares that it is still uncertain as to whether or not this improved micro-economic performance translates to poverty reduction, given the few research projects that look at privatization-related poverty issues. As such, there is a pressing need to conduct research that assesses the effects of privatization on poverty reduction and consumer welfare. It is necessary to ensure that practices favoring economic returns should be replaced with paradigms promoting a balance between the well-being of the consumers and the critical requirements of the natural and built environments, between profitability and public service, as well as between efficiency and equity. Given the realities on the ground, *how then do we define and assess the state of equitable provision in an urban water system, particularly for poor communities?*

### **3.4 SHS Framework for Assessing Equitable Water Provision in Metro Manila**

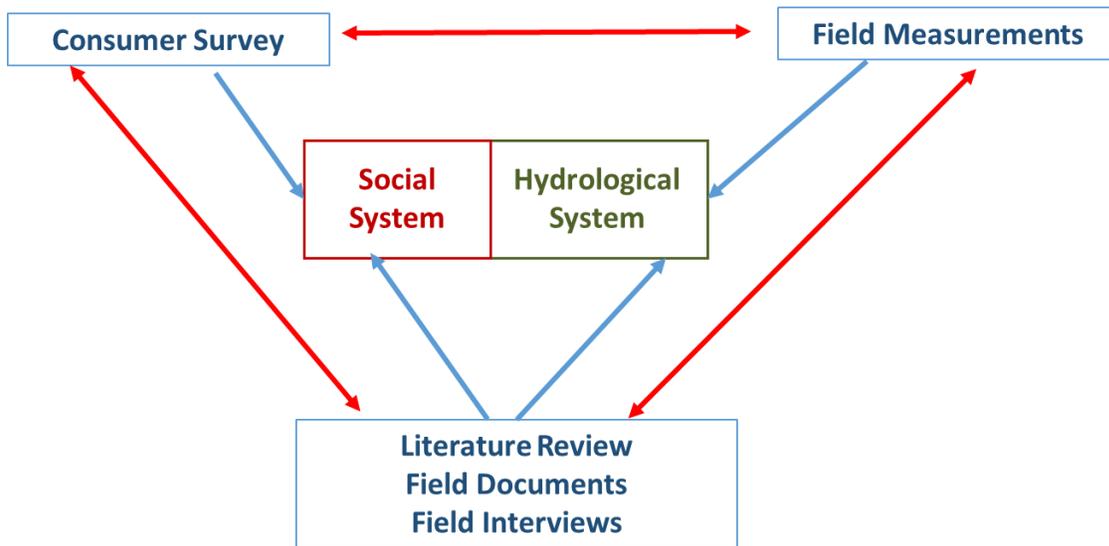
Using the Metro Manila water privatization as a case study, I examine whether or not the program has been beneficial to all consumers, irrespective of socio-economic class. Moreover, from an environmental justice perspective, I evaluate the influence of socio-economic class on performance indicators that are used to identify the existence of urban water inequity.

Specifically, I assess the performance of two private service providers, Maynilad Water Services, Inc. and Manila Water Co., Inc. (west and east concessionaires, respectively), in addressing the water needs of poor communities. This research is guided by the underlying notion that the privatization program's success is not measured in terms of profits generated by the private concessionaires, not based on abstract notions of efficiency, but more adequately, in terms of their ability to provide access to clean and affordable water for the impoverished consumers who are often excluded from the networks as they are deemed unprofitable and risky (see Budds and McGranahan, 2006 for more discussion on private water provision for low-income areas). The poor are important urban residents as they provide many of the essential goods and services necessary to keep the city running. Yet, they live mostly in informal settlements/squatter communities with limited access to affordable and clean water. Such living conditions result in high incidences of water borne diseases, lost productivity, public health threats, and loss of human dignity (Water and Sanitation Program & PPIAF, 2002). To assess the pro-poor performance of the private operators, I use the coupled Social-Hydrological Systems framework as shown in Figure 4, utilizing feedback from the consumers as well as information on the natural and built environments of the Metro Manila water system.

Hydrological system data were obtained from field measurements made by the private concessionaires, contained in the regulatory and performance reports submitted to the Metropolitan Waterworks and Sewerage System. These reports provide details of concessionaires' accomplishments vis-à-vis the service targets for service coverage, water pressure, water quality, water availability, and customer service. Moreover, they contain current financial information such as billed volume and collection, operating expenses, and capital

expenditures. When necessary, other relevant regulatory reports were also requested from MWSS, as with additional data or clarifications from the two private water firms.

**Figure 4. SHS-Based Methodological Framework for Assessing Equitable Provision of Metro Manila Water**



Methodology diagram drawn by Author (2015). Findings arising from the consumer survey of the Metro Manila Water Demand Study are triangulated with field measurements reported by the concessionaires, privatization documents, field interviews, and literature review.

Vital information on the social system, the consumers, were obtained from the results of an extensive household survey conducted by the UP National Engineering Center<sup>23</sup> [UP NEC]. This consumer survey was part of a study undertaken in 2011, the purpose of which was to forecast the water demand for Metro Manila over the next 25 years (UP NEC, 2011a, 2011b). Throughout the research, this study will be referred to as the Metro Manila Water Demand Study [MMWDS]. Unlike previous surveys conducted by the UP NEC for the Public Assessment of

<sup>23</sup> The UP National Engineering Center (a unit of the College of Engineering, University of the Philippines) undertakes continuing engineering education, research and development, technical consultancy, and publications related to the engineering field (UP NEC, 2010a). Since commencement of Metro Manila’s water privatization, the UP NEC has conducted 6 Public Assessment of Water Services, the results of which were used to monitor and evaluate the performance of the concessionaires (UP NEC, 2011e, p. 5).

Water Services [PAWS], the aforementioned survey covered all cities and municipalities in the MWSS service area, inclusive of those connected and unconnected to the networks of the two private firms (see UP NEC, 2010b, UP NEC Official, Personal Interview, February, 17, 2014). Yet, like PAWS, this survey contains valuable data that may be used by MWSS to regulate and monitor the private water firms' performance as well as promote public awareness and participation in the assessment of the latter's performance regarding water service provision.

Proper structuring of the SHS framework requires the use of select indicators, which Milman & Short (2008) consider as necessary for establishing base line conditions, forecasting future trends, monitoring systems across spatial and temporal scales, conducting performance reviews, and providing early warning signs. In the context of public policy, they provide value-free metrics for decision-making and help set policy directions. The following indicators were identified and systematically examined across different socio-economic classes: *access to water connections; water pressure; water quality; duration of water supply; affordability*. These indicators were used to ascertain the existence of urban water inequity, generally considered as conditions for which impoverished communities experience low service connection rates, poor water quality, low water pressure and short availability periods, and unaffordable water tariffs. Since conditions in the field vary across spatial and temporal scales, results may not be homogenous, with water inequity scenarios determined by realities on the ground.

Low or no access in poor neighborhoods, a possible indication of the undesirability of this consumer class as far as the private concessionaires are concerned, may require the implementation of new or revised policy guidelines to address service connection issues in such neighborhoods. Under the Metro Manila water concession agreements (MWSS, 1997a, 1997b), it is the responsibility of the two private water companies to connect 94%-97% of all consumers to

their main water networks by 2011. Using the new MWSS Regulatory Office formula, the two concessionaires were only at the 86%-87% levels for that period. On this issue, it is worth mentioning that the definition for service coverage at the time of bidding for the concessions was a bit vague and subject to interpretation. Hence, there is a need to define service coverage properly using guidelines that enable connections to as many households as possible, in a manner that is both fair and reasonable.

For connected poor households, conditions of water inequity are present if the levels of service provided to them in terms of water supply availability, pressure, and quality are below the standards set by MWSS or the standard norms for urban drinking water. As an indicator, water pressure also affects water quality and supply since low water pressure may result to low water quality and may indicate poor water supply conditions. In the field, the private operators measure water pressure and supply availability at several gauging points in their networks (see MWSI, 2014c, 2014d; MWCI, 2014e, 2014f). Aside from their daily quality control tests, the concessionaires monitor the water quality on a monthly basis with other members of the Metro Manila Drinking Water Quality Monitoring Committee to make sure that their products meet the Philippine National Standards for Drinking Water (MWCI, 2015b; MWSI, 2015b). For both connected and unconnected poor households, affordability of water tariffs is also a good water inequity indicator as it brings to light the different reasons why such a life-supporting resource is beyond the reach of ordinary people. Examined across the different socio-economic classes, affordability may be measured as a percentage of water expenditures to household income or total household expenditures, and benchmarked against a maximum threshold of 5%<sup>24</sup> (see World Bank, 2008; Fankhauser & Tepic, 2007).

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<sup>24</sup> The World Bank uses a 3% - 5% affordability threshold while the Asian Development Bank prescribes a 5% limit based on household income (World Bank, 2008; Fankhauser & Tepic, 2007).

Results generated from consumer data were triangulated with interviews of major privatization stakeholders and contextualized with a review of relevant literature. Specifically, these results covered water supply availability, water pressure, water quality, consumption, water tariff, water expenditures, number of persons per household, connection fees, and other data necessary to complete the water inequity assessment. Furthermore, these results were cross-checked with documentation obtained from MWSS regarding tariff pricing, regulatory decisions, new water sources, and other related privatization concerns, together with primary information on actual operational results provided by the private concessionaires. These findings will help inform MWSS regulatory practices related to the service targets of the water providers, water infrastructure for the poor, tariff setting, and new water sources. Additionally, they will inform policy on future government programs requiring private sector participation in water systems and other key public utilities to better and adequately address the needs of low-income households.

In the interest of transparency and fairness, I again disclose that my previous involvements in the MWSS privatization, both in the private and public sectors, have helped facilitate access to primary sources of information as well as to officers and staff of major stakeholders in the water privatization program. Although I am extremely grateful for the assistance that MWSS, MWSI, and MWCI officers and staff have provided me during my field research in Metro Manila, I also consider the welfare of about sixteen million consumers in the metropolis. Hence, I am committed to use the information I have obtained for the conduct of an independent and scholarly research that will determine the prevailing conditions of water provision in Metro Manila, which will allow me to offer policy recommendations to address existing water equity concerns.

### 3.5 Consumer Survey

The SHS framework places equal importance on the social component, which comprises of the people who depend on the natural and technological environments of the water system for their daily water needs, collectively with their customs, daily practices, and beliefs. Feedback from consumers on their experience, impressions, and thoughts on vital privatization issues were obtained from a comprehensive household survey conducted by the UP National Engineering Center for the 2011 Metro Manila Water Demand Study. This study was used by MWSS for planning and development of a new water supply source, in line with its water security program for Metro Manila (see MWSS, 2012a). Currently, MWSS is bidding out, via the PPP process, a 600 million liter per day water supply project, known as the New Centennial Water Supply Project, to meet the increasing demand for urban water (MWSS, 2013a).

Surveys were conducted for all consumer groups, as classified below (see UP NEC, 2011a, 2011b):

- Residential - customers with purely household consumption
- Semi-business – customers that operate businesses out of their homes, such as convenient stores, repair shops, and small cottage industries
- Commercial – customers engaged in wholesale and retail trade, hotels and restaurants, banks, schools, and other commercial activities
- Industrial – customers engaged in construction and manufacturing activities

The research concentrates on residential households and thus, utilizes only the residential household survey, the consumer survey that will be referred to throughout this dissertation. The consumer survey used by the research covers 2,372 barangays<sup>25</sup> (or villages) of the west and east

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<sup>25</sup> A barangay is the smallest political unit in the Philippines and serves as the primary planning and implementing unit of the government's policies, programs, and projects. It may be created, merged, or abolished by a law or an ordinance of the local municipal/city council, subject to the approval of majority vote in a plebiscite. A barangay

zones, covering 53,773 respondents<sup>26</sup>. Table 4 presents the number of barangays and respondents surveyed in the service zones while Appendices A.1 and A.2 provide a breakdown of the number of barangays and respondents for each city and municipality that form part of the service areas of MWSI and MWCI, respectively. The number of barangays are not uniform across all Metro Manila cities and municipalities, with the west zone having more barangays, and its barangays being more densely populated than those in the east zone.

**Table 4. Number of Barangays and Respondents Covered by the Consumer Survey**

Service Zones	Number of Barangays	Number of Respondents
West (Maynilad Water)	1,810	37,170
East (Manila Water)	562	16,603
<b>Total</b>	<b>2,372</b>	<b>53,773</b>

Table developed by Author (2015) using data from UP NEC (2011a, 2011b). This research uses the MMWDS residential consumer survey which covers 53,773 respondents from 2,372 barangays.

Aside from consumption-related data, consumer feedback for the 2011 Metro Manila Water Demand Study provided information related to water supply, water quality, customer service, socio-economic profile, willingness to pay, and housing mix. Based on a review of the questionnaires and datasets, information provided by this consumer survey were similar to those contained in the household survey of the Public Assessment of Water Services. However, as previously noted, the consumer survey for the water demand study also covered households in areas that were not connected to the private water networks, such areas consistently not being included in consumer surveys of all 6 PAWS studies in the past. This was also confirmed in an

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may be created out of a contiguous population of at least 2,000 people and 5,000 people, for local government units outside and within Metro Manila, respectively (Local Government Code of 1991).

<sup>26</sup> Although the Bulacan municipalities of Meycauayan and Obando were included in the MMWDS consumer survey, they were excluded from the survey used by the research as they are not part of the MWSI service areas. MWSI only provides bulk water supply to the water districts in these municipalities.

interview with a UP NEC Official (February 17, 2014). Much as results of the PAWS consumer survey are commonly used for monitoring and evaluating performance of the two private concessionaires (UP NEC, 2011e), the consumer survey of the water demand study can also be used for the same purpose; albeit with an even more robust database because it includes responses from consumers both served and unserved by the private water firms. Results from these two areas are essential for proper evaluation of equity issues related to urban water provision and for crafting policies that will address such issues.

### **3.6 Indicators**

Information on the selected water inequity indicators were processed from a customer survey containing over 5,000,000 separate responses, based on more than 100 responses from each of the 53,773 respondents selected from barangays within and outside the water networks of the concessionaires. These indicators were examined across the different socio-economic classes to determine possible influences of socio-economic status on the provision of water services. In addition, geospatial trends for these indicators were investigated by processing consumer data and mapping out with GIS software the results for all the barangays that were included in the survey. Trends that were observed were cross-checked with actual field data measurements made by the concessionaires as well as personal interviews with the relevant parties. The remainder of this section discusses the manner in which information on water inequity indicators were determined from raw data provided by the consumer survey.

### 3.6.1 Access to Water Connection

As the consumer survey covered the entire MWSS service area, the research was able to establish geospatial profiles for households within and outside the concessionaires' networks. Aside from identifying the locations of these two sets of households, the survey provided essential information and defined certain patterns related to consumption, water expenditures, willingness to pay, water supply options, willingness to get connected to the networks, and other significant issues. In the process, the survey results were able to present the underlying dynamics in water provision for all types of households.

### 3.6.2 Water Pressure

Connected households were asked to rate water pressure during 4 six-hour periods using the following descriptions: strong, moderate, weak, or no pressure. Their responses were converted to numerical scores using the conversion table below:

**Table 5. Scoring for Responses on Water Pressure**

<b>Response</b>	Strong	Moderate	Weak	No Pressure	No Comment
<b>Score</b>	1.00	2.33	3.67	5.00	No Score

Table developed by Author (2015). The table shows numerical equivalent of qualitative responses provided by respondents on queries about the water pressure at the taps.

Average scores for two daytime and two nighttime pressure responses were computed. Based on the barangay-level pairwise ratings<sup>27</sup> (see Appendix B) for daytime and nighttime water pressure responses from a previous PAW study (UP NEC, n.d.; UP NEC Official, Interview, February 11,

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<sup>27</sup> Previous PAWS surveys asked respondents to rank the order of importance for certain parameters, particularly for water pressure and water quality. Appendix B provides a copy of the results of pairwise ratings determined from a previous PAWS survey.

2014), a unified score for water pressure was determined for each respondent. Using Table 6, this score was transformed back to a qualitative rating of water pressure.

**Table 6. Conversion of Unified Scores to Descriptive Ratings**

<b>Rating</b>	Very Good	Good	Fair	Poor	Very Poor
<b>Score</b>	1.00 – 1.50	1.51 – 2.50	2.51 – 3.50	3.51 – 4.50	4.51 – 5.00

Table developed by Author (2015). The table provides descriptive ratings for unified scores of water pressure and water quality.

A sample determination for water pressure rating by a respondent is presented in Table 7.

**Table 7. Sample Determination for Water Pressure Rating**

<b>BRGYCODE</b>	<b>Daytime Pressure</b>			<b>Nighttime Pressure</b>		
<b>3901029</b>	<b>6 AM – 12 NN</b>	<b>12 NN – 6 PM</b>	<b>Average DP</b>	<b>6 PM – 12 MN</b>	<b>12 MN – 6 AM</b>	<b>Average NP</b>
Response	Weak	Strong		Strong	Strong	
Numerical Score*	3.67	1.00	2.34	1.00	1.00	1.00
Pairwise Rating**	87%			13%		
Unified Water Pressure						<b>2.16</b>
Qualitative Rating***						<b>Good</b>

\*Based on Table 5

\*\*From Appendix B

\*\*\*Based on Table 6

Table developed by Author (2015). Sample responses to daytime and nighttime water pressure queries converted to numerical scores. Pairwise ratings are used to generate unified scores which have equivalent qualitative ratings.

Like other indicators, individual ratings are then used to determine the overall ratings for each socio-economic class and each barangay. Appendix C provides sample questions from the consumer survey pertaining to water supply, pressure, quality, and acceptable price increases.

### 3.6.3 Water Supply Availability

Consumers in connected areas were asked about their experience regarding the availability of water supply on a daily basis. Their answers provided the number of hours per day of continuous water supply they were able to receive.

### 3.6.4 Water Quality

Overall water quality was determined through questions probing the presence of a particular odor and taste (aside from that of chlorine), color, and foreign bodies. Affirmative responses to these parameters received a score of 5 while those in the negative received a score of 1. Unified water quality scores from these sub-indicators were computed using a weighted average formula, with weights provided by barangay-level pairwise ratings obtained from a previous PAWS survey (see Appendix B). Using Table 6, the unified score was then converted into a single qualitative rating of water quality, facilitating ease of understanding and appreciation. Table 8 illustrates the manner of determining the water quality rating from the responses of a surveyed household.

**Table 8. Sample Determination for Water Quality Rating**

<b>BRGYCODE</b>	<b>Water Quality</b>			
<b>3911023</b>	<b>Taste</b>	<b>Color</b>	<b>Smell</b>	<b>Foreign Bodies</b>
Response	None	Yes	Yes	None
Numerical Score	1.00	5.00	5.00	1.00
Pairwise Rating	17%	17%	29%	13%
Unified Water Quality				<b>2.57</b>
Qualitative Rating*				<b>Fair</b>

\*Based on Table 6

Table developed by Author (2015). Responses to sub-indicators of water quality are converted to numerical scores. Pairwise ratings are used to generate unified water quality scores, which have equivalent qualitative ratings.

The concept of using numerical scores for sub-indicators, then aggregating them into a single unified score for the selected indicator, and finally converting it into a single descriptive rating was originally used by the National Engineering Center for their PAWS study (see UP NEC, 2011c; UP NEC Official, Personal Interview, February 17, 2014).

### 3.6.5 Affordability

Affordability issues were evaluated by calculating the percentage of monthly water expenditures to total household income. The resulting percentage was benchmarked against a ceiling of 5% of household income (see World Bank, 2008; Fankhauser & Tepic, 2007). For this research, the annual income will be based on Africa's (2011) estimates for the different socio-economic classes, as provided in Table 9. However, these estimates will be adjusted to account for a higher number of persons per household, arising from many instances of multiple families sharing a common household connection, specifically in low income communities. The following chapter provides a more detailed discussion on the average number of persons per household for different socio-economic classes based on the consumer survey results.

**Table 9. Estimated Average Annual Income vis-à-vis Socio-Economic Class**

<b>Socio-Economic Class</b>	<b>Average Annual Income (In Thousand ₱)</b>
AB	1,857
C	603
D	191
E	62
<b>Total</b>	<b>206</b>

Adopted from Africa, T. (2011). Family income distribution in the Philippines, 1985-2009: Essentially the same. Quezon City: Social Weather Stations, p. 37. This table provides the estimated average annual income for each socio-economic class.

Additionally, connected households were asked at several points if they were willing to pay higher water tariffs to maintain or improve the provision of water supply; while unconnected households were asked if they were willing to pay higher water tariffs in order to connect to the main networks of the private concessionaires. Questions on acceptable levels of increases were organized as increasing price hike intervals, where the respondent stops to answer only when the final acceptable price hike interval was reached.

### **3.7 Socio-Economic Classification Used for the Consumer Survey**

The consumer survey used the ABCDE socio-economic classification typically used by market research organizations that are affiliated with the Marketing and Opinion Research Society of the Philippines (see Arroyo, 1990). Used as a proxy for wealth or household income, this classification is based on the community where the household is located, the construction materials used, available furnishings, and ownership of the house and lot (see UP NEC, 2013). Table 10 shows the guidelines used by the surveyors for the Metro Manila Water Demand Study.

Based on Africa's (2011, p. 37) study, the AB class, the extremely rich household, constitute only 1% of the total number of families in the country. Yet, their aggregate income is equivalent to the total income of the E class (extremely poor households), which constitute 30% of the total number of families in the Philippines. In terms of average annual salary, an AB household earns 30 times more than that of an E household. Per capita income of the E socio-economic class lies below the international poverty line of \$1.25 per day while per capita income of the D socio-economic class is slightly above the moderate poverty line of \$2.00 per day (see UN HABITAT & ESCAP, 2010). This research focuses more on the E households as they suffer the most from lack of water and other basic services.

**Table 10. Guidelines Used for the Identification of Socio-Economic Class**

<b>Classification</b>	<b>Description</b>
<b>AB (Extreme Rich / Rich Class)</b>	Dwellings are made of heavy/high quality materials, very well constructed, well-painted, generally with lawn or garden, located in an expensive neighborhood, with expensive furnishings.
<b>C (Middle Class)</b>	Dwellings are made of mixed heavy and light materials, well-constructed, painted, may or may not have a garden, adequate furnishing but not necessarily expensive. Generally found in mixed neighborhood of houses larger or smaller than the house of the respondent
<b>D (Lower Class)</b>	Dwellings are made of very light/cheap materials with scanty furniture, poorly constructed, generally no garden, usually located in shabby surroundings. Found mostly in neighborhood of houses generally of the same size, with occasionally larger houses
<b>E (Extreme Lower Class)</b>	A ‘barong-barong’ (shanty) type of dwelling, or a one-room affair in a poorly constructed house, dilapidated, bare, with hardly any furniture. Located generally among informal settlers or slum districts or interiors

Source: UP National Engineering Center. (2013). Sample PAWS survey questionnaire. Quezon City: UP National Engineering Center. *(With permission to use)* The ABCDE classification, used as proxy for wealth or household income, is based on the community where the household is located, the construction materials used, available furnishings, and ownership of the house and lot.

In addition to household level evaluations, the indicators were analyzed and mapped at the village level to assess geospatial variations across the service areas of the concessionaires. As Metro Manila villages are a heterogeneous mix of households and communities of different socio-economic classes (as shown from the results of the consumer survey), the assignment of the village’s socio-economic class was based on the predominance of certain socio-economic classes. Villages with AB neighborhoods, whether as a majority or part of the predominant socio-economic classes, were classified as belonging to the extremely rich and rich neighborhoods. Conversely, those with E neighborhoods, as a majority or part of the predominant socio-economic classes, were classified as extremely poor neighborhoods. Other combinations were considered, but these two types of villages played a major role in determining

the geospatial trends for the indicators. The effectiveness of these concepts will be more apparent when the results and findings obtained from the field data are presented in Chapter 4.

### **3.8 Field Research**

Seven months of field work in the Philippines were undertaken from 2013-2014. The field research was designed to support the coupled Social-Hydrological Systems approach using available consumer and technological data for the Metro Manila water system. The researcher was embedded into the MWSS organization, working at an office in their headquarters. This facilitated meetings and discussions with officers and staff of MWSS and the concessionaires. Likewise, this arrangement allowed for better access to privatization documents from MWSS and operational data from the concessionaires.

#### **3.8.1 Interviews**

Non-structured interviews with major stakeholders of the Metro Manila water privatization were conducted to gather firsthand information on their experience, knowledge, and views on the program. A total of 100 persons were interviewed, most of them (particularly those from MWSS and the two concessionaires) being interviewed on more than one occasion to get supplementary information or clarify certain issues regarding the program. Table 11 provides a general overview of the interviews undertaken, inclusive of the number of interviewees and the topics associated with them. These interviews offered a better understanding of the stakeholders' viewpoints on, assessment of, and/or future plans for the Metro Manila water privatization program as well as the broader issues related to the Metro Manila water system. Information

obtained from these interviews were used to validate and cross-reference the results provided by survey and concessionaire's operational reports.

**Table 11. List of Interviews**

<b>Organization / Cluster</b>	<b>No. of Interviewees</b>	<b>Topics</b>
MWSS Corporate Office	12	Metro Manila water privatization experience, major issues and problems; global water privatization history and trends; water governance and institution building; water security; future plans, specifically on new water supply sources
MWSS Regulatory Office	8	Regulatory issues; performance assessment results; PAWS survey; tariff history and policy; Social-Hydrological Systems framework; water provision for the urban poor
Private Concessionaires	37	Programs for the urban poor; service targets and self-assessments; operations & investments; major privatization issues and recommendations; future programs
Non-Governmental Organizations, Civil Society Organizations, Urban Poor Groups	14	Experiences of the urban poor, particularly accessibility and affordability of water services; major privatization issues and corresponding recommendations
National Engineering Center	4	PAWS and MMWDS: history, results, methodology, guidelines, formulas
Academics	8	Effects of privatization/PPP projects on poverty reduction
Other Stakeholders (Other Government Agencies, Private Sector)	17	Metro Manila water privatization
<b>Total</b>	<b>100</b>	

Table developed by Author (2015). A total of 100 people were interviewed during the field research in Metro Manila. Embedded at MWSS, this researcher was able to interview representatives of MWSS and the two concessionaires on more than one occasion.

### 3.8.2 Review of Primary Documents

The seven-month field research also involved a review of primary documents related to the Metro Manila water privatization. Aside from other source materials, the research used documents related to the MWSS history, privatization strategy, water tariffs, urban poor supply programs, water security, existing facilities, regulatory concerns, and future MWSS programs. Information on the urban watershed and water supply were obtained from documents on Angat Dam, inclusive of schematic diagrams, water operating protocol agreement, flood control and discharge guidelines, and an integrated water management study.

Data for the built environment (treatment plants, pipes, storage facilities, etc.) were sourced from the performance reports submitted by the concessionaires together with their long-range capital and operating plans; and the MWSS Regulatory Office's annual performance assessment reports for the two concessionaires as well as their rate-rebasing<sup>28</sup> resolutions. Additionally, the private concessionaires shared data on consumption and connection profiles as well as GIS maps showing current profiles of the distribution system, water pressure, availability, and non-revenue water levels. Operating data obtained from actual field measurements, which formed part of these documentations, helped validate and support critical feedback from the consumers. Furthermore, the NGOs contributed articles, reports, and case studies on water provision for Metro Manila's poor.

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<sup>28</sup> Every 5 years, there is a rate-rebasing exercise allowing the concessionaires to submit documents showcasing their past performances (operational and financial) as well as their proposed future operating and capital expenditures together with the projected results and benefits. These submissions are reviewed by the MWSS Regulatory Office to determine whether or not the concessionaires will be entitled to a tariff increase based on their performance and future programs (See MWSS Regulatory Office, 2013a, 2013b).

### **3.8.3 Site Visits**

Within the areas where the networks of the private concessionaires are in place, households in informal settlements are generally not connected directly to these networks because they are situated on land they neither own nor rent. To get water supply from these private networks, these households have to buy water from community-based water operators who buy water in bulk from the concessionaires and deliver them to individual households through above-ground plastic pipes, known in the local setting as “spaghetti connections.” This supply option provides them with 24-hour water supply of acceptable water pressure at a price that is higher than water directly obtained from the private water networks, but still lower than water delivery by cart or tanker, for which access is difficult and oftentimes, of poor water quality. This water provision mode will be discussed in more detail in Chapter 4. Visits were made to eight such systems within the service areas of the two private concessionaires.

### **3.9 Literature Review**

The research benefitted much from existing literature on water privatization and governance; Neoliberalism; human rights to water; equity and social justice; resiliency, vulnerability and adaptive capacity; Social-Ecological Systems; indicators and benchmarking; water pricing and affordability; water security; urbanization; poverty; and the political economy and history of Metro Manila. Moreover, other related literature were reviewed with the objective of establishing a strong foundation of knowledge and understanding as regards the issues being examined.

### **3.10 Conclusion**

In conducting this research, I have viewed Metro Manila's water system as coupled social (consumers) and hydrological (natural and built environments) systems that continuously interact with each other, generally influenced and affected by external factors such as the public sector's governance capacity, private sector's expertise, existing laws, politics, economic conditions, climate change, and other influencing factors. The research uses information from these two systems to assess conditions of inequitable water provision across the urban waterscape. Vital consumer information were sourced from a 53,733-respondent residential consumer survey, while technological information were obtained from direct field measurements reported by the concessionaires. General consumer-technological trends were cross-referenced, verified or supported by information obtained from personal interviews, site visits, primary documents, and relevant academic literature.

## **Chapter 4: The Realities of Water Equity Conditions in Metro Manila**

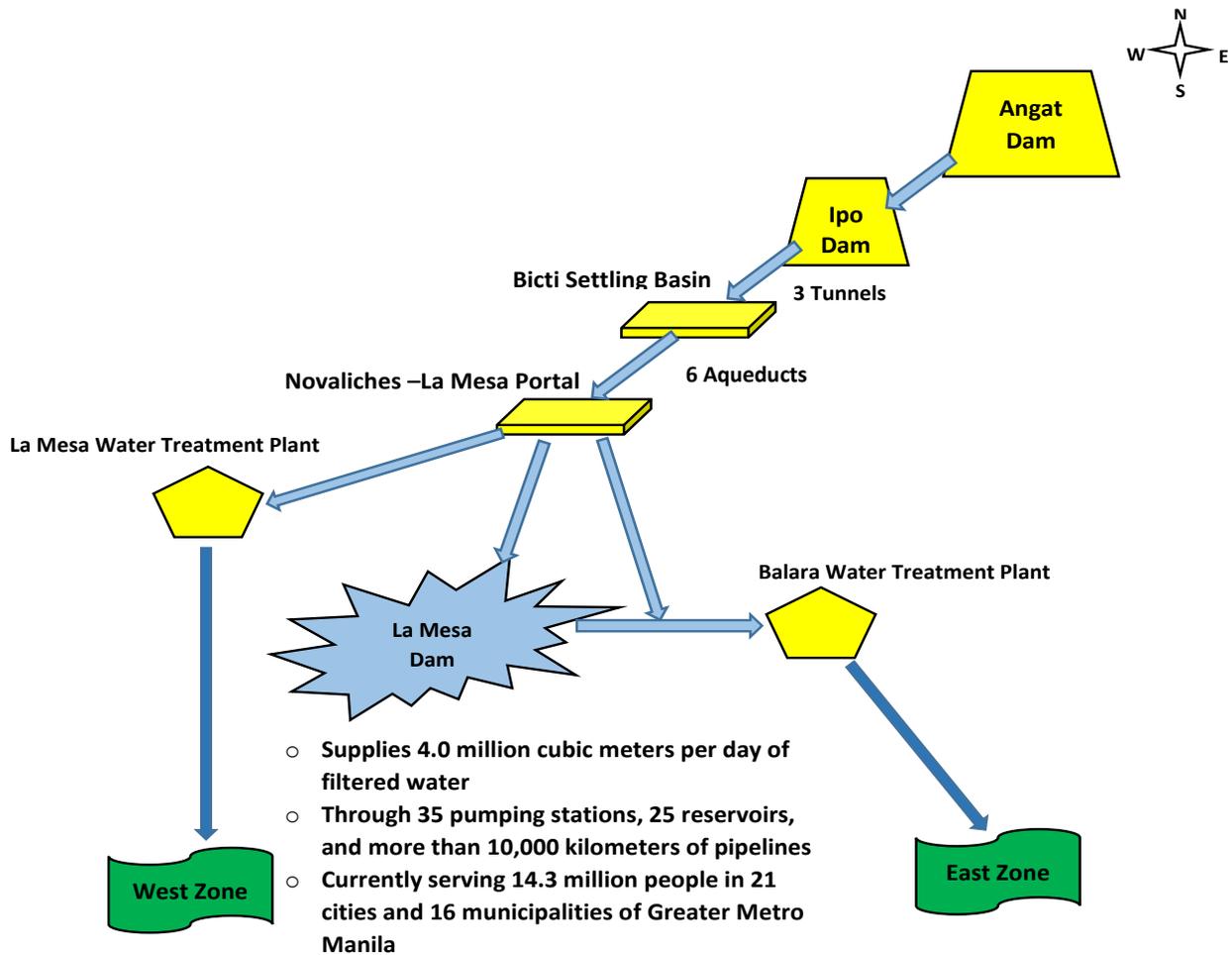
### **4.1 Introduction**

In this chapter, I apply the concept of Social-Hydrological Systems to assess water equity conditions for households within and outside the coverage of the private concessionaires' networks. Using consumer survey data obtained from the Metro Manila Water Demand Study, I examine consumer experiences as regards water supply availability, water pressure, water quality, affordability, and access to household connections. Analyzing these experiences across the different socio-economic classes allows for a better determination of conditions related to consumer benefits and welfare. In this chapter, I also describe the existing "North to South" water supply corridor and discuss its influence on the progression of water service connections across the concessionaires' service areas. Following the flow of water along this corridor, other relevant parameters are also examined to determine the geospatial trends that exist across the entire MWSS service area. Moreover, this chapter looks into the unique case of informal settlements served by community-based water operators, acting as substitutes for the concessionaires for the last stage of water provision in some pockets of the city. The chapter then unmasks the many faces of water inequity across the urban waterscape and explains the circumstances that propagate and support them.

### **4.2 "North to South" Water Supply Corridor**

By design, water from Angat Dam flows to Metro Manila households through a "North to South" supply corridor. Figure 5 below presents a simple flow diagram for Metro Manila's water system, starting from supply source to treatment plants, ultimately ending at the consumers' taps.

**Figure 5. Source-to-Tap Flow Diagram for the Metro Manila Domestic Water Supply**



Flow diagram drawn by Author (2015) using data from MWSS (2012a, 2014d); JICA et al. (2013). The Metro Manila “North to South” water supply system supplies 4.0 million m<sup>3</sup>/ day to 14.3 million people in 38 cities/municipalities. About 2.4 million people in the southern peripheries are not connected to the system.

Released through the auxiliary turbines of Angat Dam, water initially traverses to IPO Dam.<sup>29</sup> It then flows through three tunnels over a distance of 6.4 kilometers until it reaches the Bicti Settling Basin, where it is further conveyed by six aqueducts to the Novaliches – La Mesa Portal,

<sup>29</sup> Irrigation water is discharged from the main turbines and flows into Bustos Dam, a fixed-type river weir without gates, standing 79 meters high (Siopongco, Wassmann, & Sander, 2013, p.8). As part of the Angat Maasim River Irrigation System, this afterbay dam supplies water to 26,235 farmers in 20 municipalities of Bulacan and Pampanga, producing 185,000 tons of food per annum (Pascua, 2007, p.8).

located 15 kilometers away from the basin. At this portal, water is distributed to the La Mesa and Balara water treatment plants for the domestic water requirements of the west and east zones, respectively. Any excess water from the portal flows into the La Mesa Lake which will later on be used to supply the Balara treatment plants (MWSS, 2014d, p. 1). From the La Mesa and Balara treatment facilities, 4,000 million liters per day of water are distributed through 35 pumping stations, 25 reservoirs and more than 10,000 kilometers of pipelines (JICA et al, 2013 p. 48 of Chapter 7). As a “North to South” infrastructure system, water ultimately ends up in the southern border of 21 cities and 16 municipalities. Interestingly, around 14.3 million people currently served by the two private concessionaires (MWSS, 2012a, p.2) depend on water that is sourced from the mountains north of Metro Manila,<sup>30</sup> which is then transmitted over long distances until it eventually reaches the consumers in the southern peripheral areas.

### **4.3 Household Water Service Connections**

Water service connections to households track the development and expansion of the private concessionaires’ networks. The progression of household connections in the west and east zones may be established by juxtaposing the geospatial maps of all households included in the MMWDS survey with those of the concessionaires’ pipe distribution networks (Figures 6-7). While there are pockets of unserved communities within the networked areas, most of the unconnected households are at the periphery of the service areas: the southern urban periphery for MWSI and the southeast peri-urban areas for MWCI as shown in Figures 6-7. In general, these pockets of unserved communities are informal settlements and residential subdivisions,

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<sup>30</sup> Maynilad Water Services, Inc., the west zone provider, recently installed a 100 MLD water treatment facility at Putatan, Muntinlupa City (located southwest of its service area), sourcing water from Laguna de Bay (see MWSI, 2011).

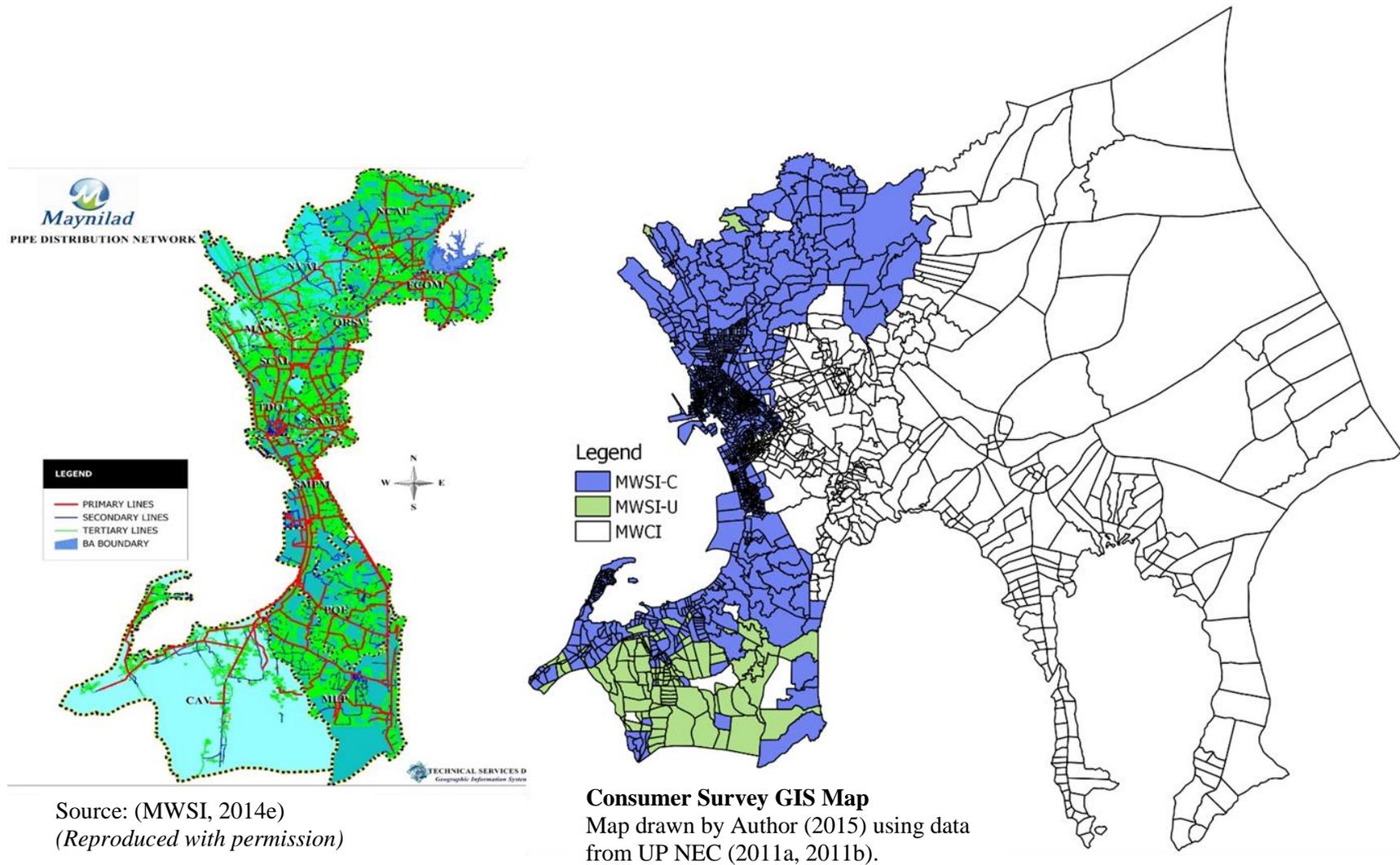
which are served by community-based water operators and housing associations, respectively, with water supply purchased in bulk from the concessionaires.

Many parts of the southern service areas were former relocation sites for inner city squatters and slum dwellers who were transferred from their previous domiciles in order to make way for government projects.<sup>31</sup> Large transfers of communities from within Metro Manila to its southern fringes align with Laquian's (1997) observation regarding the overall policy in developing countries to relocate such communities to urban peripheries. Moreover, Porio's (2002, pp. 85-86) study on the number of poor families affected by large infrastructure projects (i.e. roads, flood control, land reclamation) shows that most of these families were relocated to areas south of Metro Manila. Without jobs and adequate service facilities in the relocation sites, Laquian (1997, p. 297) observes high rates of abandonment for these sites, particularly mentioning one such program where 80% of the families left the site within two years of relocation. Using the socio-economic classification guidelines for barangays, which were developed by the research and discussed in Chapter 3, Figure 8 maps the socio-economic status of the barangays in the MWSS service areas based on consumer survey results of the water demand study. These maps support the trends observed by Laquian (1997) and Porio (2002), showing that barangays further away from central Metro Manila, particularly those near the metropolis' southern boundaries, generally belong to the lower socio-economic strata. While middle to high end residential communities are sprouting up in these areas due to urban sprawl, there are still many poor and extremely poor households found within these localities. Though probably not the intention, the "North to South" water supply scheme has made water access for these households difficult and seemingly inequitable.

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<sup>31</sup> Aside from areas in the south, there were certain localities in Bulacan which also served as relocation sites. However, these localities are not part of the MWSS service areas.

**Figure 6. MWSI Pipe Distribution Network vs. MWSI Connected and Unconnected Areas**

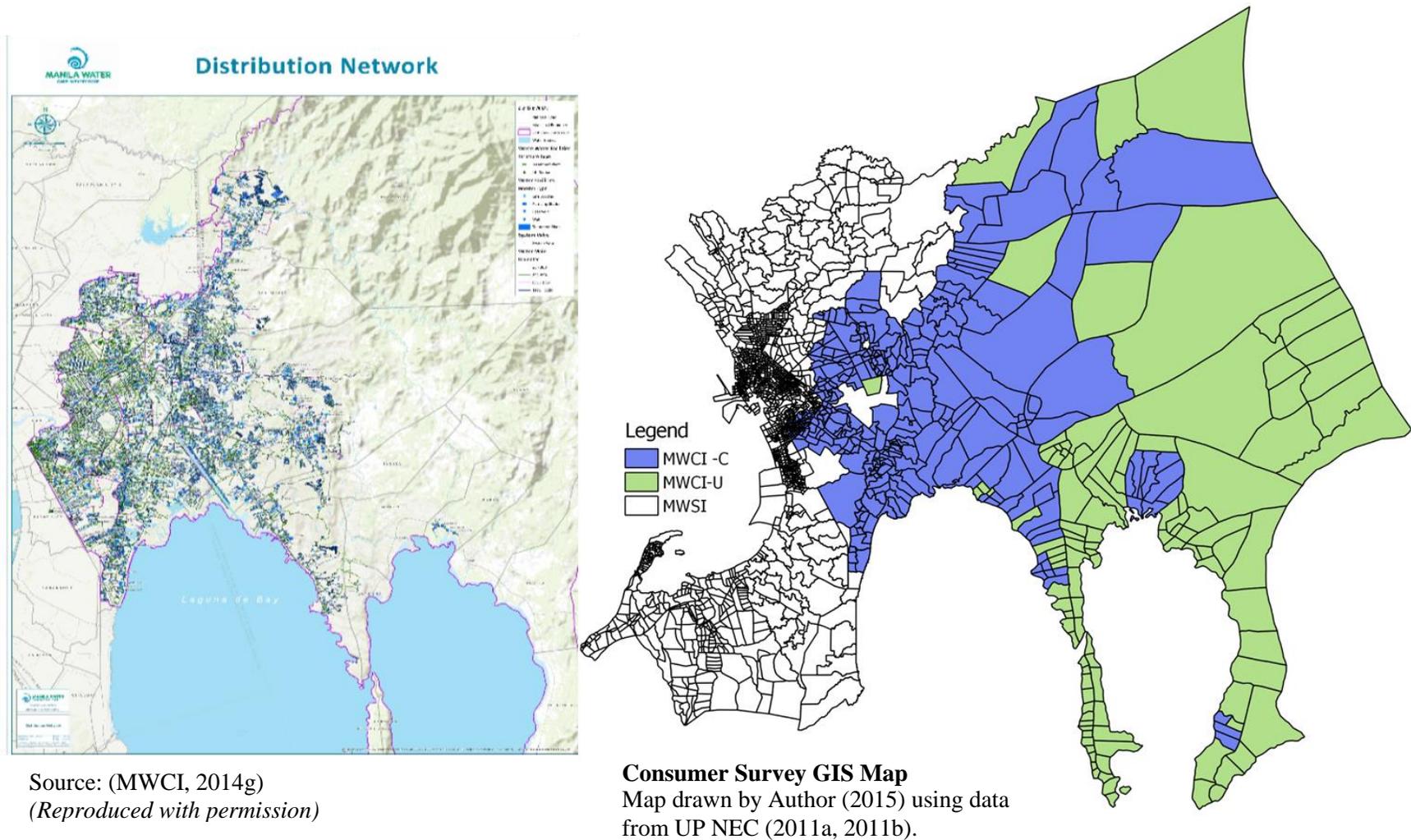


Source: (MWSI, 2014e)  
 (Reproduced with permission)

**Consumer Survey GIS Map**  
 Map drawn by Author (2015) using data  
 from UP NEC (2011a, 2011b).

Note: MWSI-C refers to MWSI connected areas; MWSI-U refers to MWSI unconnected areas; MWCI refers to service areas of MWCI  
 Most of the MWSI unconnected areas are at the southern peripheries of the west zone service area.

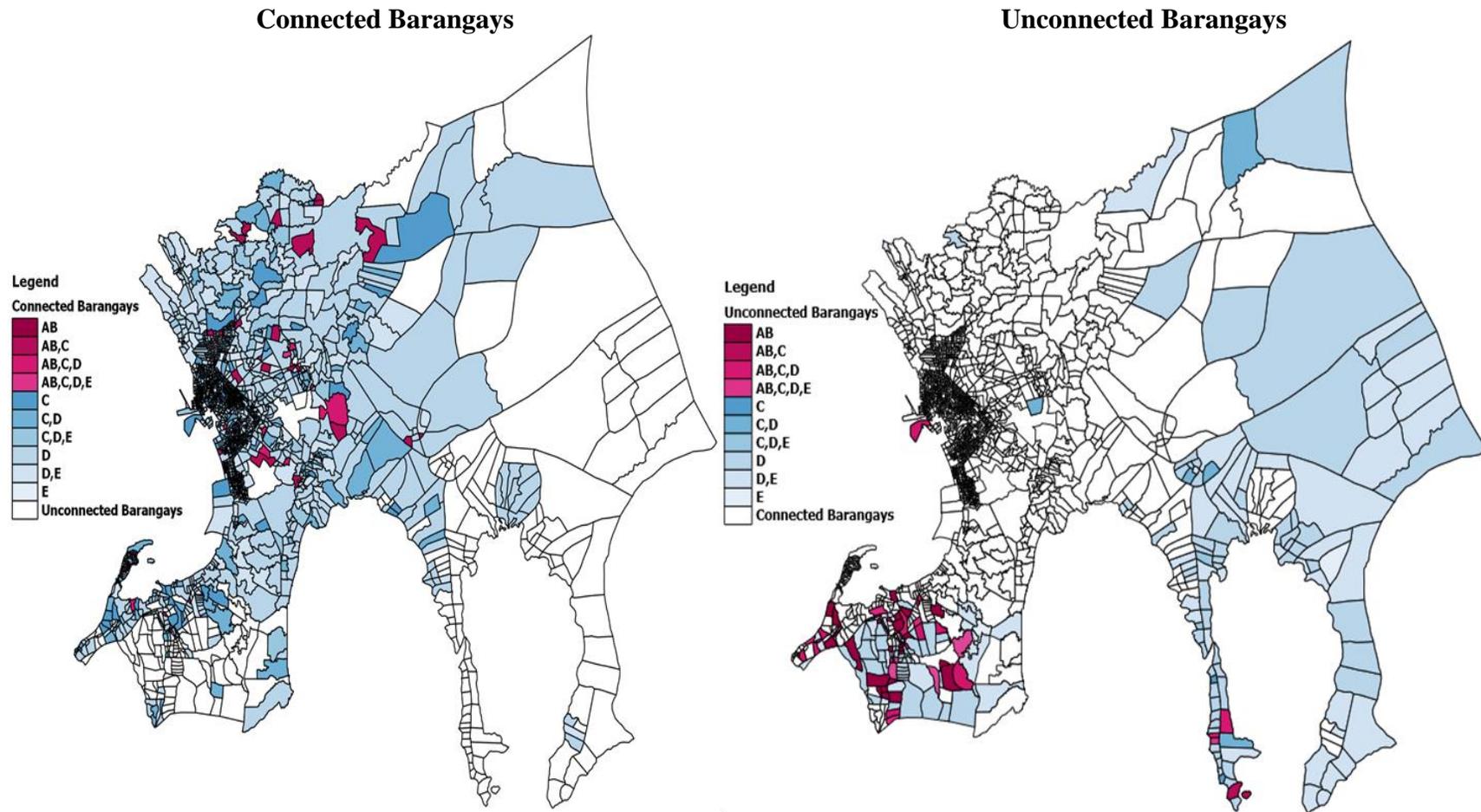
**Figure 7. MWCI Pipe Distribution Network vs. MWCI Connected and Unconnected Areas**



Note: MWCI-C refers to MWCI connected areas; MWCI-U refers to MWCI unconnected areas; MWSI refers to service areas of MWSI

Most of the MWCI unconnected areas are at the southeastern peripheries of the east zone service area.

**Figure 8. Socio-Economic Classification of Barangays**



Maps drawn by Author (2015) using data from UP NEC (2011a, 2011b). Maps show that barangays further away from central Metro Manila, particularly those near the southern boundaries of the metropolis, generally belong to the lower socio-economic strata. While middle to high end residential communities are sprouting up in these areas due to urban sprawl, there are still many poor and extremely poor households found within these localities.

In their 2011 reports, MWSI states that they have attained a service coverage of 92.5%<sup>32</sup> (MWSI, 2012a, p. ES-2), while MWCI declares a 99% service coverage (Marcial, 2011, p. 29) for water provision. Yet, in its resolutions for the third rate rebasing exercise, the MWSS Regulatory Office (2013a, 2013b) recognized only 86% and 88% water supply coverage for MWSI and MWCI, respectively. The discrepancy in service coverage figures may be attributed to several reasons, one of which is the propensity of the concessionaires to reflect only those areas where their networks are in place, and not the entire service area which forms the basis for the MWSS RO computations. In turn, this may be ascribed to the loose interpretation of the service coverage definition plus the desire to report operational improvements. Hence, the service coverage gaps between the figures of the MWSS RO and the concessionaires may represent households that are not directly connected to the concessionaires' networks. The discrepancy may also be due to a double counting error related to households initially getting water supplies through bulk deliveries of the concessionaires to residential subdivisions and community water systems<sup>33</sup> that were eventually converted to individual service connections (MWSS Officials, Personal Interviews, February 5, 2014, November 28, 2014).

The MWSS RO and the concessionaires are addressing this issue by removing the number of converted households from the total count of households indirectly served by the concessionaires through bulk water deliveries. A new water service coverage formula, presented in Appendix D, was agreed upon and adopted by the MWSS RO and the two private water firms in an effort to ascertain the total population currently being served. Nevertheless, as with the previous formula, which is based on equivalent population served, the new computation also

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<sup>32</sup> For 2014, MWSI cites a 97% service coverage using the old formula and 90.6%, using the MWSS RO formula (MWSI, 2014b).

<sup>33</sup> Bulk delivery customers include gated residential communities, or subdivisions as they are called in Manila, as well as community water systems operated by local political or community leaders.

includes the population of informal settlements and gated subdivisions indirectly served by the concessionaires through community water systems and housing associations, respectively. If only direct household connections were considered, it is likely that service coverage figures may even drop below the levels acknowledged by the MWSS RO.

For households in areas that are currently unserved by the concessionaires, water service connections top the list of preferred service improvements followed by better water quality, lower water tariffs, and high water pressure. The survey shows that across all socio-economic classes, about 81% and 90% of the households in unconnected neighborhoods of the west and east zones, respectively, are willing to connect to the main networks. Nonetheless, when asked if they were willing to pay connection fees, 44% to 65% of the respondents in these areas replied that they were not, given the large amount involved. Appendix E presents a summary of household-level results across all socio-economic classes. In addition, various GIS maps are used to illustrate the barangay-level results for all areas included in the consumer survey.

#### **4.4 Connected Households: Water Supply Availability, Pressure and Quality**

For all households connected to the water networks of the private concessionaires, the consumer survey results are homogenous for water supply availability, water pressure and water quality, as may be seen from Table 12. *On average, all connected households, irrespective of socio-economic class, experience almost 24 hours supply of water that is of adequate pressure<sup>34</sup> and of very good quality.<sup>35</sup>* These results are often used to portray the usual notions of success for

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<sup>34</sup> As mentioned earlier, the original concession agreement called for water pressure of 16 psi (MWSS, 1997), but this was relaxed to 7 psi until 2016, upon which time the concessionaires will be required to supply water at the original pressure of 16 psi (Concessionaire's Manager, Personal Interview, August 1, 2014).

<sup>35</sup> As discussed in Chapter 3, overall water quality was determined based on odor, taste, color, and presence of particulates.

the Metro Manila water privatization and conform to the general conclusions established from the privatization scorecard (Table 2).

**Table 12. Privatization Experiences on Water Supply Availability, Pressure, and Quality**

<i>Water Supply Availability (# of hours)</i>					
	<b>AB</b> <i>(Extremely Rich / Rich)</i>	<b>C</b> <i>(Middle Class)</i>	<b>D</b> <i>(Poor)</i>	<b>E</b> <i>(Extremely Poor)</i>	<b>Ave</b>
<b>MWSI-C</b>	21.4	22.3	22.6	22.1	22.5
<b>MWCI-C</b>	24.0	24.0	24.0	23.9	24.0
<i>Water Pressure (@ 7 psi)</i>					
	<b>AB</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Ave</b>
<b>MWSI-C</b>	Good	Good	Good	Good	Good
<b>MWCI-C</b>	Very Good	Very Good	Very Good	Very Good	Very Good
<i>Water Quality (odor, taste, color, foreign bodies)</i>					
	<b>AB</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Ave</b>
<b>MWSI-C</b>	Very Good	Very Good	Very Good	Very Good	Very Good
<b>MWCI-C</b>	Very Good	Very Good	Very Good	Very Good	Very Good

Note: MWSI-C and MWCI-C refer to connected areas of MWSI and MWCI, respectively. Appendix C provides a copy of the sample questions used to obtain these information.

Table developed by Author (2015) using data from UP NEC (2011a, 2011b). Regardless of socio-economic class, all connected households experience almost 24 hours supply of water that is of adequate pressure and of very good quality.

In doing this research, I conduct a more extensive review of the performance of the two concessionaires and probe deeper into issues not normally looked into by other observers of the program. In the succeeding sections, I examine conditions of access and affordability across the “North to South” supply corridor to identify and define the different states of inequitable water provision. In the meantime, I validate these consumer survey findings with various reports prepared by the MWSS RO, concessionaires, and UP NEC as well as interviews with representatives of these organizations. Please note that in the provision of water to Metro Manila

residents, water quality has always been a priority for MWSS (see UTCE Ltd & Japan PFI Association, 2003), regardless of the role they have assumed, whether as previous service provider or current regulator of the privatized water system.

#### **4.4.1 Validating Results Using Concessionaires' Reports**

From Table 12, Manila Water Co., Inc. appears to have registered a better performance than Maynilad Water Services, Inc., with more homogenous results throughout its service areas.<sup>36</sup> At the time of the survey, the new owners of MWSI have been operating the west concession for only a period of 5 years, after taking over the re-privatized concession in 2006 (see MWSS, 2006). Prior to re-privatization, the previous local and foreign owners had returned the west concession to the Philippine government after 7 years of operational difficulties and financial losses. The years after re-privatization has seen tangible operational improvements for the company.

Figure 9 provides the overall accomplishments of MWSI and MWCI from 2011 to 2014 for the three parameters under consideration, based on the concessionaires' Key Performance Indicators and Business Efficiency Measures reports for the years 2011, 2013, and 2014. The time frame covering 2011 to 2014 was selected to provide a basis for comparing the results of the 2011 consumer survey as well as to show the concessionaires' performance over the years, especially for MWSI as it was lagging behind MWCI in 2011.

For 2011, MWCI reported that it had provided a 24-hour supply of water, with a minimum water pressure of 7 psi and water quality that meets the Philippine National Standards

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<sup>36</sup> P-value results for supply availability, pressure, and quality shown in Appendix E support this observation.

for Drinking Water for nearly all households connected to its network. For the next three years, MWCI reported that it had maintained this level of service.

**Figure 9. Concessionaires’ Overall Achievement in Water Supply, Pressure and Quality**



Note: Water supply is measured as a % of customers enjoying 24-hour supply; water pressure as a % of customers enjoying a minimum of 7 psi water pressure; water quality as a % of tests meeting the Philippine National Standards for Drinking Water.

Graphs drawn by Author (2015) using data from MWCI (2012b, 2014a, 2014b); MWSI (2012c, 2014a, 2014b). Processed results of MMWDS residential consumer survey data are in line with the concessionaire’s reports to the MWSS RO on water supply, pressure, and quality.

In 2011, while MWSI reported 100% compliance to the Philippine drinking water standards, the company was able to provide only 84% of households connected to its network

with 24-hour supply of water. On average, when water supply was available, the company was able to deliver water at a minimum water pressure of 7 psi to 96% of the connected households. For 2013 and 2014, MWSI reported highly improved operating results, very near the levels attained by MWCI, its east zone counterpart. Nearly 100% of households connected to its system were able to receive a 24-hour supply of high quality water at a pressure of 7 psi and above. Based on Figure 9 and MWSI (2015a), it had taken MWSI about 7 years from re-privatization and about ₱38 billion (US\$844 million) in new investments to achieve their current performance level. The 2011 accomplishments reported by the two concessionaires, presented in Figure 9, support the overall experience of the consumers for water supply, pressure, and quality that were expressed in their responses to queries contained in the 2011 consumer survey of the Metro Manila Water Demand Study.

#### **4.4.2 Validating Results Using MWSS RO and UP NEC Reports**

For additional validation, the consumer survey results were also compared with the findings of the MWSS RO performance assessment for 2011 (Table 13) and the PAWS Year 5 review (Table 14). The findings of the MWSS RO assessment on the 2011 performance of the two concessionaires for the three parameters under consideration are essentially identical to the results contained in the 2011 KPI-BEM reports of the two concessionaires.

For the consumer survey of the PAWS Year 5 review, UP NEC used two main parameters, Network Quality and Water Quality, the composite scores of which were obtained from several identified sub-parameters. For 2011, practically all the east zone consumers who participated in the PAWS Year 5 survey gave very good scores to MWCI on Network Quality and Water Quality. Meanwhile, MWSI received a very good rating on Water Quality from

almost all the west zone consumers who were surveyed. However, for Network Quality, only 77.3% gave a very good rating while only 21% provided a good rating. Generally, these results also support the 2011 KPI-BEM performance reports of the two concessionaires. For water supply, pressure, and quality, the findings of the MWSS RO Performance Assessment (Table 13) and the PAWS study (Table 14) validate the general trends established from the consumer responses of the survey conducted for the Metro Manila Water Demand Study.

**Table 13. 2012 MWSS RO Assessment on Water Supply, Pressure and Quality**

Parameters	Standards Used	MWSI (West)	MWCI (East)
Water Supply	% of customers receiving 24 hours of water supply	84%	99%
Water Pressure	% of customers receiving water at 7 psi or above	96%	99%
Water Quality (Distribution System)	Minimum 95% satisfactory requirement for coliforms*	Passed	Surpassed

\* Based on the Philippine National Standards for Drinking Water

Table developed by Author (2015) using data from MWSS RO (2012a). Processed results of the MMWDS consumer survey data conform to the MWSS RO assessment of the concessionaires' performance as regards water supply, pressure, and quality.

**Table 14. PAWS 5 (2010-2011) Consumer Survey Results**

Parameters	Sub-Parameters	MWSI (West)	MWCI (East)
		% of Very Good Scores	
Network Quality	Continuity of supply / Water Pressure	77.3%*	99%
Water Quality	Odor / Taste / Color / Foreign Bodies	99.6%	100%

\* In addition, 21% of the respondents gave MWSI a score of "Good" for Network Quality.

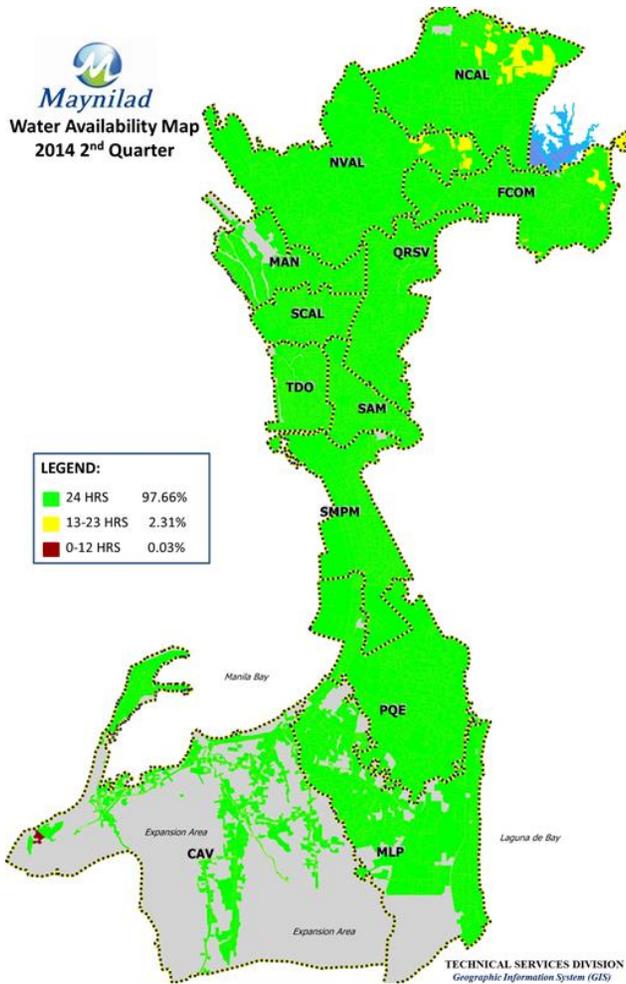
Table developed by Author (2015) using data from UP NEC (2012c). Processed results of the MMWDS consumer survey data conform to the PAWS Year 5 consumer survey results on water supply, pressure, and quality.

#### **4.4.3 Validating Results Using Barangay-Level Estimates**

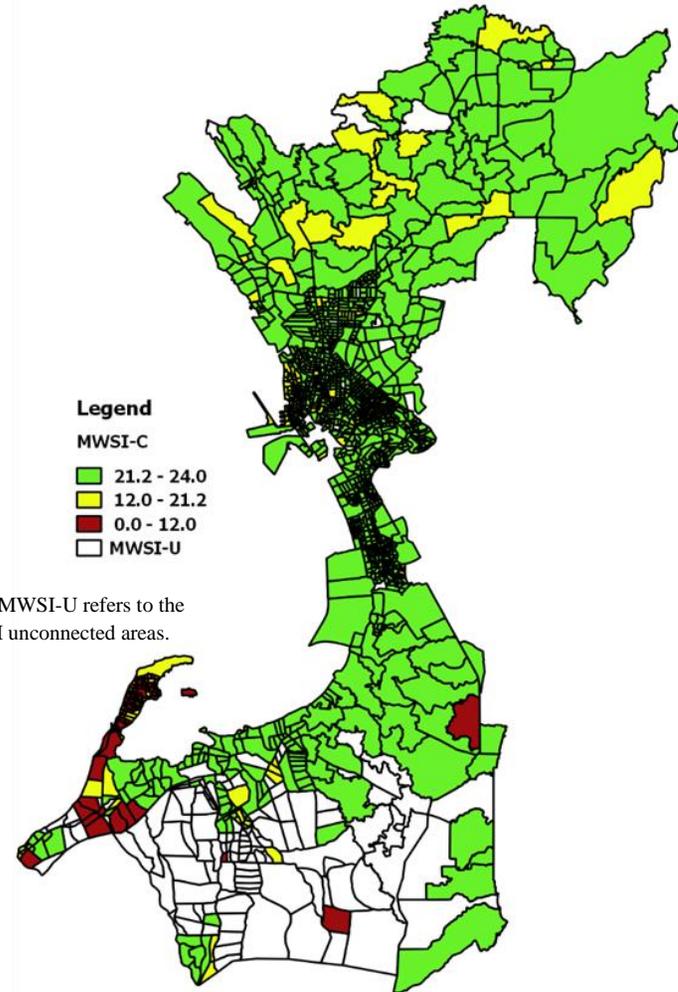
As an additional exercise, the research validated the consumer survey results at the barangay level by calculating the parameters' averages per barangay, mapping these results using a GIS software, and comparing these maps with those drawn by the concessionaires based on actual field measurements. As shown in Figures 10-13, GIS maps for consumer survey results on water supply availability and water pressure generally matched GIS maps drawn by the two concessionaires (i.e. MWCI, 2014e, 2014f; MWSI, 2014c, 2014d), despite a difference in time frames. Together with the GIS maps showing the barangay socio-economic classifications (Figure 8), these maps basically confirm uniform experience as regards these two parameters for all connected households. For water quality, the concessionaires' reports of 100% compliance to the Philippine National Standards for Drinking Water (see MWCI, 2012b, 2014a, 2014b; MWSI, 2012c, 2014a, 2014b), were validated by the GIS water quality maps (Figure 14) generated by the research. Again, together with the barangay socio-economic data provided by Figure 8, these GIS maps show uniform water quality for all connected households.

Together with substantially lower Non-Revenue Water levels, these different performance assessments showing longer duration of water supply, higher water pressure at the taps, and good water quality, present notable improvements in service provision and tend to paint a robust picture of the privatization program. Looking at Table 2, these parameters form majority of the privatization scorecard and, as previously pointed out, may only be a partial narrative of the Metro Manila water privatization. To complete this story, there is a need to further evaluate affordability concerns in relation to conditions of access, with specific focus on impoverished households.

**Figure 10. MWSI Water Supply Availability Maps Based on Field Measurements and Consumer Responses**



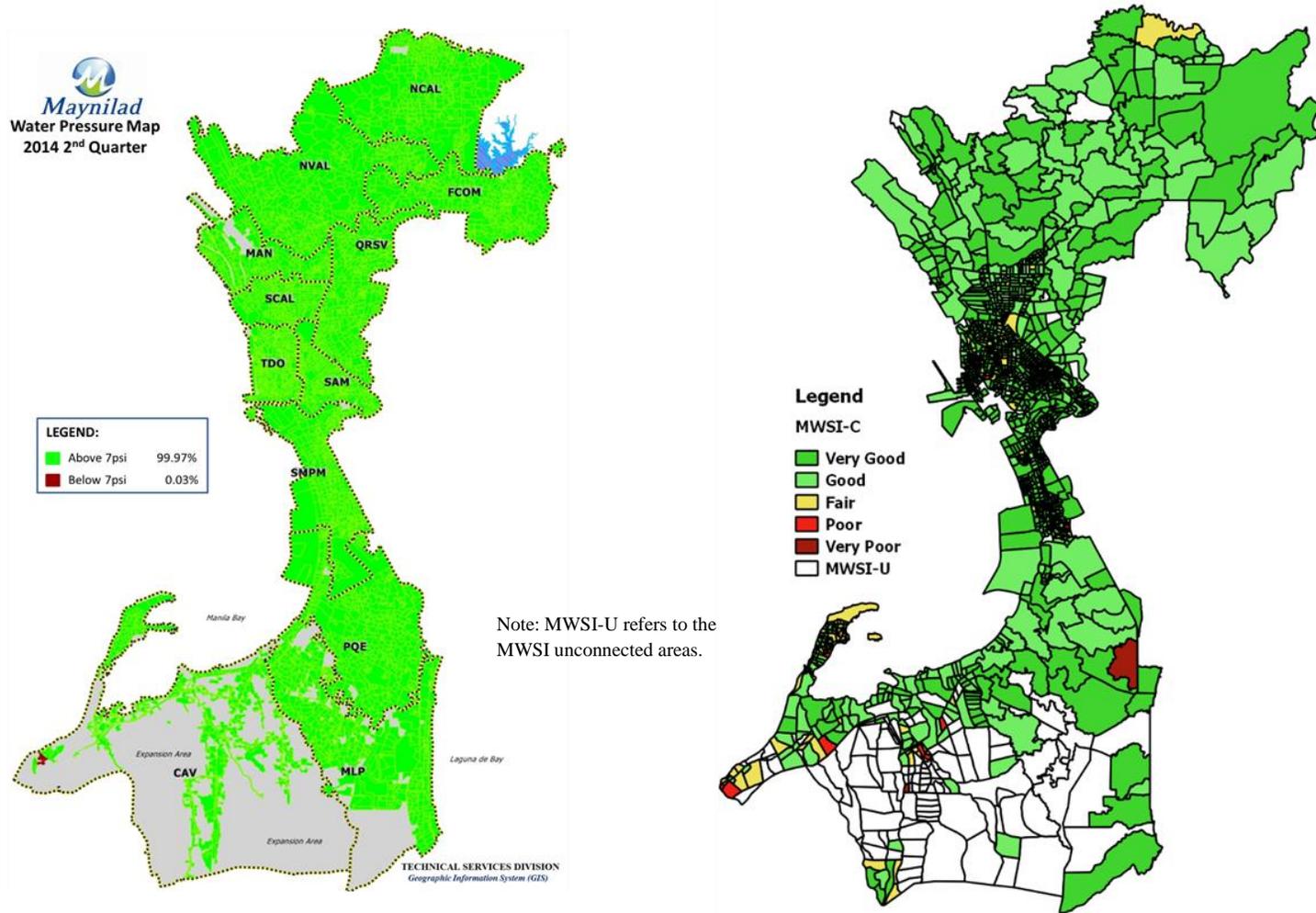
Source: MWSI (2014c)  
(Reproduced with permission)



**2011 Consumer Survey**  
Map drawn by Author (2015) using data from UP NEC (2011a).

The GIS map developed by MWSI for water supply availability generally conform to that developed by the research despite the use of 2014 data by MWSI.

**Figure 11. MWSI Water Pressure Maps Based on Field Measurements and Consumer Responses**

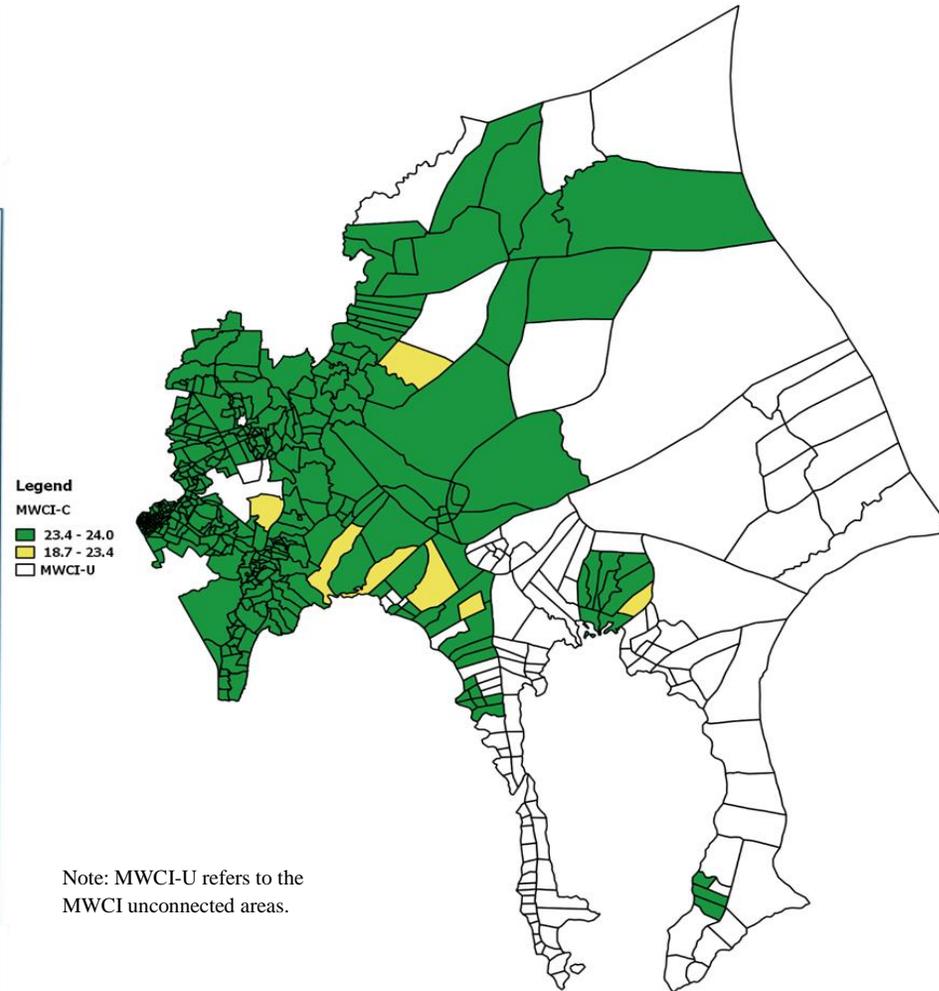
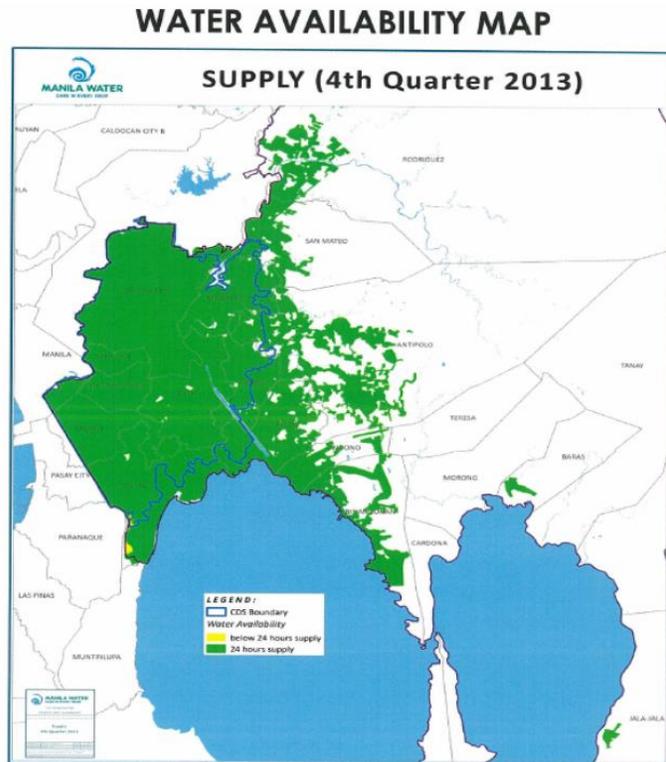


Source: MWSI (2014d)  
(Reproduced with permission)

**2011 Consumer Survey**  
Map drawn by Author (2015) using data from UP NEC (2011a).

The GIS map developed by MWSI for water pressure generally conform to that developed by the research despite the use of 2014 data by MWSI.

**Figure 12. MWCI Water Supply Availability Maps Based on Field Measurements and Consumer Responses**



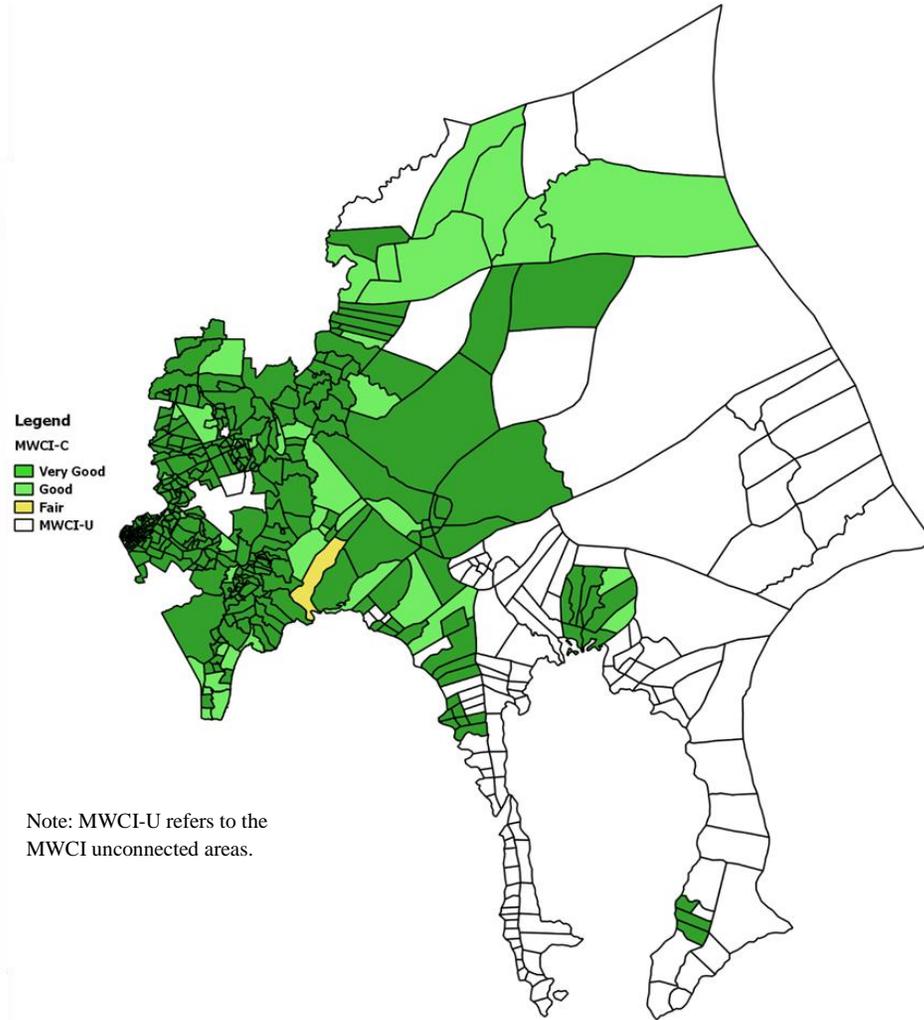
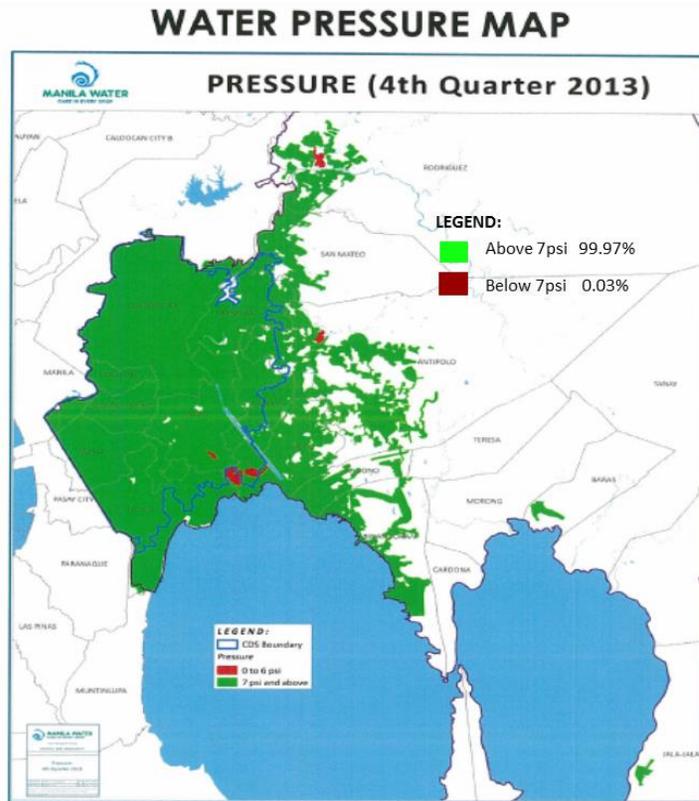
Note: MWCI-U refers to the MWCI unconnected areas.

Source: MWCI (2014e)  
 (Reproduced with permission)

**2011 Consumer Survey**  
 Map drawn by Author (2015 using data from UP NEC (2011b).

The GIS map developed by MWCI for water supply availability generally conform to that developed by the research despite the use of 2014 data by MWCI.

**Figure 13. MWCI Water Pressure Maps Based on Field Measurements and Consumer Responses**

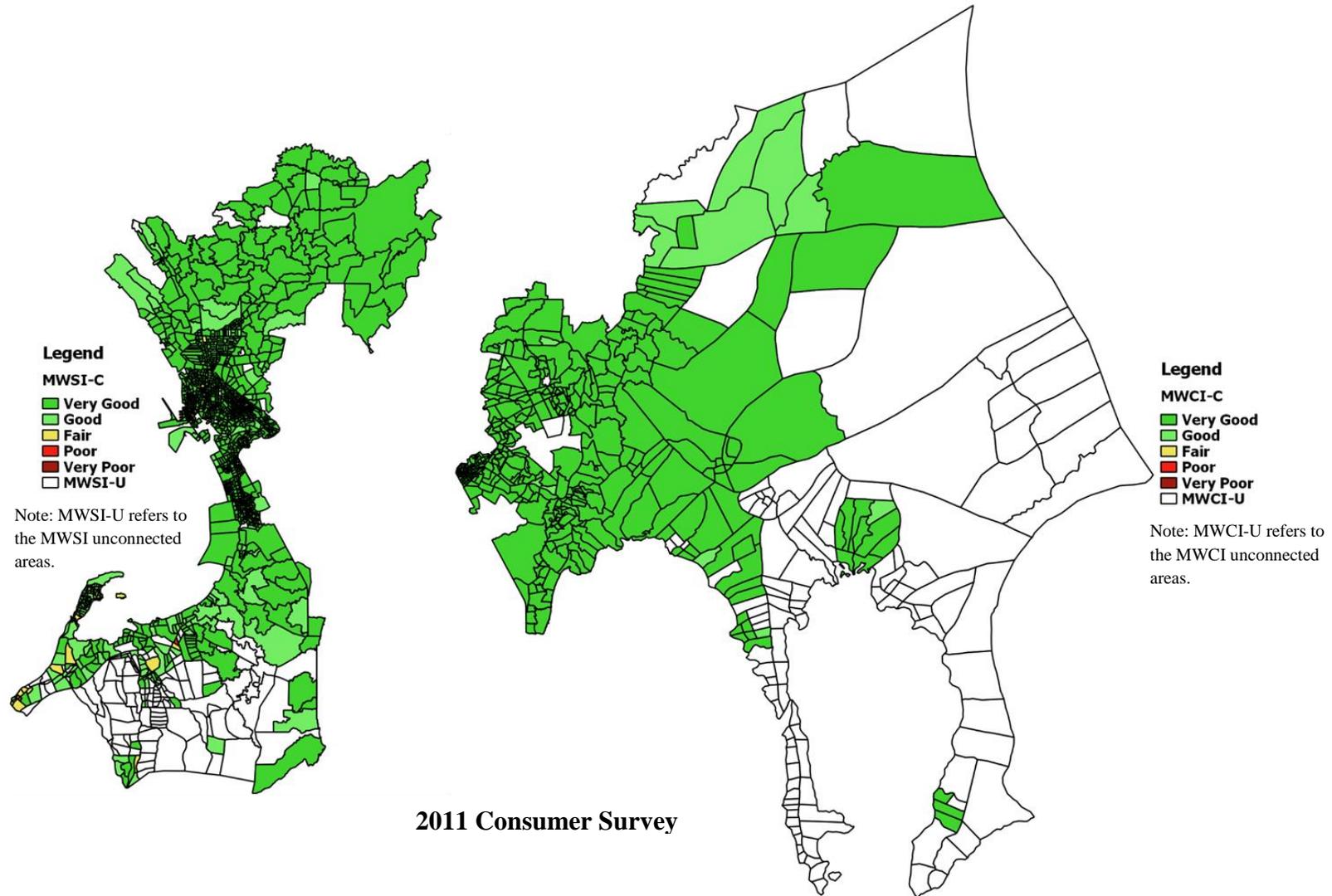


Source: MWCI (2014f)  
 (Reproduced with permission)

**2011 Consumer Survey**  
 Map drawn by Author (2015) using data from UP NEC (2011b).

The GIS map developed by MWCI for water pressure generally conform to that developed by the research despite the use of 2014 data by MWCI.

**Figure 14. MWSI & MWCI Water Quality Maps Based on Consumer Responses**



Maps drawn by Author (2015) using data from UP NEC (2011a, 2011b). The GIS maps developed by the research for water quality conform to the concessionaires' reports of full compliance with Philippine National Standards for Drinking Water.

#### 4.5 Affordability and Access

For both served and unserved neighborhoods, affordability was measured as a percentage of monthly water expenditures in relation to household income and benchmarked against the maximum limit of 5%<sup>37</sup> (see World Bank, 2008; Fankhauser & Tepic, 2007). The formula used by the research in examining monthly water expenditure (MWE) per household is as follows:

$$MWE = \underbrace{PCC \times NPH \times CF}_{MWC} \times PW$$

Where: MWC = Monthly water consumption, cubic meters/household  
PCC = Per capita consumption, liters/day  
NPH = Number of persons per household  
CF = Conversion factor for monthly consumption in cubic meters  
PW = Price of water, ₱/cubic meter

The overall quantitative results provide a good indication of the level of affordability for water supplied by the private concessionaires as well as the mix of service providers in the non-networked areas. Additionally, an examination of individual factors affecting monthly water expenditures sheds valuable insights for policy making as regards water tariffs and related concerns. At the end of this section, Table 19 presents a summary of the different issues surrounding affordability and access of water provision in Metro Manila.

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<sup>37</sup> As previously mentioned, the World Bank uses a 3% - 5% affordability threshold while the Asian Development Bank prescribes a 5% limit based on household income (World Bank, 2008; Fankhauser & Tepic, 2007).

#### **4.5.1 Per Capita Consumption**

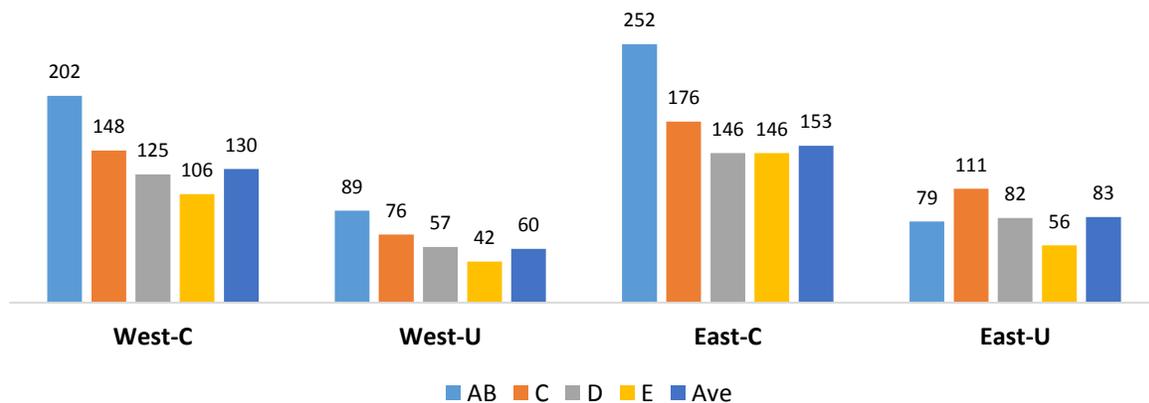
On average, all connected households consume twice as much as their counterparts in the non-networked areas (Figure 15). In-house access to continuous supply of adequate pressure and good quality water brings about increased consumption of households that are able to connect directly to the private water networks. The doubling effect of consumption for newly connected households is confirmed by per capita consumption studies made by MWSI (MWSI, 2014f, Concessionaire's Staff, Personal Interview, December 10, 2014). On the other hand, unconnected households have to rely on water supply options that are difficult to access, are available only for certain hours of the day, and at times, of poor water quality. Earlier improvements in operations as well as investments in new facilities by MWCI, as compared to MWSI, resulted in longer hours of supply availability and higher water pressure in the east zone (as seen from Table 12). In turn, these factors, brought about higher water consumption in the east zone vis-à-vis the west zone. Likewise, relatively lower water tariffs in the east zone contributed in some measure to higher per capita consumption of its customers.

Average daily consumption of extremely poor households (Class E) in connected areas are almost 3 times as much as the average of their counterparts in unconnected areas. Of particular concern are the unconnected E households in the west zone consuming below the standard of 50 liters per capita per day prescribed by the World Health Organization for low levels of health concern, usually for situations where water is delivered through one tap on-plot or within 100 meters from the household (see Howard & Bartram, 2003, p. 3). Their continued low consumption, averaging only 42 liters per capita per day, may pose health risks not only for individuals but also for the community. Unlike unconnected E households in the east zone which rely mostly on local governments for their water supply, these west zone unconnected E

households source much of their water from ground aquifers that are already at low levels due to overharvesting and possibly, of low quality which may pose as another potential health risk for these households (see Appendix E for the breakdown of water sources).

For water supplied continuously through multiple taps, such as water provision in connected households, WHO recommends an average of 100 liters per capita per day for very low health concern levels (see Howard & Bartram, 2003, p. 3). For the east and west zones, average daily per capita consumptions for all households are above this prescribed level, including those for connected E households. However, these average daily per capita consumption levels are still lower than the 2001 average for 18 Asian water utilities, which was registered at 165 liters per capita per day (ADB, 2004b, p. 3), and the 2010 South East Asian region’s average of 280 liters per capita per day (ADB, 2010, p.8).

**Figure 15. Per Capita Consumption (liters/day)**



Note: For all graphs in this section: West zone concessionaire – MWSI; East zone concessionaire – MWCI; C – Connected areas; U – Unconnected areas

Graphs drawn by Author (2015) using data from UP NEC (2011a, 2011b). Connected households consume twice as much as their counterparts in unconnected areas as a result of in-house access to continuous supply of adequate pressure and good quality water.

The per capita consumption data established from the consumer survey were compared to similar data obtained from various reports and studies. Based on the comparison presented in Table 15, the per capita consumption figures obtained by the research from the consumer survey data are corroborated, with minimal disparities, by similar data gathered by the concessionaires from actual operations, and by the UP NEC, from previous consumer surveys. In particular, the average per capita consumption generated by the research has only a 2% - 3% difference from actual per capita consumption reported by the two concessionaires. Compared to the per capita consumption computed by UP NEC for the Metro Manila Water Demand Study, the research generated consumption levels for the different socio-economic classes generally vary by only 1%. Hence, the research believes that the per capita consumption it uses for computational purposes reflects the actual consumption levels of the concessionaires' customers for all socio-economic classes.

**Table 15. Comparison of Per Capita Consumption Data for Domestic Water**

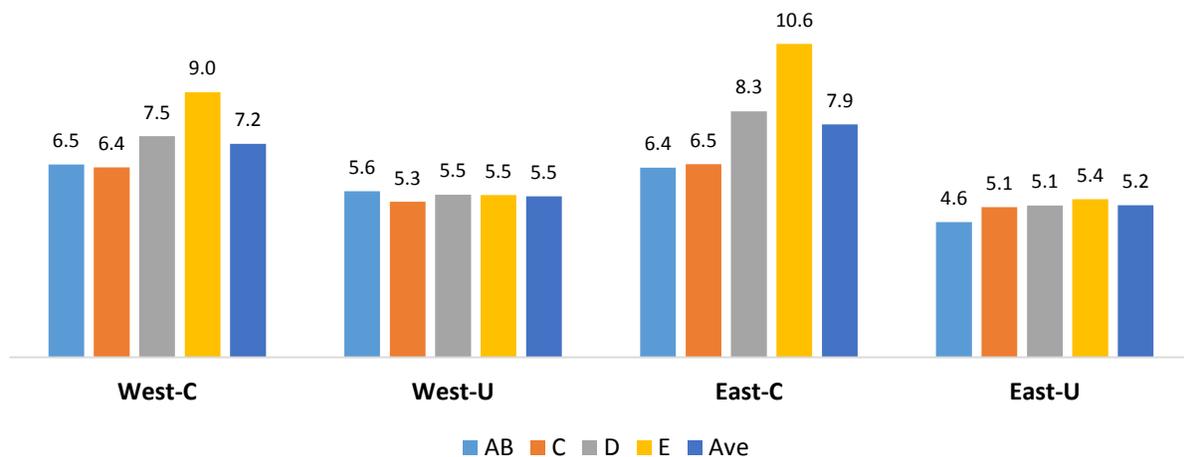
	West Zone				East Zone			
	Research	MWSI <sup>1</sup>	MM WDS <sup>2</sup>	PAWS (2009) <sup>2</sup>	Research	MWCI <sup>3</sup>	MM WDS <sup>2</sup>	PAWS (2009) <sup>4</sup>
<b>AB</b>	202	229	200	239	252		249	360
<b>C</b>	148	139	147	172	176		174	195
<b>D</b>	125	125	124	134	146		144	154
<b>E</b>	106	106	102	118	146		144	131
<b>Average</b>	<b>130</b>	<b>128</b>	<b>125</b>	<b>140</b>	<b>153</b>	<b>158</b>	<b>151</b>	<b>165</b>

Table developed by Author (2015) using data from <sup>1</sup> MWSI (2014e); <sup>2</sup> UP NEC (2011a); <sup>3</sup> MWCI (2014b); <sup>4</sup> UP NEC (2011b). Per capita consumption figures obtained from the consumer survey data are validated by similar data obtained from actual concessionaires' reports and previous PAWS consumer surveys.

#### 4.5.2 Number of Persons per Household

For the research, as well as the MWSS RO guidelines for computing service coverage (see Appendix D), a connected household represents either a single family or several families being supplied with domestic water from a network connection. On the other hand, an unconnected household generally represents a single family unless it is part of a community whose water supply is provided by a local government unit, water district, or substitute private operator supplying water from a small pipeline distribution system. In which case, the latter unconnected household may represent a number of families, similar to those connected to the private concessionaires' networks. The figures used by the research to represent the number of persons per household can be properly reconciled with the Philippine Statistics Authority (PSA) figures, which recognizes only one family per household. A comparison of figures used by the Metro Manila Water Demand Study and PSA is provided in Appendix F, together with a sample computation used to reconcile these numbers.

**Figure 16. Number of Persons per Household**



Graphs drawn by Author (2015) using data from UP NEC (2011a, 2011b). Generally, connected households have higher number of persons per household than unconnected households due to multiple families sharing a single water service connection. This situation is more prevalent in lower income households that are unable to afford the connection fees.

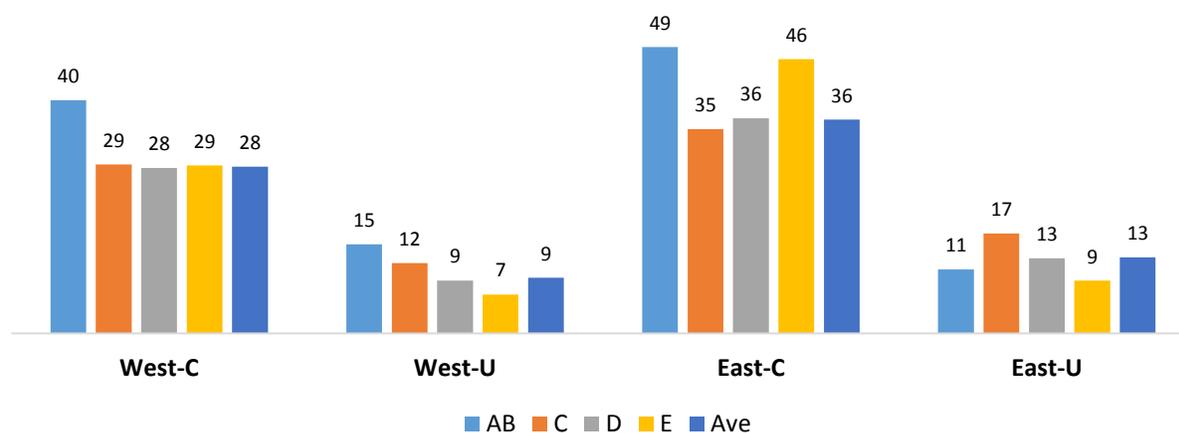
Figure 16 illustrates the presence of more persons per household in connected areas than unconnected areas, which is explained by the incidence of multiple families sharing a particular service connection to the main water networks. This phenomenon is especially true for D and E households, many of which cannot afford the service connection fee of P8,220.03 (US\$182.67) (MWSI, 2015c, p. 1). The higher number of persons per connected household in the east zone may be a reflection of a higher number of community water systems that have already been converted to individual household connections (see MWCI, 2013, 2014h; MWSI, 2013), a big portion of which may be serving multiple families. For unconnected households which are normally comprised of single families, with the exception of those connected to small water networks operated by a local government unit or small private operators, the number of persons per household is closer to the Metro Manila average of 4.3 (see Philippine Statistics Authority, n.d.).

#### **4.5.3 Monthly Water Consumption**

Across all socio-economic classes, monthly consumption of connected households are on average 3 times the monthly consumption of unconnected households (Figure 17). This large disparity in consumption is attributed to the higher per capita consumption of a bigger “household” being served by the private concessionaires. For networked areas, extremely rich and rich households (AB) consume 36% to 40% more than the average of all households while consumption levels for the other households (C, D, E) are generally within the average. Connected E households in the east zone have higher monthly consumptions than the average of all connected households because of the significantly higher number of people per household.

Apart from water pricing issues, concerns related to difficulty of access, irregular delivery, and poor quality suppress the water demand of unconnected households. In this regime of low water demand, unconnected E households are the most vulnerable among all unconnected households as their consumption levels are the lowest for this group, suggesting a lack of purchasing power and limited ability to source water from cheaper supply sources. Access to the main water networks unleashes the suppressed demand of households in unserved areas of the west and east zones, bringing about new dynamics and concerns regarding their daily use of water.

**Figure 17. Monthly Water Consumption (cubic meters)**



Note: The average monthly consumption levels for connected households of MWSI (West) and MWCI (East) compare closely with the levels of 27 and 32 cubic meters, respectively, which were computed using actual data from the MWSS RO (2012b), MWSS RO (2014b) and MWCI (2012b) reports.

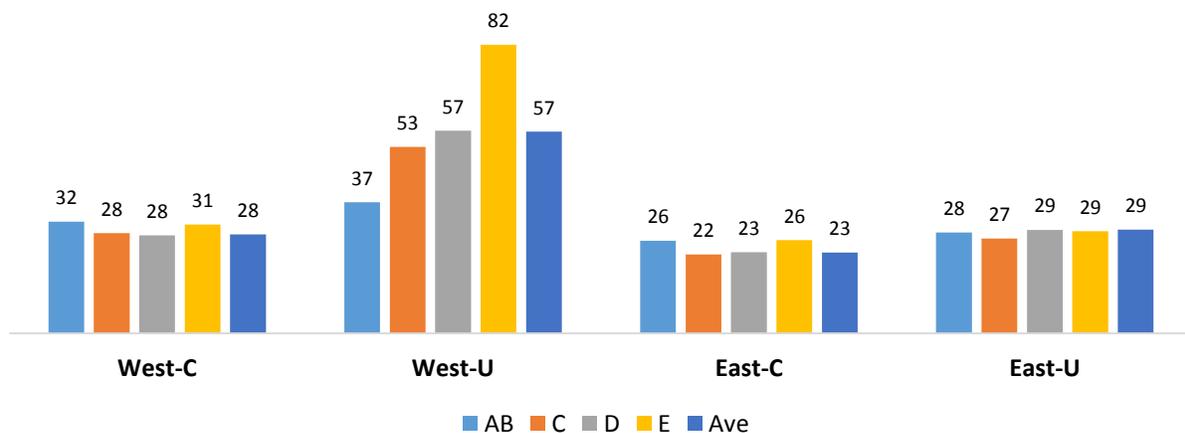
Graphs drawn by Author (2015) using data from UP NEC (2011a, 2011b). Across all socio-economic classes, monthly consumption of connected households are about 3 times that of unconnected households, which are attributed to the higher per capita consumption of a larger “household” being served by the private concessionaires.

#### 4.5.4 Price of Water

Water prices tend to be higher in unconnected areas, where water is supplied by a mix of service providers, such as local government units, water districts, and alternative private

suppliers. Figure 22 provides a comparison of water prices for households that are within and outside of the current service coverage of the private water networks. It may seem counter intuitive that in areas served by several water suppliers where competition may exist, the price of water is higher than in locations where a single entity delivers the service. In this respect, regulation plays a major role. While the MWSS RO can exercise regulatory authority over the concessionaires on water pricing, it is unable to do so for community water systems, subdivisions, LGU water systems, water districts, and other alternative suppliers as these providers are regulated by other agencies of government (see National Economic and Development Authority [NEDA], 2010 for a discussion on the regulation of the different water supply services in the Philippines). It is only when the concessionaires are able to provide direct connections to households in these areas that the MWSS RO can fully exercise regulatory functions over service delivery in such locations.

**Figure 18. Price of Water (₱/cubic meter)**



Note: The average prices of water for connected households of MWSI (West) and MWCI (East) compare closely to the average prices of ₱27/m<sup>3</sup> and ₱23/m<sup>3</sup>, respectively, which were computed using actual data from the MWSS RO (2014a, 2014b, 2014c) reports.

Graphs drawn by Author (2015) using data from UP NEC (2011a, 2011b). Water prices are higher in unconnected areas where water is supplied by a mix of service providers that include local government units, water districts, and alternative private suppliers.

In the west zone, the average water price for connected households is about 50% lower than that of unconnected households. Of particular interest are the circumstances of unconnected E households in this zone which are able to access only small amounts of water but have to purchase them at a high price. For the east zone, though water prices for unconnected households are also higher than those for households served by MWCI, the difference between the average prices is only about 26% (see Figure 18). These unconnected households are able to source more water supply from local government units, which oftentimes do not charge the full cost of water provision.

When respondents were asked if they were amenable to a price increase in order to maintain or improve services, only 21% and 15% of connected households in the west and east zones, respectively, answered positively to the query. For want of better water provision, unconnected households in the west and east zones registered higher percentages of 37% and 44%, respectively, on the issue of increased prices for improved services. As may be noted from Table 16, connected households will accept only a ₱2.00/m<sup>3</sup> (US\$0.04/m<sup>3</sup>) increase while unconnected households are amenable to a ₱10.00/m<sup>3</sup> – ₱ 14.00/m<sup>3</sup> (US\$0.22/m<sup>3</sup> – US\$0.31/m<sup>3</sup>) increase in water price. The acceptance of a higher price increase by unconnected households should not be misconstrued by the concessionaires as a license for price increases in return for water service connections to these households. After connecting to the concessionaires' networks, newly connected households double their water consumption, thereby making them reconsider the level of price increase they had initially accepted. Continuous high water consumption will ultimately make them yearn for a lower water tariff, one that is within the range accepted by households already connected to the system.

**Table 16. Possibility of Price Increases**

	<b>Favorable Answers, % of Respondents</b>	<b>Acceptable Price Increase, P/m<sup>3</sup></b>
<b>West-C</b>	21%	2
<b>West-U</b>	37%	14
<b>East-C</b>	15%	2
<b>East-U</b>	44%	10

Note: P-values show no difference in acceptable price increases for all socio-economic classes in both served and unserved areas. Sample questions on acceptable price increases are provided in Appendix C.

Table developed by Author (2015) using data from UP NEC (2011a, 2011b). For want of better water services, more unconnected households are amenable to price increases and would accept higher water tariffs as compared to their connected counterparts.

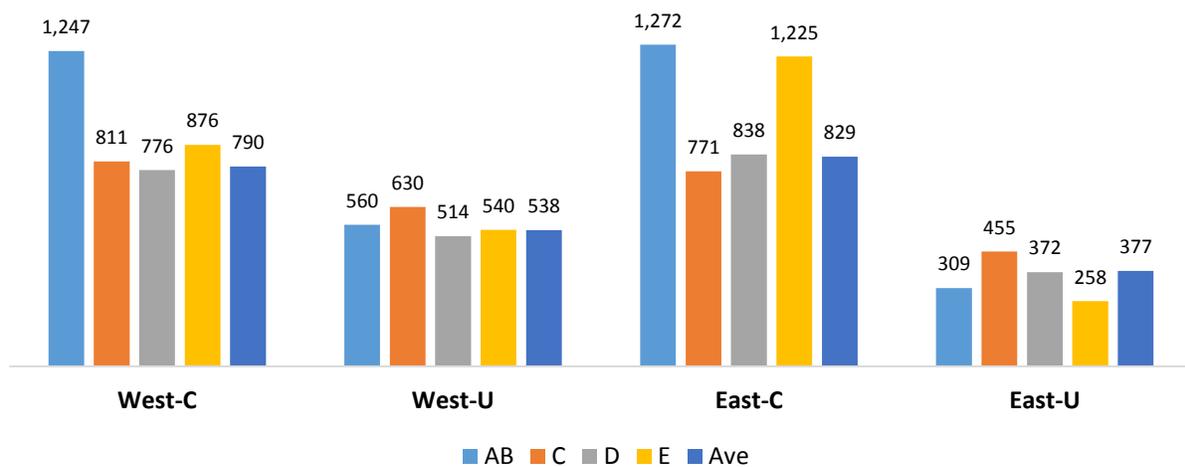
#### **4.5.5 Monthly Water Expenditures**

Water expenditures are a function of consumption and price. Generally, connected households consume more than unconnected households due to higher per capita consumption and more persons per household. Unconnected households also bear the higher price of water service compared to connected households. This is especially true for unconnected households in the west zone that rely mostly on deep wells as compared to unconnected east zone households that are supplied mostly by municipal water systems at subsidized prices.

Across all socio-economic classes of connected households, average monthly water expenditures are about 1.5 to 2.2 times higher than their unconnected counterparts. This is primarily due to the huge disparity between the consumption levels of these two groups of households. Large differences in consumption levels are brought about by the twin effects of high water prices that suppress demand and difficulty of access in unconnected neighborhoods. Water service connections to the main networks generally unleash the suppressed demand of these households. Continued water use of these households creates a situation where they can no

longer revert back to previous water supply modes and consumption levels. This increased consumption phenomenon associated with connected households offers insights on affordability concerns of the most impoverished households, necessitating a need to review the existing water tariff structure, most especially the lifeline rate.<sup>38</sup>

**Figure 19. Monthly Water Expenditure (₱)**



Graphs drawn by Author (2015) using data from UP NEC (2011a, 2011b). Across all socio-economic classes of connected households, average monthly water expenditures are about 1.5 to 2.2 times higher than their counterparts in unconnected areas. Basically, this is due to the huge disparity in consumption levels between households that are within and outside the concessionaires' networks.

Water expenditures, as discussed above, are exclusive of those related to the purchase of bottled water by households in Metro Manila. Although consumption of bottled water is very low, generally less than 1 cubic meter per month per household, its price ranges from 51 to 68 times that of water supplied by the two concessionaires (see Appendix E). Since water quality is a concern for unconnected households, their consumption of bottled water is twice as much as

<sup>38</sup> The lifeline rate is the lowest water tariff, and is provided for consumers that consume less than 10 cubic meters per month.

those of households connected to the main networks (see also Appendix E). By providing water service connections, previously unserved households will be able to reduce their bottled water consumption, affording them a level of savings ranging from 17% -20%. Interestingly enough, despite the high marks given by consumers in the connected areas on the quality of water they receive, these consumers still purchase bottled water for drinking purposes. When asked why this is so, a high official of one of the concessionaires (Personal Interview, August 1, 2014) remarked that the advertising campaigns of bottled water suppliers have conditioned the minds of the drinking public about the merits of using their products in lieu of regular tap water. As a consequence, the east concessionaire has already created a subsidiary to sell bottled water (Feliciano, 2015), most probably to capture the high value segment of the retail water market.

#### **4.5.6 Levels of Affordability**

Affordability levels for water service, measured as a percentage of water expense to household income, were generated from Africa's (2011) household income estimates for the various socio-economic classes and likewise, from income figures provided by the respondents of the consumer survey. Table 17 exhibits these affordability levels. Please see Appendix G for the computation of these figures using the two sets of household income data.

For all areas, whether or not connected to the networks of the private concessionaires, E households spend more of their income to pay for water service. Except for unconnected households in the east zone, E households spend from 6% to 11% of their income for their water bills, exceeding the maximum prescribe limit of 5%<sup>39</sup>. Though roughly all E households have to

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<sup>39</sup> Fankhauser and Tepic (2007, p. 1040) provide benchmarks used in measuring affordability for different utilities, either as a percentage of total household income or expenditure: water (2.5%-5%); electricity (10%-15%); heating (6%-20%); all utilities (20%). For water, ADB prescribes 5% while the World Bank suggests 3%-5%.

contend with the problem of affordability, the dynamics of water provision are distinct for areas within and outside of the private networks, requiring different approaches to resolve the problem.

**Table 17. Affordability Levels Measured as a Percentage of Household Income**

	<b>AB</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Average</b>
<b>West-C</b>	1% - 3%	1% - 3%	3% - 4%	<b>7% - 9%</b>	3% - 4%
<b>West-U</b>	0.3% - 2%	1% - 3%	3% - 4%	<b>6% - 11%</b>	3% - 4%
<b>East-C</b>	1% - 2%	1% - 2%	3% - 4%	<b>10% - 11%</b>	3% - 4%
<b>East-U</b>	0.2% - 2%	1% - 2%	2% - 3%	3% - 5%	2% - 3%

Table developed by Author (2015) using data from UP NEC (2011a, 2011b); Africa (2011). In general, all E households, whether connected or unconnected, spend more than 5% of their household income for monthly water expenditures, the maximum limit for such expenditures.

Class AB households pay the least for water provision, as a percentage of their income. Benefitting the most from improved services provided by the private water concessionaires, connected AB households consume high volumes of water at prices very affordable to them. Despite the inability of unconnected AB households to avail of water from the main networks, these households are able to tap other supply options, as compared to the lower class households, thus allowing them to meet their daily water needs.

Under existing supply conditions, middle class (C) households in all areas are able to meet their water needs at rates that are affordable to them. While Class D households still meet their daily water requirements, their affordability level is near the optimum limit; hence, any increase in water tariff may prove to be difficult for them. It is interesting to note that affordability assessments which use an aggregate of all households tend to suggest that water services are reasonably priced for everyone, notwithstanding the fact that they may already be

expensive for extremely poor households (those earning less than US\$1.25 per capita per day). As such, the true state of affordability can only be established using a methodology that segments the households across the different socio-economic classes.

Alternatively, affordability levels can also be measured as a percentage of household expenditures (see Appendix E for the total household expenditures of the different socio-economic classes). Benchmarking against Fankhauser and Tepic’s (2007) limit of 5% of household expenditures for water, Table 18 presents levels computed from consumer responses on household expenditures.

**Table 18. Affordability Levels as a Percentage of Household Expenditures**

	<b>AB</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>Average</b>
<b>West-C</b>	4%	4%	5%	<b>8%</b>	5%
<b>West-U</b>	4%	4%	<b>6%</b>	<b>10%</b>	5%
<b>East-C</b>	3%	3%	4%	<b>6%</b>	4%
<b>East-U</b>	3%	3%	4%	4%	4%

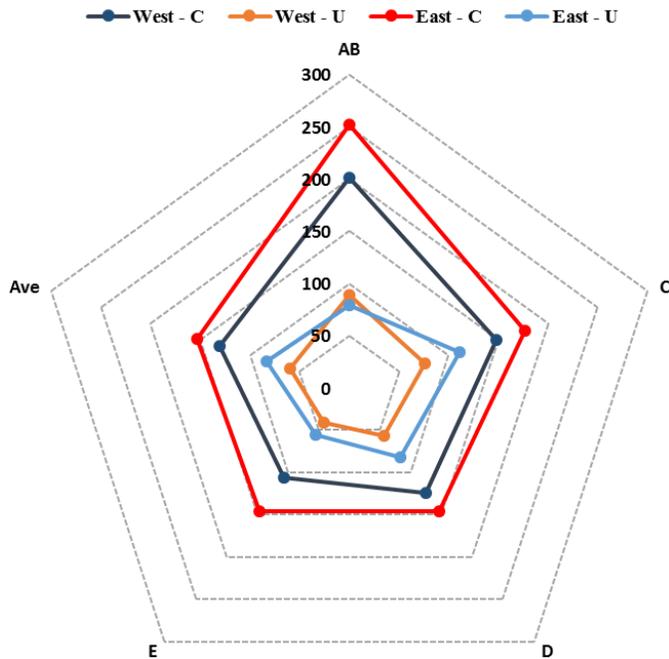
Table developed by Author (2015) using data from UP NEC (2011a, 2011b). As a % of household expenditures, E households also spend the most for their water bills among all socio-economic classes, confirming the initial affordability findings based on household income.

These affordability results lend support to the findings that Class E households spend the highest amount for their water bills, whether as a percentage of total household expenditures or total household income. Extremely poor households generally have just enough income to cover their total household expenditures and at times, even have to resort to deficit spending. Class D households’ water expenditures are at the fringe of the 5% limit, while those of the AB and C households are still within affordable ranges.

**Table 19. In a Nutshell: Access and Affordability Issues**

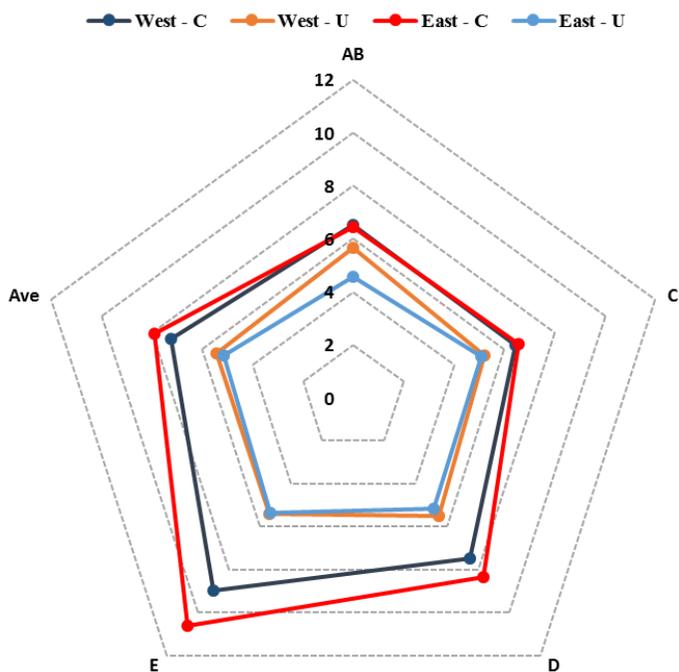
**a) Per Capita Consumption (liters/day)**

- On average, connected households consume twice as much as their unconnected counterparts. In-house access to continuous supply of adequate pressure and good quality water brings about increased consumption of households able to connect directly to the private water networks
- Difficulty of access, irregular delivery schedules, poor quality, and high prices suppress the water demand of unconnected households.
- Unconnected E (extremely poor) households consume roughly one-third of the level of consumption of connected E households. Continued low consumption of unconnected E households (42 liters/capita/day) in the west zone may pose health risks to individuals and communities.



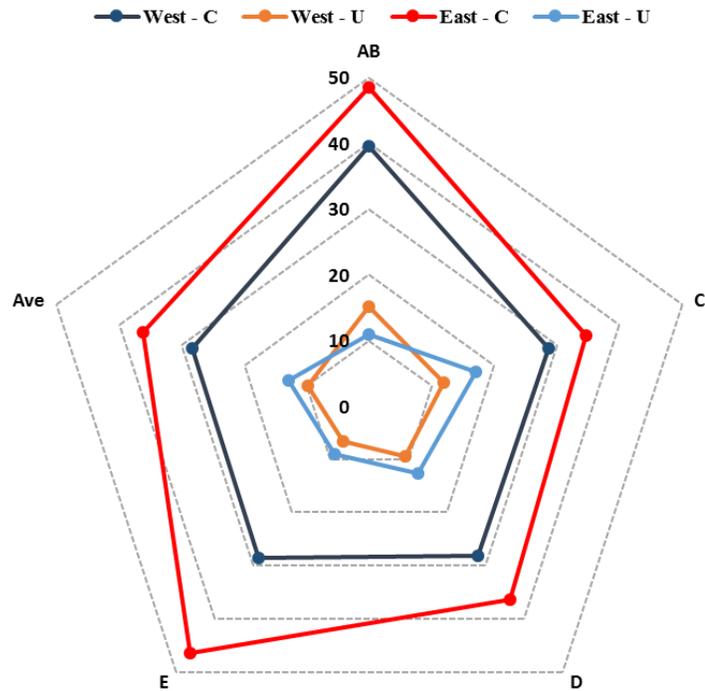
**b) Number of People / Household**

- Using the water sector’s concept of households, there are more persons per household in connected areas than unconnected areas due to multiple families sharing a single water service connection. This is particularly true for D and E households which cannot afford service connection fees
- The presence of more persons per connected household in the east zone is due to the conversion of a large number of community water systems and subdivisions into direct household connections, with many cases of multiple families per connection.



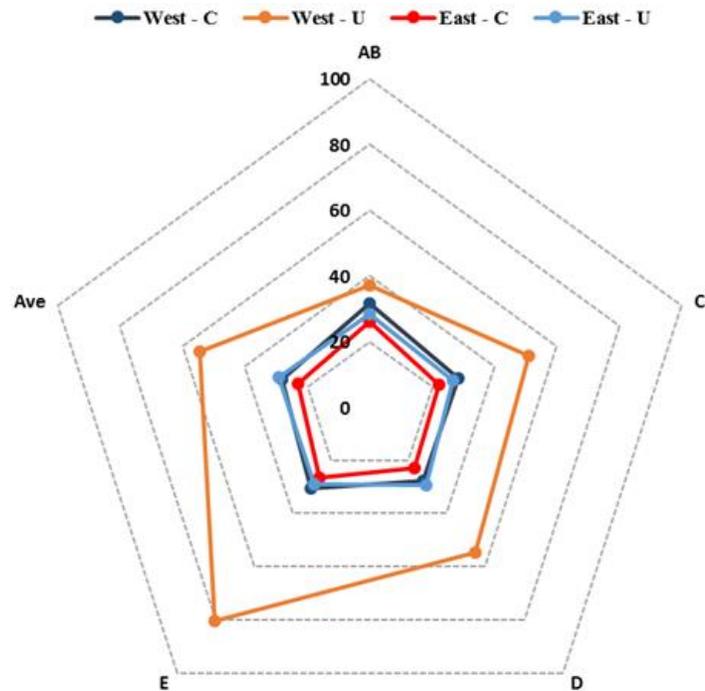
### c) Monthly Water Consumption (m<sup>3</sup>)

- On average, monthly consumption of connected households are three times more than unconnected households across all socio-economic classes.
- Access to the main networks brings about the conveniences of piped water and unleashes the suppressed demand for water of previously unconnected households.
- For connected areas, AB households consume 36% - 40% more than the other households.
- For unconnected areas with a regime of low water demand, E households are the most vulnerable among all socio-economic classes as their consumption levels are the lowest in this group, suggesting a lack of purchasing power and limited ability to negotiate better deals for themselves.



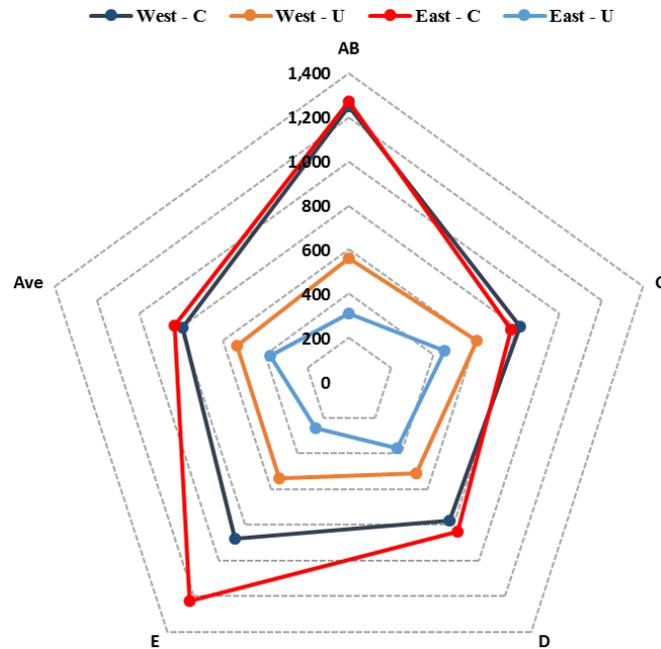
### d) Price of Water (P/m<sup>3</sup>)

- Compared to the MWSS-regulated tariffs, water prices are higher in areas not connected to the main networks, where water is supplied by a mix of service providers.
- For the west zone, average water price for connected households is nearly 100% lower than that of their unconnected counterparts. Of special interest are the unconnected E households which pay the highest price of water for every cubic meter of consumption, for the least amount of water consumed among all households.
- For the east zone, average water price for connected households is only 26% lower than that of unconnected households as the latter is able to source water from water systems of local government units that often do not charge the full cost of water provision.



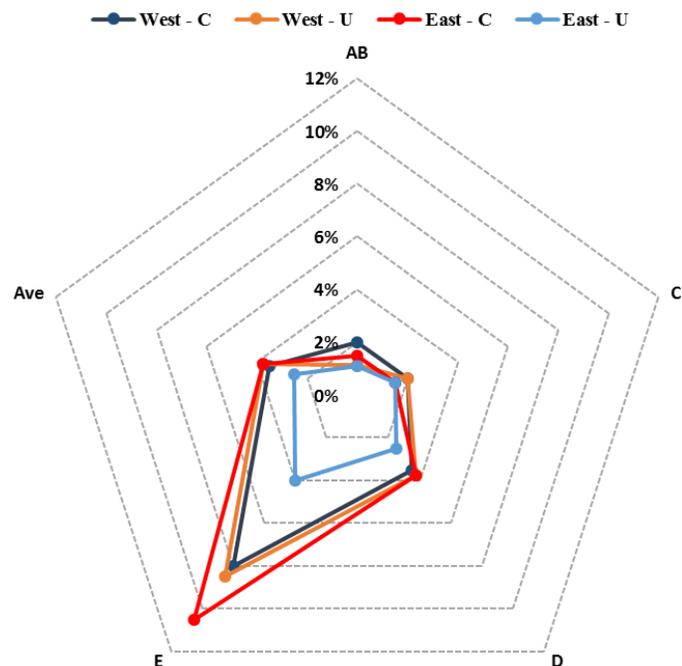
### e) Monthly Water Expenditures (P)

- Across all socio-economic classes, connected households spend 1.5 to 2 times more than the unconnected households, primarily due to large disparities in consumption levels.
- Continued use of networked water and its accompanying conveniences create a consumption habit where connected households no longer want to revert back to previous low water consumption levels prior to getting network connections.
- Connected households' consumption of bottled water is about half of that of unconnected households. Water service connections thus afford the latter 17% -21% savings, arising from reduced bottled water consumption.



### f) Level of Affordability (% of household income)

- For both networked and non-networked areas, E households spend more of their income to pay for water services. Except for the unconnected E households in the east zone, all other E households spend more than the maximum limit of 5% of income to pay for water expenditures.
- As a percentage of income, connected AB households spend the lowest amount for the largest volume of water consumed. Unconnected AB households are able to meet their daily water requirements as they are able to avail of other supply options.
- Class C households are able to meet their minimum water supply needs at prices still affordable to them. While the same is true for Class D households, their affordability level is near the maximum limit, and any future increase in water tariff may prove to be difficult for them.



Graphs drawn by Author (2015) using data from Figures 19 -23 and Table 18.

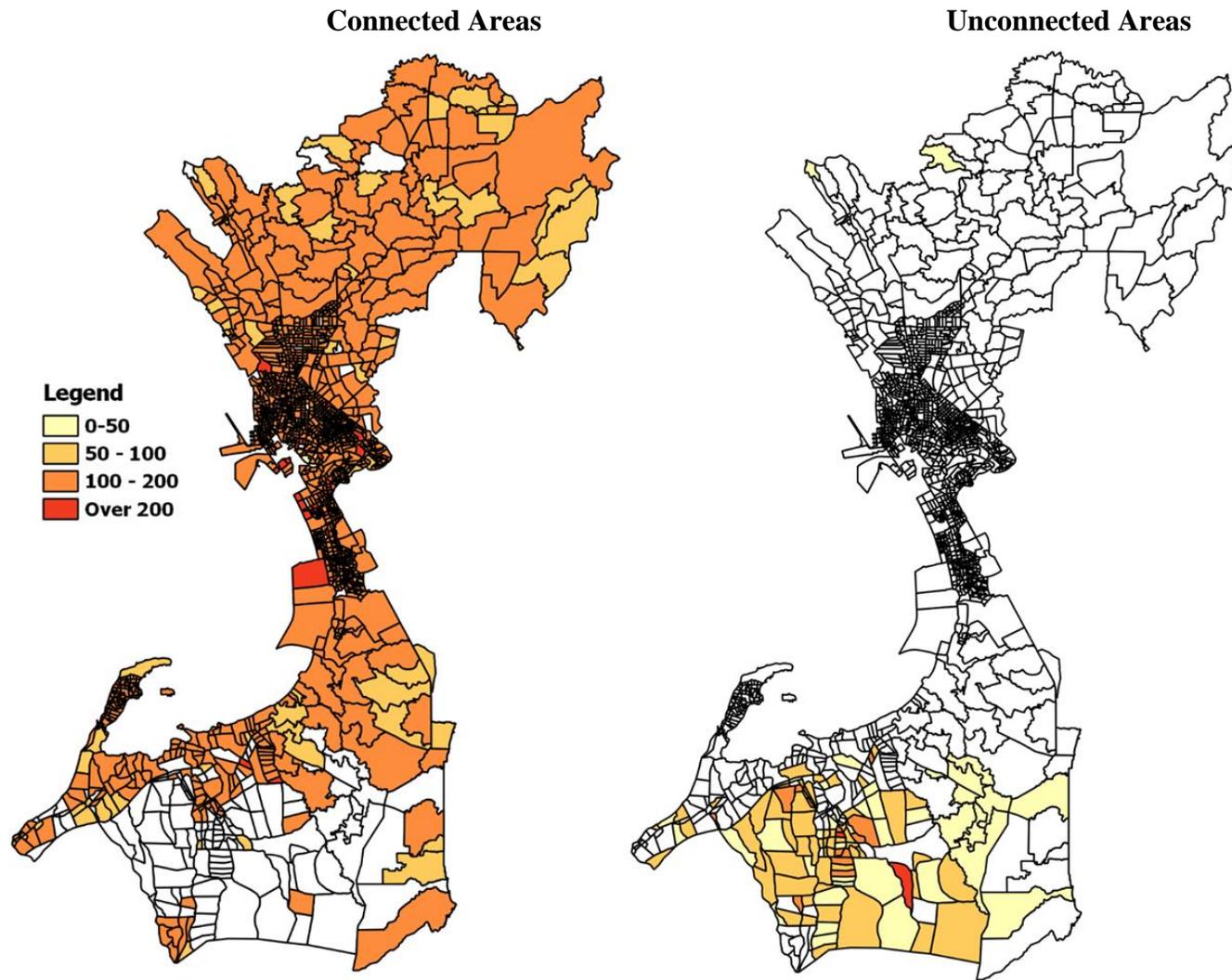
## 4.6 Geospatial Analysis

At the barangay level, per capita consumption, average water price, monthly water expenditures (in absolute terms and as a percentage of household expenses) were determined and mapped across the entire service areas of the two concessionaires (Figures 20-27). The overall trends established from geospatial mapping validate the findings of household-level assessments performed across the different socio-economic classes. These trends describe the effect of a “North to South” water infrastructure system and further highlight the need for a holistic approach in the design and construction of hydrological infrastructure, one that is inclusive of concerns and requirements of the social system. For both water concessions, unconnected barangays have to deal with the problems of lower per capita consumption and higher water prices, when compared to the experience of connected barangays for the same parameters.

In line with observations using individual household results, the high prices of water sold by different water suppliers in unconnected barangays coupled with the difficulty of accessing water has suppressed demand of households in these locations, resulting in lower water expenditures. While low water expenditures are normally desired, the levels of consumption must also ensure the ability to sustain the health of individuals and communities. Currently, there are some areas outside of the main networks that are below the minimum WHO requirement of 50 liters per capita per day. Such conditions may be unable to support the long term health requirements of communities in these areas, especially during periods of severe dry spells.

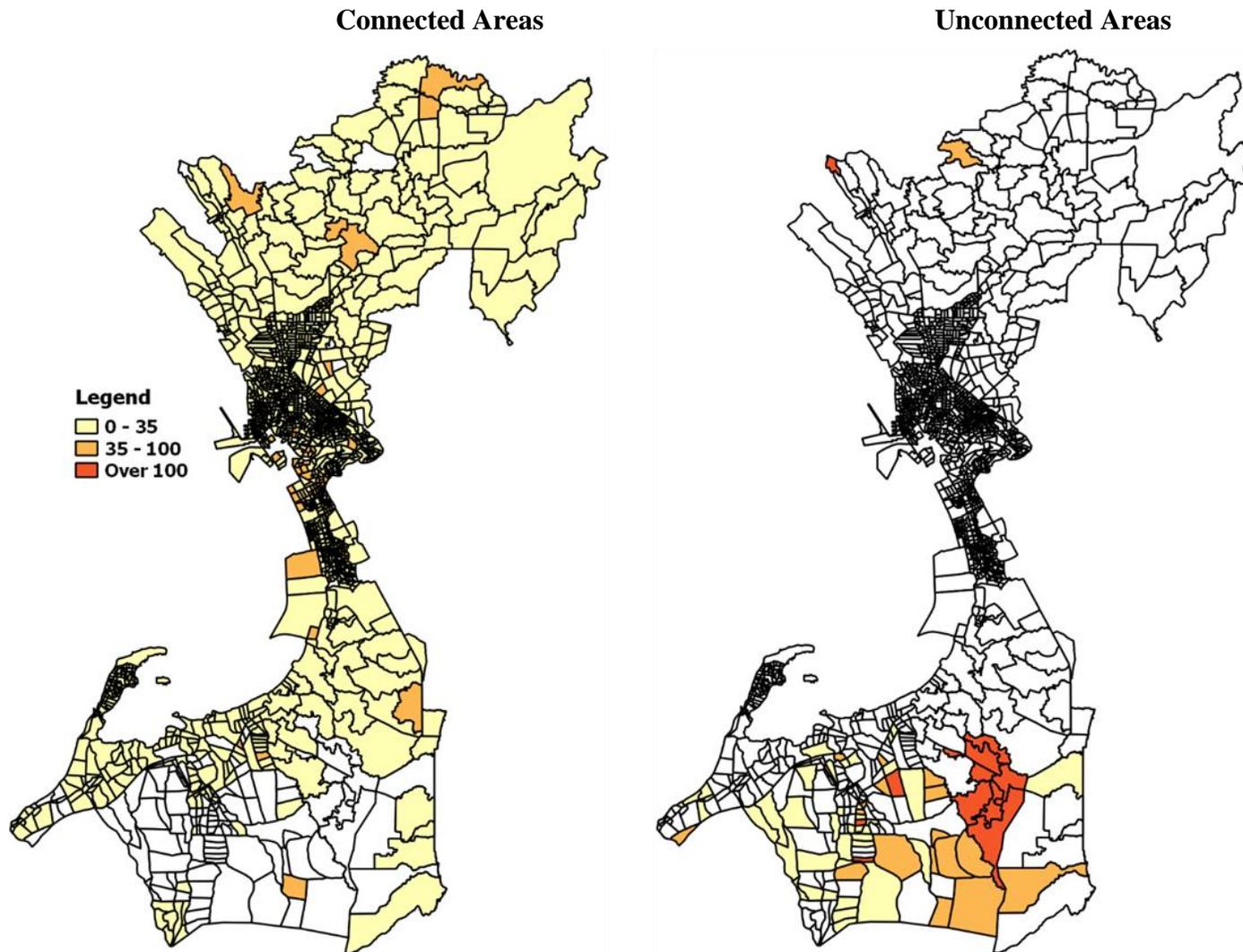
Geospatial mapping of performance indicators, such as those shown in this dissertation, provides information that may aid the MWSS RO in its regulatory and policy making functions. Likewise, for the concessionaires, similar maps generate information that they can use for monitoring field operations and planning future investments.

**Figure 20. MWSI GIS Map: Per Capita Consumption (liters/day)**



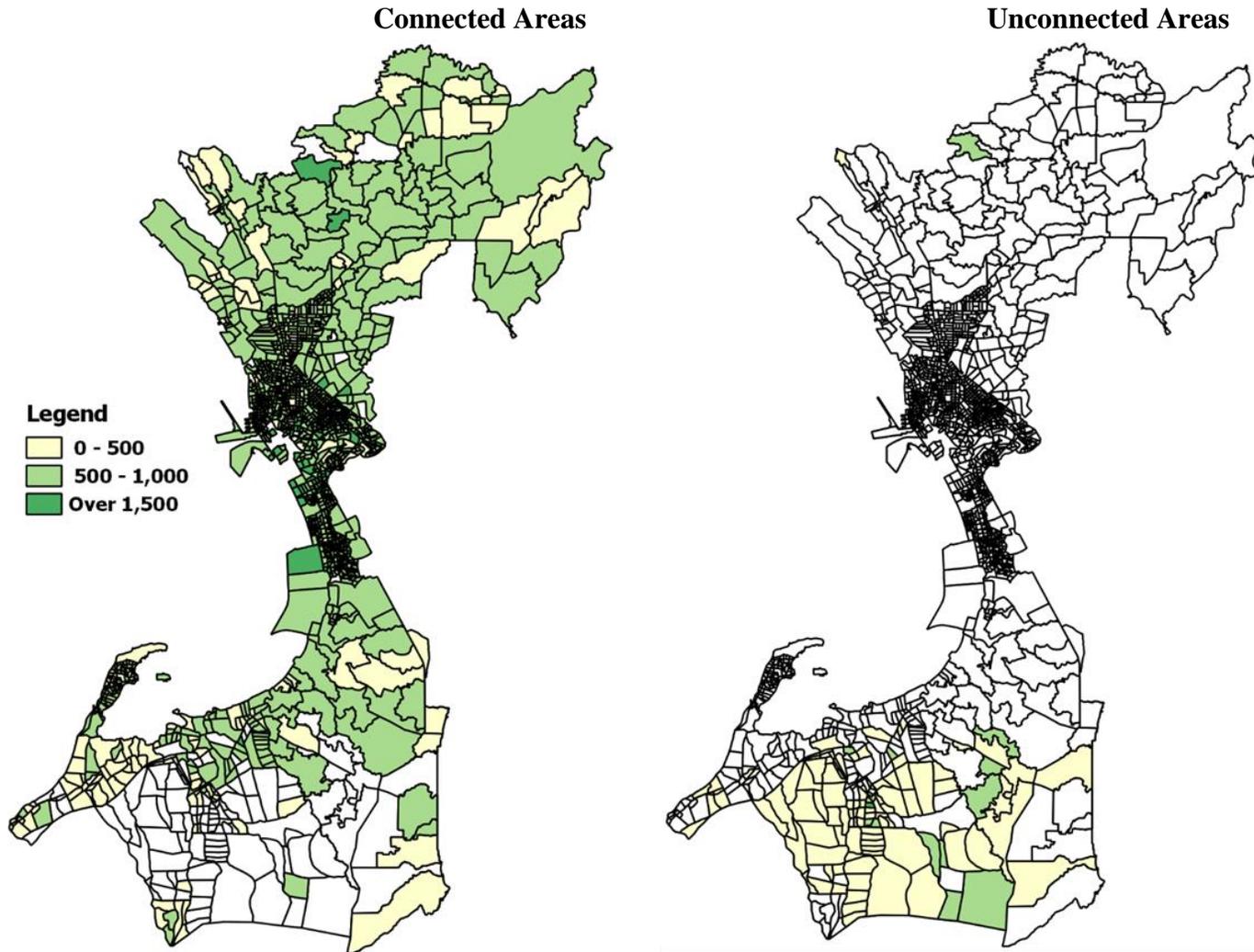
Maps drawn by Author (2015) using data from UP NEC (2011a). Average per capita consumption level for connected barangays is twice as high as that for unconnected barangays.

**Figure 21. MWSI GIS Map: Average Water Price (₱/cubic meter)**



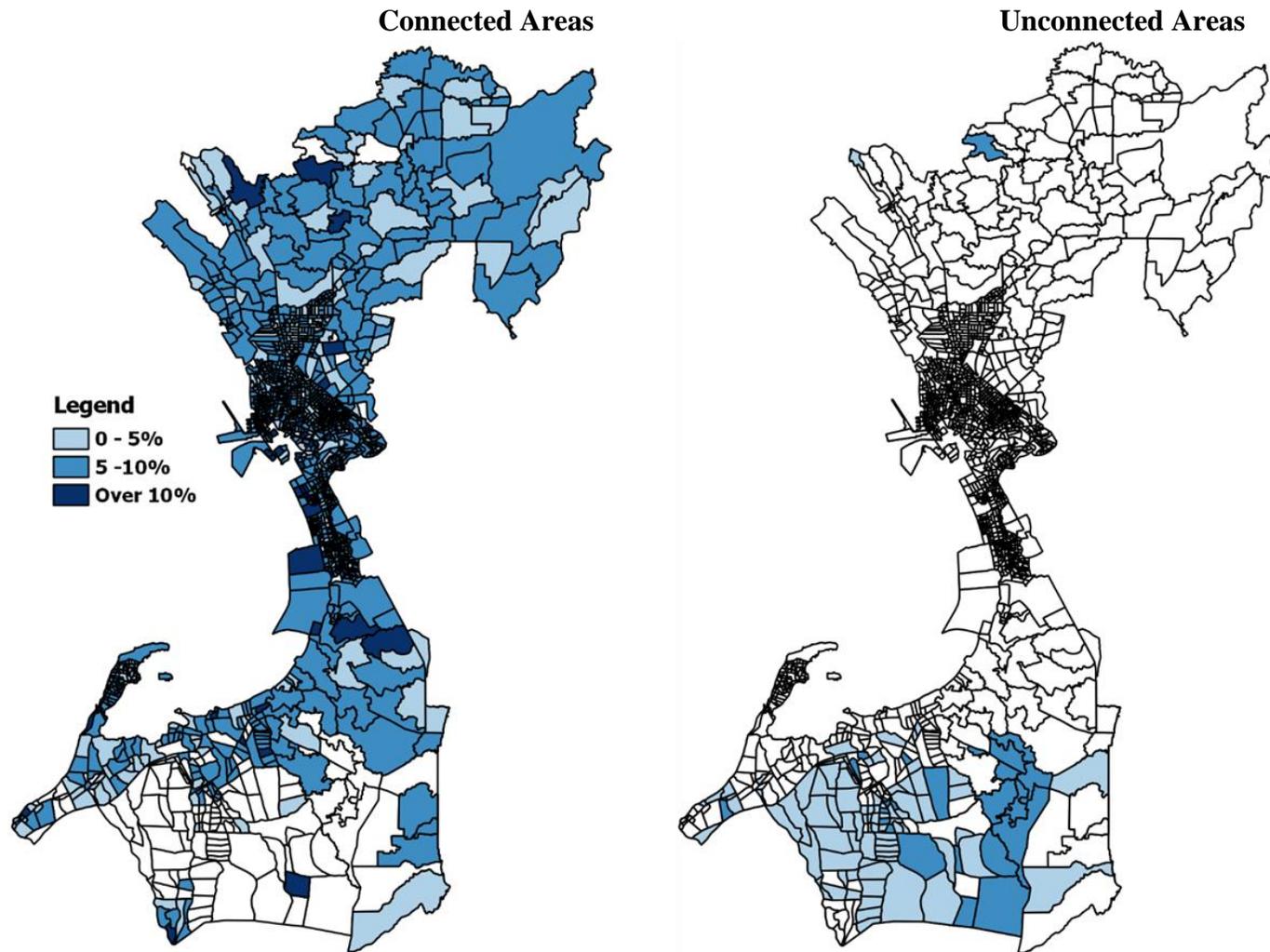
Maps drawn by Author (2015) using data from UP NEC (2011a). Average water price for connected barangays is 100% lower than that for unconnected barangays.

**Figure 22. MWSI GIS Map: Monthly Water Expenditure (₱)**



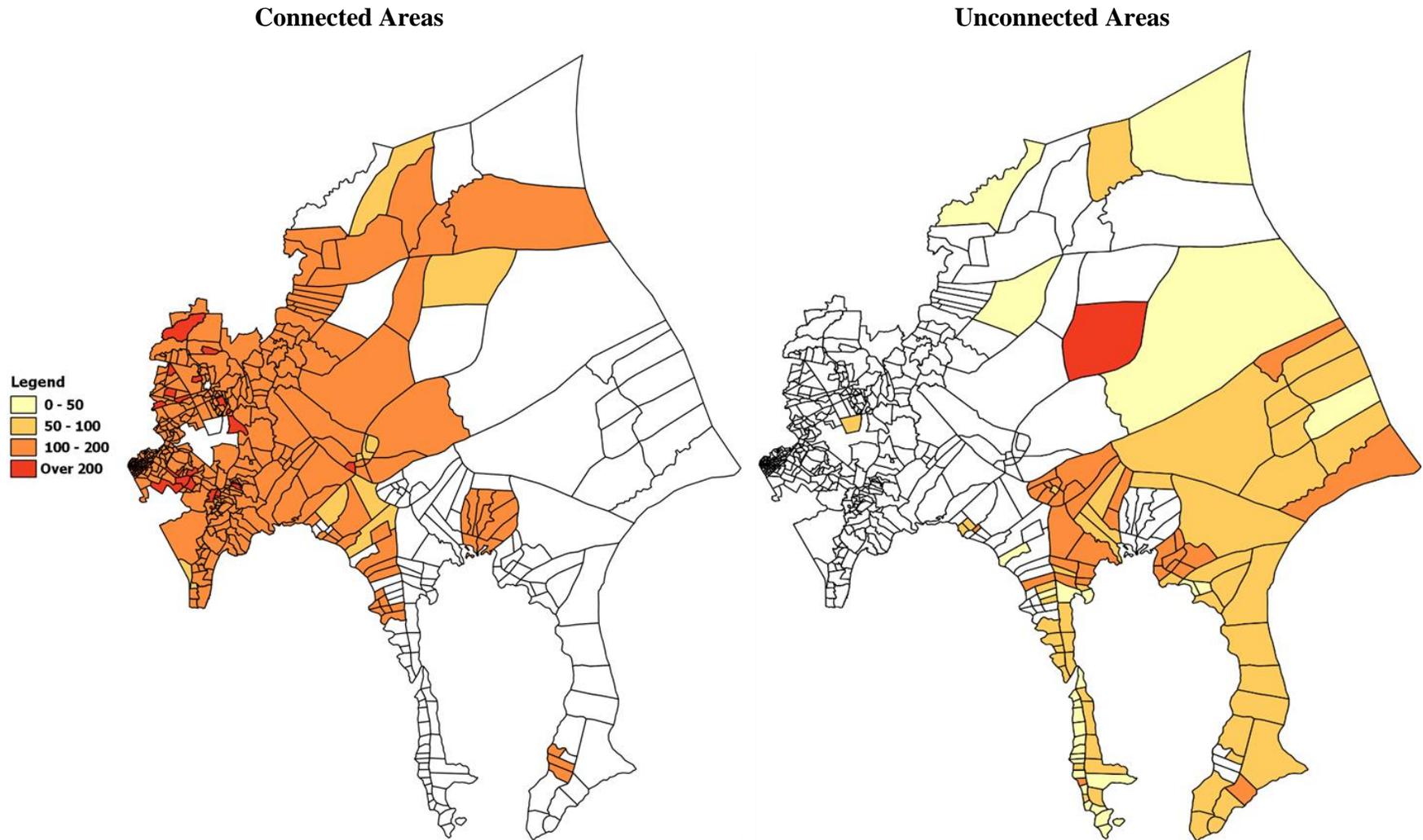
Maps drawn by Author (2015) using data from UP NEC (2011a). Despite higher water prices in unconnected barangays, significantly lower consumption levels resulted in average monthly water expenditures that is 45% lower than that of connected barangays.

**Figure 23. MWSI GIS Map: Affordability (% of household expenditures)**



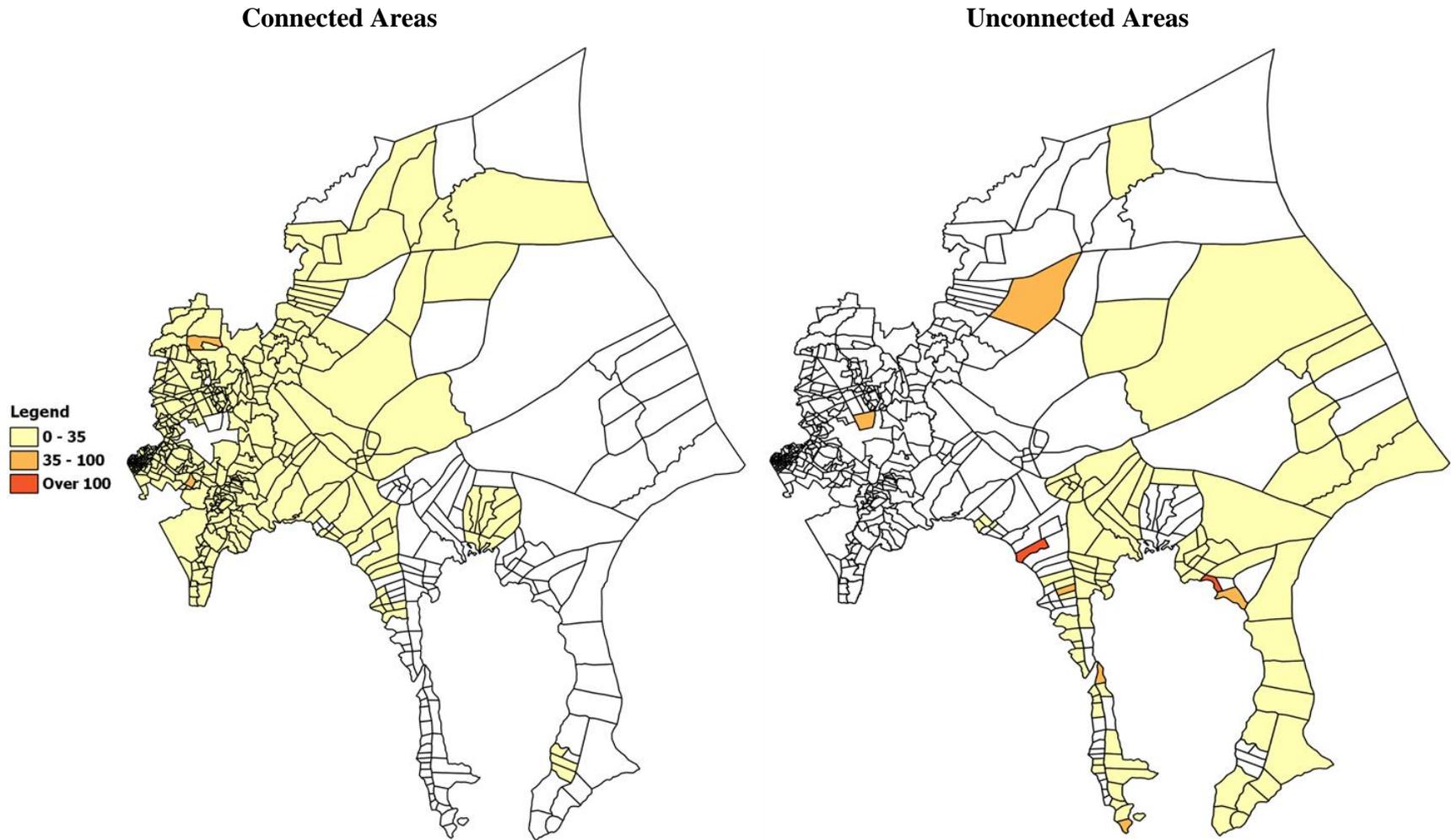
Maps drawn by Author (2015) using data from UP NEC (2011a). As a percentage of household expenditures, connected and unconnected barangays register similar levels of affordability, indicating the likely presence of many low income communities in unconnected areas.

**Figure 24. MWCI GIS Map: Per Capita Consumption (liters/day)**



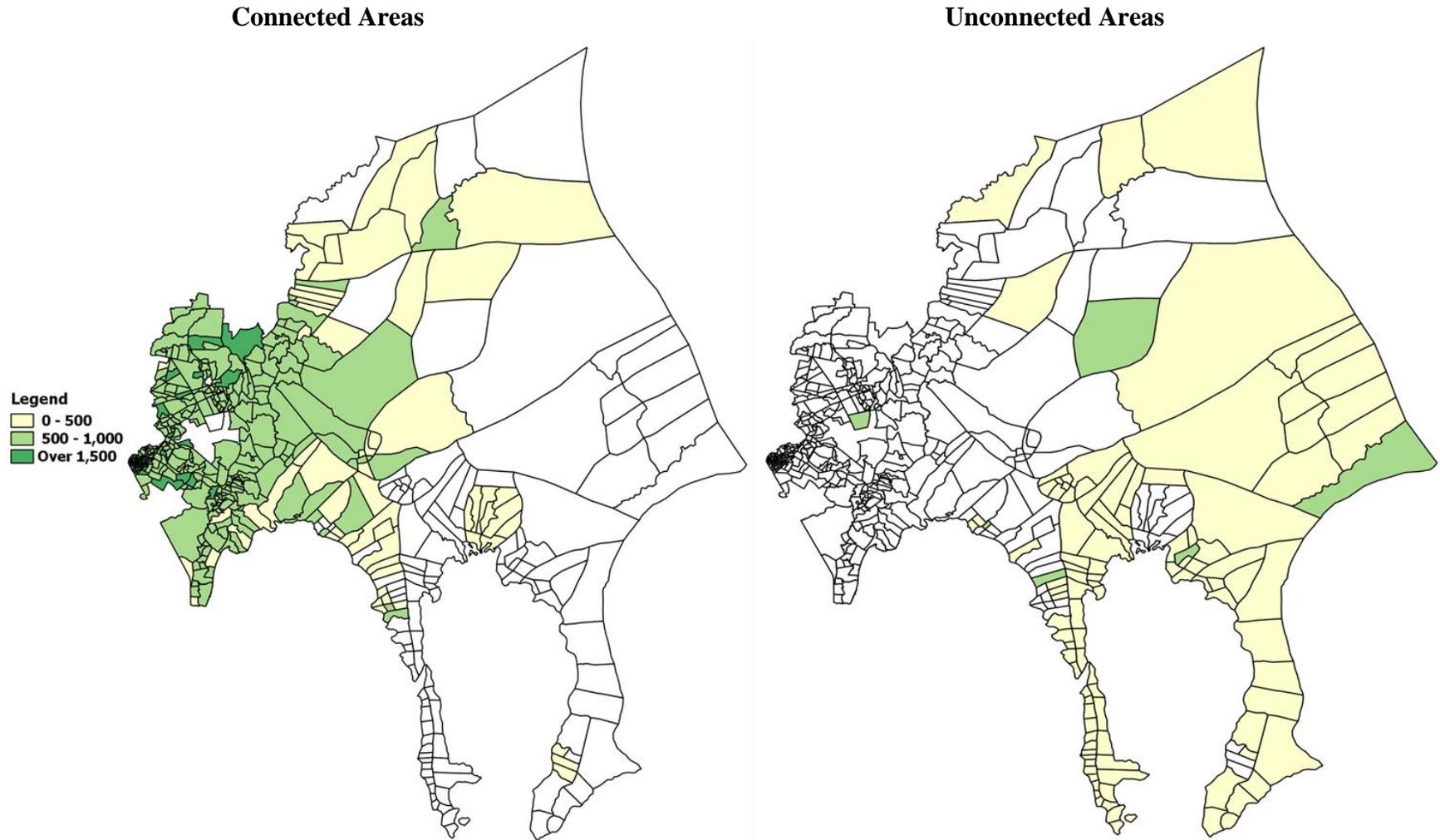
Maps drawn by Author (2015) using data from UP NEC (2011b). Average per capita consumption level for connected barangays is twice as high as that for unconnected barangays.

**Figure 25. MWCI GIS Map: Average Water Price (₱/cubic meter)**



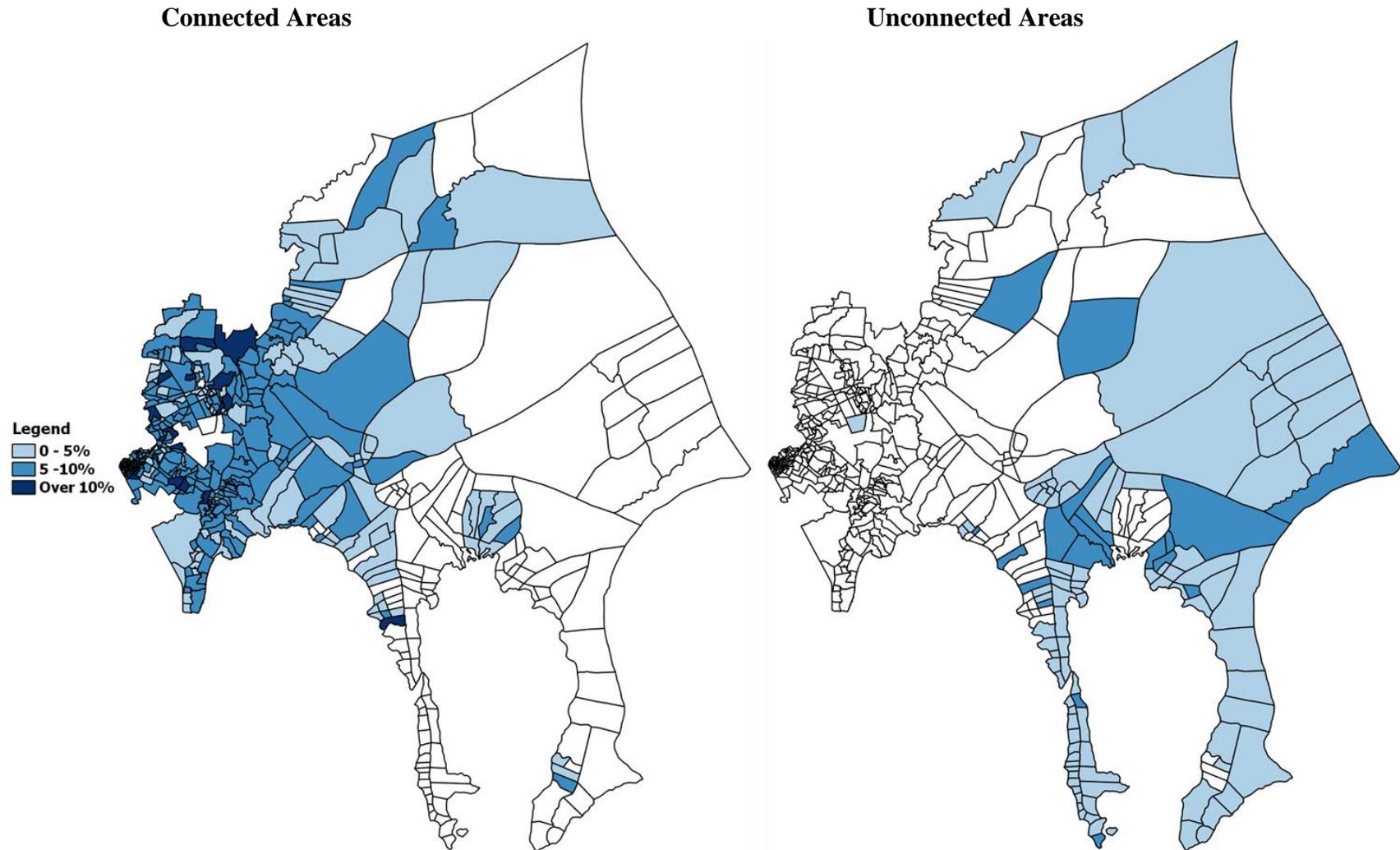
Maps drawn by Author (2015) using data from UP NEC (2011b). Average water price for connected barangays is only 26% lower than that for unconnected barangays.

**Figure 26. MWCIS GIS Map: Monthly Water Expenditure (₱)**



Maps drawn by Author (2015) using data from UP NEC (2011b). Minor price differences but large consumption disparities result in a 120% lower average monthly water expenditure for unconnected barangays vis-à-vis connected barangays.

**Figure 27. MWCI GIS Map: Affordability (% of household expenditures)**



Maps drawn by Author (2015) using data from UP NEC (2011b). As a percentage of household expenditures, unconnected barangays spend much less than connected barangays for their water needs, indicating a large disparity in their water consumption levels.

## **4.7 Community Water Systems**

In locations where the concessionaires' water networks are already in place, there are certain communities, mostly squatter families and slum dwellers, which are still not directly connected to these networks. The Philippine government defines squatting as the act of occupying a piece of land or building without the permission of the owner; and slum dwelling as living in congested and dilapidated homes under conditions that pose risks to health, safety, and well-being. While there are some exceptions, squatting and slum dwelling normally occur together in the Philippine setting (Philippine Sociological Society, 1968). Thus, squatter communities, which the research also refer to as informal settlements, normally have to contend with poor socio-economic conditions amidst legal issues related to their tenancy.

### **4.7.1 Informal Settlements: Indirect Access to Concessionaires' Water**

The government has estimated that there are about 560,000 families living in informal settlements throughout Metro Manila (MWSI, 2014g). Aside from the financial difficulty of paying connection fees, these families have to present proof of property ownership<sup>40</sup> when applying for water service connection (see MWCI, 2015c; MWSI, 2015c). While concessionaires extend amortized payment schemes to make connection fees more affordable, the requirement regarding property ownership is oftentimes strictly enforced, making it very difficult for informal settlers to comply. Realizing the threat of pilferage and potential leaks because of possible indiscriminate puncturing of water lines to steal water, the two concessionaires have developed programs to supply water to informal settlements by partnering with community-based

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<sup>40</sup> Applicants must present either a land title or deed of sale (MWCI, 2015c; MWSI, 2015c).

organizations<sup>41</sup> to operate what the research calls community water systems.<sup>42</sup> Known as *Samahang Tubig Maynilad* (translated as Maynilad Water Association) and *Tubig para sa Barangay* (translated as Water for the Village) for the west and east zones, respectively, these programs are designed to allow community-based organizations to handle the daily operations and management of water systems for these settlements (see Rivera, 2014; Berina & Kim, n.d.; MWSI, 2014g). In the event communities decide to organize themselves into cooperatives, the concessionaires may provide training and funding to support livelihood projects that generate additional income or employment for their members (Concessionaires' Managers, Personal Interviews, August 13, 2014, December 2, 2014).

Though many iterations are possible (Figure 28), the general arrangement requires MWSI and MWCI to provide bulk water supply to these communities through pipelines that are installed with bulk meters. From the metering points, the concessionaires allow these organizations (usually headed by local political or community leaders) to install connections directly to the households, read household meters to determine consumption, send water bills, and collect payments. In a few instances when there are no individual water lines connected to the households, a long water hose is used to supply water from one household to another. Where possible, the concessionaires also install meters in clusters outside informal settlements to reduce the cost of connecting to the main water system. Residents individually make arrangements on their own or through the community-based water operators to connect their households to the main distribution system (Concessionaires' Managers, Personal Interviews, August 13, 2014, December 2, 2014).

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<sup>41</sup> Also called People's Organizations by MWSS and the concessionaires

<sup>42</sup> A few community water systems are funded and operated by NGOs. Normally, their water rates are lower than those of other community water systems (NGO Officials, Personal Interview, November 17, 2014).

**Figure 28. Different Supply Options for Community Water Systems**



Photos taken by Author (2015) showing different options used by community-based operators for supplying water to informal settlers.

Cheng (2015) describes this arrangement between the concessionaires and the community-based organizations as a form of Public-Private-Community Partnerships (PPCPs), where the state partners with the private sector and the community to achieve certain developmental goals. Specifically, for Metro Manila, she (2015, pp. 241-242) identifies the arrangement as a delegated management model, a variation of the condominium sewerage system pioneered by Brazil in the 1980s. Cheng (2015) says that this type of partnership usually passes

on the risks and costs to the community by requiring them to help construct and maintain networks in areas the private water firms would normally deem unprofitable. As such, this arrangement results in cost-savings for the firms, but not necessarily for the poor consumers who are supposed to be the main program beneficiaries. Moreover, Cheng (2015) maintains that there is limited empowerment and participation by local residents, as the program design for community roles and infrastructure development is determined by the dominant partners, the private concessionaires in the case of Metro Manila's water privatization. In certain instances, the more marginalized members of the community are also unable to participate in the program due to their inability to cover the cost of connecting to the system. Bakker (2010) says that while community water supply options are indeed not necessarily equitable or democratic, these arrangements can also be highly functional in instances that provide a minimum threshold for the access of resources by the poor or for those that promote conservation of resources. To this, she adds that the state needs to fulfill its responsibility of ensuring equitable and universal water provision, a necessary task for good water governance. Hence, I would like to point out that these types of water supply arrangements should not diminish the role of government, but rather, make a case for its continuing presence if they are to help resolve the water problems of the poor.

#### **4.7.2 Water Pricing: Glass Half-Empty or Half-Full?**

For water supplied in bulk to community water systems in Metro Manila, the private concessionaires charge a water tariff rate known as “averes” (acronym for average residential), based on the average consumption of all households in the community (Concessionaires' Managers, Personal Interviews, August 13, 2014, December 2, 2014). Most of the time, this average falls within the lifeline rate, or the lowest residential water rate, as the operators tend to

limit household consumption below 10 cubic meters per month, the lifeline rate's upper volume limit. Hence, maintaining average household consumption volume within the block covered by the lifeline rate, which the research refers to as lifeline volume, provides the highest margin for community-based water operators. At the consumers' end, the operators bill each household using a unitary tariff of ₱100 per cubic meter (US\$2.22 per cubic meter), with the difference in water pricing (as may be seen in Table 20) providing cash flow to cover salaries of operating personnel, fund livelihood projects, and payout dividends to members (Community-Based Operators, Personal Interviews, August 13, 2014, December 2, 2014).

**Table 20. Water Pricing for Community Water Systems, ₱/cubic meter (US\$/cubic meter)**

<b>Private Concessionaires</b>	<b>Community Water Systems*</b>	<b>Manual Delivery (Carts / Tankers)*</b>
10 – 12 (0.22 – 0.27)	100 (2.22)**	200 (4.44)

\* From interviews with community-based water operators on August 13, 2014 and December 2, 2014.

\*\* NGOs charge only ₱30 / m<sup>3</sup> (US\$0.66 / m<sup>3</sup>) (NGO Representatives, Personal Interview, November 17, 2014)

Table developed by Author (2015) using data from MWCI (2011); MWSI (2012d); various personal interviews (as indicated above). For monthly consumption of 10 cubic meters, water prices for households supplied by community water systems are 10 times higher than prices charged to connected households, but still 50% less than prices for water supplied by carts and tankers.

While the water tariff charged by the community water systems is about 10 times the tariff charged by the concessionaires, the former is still 50% lower than the price charged for water delivered manually by carts and tankers. Furthermore, households serviced by community-based water operators are able to enjoy continuous water supply. However, water pressure and quality may be affected at times because of the relatively crude design and construction of these operators' reticulation systems. Nevertheless, such a supply option is much better than the manual delivery of water by carts and tankers, an option usually associated with long waiting periods, difficulty of access, and questionable water quality.

### 4.7.3 Program Awards and Critiques

With the implementation of these programs, the concessionaires acknowledge that they have reduced systems losses, increased the number of water service connections, and improved collection efficiency, over and above establishing partnerships with these communities (Berina & Kim, n.d.; MWSI, 2014g;). Over the years, these community-based water supply programs have earned several awards for the two concessionaires, citing innovation and corporate social responsibility in the provision of water to informal settlements.<sup>43</sup> MWCI claims that its *Tubig para sa Barangay* program has provided water to 1.7 million people from low-income communities, and in the process, reduced the incidences of diarrhea cases from 15 to 4, for every 1000 people, for the period covering 2000-2008. Likewise, their partnership with community-based cooperatives for livelihood programs has generated jobs worth ₱60 million (US\$1.5 million) for 1,000 low-income families (Berina & Kim, n.d., pp. 10-13). For MWSI, its *Samahan Tubig Maynilad* program has provided water for 2,683 low income families and established for its Tondo project, a livelihood program for the manufacture of hand soaps and home care products (MWSI, 2014g, p. 1).

In contrast, there are officials from NGOs (NGO Officials, Personal Interviews, November 17, 2014, November 25, 2014) and the local government sector (Local Government Official, Personal Interview, December 2, 2014) who have expressed concern over the concessionaires' motives for implementing this water supply mode for low income communities. They feel that the private water firms are assigning to the community-based organizations the functions and responsibilities of providing water directly to informal settlers, effectively

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<sup>43</sup> MWCI awards include the 2010 Global Corporate Social Responsibility Award for Leadership; Management Association of the Philippines CSR Main Award; and Intel–Asian Institute of Management Responsibility Award (Berina & Kim, n.d., pp.14-16). For its STM-Tondo project, MWSI won the Anvil Award for Excellence in 2009 (MWSI, 2014g, p. 1).

transferring the operational and financial risks associated with “the last mile”, as Cheng (2015) calls it, of water service provision. While indeed both concessionaires and community-based organizations benefit in some way from the partnership, Cheng (2015) believes that the concessionaires are distancing themselves from low income communities, becoming pseudo state-like entities, with the latter becoming the face of water service provision.

To address the issues that have been raised against this alternative form of water supply to informal settlements, the MWSS Regulatory Office has given directives to the concessionaires to increase efforts in connecting these households directly to their systems, and to report on a quarterly basis their achievements in this regard (MWSS Official, Personal Interview, November 28, 2014; see MWSS RO, 2012a; MWCI, 2013, 2014h). As of July 2014, the research estimates that there are about 832 and 256 community water systems in the west and east zones, respectively, based on data obtained from the MWSI (2014h) report on bulk selling customers and the MWCI (2014h) report on the supply of water to people’s organizations. Together with data from the MWCI (2012c) report, the research also estimates that service coverage levels may actually be 6% to 8% lower, if the formula for computing this service target includes only those households directly connected to the system.

#### **4.8 The Many Faces of Urban Water Inequity**

Using the concept of Social-Hydrological Systems, this chapter examines the Metro Manila water privatization experience of consumers across all socio-economic classes, using the parameters of water supply availability, water pressure, water quality, affordability, and access. In general, Class E households, which belong to extremely poor communities, have not fared as well as households belonging to other socio-economic classes (AB, C, and D). Nonetheless, I

would like to point out that connected E households have enjoyed considerably better services than their unconnected counterparts, but such services generally come with a price tag. In the succeeding sections, I explain why these households are in various states of water inequity, with each state distinct from the other because of varying contributory factors. In connected areas, water inequity arises from an outdated lifeline volume amidst significant consumption increases in one case, and the absence of property rights in another. In unconnected areas, water inequity arises from the absence of the concessionaires' centralized networks coupled with the inherent regulatory problems associated with various alternative water suppliers. Along the "North to South" supply corridor, water inequity morphs from one form to another, the worst scenario being found in the southern urban fringes.

#### **4.8.1 Conditions of Water Inequity for Directly Connected E Households**

As already established in the preceding sections, in areas where the concessionaires' networks are in place, all network-connected households, regardless of socio-economic class, enjoy continuous supply of high pressure and high quality water. The household connection-consumption relationship (see MWSI, 2014f; Appendix E) reveals that these conveniences bring about a twofold increase in water consumption of households that are able to connect to the concessionaires' distribution systems. The continuous use of piped water creates a comfort zone, pushing these households to a point where they can no longer reduce or revert back to previous consumption levels. Moreover, the fact that the per capita consumption of Metro Manila, which ranges from 130-150 liters/month, is still below the 165-280 liters/month average per capita consumption registered for Asian cities (ADB, 2004b, 2010), makes it more difficult to convince Metro Manila households to reduce their water consumption.

With the present tariff structure, water service is still within affordability limits for all connected households, except for those belonging to Class E. To reiterate, the average water bill of connected Class E households as a percentage of their household income, ranges from 7% to 11%, exceeding the World Bank and the Asian Development Bank's prescribed ceiling of 5% (see World Bank, 2008; Fankhauser & Tepic, 2007). A closer look at the existing tariff structure, with special focus on the lifeline rate, provides valuable insights on the affordability concerns of extremely poor households and may help set policy directions for MWSS towards this end. Just like in many developing countries, MWSS uses an increasing block rate tariff structure that is intended to promote equity, efficiency, and conservation (see Diakit , Semenov, & Thomas, 2009 for more discussions on increasing block rate tariffs). As noted previously, the Metro Manila water tariff structure has a lifeline rate for a monthly consumption of less than 10 cubic meters, which is intended to make water affordable for low income communities. Likewise, high volume users subsidize low volume users within each customer category (i.e. residential, commercial, industrial) as well as between these categories, requiring commercial and industrial customers to subsidize residential users (see MWSS, 1997a, p. 92; 1997b, p. 94). What may seem trivial, but fundamentally important in addressing the affordability issue, is the fact that the current lifeline rate was developed at a time when water supply was available for only 16 hours a day; water pressure was erratic (very low for the most part), and systems losses were at the level of 61% (see Table 2). Given that consumption has increased tremendously for connected E households (as well as for other household classes) under prevailing conditions of urban water supply, the consumption range for the lifeline rate may no longer be applicable for low income communities. I provide a more extensive discussion on the Metro Manila water tariff structure in

Chapter 6 when I articulate the policy reform necessary to address this particular state of water inequity.

In a developing country such as the Philippines, a water service connection is not merely a physical connection to the water mains, but a symbol of connectivity to the conveniences enjoyed by more affluent members of society. Particularly, for members of impoverished communities, a water service connection accords them a notion of “citizenship”, which is beyond the basic legal rights and responsibilities, but one that takes on a moral dimension of acceptability and belongingness to society (see Morales, Harris, & Öberg, 2014, p.2818). Thus, it becomes a precious asset for members of these communities.<sup>44</sup> However, the conveniences that come along with this asset also unleash the suppressed demands of consumers previously suffering from poor service, effectively ushering these households towards a one-way path of increased water consumption. Under the existing water tariff regime, Class E households (when compared to the AB, C, D households) bear the heaviest burden, requiring state intervention to make such conveniences affordable to them. The findings of the research suggest that it may be time for MWSS to review the existing tariff structure to determine whether or not pricing policy changes need to be made, particularly as they relate to making water provision more affordable to the poorest households in the metropolis.

#### **4.8.2 Conditions of Water Inequity for Indirectly Connected E Households**

Most informal settlers, generally belonging to the socio-economic class E, are not served directly by the concessionaires even though these communities are found in areas where the

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<sup>44</sup> This was supported by an anecdote shared by a concessionaire’s manager (Personal Interview, August 13, 2014) about a new water service connection to a household in one of the more disreputable informal settlements. The head of the household, a toughie in the neighborhood, was in tears after getting a water service connection and was so thankful to the concessionaire’s representatives that he offered to give his gun to them in return.

private water networks are in place. As these communities occupy land on a rent-free basis, without the consent of the landowner (see Cruz, 2010), the concessionaires are somewhat constrained from providing them with direct network connections, and therefore, can only serve them indirectly through community water systems. Because the concessionaires are not directly responsible for the quality of water service provided to these communities, the latter did not form part of the Metro Manila water demand consumer survey. By default, the operators of community water systems fulfill the functions of the concessionaires over the last mile (see Cheng, 2015) of water provision to informal settlements. Where the concessionaires' pipes end and where the communities' pipes begin is a function of the boundaries surrounding the areas where these communities reside. With both private and public ownership of the properties involved, resolution of cases concerning squatting on another party's land takes many years to resolve. Until the land dispute case is finally settled, it is as if time has been suspended as a stalemate ensues, with the owners unable to evict the informal settlers and the latter unable to get water connections and services directly from the concessionaires. Within the bounds of these contested properties, community-based organizations operating the water systems become the face of the concessionaires, the entity to whom the functions of government were entrusted as regards the provision of this essential basic service.

Mimicking the concessionaires, the community-based operators try to provide the conveniences of direct household connections, although water pressure and quality may at times be at sub-par levels. While community water systems are indeed a better alternative than water supply by carts and tankers, the presence of intermediaries between the concessionaires and the households have made this alternative form of water provision ten times more expensive than water supplied directly by the concessionaires (see Table 16). Moreover, there is a tendency for

operators to limit average household consumption to the lifeline volume of 10 cubic meters per month, in order to avail of the lowest tariff rate for water supplied in bulk by the concessionaires (Community-Based Operators, Personal Interviews, August 13, 2014, December 2, 2014). As such, informal settlers pay more for the opportunity to experience the conveniences of piped water supply, even though such conveniences still fall short of the lived experiences of households directly connected to the main distribution systems. Admittedly, the problems related to property rights are very difficult to resolve and status quo conditions may endure a lifetime. However, informal settlers are also entitled to enjoy the full benefits of improved services at a price that is affordable to them. Thus, it is imperative that innovative policies and programs be implemented to achieve this objective, whether or not the problems of property rights still persist.

#### **4.8.3 Conditions of Water Inequity for Unconnected E Households**

The design and implementation of a “North to South” water supply infrastructure system has left a great majority of the households in the southern urban fringes unconnected to the main water lines of the concessionaires. Though unable to share the conveniences of concessionaire-connected households, most of the unconnected households, with the exception of E households, are able to avail of different water supply options to meet their daily water requirements. As unconnected E households have low purchasing power and limited ability to negotiate for better water provision, they bear the twin problems of low monthly water supply and high water prices. Hence, these households suffer the worst form of water inequity among all households. Difficulty of access and low water quality plus the added burden of high prices have suppressed demand, reducing consumption of unconnected E households in the west zone to only 42 liters

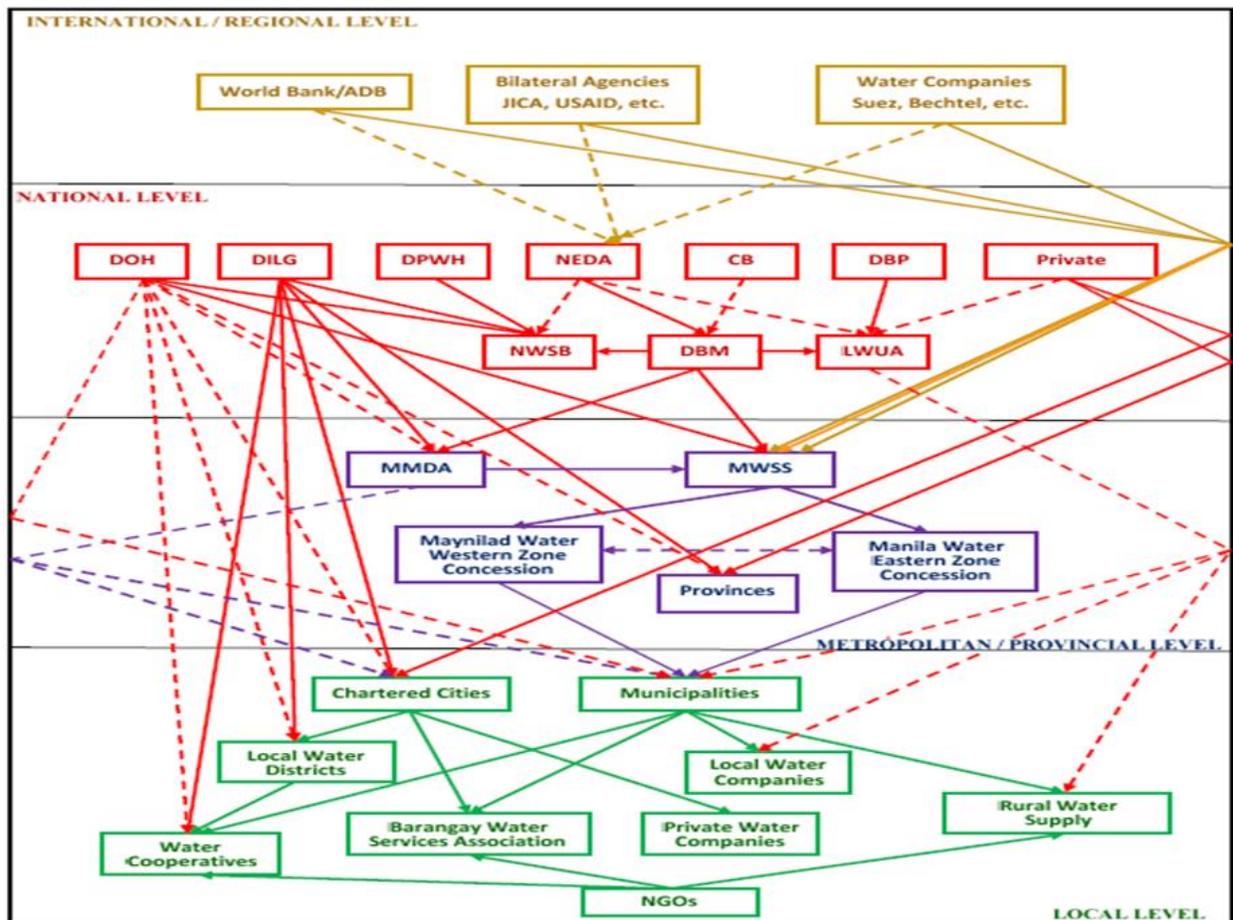
per capita per day, lower than the minimum water consumption level necessary to ensure the well-being of individuals and communities alike.

Plans and policies on major infrastructure projects must take into consideration that their benefits or effects on the population will vary according to their socio-economic circumstances. Given that conditions of water inequity at the southern peripheral areas may be attributed to the non-existence of a centralized water infrastructure system, there is a need to build new sources of water supply bundled with the requisite pipeline distribution systems that will deliver water to these households. At present, these households are outside the physical boundaries of the centralized urban waterscape, able to view only from a distance the conveniences enjoyed by their connected counterparts.

With many service providers, including local government units, trying to fill in the void in water provision, the regulatory environment may be described as one of complexity or even confusion, given the involvement of different agencies regulating these service providers. To better appreciate the complicated nature of the regulatory environment in the Philippine water sector, please see Figure 29 which presents Laquian's (2014) illustration of the different government agencies involved in the provision of water services. The Philippine water sector is comprised of 5,400 water service providers. MWSI and MWCI, water districts, local government units, and other private water operators service urban centers, while barangay water and sanitation associations, rural water and sanitation associations, and cooperatives service rural areas (NEDA, 2010, p. xv). The regulation of water services in the country remains fragmented and overlapping, with so many institutions taking part, such as the national regulatory agencies, local government units, and special water regulatory bodies like the MWSS RO. Of the 15 departments with involvement in water supply provision, there are 36 line bureaus or concerned

agencies within these departments that have some form of responsibility and authority on issues involving water (NEDA, 2010, pp. 19-25). In the southern urban fringes of Metro Manila, it is only when the concessionaires are able to claim their territories by extending their networks and delivering the water service that the MWSS Regulatory Office is able to fully regulate the provision of water. The absence of a centralized water system and an effective regulatory environment in these areas has made it problematic for the lowest income group to meet their daily water requirements.

**Figure 29. Water Governance in the Philippines**



Source: Laquian, A. A. (2014). Asia Pacific. In *Basic services for all in an urbanizing world* (pp. 32-38). Barcelona: United Cities and Local Governments. (Reproduced with permission) In the Philippines, 15 major departments and 36 line agencies have overlapping functions in the water sector.

## **4.9 Water Equity Considerations: Pre and Post-Privatization**

### **4.9.1 Comparing Pre and Post-Privatization Consumer Survey Results**

After almost two decades of water privatization in Metro Manila, how do current conditions of water equity compare to those prior to privatization? To answer this query, I examine the results of a 1996 consumer survey and compare them to the 2011 consumer survey results that I used for the research. The 1996 survey was conducted by Social Weather Stations [SWS]<sup>45</sup> for the International Finance Corporation, the transaction advisor for this water privatization. This survey involved 300 households, 77% of which were connected to the MWSS water system (Mangahas & Guerrero, 1996, p. 1). While the sample size for the 1996 SWS survey is very small compared to that of the 2011 survey, the former may be considered as the best available pre-privatization survey on Metro Manila's water provision. Table 21 presents the survey results on water supply availability, quality, and pressure.

An analysis of Table 21 shows that MWSS provided uniform service as regards water supply duration, quality and pressure for all households connected to its network, regardless of socio-economic status. However, please note that water service provision related to these parameters, during the period prior to privatization, was experienced by a much smaller percentage of the population and at a much lower level of service compared to that of the post-privatization era. On average, water supply was available for 19 hours a day and water quality was generally good except for some concerns on turbidity. Compared to the previous 6-month period, water pressure was lower at the time of the survey. In general, these results conform to the 1997 data provided by the privatization scorecard in Table 2.

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<sup>45</sup> Social Weather Stations is a private non-stock, non-profit social research institution in the Philippines (SWS, 2016).

**Table 21. 1996 SWS Survey: Connected Households - Water Supply Availability, Quality and Pressure**

Parameter	Socio-Economic Class			
	ABC	D	E	Ave
<b>Water Availability</b>				
Daily Supply, hours	20	19	19	19
24-Hour Service Interruption, days	6	3	3	4
Net More Supply Now, points	-9	-11	-11	-10
<b>Water Quality</b>				
Always Clear, %	43	44	47	43
Odorless, %	80	81	85	81
Colorless, %	75	78	81	73
Tastes Good, %	78	80	87	82
Net Better Quality Now, points	0	+4	0	+3
<b>Water Pressure</b>				
Net More Pressure Now, points	-15	-22	-6	-19

Note: Results based on experience for past 6 months, at the time of survey.

Net results – Difference in percentage of respondents saying service improved vs. those saying it deteriorated.

Table developed by Author (2016) based on data from Mangahas and Guerrero (1996). Prior to privatization, all connected households experienced uniform service quality, regardless of socio-economic class. While such is still true today, service levels are higher due to larger service coverage, higher water pressure, longer supply duration, and better water quality.

Together with the 2013 operational performance data in Table 2 and the 2011 consumer survey results in Table 12 (Privatization Experiences on Water Supply Availability, Pressure, and Quality), the SWS survey results support the conclusion that a much larger population (twice the 1997 population size) currently enjoy significantly improved services related to these parameters across all socio-economic classes. Revisiting current service levels, about 14.9 million people enjoy nearly 24-hour supply of water at a pressure of 7 psi, with water quality that meets Philippine drinking standards almost 100% of the time. In the following sections, I discuss the implications of improved service levels with respect to urban water equity conditions.

#### 4.9.2 Increased Water Equity Due to Improved Water Services for Connected Households

In the post-privatization scenario, improved water services for households already connected to the system generally enhances conditions of water equity for these households. This is especially true for households that are able to enjoy the conveniences of in-house access to water supply at improved service levels and within affordability limits, despite an average increase in consumption of 48% (21 m<sup>3</sup> to 31 m<sup>3</sup>, Table 22). Normally, these households belong to the AB, C, and D socio-economic classes. Of special interest are the middle class (C) and poor (D) households whose water expenditures still fall within acceptable affordability levels (Tables 17 and 18), in spite of a 200% increase in average water tariff since commencement of the program in 1997.

**Table 22. 1996 Survey: Connected & Unconnected Households – Water Consumption, Price and Expenditure**

Parameter	Pre-Privatization (1996) <sup>1</sup>		Post-Privatization (2013) <sup>2</sup>	
	Connected	Unconnected	Connected	Unconnected
Water Consumption, m <sup>3</sup>	21	12	31	11
Water Expenditure, ₱	212	305	806	474
Implicit Water Price, ₱/ m <sup>3</sup>	10	25	26	43

Note: Weighted average based on % of total population served, with 60% and 40% for MWCI & MWSI, respectively

Table developed by Author (2015) using data from <sup>1</sup> Mangahas, & Guerrero (1996); <sup>2</sup> Figure 21. Water service connections significantly increase household consumption. The level of increase is dependent on water service quality as seen from pre and post-privatization increases.

Since the concessionaires are able to provide uniform services for all connected households, connected Class E households are likewise able to enjoy significantly improved water services. Similarly, the accompanying conveniences of direct connections to the networks considerably increase these households' water consumption. Amidst increased consumption

levels, the current water tariff structures have created a scenario where connected Class E households are spending more than the maximum limit of 5% of household income. In contrast, higher income groups have average water expenditures that are still below this threshold. In the absence of SWS survey data on water consumption, price, expenditure, and household income for the different socio-economic classes, it is difficult to ascertain whether or not such was also the circumstance surrounding these households prior to privatization. If this were the case at the time of the SWS survey, then the lifeline volume may have already been inappropriate for prevailing consumption levels. Otherwise, tariff increases over time may have eventually negated the lifeline volume's ability to meet the tariff's equity objective. What has become evident from comparing conditions of water equity during pre and post-privatization scenarios is that access to water service connections must be coupled with an affordable water tariff to comprehensively address water inequity issues. While there may have been some broad "equity" gains with respect to service enhancements across the connected population, it is clear that there remains considerable room for improvement as regards class E households, especially from an affordability perspective. Related to this, I examine more closely the matter of water tariff structure reform in Chapter 6 with the goal of making water provision for Class E households more affordable.

#### **4.9.3 Reduced Water Inequity Due to Higher Water Service Coverage Levels**

The inability of a public or private water utility to provide direct access to piped water is an underlying factor that propagates conditions of water inequity for households within the networked areas, particularly in informal settlements, as well as in unconnected areas in the southern peripheries of Metro Manila. To the extent that service coverage has increased by 24%

from 1997 to 2013 (as seen from Table 2), the concessionaires were able to provide many households with water service connections in areas where MWSS water networks were already in place at the start of privatization as well as in areas where the concessionaires were able to expand these networks. In this regard, there has been considerable reduction in associated water inequity for newly connected households as they are now able to experience the conveniences of piped water supply which previously connected households already enjoy. Nonetheless, the MWSS Regulatory Office must ensure that water service is affordable for these households in the long-run, most especially for the Class E households, by ensuring that the lifeline rate/volume policy remains relevant amidst large consumption upswings brought about by direct water service connections.

As seen from Table 22, in the post-privatization period, average household consumption increased by 200% (11 m<sup>3</sup> to 31 m<sup>3</sup>) once a household is able to get connected to the network. Even during the pre-privatization period, average water consumption increased by 67% (12 m<sup>3</sup> to 20 m<sup>3</sup>) with network connection. These pre and post-privatization survey results also indicate that the rate at which household consumption increases with water service connections is dependent on the level and quality of services provided by the water utility. Substantial increases in consumption due to new water service connections further support the need for a regulatory review of existing water tariff structures, to determine necessary interventions that would make water provision affordable for newly connected Class E households.

#### **4.9.4 Persisting Conditions of Water Inequity**

Although there have been considerable improvements in water equity conditions with more efficient water provision, there are still evidences of water inequity which MWSS and the

concessionaires need to fully address. As a general rule, MWSS must deal with the twin concerns of access and affordability that still hound Class E households in order to substantially negate the factors that propagate these conditions. Indeed, the provision of water service connections is a big step towards addressing water inequity in Metro Manila, as extremely poor households (E) are afforded the opportunity to meet their daily water needs for healthy and productive living. Note that households remaining unconnected since 1997 have maintained low levels of water consumption (about 11 m<sup>3</sup> - 12 m<sup>3</sup>, Table 22), with Class E households affected the most because of their low purchasing power and limited supply options. As emphasized in the preceding sections, a water tariff reform policy may be necessary to make long-term water use affordable for these households, considering large increases in their consumption arising from improved water services.

#### **4.10 Conclusion**

While efficiency-based performance assessments offer a general sense of the program's achievements in improving water services, assessments based on equity metrics provide a fuller appreciation of the degree to which all consumers benefit from such improved services. Across the Metro Manila waterscape, various scenarios of water inequity still persist due to prevailing access and affordability concerns. As defined in this dissertation, equity is the ability of impoverished households to avail of improved water services at consumption levels that meet their daily water needs, at a price affordable to them.

The research shows that all connected households, including extremely poor (E) households, now experience nearly 24 hours of clean water at a pressure of 7 psi. On the other hand, the unconnected households' average consumption level is only half of that of connected

households due to the twin effects of high water cost and difficulty of access, which greatly suppress the former's water demand. Specifically, for unconnected Class E households, consumption is generally below the WHO-prescribed minimum per capita consumption of 50 liters per day, posing health risks to individuals and communities alike. Among all socio-economic classes, Class E households spend the most for their water needs for both connected and unconnected areas, paying more than the maximum threshold of 5% of their household income.

Within the networked areas, Class E households in squatter communities are unable to directly connect to the concessionaires' water lines due to the absence of legal property rights. Such households are served mostly by community-based operators with water purchased from the concessionaires and supplied through a reticulation system of above ground plastic water pipes. Seemingly considered as second class water citizens, households in these communities usually pay ten times more to enjoy the conveniences offered by direct household connections. Over time, this sub-contracting arrangement for the last mile of water delivery eventually transfers to these operators the contracted responsibility of the concessionaires to provide these urban residents with continuous and adequate supply of good quality water.

While there are still existing conditions of water inequity, I also acknowledge that improved services brought about by Metro Manila's water privatization have lessened such conditions to a certain extent. Connected households belonging to the AB, C, and D socio-economic classes experience highly improved levels of service at affordable prices. Moreover, increased connections for Class E households have allowed them to experience the conveniences of in-house access to continuous supply of good quality water. However, certain lingering states of water inequity continue to affect these extremely poor households, requiring the state to

implement policies that address the factors that propagate these conditions. In this regard, I offer policy recommendations specific to Metro Manila's water privatization in Chapter 6. Meanwhile, I examine the existing rural-urban equity nexus in the following chapter to explain why the issue of equitable urban water provision is also important for rural farmers who share water supply with Metro Manila consumers.

## **Chapter 5: The Rural-Urban Equity Nexus of Metro Manila's Water System**

### **5.1 Introduction**

Using the concept of Social-Hydrological Systems, this chapter explores the rural-urban equity nexus of the Metro Manila water system. Starting with the source of water supply, the chapter describes the physical structure and hydrology of Angat Dam as well as its operation and governance, as dictated by a set of established protocols. The conflicting nature of water allocation and use as well as the equity issues related to these protocols are then examined, focusing on periods of droughts or long dry spells when irrigation water supply is reallocated for Metro Manila's domestic requirements. Highlighting the importance of the rural-urban equity nexus, the chapter explains why only an equitable provision of urban water may be able to justify the relatively inequitable allocation of water supply from the Angat Dam during times of scarcity and difficulty.

### **5.2 Angat Dam: A Symbol of Inequity?**

Viewed solely as a technological infrastructure, a reservoir may be regarded as a large and expensive impounding facility for rain water that drains into the river and subsequently flows into the reservoir. Its operations may seem inconsequential - impounding rain water through river flows, storing it for future usage, and finally, releasing stored water for multiple uses such as power generation, irrigation, and consumption. With very little rain, there may not be enough water to supply the various users and as such, the reservoir operators are obligated to limit the release of water. With heavy rainfall, the ensuing high level of water in the reservoir may compromise its integrity, thus forcing the operators to release large volumes of water to

prevent any possible damage from occurring. In the context of coupled social and hydrological systems, these seemingly mechanical and routine actions performed on massive walls of concrete and rocks have critical consequences for the people who depend on water for its many uses.

Acknowledging La Porte's (1994) statement that technological systems are also networks of social relationships, a dam or reservoir may then be perceived as a social infrastructure. Dams are also seen as symbols of modernization, being products of "socially and culturally embedded plans, dreams, and geographical imaginations of modernization" (Kaika, 2006, p. 277). Dams have played prominent roles in nation-building, thus, socially and politically empowering those who are able to control the flow of water (Strang, 2013). Conversely, these ruling elites may use the symbolisms of dams to propagate patriotism and national identity (see Menga, 2015).

At times, dams have been turned into quasi-sacred places, becoming destinations for tourists who want to view these technological marvels. Able to reconfigure the agricultural and industrial processes, dams also affect patterns of human consumption. (Bromber, de la Croix, & Lange, 2015). As dams have reshaped landscapes and waterscapes to support human processes, they also represent the triumph by humans over the physical environment (see Strang, 2013). Yet, while humans have been able to reshape the physical environment through these dams in order to promote human development, the World Commission on Dams [WCD] (2000, p. 310) stresses that "in too many cases an unacceptable and often unnecessary price has been paid to secure those benefits, especially in social and environmental terms, by people displaced, by communities downstream, by taxpayers and by the natural environment." The WCD (2000, p. 129) estimates that the more than 45,000 dams around the world have physically displaced 40-80 million people while 60% of the world's rivers have been affected by dams and diversions. In

many instances, there have been significant and irreversible loss of species and ecosystems, and the required mitigation efforts oftentimes have not been successful (WCD, 2000).

In this chapter, I focus on Angat Dam, a multi-purpose reservoir that supplies irrigation water to rural farmers and domestic water to urban residents while generating power in the process. Farmers rely on water supply from the dam to produce food needed by the populace while city residents depend on it for daily living and hygiene. Able to generate power, water is also a resource that makes people's lives more productive, comfortable, and enjoyable.

Downstream from the dam, the river also needs its share of water releases in order to perform life-supporting services for riverbank communities as well as accomplish vital ecological functions. With multiple uses shoring up demand for a resource that is limited in supply, the allocation of water from the reservoir is not just a set of numbers but a means of survival for vulnerable and marginalized users, the farmers and the poor urban consumers, who are normally unable to voice their concerns and negotiate better deals for themselves. Yet, how do we define environmental justice for these water users? Holifield (2001) cautions against referring to environmental justice as a single uniform agenda since it has different meanings in different contexts. Further, environmental justice has gone beyond the traditional definition of ensuring that all people, regardless of race or social status, should be protected from the disproportionate effects of environmental hazards. To this, Holifield (2001) declares that the understanding of environmental justice by different people will depend on their geographic, historical, political, and institutional backgrounds

Taking into consideration the farmers and poor consumers who rely on this infrastructure, the reservoir may be construed as a symbol of inequity, depending on whether or not their interests are properly considered and cared for. Equity is generally defined as "the quality of

being fair and impartial” (Equity, 1993). For this research, equity conditions at the reservoir, the source of water supply, relate to the fairness in water allocation for the different users. At all possible times, water supply for the different users must be allocated according to their water rights. At times of drought or El Niño occurrence, if the allocation of a certain party is reduced in favor of another, the former should be properly and fairly compensated for the volume of water reallocated to the latter. At the urban water side, as previously discussed in Chapter 3, equity relates to the level of fairness in water provision, generally described by high levels of water services for all socio-economic classes and a level of affordability according to each socio-economic class’ paying capacity. Compared to the assessment of equity conditions for urban water supply for which the methodology was discussed in Chapter 3, the review of equity concerns surrounding the water allocation from Angat Dam is quite straight forward as there are only three major parties utilizing water from the dam, those for power generation, irrigation, and domestic water supply.

When used to examine equity conditions across the Metro Manila water system, the SHS framework shows that equity concerns for water supply allocation and urban water provision are interlinked and have undergone some form of transformation from pre to post-privatization scenarios. The ability to assess equity conditions in urban water provision becomes more important considering that only the equitable water provision in Metro Manila can rationalize the inequity in water supply allocation suffered by farmers in times of El Niño occurrences or long dry spells. I explain the reasons for this after describing the physical structure and hydrology of Angat Dam together with its operating and governance protocols.

### 5.2.1 Physical Structure and Hydrology

Completed in 1967, Angat Dam is a 131-meter rock fill multipurpose reservoir located in Barangay San Lorenzo, Norzagaray, Bulacan (MWSS, 2012b, p. 1), 58 kilometers northeast of Metro Manila (Network of Asian River Basins Organization, 2002, p.2). With a storage capacity of 850 million cubic meters of water, the dam supplies 97% of Metro Manila's domestic water requirements, irrigates 28,000 hectares of farmlands in the nearby provinces of Bulacan and Pampanga<sup>46</sup>, and generates 246 megawatts of electricity, equivalent to 5% of the total power requirement of Luzon<sup>47</sup> (MWSS, 2012b, p.1). Functioning also as a flood control facility, it regulates water release during extreme rainfall conditions to prevent heavy flooding of low lying communities along the Angat River.

As seen in Figure 30, water for Angat Dam is supplied by inflows from the Angat River basin and the adjacent river basin to the east, the Umiray River basin. Located on the western side of the Sierra Madre Mountains, the upstream catchment of Angat Dam is 568 square kilometers of mountainous terrain, with some of the heaviest rainfalls in the country (Tabios & David, 2004, p.108). With mean annual rainfall of about 4,391 mm, the average inflow from this upstream catchment is 58.3 cubic meters per second [CMS]. In 2000, a diversion tunnel<sup>48</sup> was completed by MWSS, providing additional water from the Umiray River to Angat Dam. The 130 square kilometer-catchment area of the Umiray River at the inlet of the tunnel contributes an average inflow of 11.7 CMS, solely for domestic water supply of Metro Manila (JICA et al, 2013 pp. 7-6 to 7-8).

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<sup>46</sup> Pampanga is another province north of Metro Manila which sources irrigation water from Angat Dam.

<sup>47</sup> Luzon is the largest of three regions in the Philippines.

<sup>48</sup> The construction of the diversion tunnel, which is 13.1 kilometers long and 4.3 meters wide, was funded by the Asian Development Bank under the Umiray-Angat Transbasin Project (MWSS, 1997b).

**Figure 30. MWSS Water Sources and Facilities Map**



Source: Metropolitan Waterworks and Sewerage System. (2014c). Water sources and facilities map. Quezon City: Metropolitan Waterworks and Sewerage System. (*Reproduced with permission*) Map shows the watersheds and facilities that supply water to Metro Manila.

Water for irrigation is released through four main hydroelectric turbines with a combined power output of 200 megawatts, and flows downstream to Bustos Dam and the Angat-Maasim River Irrigation System [AMRIS] before eventually reaching the farmlands. Domestic water supply for Metro Manila is released through five auxiliary turbines<sup>49</sup>, generating 46 megawatts of electricity in the process, and flows to Ipo Dam for distribution to the treatment plants of the two private concessionaires (MWSS, 2012b, p. 1). Appendix H provides a schematic diagram of the

<sup>49</sup> The first 3 auxiliary turbines are owned by PSALM while the last 2 are owned by MWSS (MWSS, 2012b, p.1).

water supply system for Metro Manila. In 2013, the Philippine government privatized the main power generating component by way of an asset sale to Korea Water Resources Corporation (see Power Sector Assets and Liabilities Management Corp., 2010).

### **5.2.2 Water Allocation Protocol for Angat Dam**

Water allocation for the dam is governed by a Memorandum of Agreement on the Angat Water Protocol [Water Protocol Agreement] (2013), which was signed by the reservoir's major users and policy makers – the National Power Corporation [NPC], the Metropolitan Waterworks and Sewerage System, the National Irrigation Administration [NIA], Korea Water Resources Corporation [K Water]<sup>50</sup>, the Power Sector Assets and Liabilities Management Corporation [PSALM], and the National Water Resources Board [NWRB]. Under its charter, NPC is tasked to undertake the development and production of electricity as well as ensure transmission of generated power on a nationwide basis. In 2001, the Electric Power Industry Reform Act created a new government corporation, PSALM, to take ownership of all NPC assets and liabilities and subsequently dispose of such assets to pay off all of the latter's outstanding liabilities and obligations. Pursuant to this law, PSALM auctioned off the power component of Angat Dam, for which K Water emerged as the winning bidder, but the former retained ownership of the non-power components<sup>51</sup> (PSALM, 2010).

As the government agency obligated to develop and manage irrigation water resources, NIA is responsible for 204 national irrigation systems supporting 704,750 hectares of farm land throughout the country (Pascua, 2007, p.8). Part of its responsibility is the supply of water from

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<sup>50</sup> The terms and conditions of the updated water protocol agreement remains the same except that the updated version already includes K Water as a contracting party, following the privatization of the main power component.

<sup>51</sup> Reservoir, auxiliary turbines, other equipment and facilities not related to the main power generating system (PSALM, 2010).

Angat Dam to AMRIS for the vegetable and rice farms of Bulacan and Pampanga (MWSS et al., 2013). NWRB, the government’s lead water resource policy and regulating institution, implements the priority system for the Angat Dam water utilization through the issuance of water permits and the appropriation of water use in accordance with the Water Code of the Philippines (1976). Furthermore, NWRB serves as the main adjudication body for settling disputes related to the appropriation, development, utilization, conservation and protection of all water resources (MWSS et al., 2013).

Based on the Water Protocol Agreement (2013, p. 3), the use of water from Angat Dam shall be governed by the principle of “priority in time of appropriation” for water coming from the same source; provided that in times of emergency, municipal and domestic use shall have priority over all other uses. Table 23 shows the water rights recognized by the different users.

**Table 23. Water Rights**

<b>Grantees</b>	<b>Amount (CMS)</b>	<b>NWRB Board Resolution No. / Water Permit No.</b>	<b>Remarks</b>
MWSS	20.1	Res. No. 016-0806*	
MWSS	15.0	Res. No .03-0188 WP No. 11462	From unutilized NIA grant
MWSS	14.0	WP No. 7359	Umiray River
MWSS	3.5762	WP No. 14202	Umiray River
Province of Bulacan	1.9	Res. No. 016-0806 Water Permit No. 20950	Reallocation from MWSS
NIA	40.0	6504 dated 11-28-79	Diversion-Bustos
MWSS	9.494	6508 dated 11-28-79	Diversion-San Lorenzo
MWSS	4.266	6509 dated 11-28-79	Diversion-Bigti
NPC	58.0	6512 dated 11-28-79	Diversion-San Lorenzo

Note: MWSS has a pending appeal on Resolution No. 016-0806 with respect to the 1.9 CMS allocation to the Province of Bulacan. MWSS' position is that the 1.9 CMS should come from the Umiray inflow, instead of the inflow from Angat River.

Source: MWSS, NIA, NPC, K Water, NWRB, & PSALM. (2013). *Memorandum of agreement on the Angat water protocol*, pp. 6-7. (With permission to use) Table enumerates the water rights for the different water users of Angat Dam. Note that total volume of water available is not cumulative as certain water rights use the same water, but at different stages.

Before the construction of Angat Dam, NIA acquired 40 CMS of irrigation water rights on Angat River in 1927, while MWSS obtained 4.3 CMS of water for Metro Manila's domestic requirements. After construction of the dam, NIA and MWSS were allocated 36 CMS and 22 CMS, respectively from Angat Dam, while NIA obtained an additional 4 CMS from the watershed between the Angat and Ipo watersheds. In 1967, NPC acquired 58 CMS of water supply for hydropower development. From the unutilized allocation of irrigation water supply, MWSS was able to get an additional allocation of 15 CMS of water in 1988 (UP NEC, 2011a).

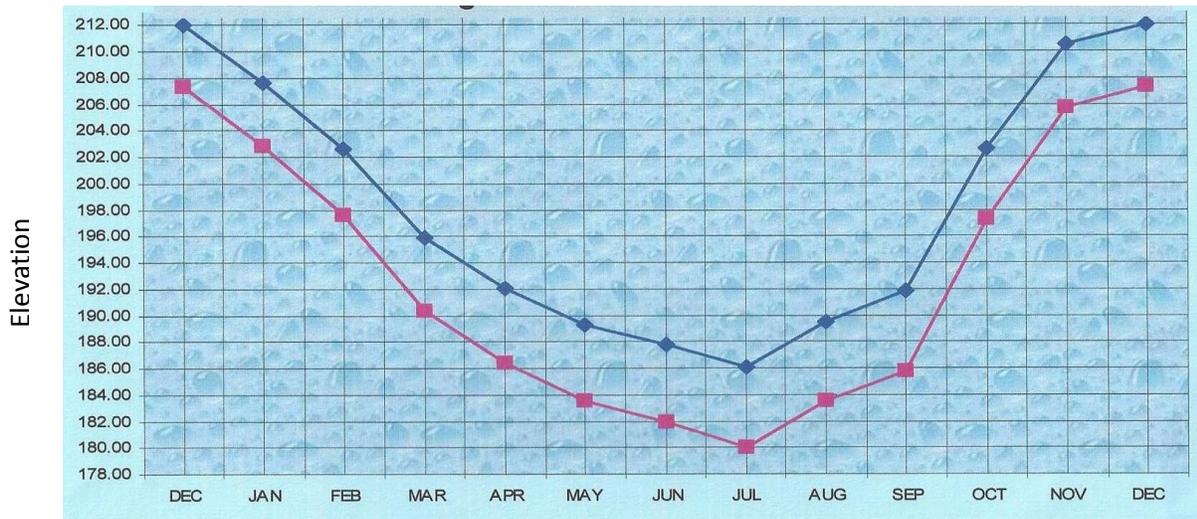
The Water Protocol Agreement further states that water releases from the dam for power generation, domestic water supply, and irrigation will be governed by the Reservoir Operation Rules. Such rules are approved by NWRB, upon the recommendation of the Technical Working Group composed of NWRB, MWSS, NPC, NIA, and the Philippine Atmospheric, Geophysical and Astronomical Services [PAGASA]<sup>52</sup> (p.4). As illustrated in Figures 31 and 32, the old and new versions of the Reservoir Operation Rules impose upper and lower rule curves that prescribe the allocation of water in the dam among its various users. Subject to the level of water inside the dam, the general guidelines (see MWSS, 2014e, 2014f; NWRB, 2004, 2006, 2009) are as follows:

- Above the upper rule curve – Allocations for both irrigation and Metro Manila water supply are met. K-Water, the reservoir operator, may generate additional power upon securing approval to release more water from NWRB.
- Between the upper and lower rule curves – Irrigation and Metro Manila water supply allocations are provided, with normal power generation, through main and auxiliary turbines.
- Below the lower rule curve – Normally occurring during periods of drought and severe dry conditions, Metro Manila water supply has priority over irrigation water. Only auxiliary turbines generate power.

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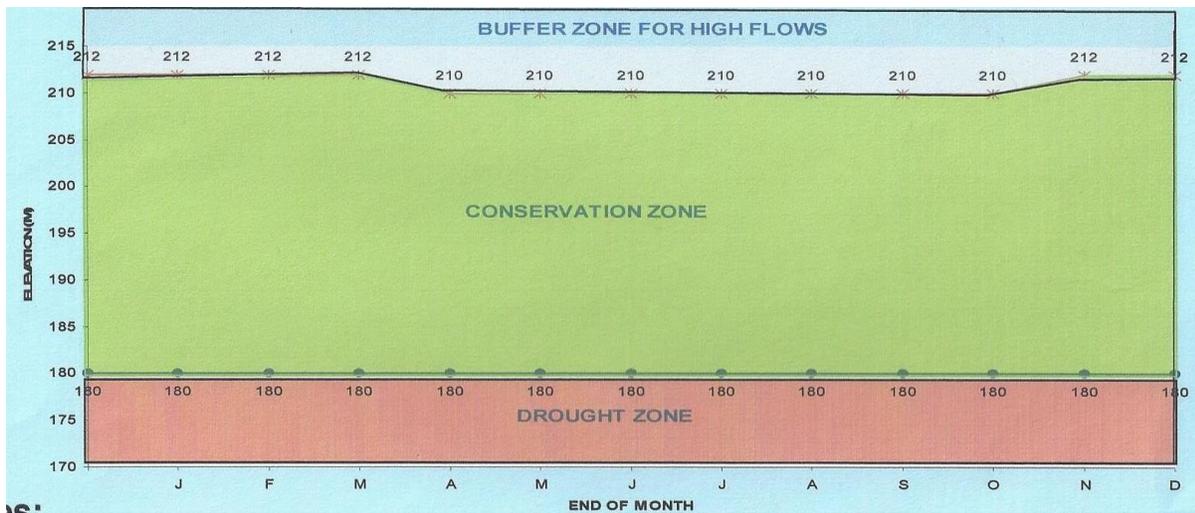
<sup>52</sup>The Philippine weather bureau

**Figure 31. Old Rule Curve for Angat Dam Operation**



Source: Metropolitan Waterworks and Sewerage System. (2014e). Angat Reservoir Old Rule Curve. Quezon City: Metropolitan Waterworks and Sewerage System. *(Reproduced with permission)* Graph shows rule curve used for Angat Dam until 2009.

**Figure 32. New Rule Curve for Angat Dam Operation<sup>53</sup>**



Source: Metropolitan Waterworks and Sewerage System. (2014f). New Angat Reservoir Operation Rules. Quezon City: Metropolitan Waterworks and Sewerage System. *(Reproduced with permission)* New rule curve enforced for Angat Dam.

<sup>53</sup> During the flooding season (May 1 – October 31), the normal high water level of 212 meters elevation is brought down to 210 meters elevation (MWSS, 2014f).

An oversight committee reviews the plans and programs for Angat Dam to ensure strict compliance with the provisions of the Water Protocol Agreement. Such a committee is comprised of representatives from all the signatories of the agreement and is chaired by NWRB.

### **5.2.3 Irrigation Water Supply Shortfall**

From 1968 -2010, annual water inflows into Angat Dam had been affected by the El Niño and La Nina phenomena, characterized by alternating periods of low and high inflows, respectively (Ortega, 2011, pp. 10-11). Of particular interest are the years of very low water inflows to the dam as these are periods of supply cutbacks for irrigation water. Irrigation water supply was permitted only when the water levels rose above the lower rule curve as a result of new inflows from precipitation during the wet season. A study made by JICA et al. (2013, p. 7-27) on the volume of water flowing into Bustos Dam from 1968 to 2010 reveals several years of water supply shortfalls for irrigation vis-à-vis the estimated mean irrigation water requirement of 600 million cubic meters [MCM] per year. Figure 32 shows these deficit periods, which generally coincided with the years of actual El Niño occurrence or the year immediately thereafter. In a few instances when there were no El Niño events, prolonged dry conditions were experienced resulting to low volumes of water inflow to Angat Dam, which negatively affected the release of irrigation water as well.

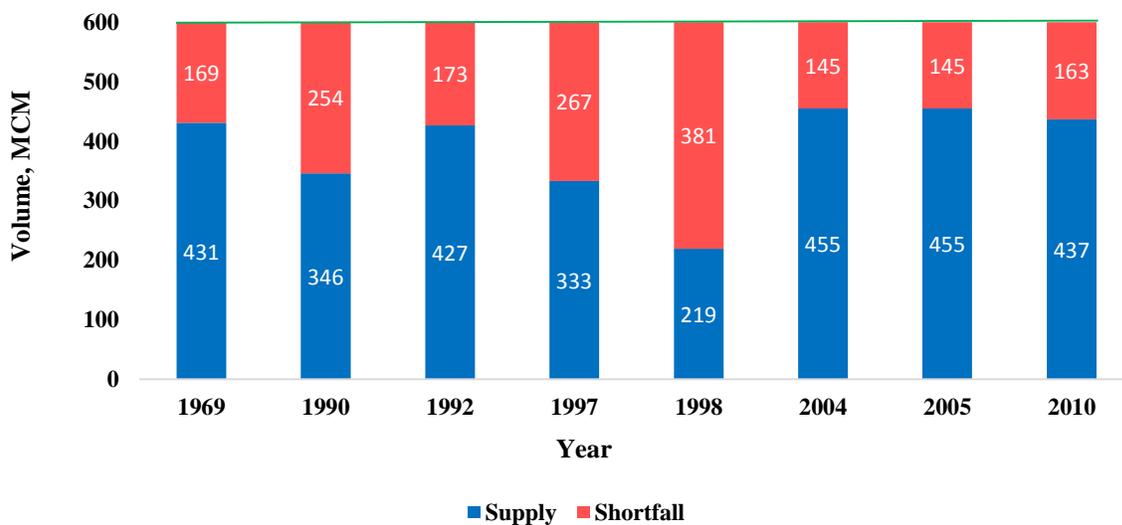
The highest shortfall was experienced in 1998 when the outflow from Angat Dam to Bustos Dam was stopped for 8 months due to a severe El Niño weather event. Dry cropping operations were suspended from November 1997 to June 1998, resulting in losses of ₱968 million (US\$21 million) and ₱29 million (US\$0.6 million) for 22,000 farmers and NIA<sup>54</sup>,

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<sup>54</sup> In terms of lost irrigation fees

respectively (Pascua, 2007, p. 4). NIA filed a claim to NWRB for compensation on these losses but MWSS insisted that such reallocation was due to an unforeseen and uncontrollable event and thus, was not subject to compensation under the Philippine Water Code. With NWRB unable to resolve the issue, NIA filed another claim in 2006 with the Office of the Government Corporate Counsel, the main adjudicator for disputes between two government agencies (Pascua, 2007).

**Figure 33. Irrigation Water Supply vis-à-vis Shortfall**



Graph drawn by Author (2015) using data from JICA et al. (2013). Irrigation water shortfall normally occurs during the El Niño phenomenon or prolonged dry conditions.

Citing a 1996 ADB study entitled “Water Management and Allocation Options: Angat River System,” Tabios and David (2007, p.127) disclose that the price of MWSS water during severely dry conditions is ₱5.70 per cubic meter. Conversely, the cost of compensating farmers arising from lost farming revenues during these weather conditions ranges from ₱1.60 to ₱2.90 per cubic meter while the foregone revenue from power generation is only ₱0.20 per cubic meter. Given the higher value of water for Metro Manila, Tabios and David (2007) point out that it is economically more feasible to reallocate irrigation water supply for domestic water

consumption, provided that the farmers and the National Power Corporation are duly compensated for foregone revenues from food production and power generation, respectively.

NIA's claim of ₱968 million (US\$24 million) in 1998 amidst an irrigation supply shortfall of 381 million cubic meters of water (Figure 33) translates to a loss of ₱2.54 per cubic meter for the farmers, well within the range of losses determined by the ADB study cited by Tabios and David (2007, p. 127). Based on 28,000 hectares of farmland, the loss per hectare of farmland is about ₱34,600.00 (US\$848.00). Without any crop insurance, a farmer tilling 2 hectares of land suffered a food production loss of ₱79,200.00 (US\$1,696.00). With a crop insurance covering a maximum loss of ₱10,000.00 (US\$245.00) per hectare in Bulacan (see Philippine Crop Insurance Corp, 2015), the same farmer still lost ₱59,200.00 (US\$1,451.00) resulting from irrigation water supply reallocation in favor of Metro Manila's domestic water requirements.

From an equity angle, the suggestion of Tabios and David (2007) to compensate the farmers for foregone revenues makes a lot of sense, especially in times of El Niño or long dry spells. Without adequate and just compensation, the farmers will always be unduly disadvantaged and suffer the consequences from circumstances beyond their control. While it is not clear if the NIA case has already been resolved, there is ongoing collaborative effort among MWSS, NIA, and the Bulacan provincial government to rehabilitate Bustos Dam, the secondary reservoir that regulates water supply for irrigation. MWSS is providing funds in the amount of ₱1.0 Billion (US\$22.2 Million) for this project, the objective of which is to strengthen the dam and increase its holding capacity (MWSS Official, Personal Interview, January 12, 2014). Though a news account (GMA News, 2015) describes the funding as payment for the temporary use of NIA's water rights of 15 cubic meters per second on two occasions during the 1990s, it

appears that, based on the amounts involved, the funding was actually payment for the water reallocated to Metro Manila during the severe El Niño event in 1998. Increasing the holding capacity of Bustos Dam, through a rehabilitation project funded by MWSS, will help alleviate the difficulties experienced by the farmers during such periods. While this may not cover the irrigation water supply shortfalls of the previous years, the Bustos Dam rehabilitation will go a long way towards the reduction of inequity related to water allocation in years to come.

### **5.3 The Rural-Urban Equity Nexus**

During periods of drought, the water protocol for Angat Dam aims to protect more than 14 million water consumers in Metro Manila and several nearby cities and municipalities. Moreover, the water protocol seeks to preserve the country's economic well-being under such conditions, by providing support to Metro Manila's services and manufacturing sectors, which employ 3.6 million workers and account for 35% of the national GDP (see ADB, 2014a, p.29). Metro Manila also serves as the country's principal shipping port, center of finance and business (ADB, 2014a), as well as the seat of political power, housing the major offices of the executive, legislative, and judicial branches of government.

Despite political and economic justifications for prioritizing the Metro Manila water supply, there is a need to contextually examine equity issues related to raw water allocation during periods of water scarcity. Priority of domestic water during these periods is based on the principle that it is the best use for a limited supply of water. Yet, it may be necessary to review certain scenarios to ensure that the "best use" principle also addresses major equity issues integral to the city's water system. Typically, these scenarios have already been mentioned in

debates concerning public vs. private water provision,<sup>55</sup> mostly in discussions of operational inefficiency that results in high non-revenue water levels and inequity in water provision that results in unaffordable prices, particularly for the poor communities. The following discussions will not delve into these debates, but rather, look at the Metro Manila water provision, pre and post-privatization, and relate how water provision in each of these periods may (or may not) have contributed to conditions of inequity in the allocation of raw water from Angat Dam. This research takes a multi-scalar approach in assessing equity conditions across the entire Metro Manila water system, looking at this issue from both regional and national perspectives, during pre and post privatization scenarios. The analysis of the rural-urban equity nexus, particularly during periods of El Niño occurrence and long dry spells is in line with Harris' (2002, p. 744) concept of "water and conflict geographies". This research uses such concept in order to capture the intersection between water use and access, and the socio-economic and political aspects related to conflicts arising from the allocation of water supply from Angat Dam.

### **5.3.1 Public Sector Provision: Rural Equity Concerns**

Aside from consumption demand, water supply is also influenced by the non-revenue water level, the amount of water that is lost due to leakage and pilferage. Operating a water system with a high NRW level requires higher volumes of water supply from the dam. Prior to privatization, the NRW level of MWSS was at 61% (MWSS RO, 2004). This means that 61% of all the water that was treated and supplied to the network never reached the consumer taps as it was lost either through leakage or pilferage. The exact volume attributed to each NRW factor

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<sup>55</sup> See (ADB, 2004a; IFC, 2010; Franceys, R., & Jacobs, J., 2008; Kikeri & Nellis, 2004; Marin, 2009) for pro-privatization discussions and (Araral, 2009; Bakker, 2003; Bakker, 2007; Bakker et al., 2008; Budds & McGranahan, 2003; Castro, 2007; Goldman, 2007; Hall & Lobina, 2006, 2007; Mehta, 2000; Laquian & Argo, 2004; Peck & Tickell, 2002, Swyngedouw, 2005) for discussions against private sector provision of water.

remained undetermined at that time. In 1995, such NRW level was higher than the average for 50 Asian water utilities, which ranged from 35%- 40% (ADB, 1997, p.3). Prior to privatization, MWSS was already using a water supply allocation of 35 cubic meters per second, inclusive of 15 cubic meters per second of water supply from the unutilized allocation for irrigation, which NWRB approved for transfer to MWSS in 1988 (Pascua, 1997, p. 7). With the same service coverage but a lower systems loss of 40%, the higher Asian water utility average, the MWSS water supply could have been reduced by up to 21% (from 61% - 40% NRW level). Such domestic water supply reduction translates to higher volumes of water inside the dam, which could have been used for supplying irrigation requirements or for setting up a buffer stock that all sectors can utilize during long dry spells. Particularly for the years 1990, 1997, and 1998 (see Figure 33), lower NRW levels may have resulted in lower water shortfalls for irrigation water supply, thereby helping alleviate the farmers' hardships and losses during those difficult times.

### **5.3.2 Private Sector Provision: Urban Equity Concerns**

Even if systems losses were already within the region's average, maintaining an allocation of 35 cubic meters per second for domestic water supply was justifiable only if MWSS managed to expand service coverage by connecting more households to the network. Until 1997, service coverage stood only at 67% (MWSS RO, 2004, p. 13); the low connection rate being another major concern aside from the problem of high systems losses. During periods of water scarcity, certain operational inefficiencies that resulted in sub-par water service for Metro Manila households have also led to inequitable allocation of water from Angat Dam, particularly for the farmers, the agricultural working class. Again, under such circumstances, water that supports the livelihood of these farmers is diverted to the city's network, which

unfortunately is lost on its way to the consumers' taps. The Metro Manila water privatization was deemed as the solution to these operational difficulties (see IFC, 1996). Moving forward two decades into the water privatization, the private concessionaires have managed to increase service coverage to 86%<sup>56</sup> and reduce the NRW level to 31%<sup>12</sup>. Likewise, in areas where they have their networks in place, they have been able to supply high pressure and good quality water almost on a 24-hour basis. With improved operating efficiencies, do equity concerns still persist as regards the allocation of water in the dam? To answer this question, I explore the rural-urban equity linkage, as I believe the answer is linked to equity conditions surrounding the provision of water in Metro Manila.

Conditions of inequity in drinking water provision manifest as scenarios where water is unaffordable for those who are connected and access is difficult for those who are not. In both scenarios, the poor always suffer. Even with improved operating efficiencies, if water provision in Metro Manila is inequitable, then the equity concerns at the water supply source still persist, albeit in a different form. Without the safeguards that ensure equitable water access for all urban domestic consumers, there is a possibility that reallocated irrigation water in the post-privatization phase may be benefitting mostly the rich households. If affordability and access remain major concerns for the impoverished households in a privatized water scenario, then equity issues concerning the farmers still linger, but this time, by way of indirect subsidy to the city's affluent residents. The shift from public to private provision of water has shifted an equity issue at the source from one that is purely related to allocation, to one of that is related to affordability and access at the consumer's tap. Without proper and fair compensation for the farmers when part or all of their water supply is reallocated for urban water use during times of

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<sup>56</sup> Average figures based on MWSS computation

drought, I maintain that such an arrangement is still inequitable for the rural farmers. However, it is only when water provision is truly equitable in Metro Manila, the country's primate city, that there is some form of rationalization and meaning as regards the farmers' suffering during periods of water scarcity. Policy makers must realize that the real cost of inequity in domestic water provision is not solely confined to the geographical area of Metro Manila but also encompasses the provinces of Bulacan and Pampanga where the farmers are unjustly deprived of their water allocation and their means of livelihood.

### **5.3.3 The Case for Broader Equity Reviews**

The SHS framework shows that the Metro Manila water governance requires the implementation of policies and programs that address inequities prevailing across the entire hydro-social cycle, inequities that are present over different geographical areas and time frames. Further, this framework establishes the rural-urban equity nexus which policy makers must be aware of, in order to fully address existing equity concerns. As possible steps toward this direction, MWSS is implementing several projects in collaboration with the provincial government of Bulacan. Besides providing the ₱1.0 Billion (US\$22.2 Million) funding for the Bustos Dam rehabilitation, MWSS is undertaking the Bulacan Bulk Water Supply Project via the Public-Private Partnership route. This project will supply 230 million liters of treated water for the province of Bulacan, benefitting 1.9 million people in 22 water districts (MWSS, 2014g, p. 24). A new domestic water supply helps obviate an impending environmental disaster and drinking water crisis for a province whose ground aquifer is already over mined for drinking water, making life better for a populace vulnerable to severe climactic conditions. The Steering Committee of Angat Dam should also look into other policy issues connected to the reservoir's

operation, such as flood control and warning, specifically on the collaboration and communication protocols with local government officials, industry leaders, residents, and other stakeholders. These policy issues should also include dam rehabilitation, watershed management, and other programs that strengthen the dam's capacity to withstand adverse conditions. Moreover, the committee needs to guarantee long-term water supply stability and reliability for the farmers by building a new reservoir or any related infrastructure that restores their ability to use their water rights of 15 cubic meters per second, previously allocated in favor of MWSS. Further, the committee should promote alternative livelihood activities for the farmers to mitigate water stress induced by climate variation (see Shah, 2015 for a more extensive discussion on this mitigation strategy for Bulacan) so that they will not always be at the mercy of the environment, suffering the negative consequences. These policy issues require extensive review and discourse, and are beyond the scope of this research.

#### **5.4 Conclusion**

During El Niño occurrences or long dry spells, irrigation water supply for Bulacan and Pampanga farmlands is diverted to Metro Manila for domestic water consumption. Inefficient urban water provision cannot justify this water allocation protocol as limited water supply is lost through leakage and pilferage. Nonetheless, efficient urban water provision falls short as well, if such provision is not equitable for all Metro Manila consumers. Under such a scenario, water supply taken from the farmers' allocation may end up in the homes of rich urban residents. Policy makers must recognize the presence of a rural-urban equity nexus related to water supply allocations at Angat Dam, realizing that only efficient and equitable urban water provision can properly rationalize the hardships farmers face under extremely dry weather conditions.

Additionally, this nexus explains that the real cost of inequitable domestic water provision during these difficult times is not only confined to Metro Manila cities and municipalities but encompasses the farmlands in nearby provinces as well.

## Chapter 6: Addressing the Many Faces of Water Inequity

### 6.1 Introduction

In this chapter, I offer policy recommendations to address the different forms and states of water inequity across the Metro Manila water system. I do not touch on the structural and sector-wide policy issues on water governance in the country but only on issues that are within the regular authority and responsibility of MWSS and its regulatory office. In particular, I look at the plight of Class E households in connected and unconnected areas within MWSS' sphere of influence. As seen from the policy platform in Figure 34, the hierarchal and interlinked nature of the different water inequity scenarios require recommendations specific to each community of Class E households, coupled with some prescriptions that cut across the different communities. These policy recommendations must be viewed and implemented on a collective basis for optimal results.

**Figure 34. Policy Recommendations to Eliminate Water Inequity in Metro Manila**

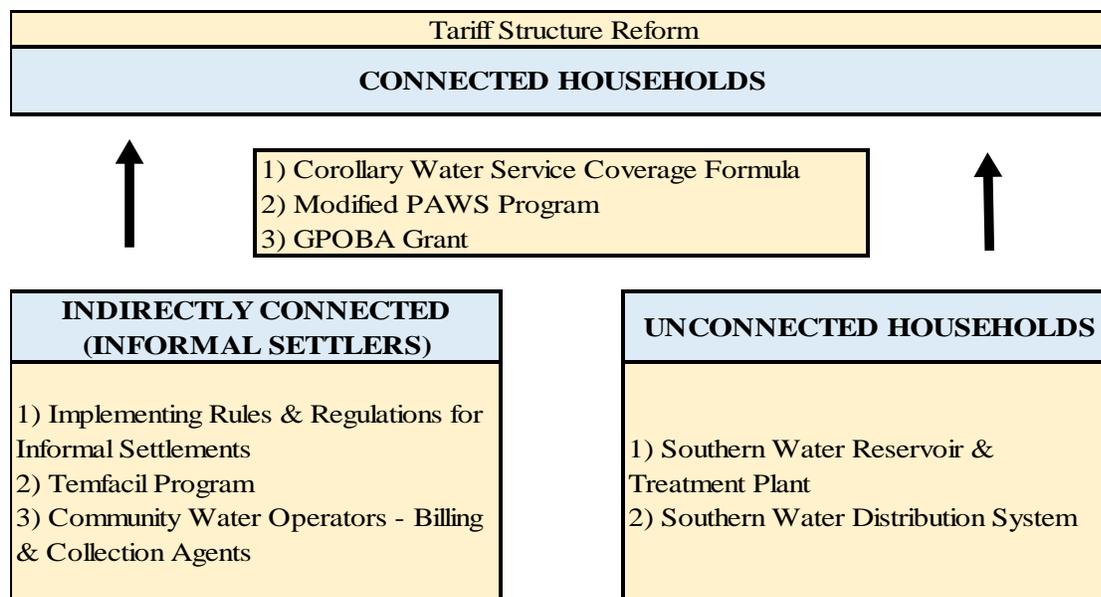


Diagram drawn by Author (2015) providing a summary of policy recommendations that address the different forms of water inequity experienced by Class E households.

## **6.2 Reforming the Residential Water Tariff Structure**

### **6.2.1 Background**

Carrying over from the MWSS operations, all households and establishments connected to the concessionaires' water networks are metered in order to measure actual water consumption. Customers are categorized as residential, semi-business, commercial, or industrial depending on the nature of their water use. Residential customers are households using water for domestic purposes only while semi-business customers refer to persons or establishments engaged in small non-domestic/economic activity, such as convenience stores or tire repair shops. Commercial customers include shopping malls, supermarkets, and the like while industrial customers include companies engaged in manufacturing, construction, mining, power generation and other large scale economic activities (see MWSS, 1997a. 1997b).

Upon takeover of the concessions in 1997, the two private water firms continued using the increasing block tariff structure which was developed by MWSS utilizing the criteria of revenue adequacy, equity, affordability, and conservation (IFC, 1996). Increasing block tariffs charge higher marginal prices for higher consumption levels, making the water tariff schedule appear like a staircase ascending from left to right (Olmstead, Hanemann, & Stavins, 2007). According to Diakité et al. (2009), most developing countries use this type of social tariff scheme to modify consumer behavior through the structure of consumption blocks, their unit prices, and the fixed component of the tariff, such as the connection fee. Countries without metered connections use a flat fee tariff, while countries that use volumetric tariffs also employ uniform marginal pricing for all consumption levels and decreasing block tariffs where lower marginal prices are charged for higher consumption levels. The latter volumetric tariff structure

is the opposite of the increasing block tariff scheme and is used in situations where there is excessive supply of water (see OECD, 2010; Olmsted et al., 2007).

For Metro Manila, different increasing block tariff rate schedules apply for each customer category, with residential and semi-business categories divided into nine consumption blocks while commercial and industrial categories, into 33 consumption blocks.<sup>57</sup> Generally, the tariff structure is designed to make high volume water users subsidize low volume users within each category as well as between the different categories. Residential customers have the lowest water rates, followed by semi-business, commercial, and industrial customers. The lowest tariff rate for semi-business customers is 68% higher than that of residential customers. For commercial and industrial customers, the lowest water rates are respectively set at levels that are 354% and 392% higher than that of residential customers (see MWSS, 1997a, 1997b, p. S-13). Figure 35 shows the 2011 basic water rates for both MWCI and MWSI residential consumers, while Appendix I presents the 2011 basic water rate schedules for all Metro Manila domestic water users.

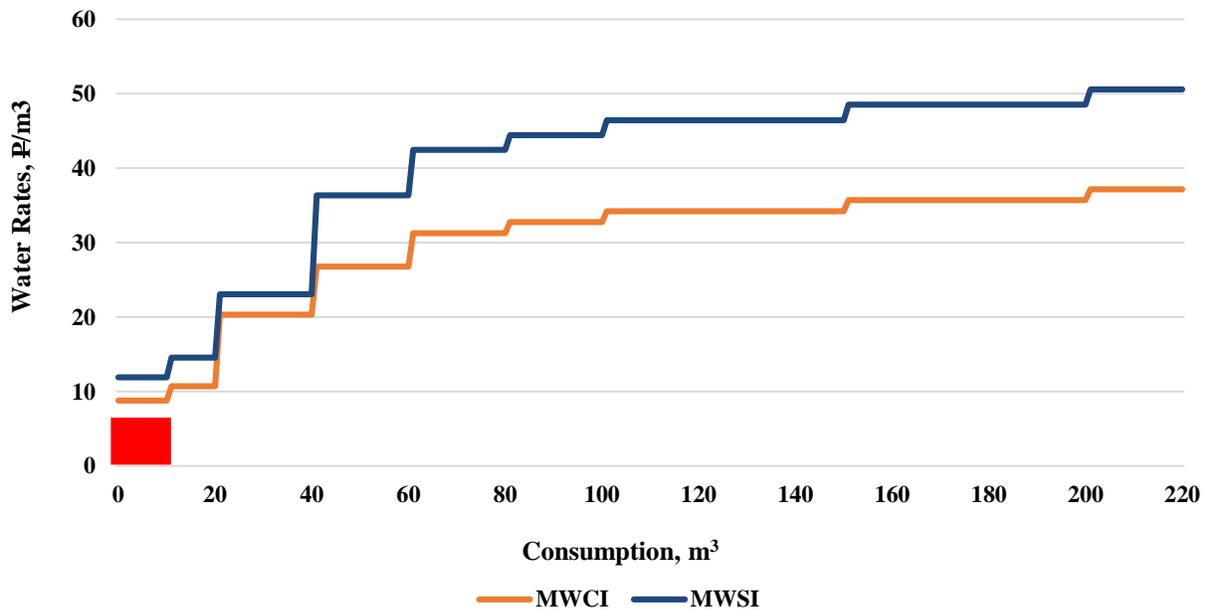
For all users, the lowest water rate in the water tariff schedule is the lifeline rate provided for residential customers that consume a maximum of 10 cubic meters per month (MWCI, 2015d, p. 2; MWSI, 2015d, p. 1). Based on Appendix I (Basic Water Rate Schedule for MWCI and MWSI), the 2011 lifeline rates for MWCI and MWSI are ₱72.45/connection (US\$1.67/connection) and ₱70.00/connection (US\$1.62/connection), respectively. For MWCI and MWSI residential customers with a total monthly consumption higher than 10 m<sup>3</sup>, the lifeline rates no longer apply as the regular water rates now become the bases for billing computations. On a per cubic meter basis, the respective rates for first consumption block of 10 m<sup>3</sup> for MWCI and MWSI are 23% and 70% higher than their individual lifeline rates. The

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<sup>57</sup> A consumption block refers to a range of consumption levels with the same water rate. In a rising block tariff, higher consumption blocks reflect higher water rates.

succeeding consumption blocks carry higher water rates vis-à-vis the lifeline rates. Hence, as residential consumption increases, the water bill continues to rise significantly above the current lifeline rate.

**Figure 35. 2011 Basic Water Rates for Residential Customers**



Note: Red rectangle denotes area covered by lifeline rate and volume.

Graphs drawn by Author (2015) using data from MWCI (2011); MWSI (2012d). MWCI and MWSI use the increasing block tariff structure for billing the different water users.

Aside from the basic water rate charged to each customer for the volume of water consumed, the final water bill includes additional charges – sanitation and sewerage fees, value-added tax, and tariff adjustments to cover inflation as well as losses due to peso devaluation, El Niño occurrence, and other unforeseen events. Table 24 presents these additional charges together with tariff-related changes that have been effected since commencement of the privatization program. Implemented to recover losses incurred from events beyond the control of the concessionaires, tariff adjustments were determined using a discounted cash flow method

that allows for the recovery of losses plus a certain rate of return, as determined by the MWSS Regulatory Office. Tariff setting exercises are done on a yearly basis if there are occurrences of specific extraordinary events that warrant these adjustments. In addition, a rate rebasing exercise is done by the MWSS RO every five years to determine the appropriate rate of return (ADR) for the concessionaires and the necessary tariff adjustments to meet these returns (see MWSS, 1997a, 1997b). Although certain numerical changes have been made for the add-on charges as well as the basic water rates, the original consumption blocks for the different user groups have remained the same since 1997.

**Table 24. Additional Charges Reflected in the Monthly Water Bill**

Upon Commencement of Privatization		After Privatization
Add-On Charges	Description	Revisions
Currency Exchange Rate Adjustment (CERA)	Fixed at P1.00/m <sup>3</sup> (US\$0.04/m <sup>3</sup> ) Covers the exchange rate movement of MWSS debt from 1984 to 1997	Discontinued in 2008
Environmental Charge	10% of (basic water rate + CERA) Charged to customers whose homes are not connected to the sewerage system, to cover the cost of desludging their septic tanks	Increased to 12% of (basic water rate + CERA) for 2008 & 2009; 16% in 2010; 18% in 2011 Increased to 20% when the sewerage fee was folded into environmental charge starting 2012
Sewerage Fee	50% of (basic water rate + CERA) Charged to customers whose homes are connected to the MWSS sewerage system (about 11% of the population in 1997)	Decreased to 40% of (basic water rate + CERA) for 2008 & 2009; 20% in 2010; 10% in 2011 Sewerage fee folded into environmental charge in 2012
Value Added Tax	10% of (basic water rate + all other charges)	Beginning 2012, Value Added Tax is 12%
Additional Tariff Adjustments		Inflation is a pass-through charge Foreign Currency Differential Adjustment (FCDA) <sup>3</sup> Starting 2002, the FCDA mechanism is used to recover /account for foreign exchange losses/gains
		Based on a discounted cash flow mechanism, adjustments in tariffs (except for the FCDA & inflation) are effected on the basic water rates, as reflected in the tariff rate schedules.

Table developed by Author (2015) using data/information from MWSS (1997a, 1997b); MWSS RO (2014c); MWSI (2006). The final tariff is obtained by adding the different add-on charges to the basic water rates. The add-on charges and the basic water rates have changed over the years but the consumption blocks have remained the same.

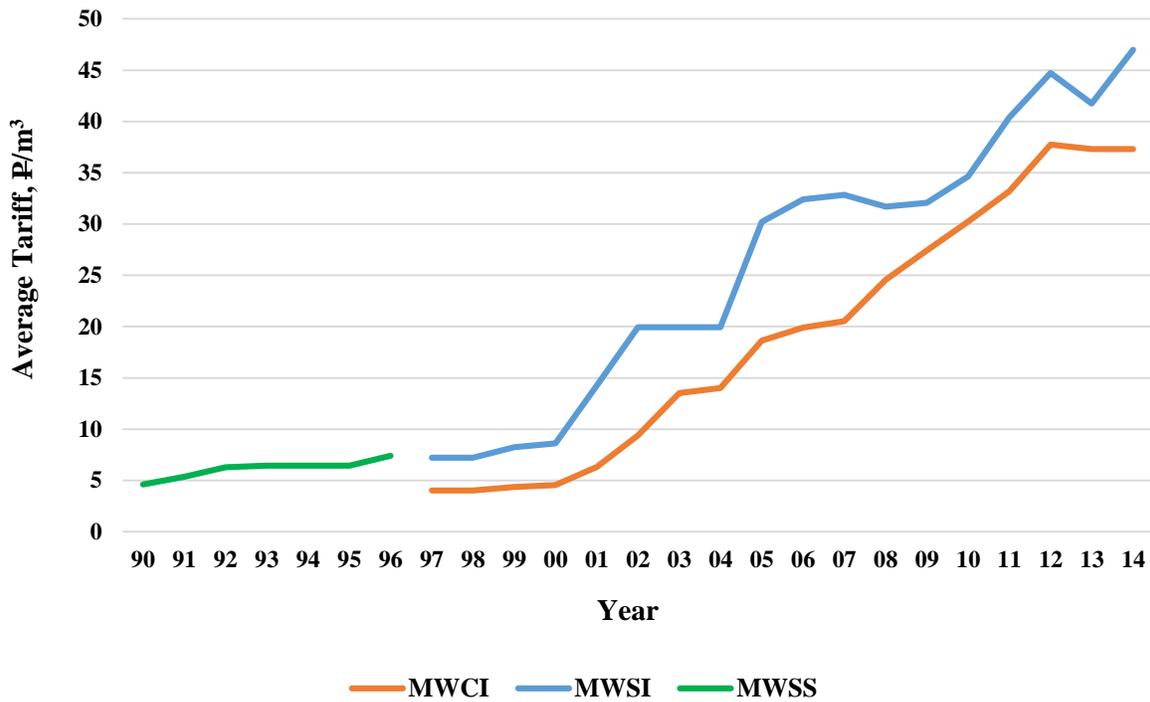
Basically, the ADR is the project rate of return, computed in real terms (without inflation) and without leveraging (without debt). A higher nominal return would be registered once the effects of inflation and borrowings are included. During the rate rebasing exercise in 2008, the MWSS RO granted the two concessionaires an ADR of 9.3% for the period 2008-2012 (MWSS RO, 2013a, p. 3, 2013b, p. 2). In simple terms, every concessionaire expenditure for the 2008-2012 period, which was accepted by the MWSS RO, earned a real, unlevered return of 9.3% for the concessionaire. For the rate rebasing exercise in 2013 (for the period 2013-2017), MWCI and MWSI asked for ADRs of 8.95% and 8.94%, respectively. Yet, based on the MWSS RO's ADR determination, they only approved 7.35% for both concessionaires (MWSS RO, 2013a, p. 26, 2013b, p. 29). Though the differences between the ADRs requested by the concessionaires and that approved by the MWSS RO seem very small, the actual monetary implications are enormous, running into billions of pesos. It is worth mentioning that the ADR is one of the major issues in the recent arbitration cases filed by the concessionaires against the MWSS RO (see MWSS RO, 2015).

Figure 36 shows the average water tariffs for all users (with add-on charges) during the pre and post-privatization scenarios. Water tariffs for the east and west zones have increased (in nominal terms<sup>58</sup>) by 829% and 552%, respectively, since the start of privatization (MWSS RO, 2014c). It is not my intention to assess whether or not such tariff increases are justified by higher operating efficiencies and better water services in a privatization scenario. Yet, I am fully aware that these water price increases in Metro Manila have been a major issue raised against this privatization program (see IBON Foundation, 2012; Water for the People Network, n.d.), particularly in relation to profitability levels enjoyed by the two concessionaires.

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<sup>58</sup> With inflation. In real terms (without inflation), water tariffs in the east and west zones have increase by 618% and 342%, respectively.

**Figure 36. Evolution of Metro Manila’s Water Tariff (All Users)**



Note: Average water tariffs were computed for all users (residential, semi-business, commercial, and industrial) and are inclusive of the base water rates and all add-on charges.

Graphs drawn by Author (2015) using data from MWSS (2014b); MWSS RO (2014c). Average water tariffs for MWCI and MWSI have increased in nominal terms by 829% and 552%, respectively since 1997.

While pricing may have played a crucial role as regards the attainment of these profitability levels (as exhibited by net profit margins as well as returns on asset and equity in Table 25), some credit must also be given to the concessionaires for initiating efficiency and productivity programs as well as investing heavily in capital assets that resulted in improved water services. Coupled with revenue increases, the concessionaires were able to keep operating expense levels at only 47% of total revenues as compared to MWSS’ level of 68%. With higher cash flows from operations and higher levels of borrowings (as seen from higher debt-to-equity ratios) the concessionaires were able invest more towards the rehabilitation and expansion of the water networks. All of these operational, financial, and capital investment considerations should

form part of discussions concerning the concessionaires' ability to generate substantial returns from their current privatization contracts. Having said this, I also believe that a study which probes deeper into the effects of current pricing policies on the concessionaires' revenue-generating capability would be welcomed by all stakeholders, especially those who have been critical of Metro Manila's water privatization. However, I will not explore this matter in the dissertation but set it aside as a possible future research topic.

**Table 25. Comparative Financial Results: Pre and Post-Privatization**

	1995	2014			
	MWSS <sup>1</sup>	MWCI <sup>2</sup>	MWSI <sup>3</sup>	Aggregate	Inc.
Revenues	155	369	415	784	406%
Operating expenses	(106)	(170)	(167)	(337)	218%
Operating income	49	199	247	446	810%
Net income	20	132	186	318	1490%
Current assets	205	205	267	472	130%
Non-current assets	1,065	1,485	1,371	2,856	168%
Total assets	1,270	1,690	1,638	3,328	162%
Current liabilities	43	177	296	473	1000%
Non-current liabilities	309	720	712	1,432	363%
Total liabilities	367	897	1,008	1,905	419%
Total equity	903	792	629	1421	57%
Debt/Equity Ratio	0.41	1.13	1.6	1.3	217%
Net profit margin	13%	36%	45%	40%	208%
Return on Assets	2%	8%	11%	10%	400%
Return on Equity	2%	17%	30%	22%	1000%

Note: Except for financial ratios, all figures are in million US\$. Both MWCI and MWSI report consolidated financial data, inclusive of their subsidiaries' financial performance.

Table developed by Author (2016) based on data from <sup>1</sup>IFC (1996); <sup>2</sup>MWCI (2015e); <sup>3</sup>MWSI (2015e). Comparative pre and post-privatization financial data show high levels of profitability for concessionaires.

Related to this, I have also disclosed that MWSS is presently engaged in arbitration proceedings with the two concessionaires over tariff rate reductions ordered by the regulatory

office, based on a rate rebasing exercise conducted in 2013. Aside from the ADR issue, MWSS and the two concessionaires have opposing views regarding the inclusion of corporate income tax in tariff rate adjustment computations, as well as on the issue of whether or not the two concessionaires are governed by public utility regulations (see MWSS, 2015). My current interest lies in finding out what changes can be made within the current tariff structure which will make it more affordable for poor households without affecting the existing average water tariffs for the two concessions. Such an arrangement allows the private concessionaires to generate the same level of revenues, making the required tariff policy recommendation acceptable to them and easier for MWSS to implement.

Of particular interest regarding the MWSS tariff is the lifeline rate accorded to residential customers consuming a maximum of 10 m<sup>3</sup>/month. Being the lowest water rate in the tariff schedule, the lifeline rate is intended to make water service affordable for poor households. Yet, an examination of Figure 17 (Monthly Water Consumption) would show that extremely poor households (Class E) in connected areas of the east and west zones are already consuming a monthly average of 46 m<sup>3</sup> and 29 m<sup>3</sup>, respectively. To reiterate, total monthly consumption levels beyond 10 cubic meters per month are no longer eligible for the lifeline rates, and are billed using the regular rates which are significantly higher than the lifeline rates. Table 26 illustrates the increase in water bills for monthly consumption levels above 10 m<sup>3</sup>. Based on Table 17 (Affordability Levels Measured as a Percentage of Household Income), connected E households spend 7%-11% of their household income for their monthly water requirements, the highest among all socio-economic classes of consumers served by the concessionaires. As such, the original lifeline volume of 10 cubic meters per month may no longer be appropriate under existing circumstances.

**Table 26. Basic Water Rates for Consumption Levels Below and Above the Lifeline Volume**

MWCI (₱)		MWSI (₱)	
Below 10 m <sup>3</sup> *	46 m <sup>3</sup> **	Below 10 m <sup>3</sup> *	29 m <sup>3</sup> **
72.45	774.29	75.73	556.50

\* Based on 2011 lifeline rate

\*\* Based on 2011 regular rates

Table developed by Author (2015) using data from MWCI (2011); MWSI (2013b). Basic water rates increase significantly for monthly consumption levels above 10 m<sup>3</sup>.

Based on the number of persons per household provided in Figure 16, the current lifeline volume of 10 cubic meters per month is equivalent to consumption levels of only 42 and 46 liters per capita per day for connected E households in the east and west zones, respectively. These consumption levels are even below the minimum WHO-prescribed per capita consumption of 50 liters per day (for low levels of health concern) for situations where water is delivered through one tap on-plot or within 100 meters from the household. Such scenarios are generally found in the unconnected areas of the west and east zones. For water supplied continuously through multiple taps such as those in connected households, WHO recommends an average of 100 liters per capita per day for very low levels of health concerns (Howard & Bartram, 2003, p. 3).

Increased consumption due to improved services has created a situation in which the lifeline volume is no longer able to make water services affordable for poor households. I would like to point out that this lifeline volume was set at a time when average residential water consumption was only 20 cubic meters per month (see Mangahas & Guerrero, 1996, p. 9), based on a service level characterized by a 16-hour daily supply of water with low pressure and covering only two-thirds of the urban population. Even by simple inference, the twofold increase in average monthly residential consumption may already be a signal for the review of the existing policy on lifeline volume and rate.

### **6.2.2 Recommendations**

Several pricing schemes spread the cost of water services to make water supply affordable for poor households. Such schemes include cross-subsidies from other water users (e.g. commercial, industrial), cross-subsidies between different services (e.g. electricity, gas) as well as income-targeted subsidies, grants and loans provided by the state (see Diakité et al., 2009; Organisation for Economic Co-operation and Development [OECD], 2010). For Metro Manila's water privatization, pricing policy adjustments must be simple and easy to implement, and at the same time, meet the objectives of revenue neutrality and affordability. Under present circumstances, I believe that it is not necessary to change the increasing block tariff structure currently in place or completely overhaul the tariff rate schedules for all user groups. The pricing policy changes would focus on the lifeline volume and rate which no longer meet the tariff's equity objective, given current consumption levels. This would require only minor adjustments on the residential tariff structure through changes in volume intervals for some consumption blocks and/or the number of blocks within the tariff rate schedule.

Undoubtedly, the process will require numerous iterations in establishing the best combination of water rates and consumption blocks that addresses both consumers' affordability concerns and concessionaire's revenue objectives. To facilitate this process, there is a need for MWSS to ensure that the concessionaires are part of the tariff restructuring process, coordinating closely with these private firms as they have the actual consumption and billed revenue data for over 2.0 million households (see tables of MWCI, 2014b; MWSI, 2014b). Any changes made on the basic water rates or consumption blocks will affect the monthly billing for all residential consumers and may create major operational problems if not properly undertaken. By being part of the process the concessionaires are also able to share their experience on implementing tariff

increases and offer recommendations for workable tariff structures. Moreover, they are able to buy into the tariff policy decision and work towards its successful implementation. However, before actual roll out of the tariff policy, MWSS must undertake an effective information campaign to explain the rationale for such a policy and conduct public hearings to gather inputs and feedback from consumers. Such inputs and feedback should become part of the overall tariff policy decisions.

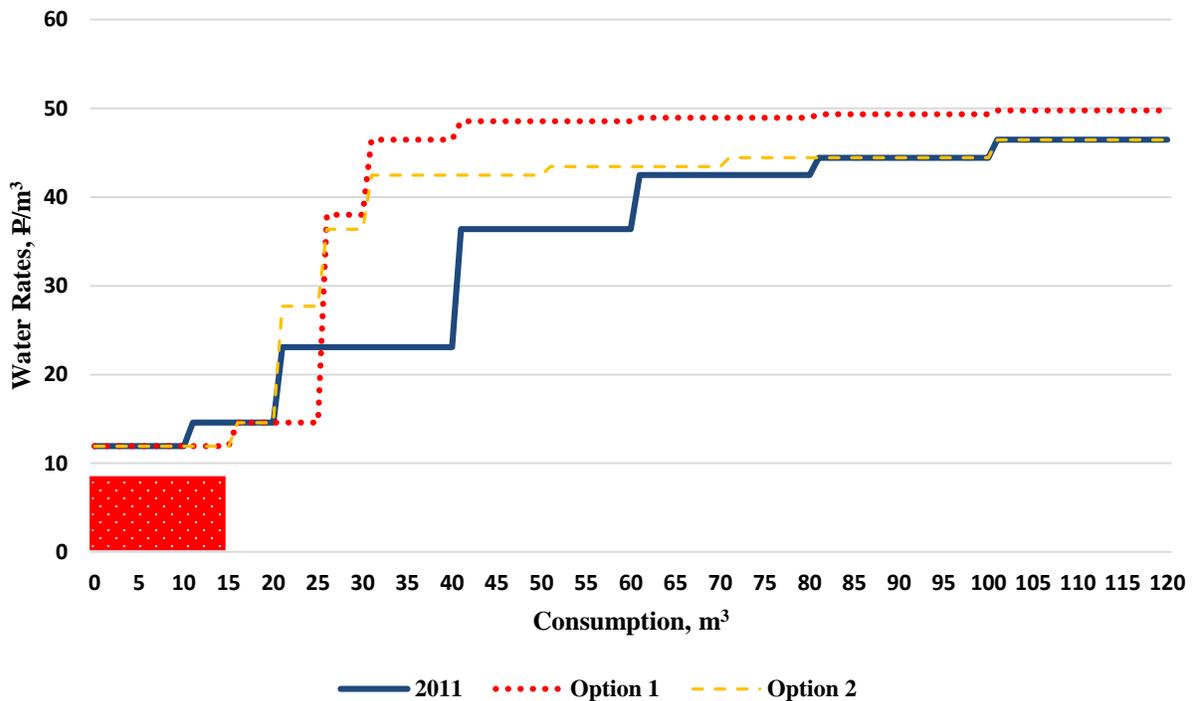
Among the myriads of tariff-restructuring possibilities, I examine two scenarios, the water rate schedules of which are presented in tabular and graphical forms in Table 27 and Figure 37, respectively. For these two cases, I use the 2011 MWSI residential water tariff schedule to illustrate the restructuring concept and process.

**Table 27. Possible Residential Water Tariff Restructuring Options for MWSI**

2011 Water Tariff Structure		Restructuring Option 1		Restructuring Option 2	
Consumption	Basic Water Rate	Consumption	Basic Water Rate	Consumption	Basic Water Rate
<i>10 m<sup>3</sup> or less</i> Lifeline rate	₱ 70.00 /connection	<i>15 m<sup>3</sup> or less</i> Lifeline rate	₱ 70.00 /connection	<i>15 m<sup>3</sup> or less</i> Lifeline rate	₱ 70.00 /connection
<i>More than 10 m<sup>3</sup></i>		<i>More than 15 m<sup>3</sup></i>		<i>More than 15 m<sup>3</sup></i>	
First 10 m <sup>3</sup>	₱ 119.30 /connection	First 15 m <sup>3</sup>	₱ 119.30 /connection	First 15 m <sup>3</sup>	₱ 119.30 /connection
Next 10 m <sup>3</sup>	14.58 /m <sup>3</sup>	Next 10 m <sup>3</sup>	14.58 /m <sup>3</sup>	Next 5 m <sup>3</sup>	14.58 /m <sup>3</sup>
Next 20 m <sup>3</sup>	27.70 /m <sup>3</sup>	Next 5 m <sup>3</sup>	38.00 /m <sup>3</sup>	Next 5 m <sup>3</sup>	27.70 /m <sup>3</sup>
Next 20 m <sup>3</sup>	36.38 /m <sup>3</sup>	Next 10 m <sup>3</sup>	46.47 /m <sup>3</sup>	Next 5 m <sup>3</sup>	36.38 /m <sup>3</sup>
Next 20 m <sup>3</sup>	42.49 /m <sup>3</sup>	Next 20 m <sup>3</sup>	48.54 /m <sup>3</sup>	Next 20 m <sup>3</sup>	42.49 /m <sup>3</sup>
Next 20 m <sup>3</sup>	44.43 /m <sup>3</sup>	Next 20 m <sup>3</sup>	48.95 /m <sup>3</sup>	Next 20 m <sup>3</sup>	43.46 /m <sup>3</sup>
Next 50 m <sup>3</sup>	46.47 /m <sup>3</sup>	Next 20 m <sup>3</sup>	49.36 /m <sup>3</sup>	Next 30 m <sup>3</sup>	44.43 /m <sup>3</sup>
Next 50 m <sup>3</sup>	48.54 /m <sup>3</sup>	Next 50 m <sup>3</sup>	49.77 /m <sup>3</sup>	Next 50 m <sup>3</sup>	46.47 /m <sup>3</sup>
Over 200 m <sup>3</sup>	50.59 /m <sup>3</sup>	Next 50 m <sup>3</sup>	50.18 /m <sup>3</sup>	Next 50 m <sup>3</sup>	48.54 /m <sup>3</sup>
		Over 200 m <sup>3</sup>	50.59 /m <sup>3</sup>	Over 200 m <sup>3</sup>	50.59 /m <sup>3</sup>

Table developed by Author (2016) based on data from MWSI (2012d). This table presents two of many possible iterations for tariff restructuring. Such an exercise requires careful planning, evaluation, and implementation.

**Figure 37. Revised MWSI Residential Tariff Structures to Address Affordability Issues of Connected E Households**



Note: Red rectangle denotes area of old lifeline rate and new lifeline volume.  
 O – Original water rates; N – New water rates

Graphs drawn by Author (2015) using data from MWSI (2012d). Proposed tariff restructuring increases lifeline volume while maintaining lifeline rate. Water usage over 10 m<sup>3</sup> requires extension of lowest consumption block and water rate increases at higher consumption blocks to maintain previous revenue levels.

These two scenarios involve an increase in the lifeline volume from 10 to 15 m<sup>3</sup>/month while maintaining the 2011 lifeline rate of ₱70/connection (US\$1.62/connection). Since such a lifeline volume/rate policy results in a reduction of concessionaires’ revenues from customers with low monthly consumption, the new tariff structure must provide for adequate recovery of these lost revenues from customers consuming high volumes of water. Compared to the existing tariff rate schedule, the proposed rate schedules are designed to have larger consumption blocks at lower water rates and higher water rates at higher consumption blocks.

Table 28 shows the post-restructuring affordability levels across the different socio-economic classes. By transferring some of the water costs from low income consumers to high income, high consumption users, both options are able to meet the objectives of revenue neutrality and affordability. Class E households' water bills are now within the 5% of household income threshold limit while those of Class AB households have increased only slightly despite water rate increases being focused at their levels of consumption. The new water rate schedules also bring about an accompanying reduction in water bills for middle class (C) and poor (D) households, broadening the beneficiaries of this tariff reform policy. Furthermore, average water expenditures for all households have remained within the levels of the current water tariff structure, indicating that aggregate revenue stream has remained basically the same.

**Table 28. Affordability Levels: Pre and Post-Tariff Restructuring**

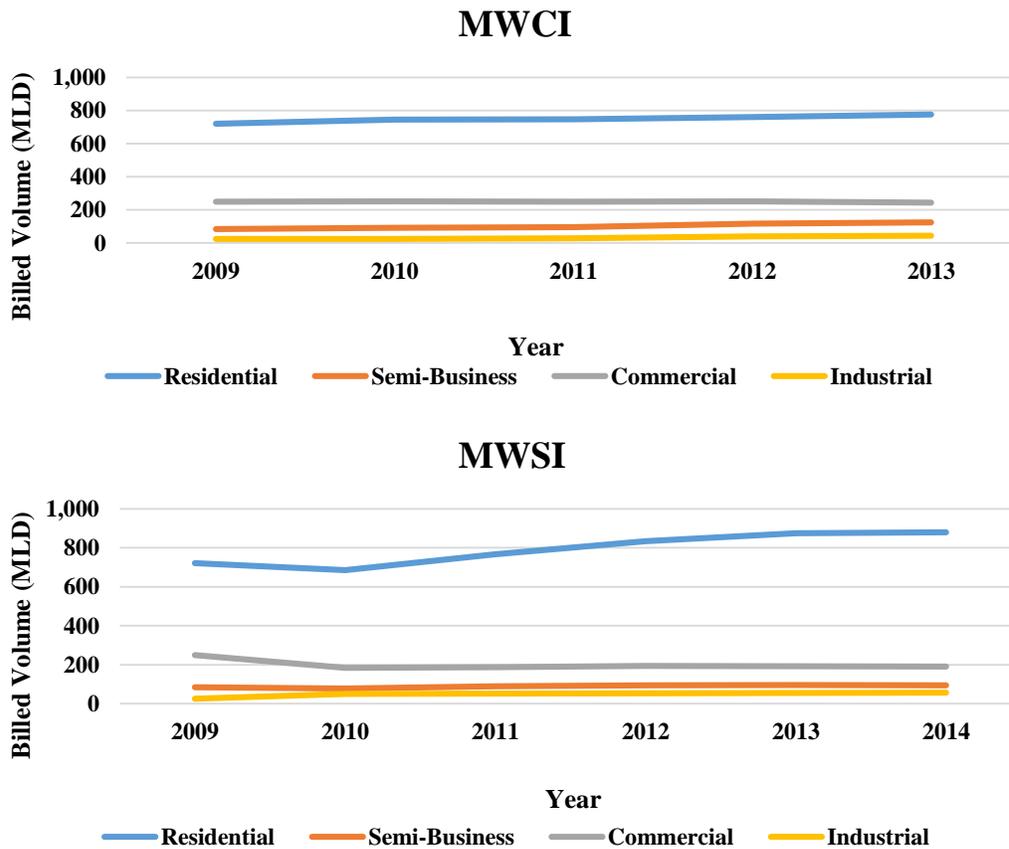
<b>Socio-Economic Class</b>	<b>2011</b>	<b>Option 1</b>	<b>Option 2</b>
AB	1% - 3%	1% - 4%	1% - 3%
C	1% - 3%	1% - 2%	1% - 2%
D	3% - 4%	2% - 3%	2% - 3%
E	<b>7% - 9%</b>	4% - 5%	5%
Average	3% - 4%	3% - 4%	3% - 4%

Note: Affordability levels are measured as a % of household income.

Table developed by Author (2016) using data from UP NEC (2011a) and Appendix G.

Although there are options involving higher cross subsidies from commercial and industrial customers that can make residential water tariffs more affordable, such options may not be feasible. As a result of high tariff increases and large premiums paid by commercial and industrial customers compared to residential consumers, the former's consumption levels have remained relatively flat over the years, as illustrated in Figure 38 (and confirmed by MWSI staff, Personal Interview, December 10, 2014).

**Figure 38. Historical Billed Volumes (million liters per day)**

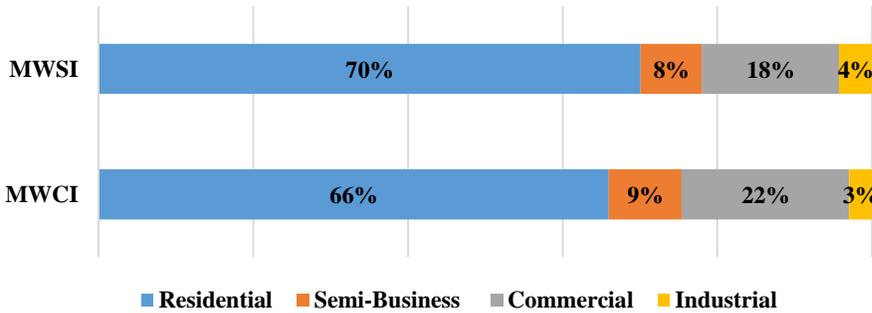


Graphs drawn by Author (2015) using data from MWSS RO (2014a, 2014b). Commercial and industrial volumes have remained flat. Additional subsidies charged to these customers may force them to use water from ground aquifers.

Aside from regulatory issues, these consumption patterns may also explain the concessionaires' inability to increase water sales to commercial and industrial users. On average, commercial and industrial customers only account for 22% to 25% of all billed volumes of the two concessionaires (Figure 39). Further increasing premiums paid by the commercial and industrial customers vis-à-vis the residential customers may force the former to reduce their piped water purchases from the two private water firms and instead, source their water requirements from their own deep wells (also confirmed by MWSI staff, Personal Interview, December 10, 2014). Besides revenue shortfall concerns for the concessionaires, there is also the

risk of overdrawing water from ground aquifers, potentially triggering more environmental problems in the metropolis.

**Figure 39. Billed Volume Comparison for All Customers (as a % of total)**



Graphs drawn by Author (2015) using data from MWSS RO (2014a, 2014b). On average, residential and semi-business customers account for the bulk of consumption, from 75% to 78%. Commercial and industrial customers account for the balance.

In the past, uncontrolled development and over-extraction of groundwater caused a severe drop of Metro Manila’s aquifer water table, resulting in salt water intrusion, most especially in coastal areas. A 1998 study made by the National Resources Water Board documented the metropolis’ groundwater extraction at the level of 2,782 liters per second, way above the groundwater potential of 620 liters per second. In 2004, another NWRB study divulged that public and private wells in Metro Manila, Bulacan, and Cavite had already caused groundwater level to drop by 80 meters below sea level in these areas. To address this problem, NWRB adopted a policy cancelling or suspending groundwater permits and reducing authorized volume extraction from existing deep wells in areas served by MWSS, through the concessionaires, as well as processing new water permits only for vital services (hospitals, firefighting, etc.). For areas not yet covered by MWSS, NWRB approved only temporary

permits, which were valid until water service connections became available (JICA et al., 2013, pp. 7-40 – 7-44).

## 6.3 Reformatting the Water Service Coverage Formula

### 6.3.1 Background

The concession agreements signed by MWSS and the concessionaires define water supply coverage, also referred in this dissertation as water service coverage, as “a percentage of the total population in the designated city or municipality at the time of the target (excluding users who are not connected to a piped source of water other than the MWSS system)” (MWSS, 1997a, 1997b, p. S-6). Time of target refers to the assessment date for this service target, based on the schedules provided in the concession agreements. Without clear formulas and guidelines, the service coverage definition is subject to many possible interpretations.

Even after commencement of the Metro Manila water privatization, the two concessionaires continued with MWSS’ practice of deriving water service coverage using the concept of equivalent population served (see MWCI 2012a; MWSI, 2014b), as illustrated by the general formulas below:

$$\text{Water service coverage} = (\text{Equivalent population served} / \text{Actual total population}) \times 100\%$$

$$\text{Where: } \text{Equivalent population served} = \text{Equivalent number of households} \times \text{Number of persons per household}$$

$$\text{And: } \text{Equivalent number of households} = \text{Actual number of connected households} + \text{equivalent number of households served through communal (public) faucets and residential subdivisions}^{59} \text{ and community water systems (bulk sales customers of the concessionaires)}$$

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<sup>59</sup> Residential subdivisions are gated residential communities in the Philippines

These formulas require proper screening and selection of data to be used for the calculations. Otherwise, the results will not be reflective of the true water supply coverage, with a high probability that they may be overstating actual accomplishments. Of particular importance are the values used to represent the number of persons per household and the equivalent number of households served through public faucets and bulk sales customers. Any under or overestimation of these values will result in service coverage levels that are unrepresentative of actual conditions in the field. In addition, proper care must be exercised to ensure that there are no double counting errors incurred as these may significantly increase service coverage results. As an example, I focus on the conversion to directly-connected customers of households previously served by the concessionaires' bulk sales customers (i.e., community water operators and subdivision associations). Such an error may occur if these households are included in the count of regular customers served by the concessionaires, without being purged from the total figures attributed to housing associations and community water systems. It is highly probable that this error may have occurred in previous assessments of this service target (MWSS Officials, Personal Interviews, February 5, 2014, November 28, 2014).

The new water service formula (presented in Appendix D) was enforced by the MWSS RO in 2013, to properly identify the different components to be used in the calculations and to provide clearer guidelines regarding its usage. Table 29 enumerates the changes that have already been instituted. With these changes, the new water service coverage formula presents more conservative results when compared to the previous formula which tends to overstate actual service coverage levels (as may be seen in Table 29). The new formula also provides a better indication of population size living in areas where the concessionaires have not yet been able to expand their networks. This population segment has not always been given much

attention, with these consumers relying mostly on their own resources to meet their daily water needs. As shown in Figure 15 (Per Capita Consumption), extremely poor households in unconnected neighborhoods are the most severely affected of all households. The MWSS RO must therefore ensure that the concessionaires are able to expand in these areas at the soonest possible time in order to address these households' water needs. The proper use, understanding, and interpretation of the water service coverage formulas help towards the attainment of this objective.

**Table 29. Revisions Made in Computing Water Service Coverage**

Items	Previous Formula	New Formula
Billed Services	Domestic (residential & semi-business) & non-domestic accounts (commercial & industrial)	Domestic accounts only
	Includes private meters (bulk sales customers)	Removed, as they are already part of the bulk sales customers' total figures
Bulk sales customers	Based on 2009 data	Based on 2012 data
Persons per connection	Based on 2007 PAWS Survey	Based on 2011 Metro Manila Water Demand Study
Communal (public) faucet	475 equivalent persons per faucet	286 equivalent persons per faucet
Base population	Based on 2007 census	Based on 2010 census
Privately served population	Deducted from total population	Not deducted, part of total population

Table developed by Author (2015) using data from MWSS RO (2013c); MWSI (2014i). New MWSS water service coverage formula was implemented for better estimates of served population. This formula still includes population served by housing associations and community-based water operators.

In several forums (i.e. Dimaano, 2015, p. 57; Marcial, 2011, p. 29; Salamat, 2014, p. 5), MWCI and MWSI representatives reported water service coverage levels of 99% and 96%, respectively, which may broadly refer to water supply coverage in areas where they have their

networks already in place. Without understanding the context under which these results were obtained, the public may misinterpret the statistics being cited. Thus, it is very important to properly understand what service coverage means in the context of this water privatization if it is to be a significant measure of the concessionaires' accomplishments. Additionally, if it is to be a meaningful service target, the MWSS RO must use service coverage as a means of getting more impoverished households connected to the concessionaires' water networks.

While the new formula is an improvement over the previous one, the former still counts as part of the overall customer base, households that are supplied with water by the concessionaires through housing associations and community water systems. Though these households may experience, partly or in full, the improvements in services, they still pay higher water tariffs compared to households directly connected to the private water networks. Residential customers in housing subdivisions can be generally classified as belonging to the higher socio-economic classes (AB & C) while those living in informal settlements, to the poor (D) and extremely poor (E) socio-economic classes. Without any intention to disregard the water requirements of residential customers inside housing subdivisions, I would like to put more emphasis on the plight of informal settlers (particularly, the Class E residents) since these consumers often find themselves under conditions of water inequity because of their low purchasing power and limited ability to negotiate. Based on Table 20 (Water Pricing for Community Water Systems), informal settlers pay about 10 times more than the lifeline rate for households consuming up to 10 cubic meters of water per month. For such a monthly consumption and a water price of P100/cubic meter, these households spend 8% to 16% of their monthly household income (based on Appendix G.1) for their water bills, way above the 5% threshold for water expenditures (see World Bank, 2008; Fankhauser & Tepic, 2007). Note that

the MWSS RO has directed the concessionaires to increase efforts to connect households in informal settlements and report to them on a quarterly basis the progress of these efforts (MWSS Official, Personal Interview, November 28, 2014; see MWSS RO, 2012a; MWCI, 2013, 2014h). In the past, NGOs have made representations to the MWSS RO regarding the water needs of informal settlers (NGO officials, Personal Interview, November 17, 2014). Accordingly, the regulatory agency may have taken cognizance of these communities' predicament (MWSS Official, Personal Interview, November 27, 2014) and as such, is now looking at ways to address their domestic water concerns. I offer the following recommendations in this regard.

### **6.3.2 Recommendations**

To properly monitor the progress of conversion to direct connections of households in informal settlements, I suggest the use of a corollary water service coverage formula. Such formula should be based on the concept of equivalent number of connections, in conjunction with the latest MWSS formula that still uses the concept of equivalent population. In essence, the corollary formula will be structured as follows:

$$\text{Corollary water service coverage} = (\text{Number of actual connections} / \text{Total equivalent number of Connections}) \times 100\%$$

Where: *Number of actual connections* = *Domestic connections only (Residential / Semi-Business)*

And: *Total equivalent number of connections* = *Total population / Number of persons per household*

This formula will provide lower service coverage results compared to the new MWSS formula as the former does not associate multiple households with a single meter assigned to a bulk sales

customer. The corollary formula counts the bulk meter, which is used to bill the community water operators, only as one meter and does not consider the individual private meters of households being served by these operators. The difference between the results derived from the new MWSS water service coverage formula and the suggested corollary formula will provide an indication of the number of consumers that are still being served by the community water operators and the residential subdivision associations. The corollary formula facilitates the monitoring of conversion rates to direct concessionaire network connections of these households. The following table helps explain the use of the corollary water service coverage formula.

**Table 30. Various Water Service Coverage Formulas for the Year 2011**

Formula	MWCI	MWSI	Remarks
Old MWSS Formula <sup>1</sup>	101%	92.5%	Based on population
New MWSS Formula	88% <sup>2</sup>	86% <sup>3</sup>	Based on population
Concessionaires' Presentation Formula	99% <sup>4</sup>	96% <sup>5</sup>	Based on population; networked areas only
Corollary Formula	82% <sup>6</sup>	78% <sup>7</sup>	Based on number of connections

Note: Figures for corollary formula based on author's computations

Table developed by Author (2015) using data from <sup>1</sup> MWSS RO (2013a); <sup>2</sup> MWSS RO (2013a); <sup>3</sup> MWSS RO (2013b); <sup>4</sup> Marcial (2011); <sup>5</sup> Salamat (2014); <sup>6</sup> MWCI (2012c); <sup>7</sup> MWSI (2014h, 2014j). The difference in results between the new MWSS and corollary formulas pertain to estimated percentage of population served by community water operators and housing associations.

For 2011, the difference between the old and new MWSS formulas may have been due to the ambiguities of the old formula plus the double counting error that was previously pointed out. Using the new MWSS formula, MWCI and MWSI have been able to supply water to 88% and 86%, respectively, of their total consumer bases, through direct household connections as well as through community water operators and housing associations. From another viewpoint, these numbers also mean that the concessionaires have not been able to serve 12% and 14% of the

population of the east and west zones, respectively. Furthermore, from Table 30, the corollary water service coverage formula indicates that 82% and 78% of the population in the east and west zones, respectively, are connected directly to the concessionaires. The difference between the values obtained from the new MWSS and corollary water service coverage formulas relates to the percentage of connected households that are still served by the bulk sales customers of the concessionaires. As of 2011, I estimate that the number of people in networked areas still being served by housing associations and community water operators ranges from 6% to 8% of the total population within the MWSS service area, or the equivalent of about one million people.

To reduce conditions of inequity for Class E households in informal settlements and non-networked areas, MWSS must pursue policies that promote direct household connections for all residential customers. Reducing the difference between the values obtained from the new MWSS and corollary formulas for water service coverage (currently at the levels of 6% to 8% of total population) means the concessionaires are able to provide more direct connections to informal settlers previously served by community water operators. These policies make water more affordable for informal settlers, thereby addressing prevailing conditions of water inequity for these households. For unconnected households, higher values for both the new MWSS and corollary formulas indicate expansion of the concessionaires' water networks into new areas and the addition of new households to their consumer bases. For the newly connected households, these would mean the opportunity to experience the conveniences of in-house water access. Together with tariff structure reform, the use of the corollary water service coverage formula promotes a scenario of affordable water provision for connected and unconnected Class E households at a consumption level that meets their daily water requirements for healthy and productive living.

## **6.4 Providing Direct Household Connections to Informal Settlers**

### **6.4.1 Background**

In December 2005, the MWSS RO (2005, p.1) declared as a policy for open communities and depressed areas, “that the ultimate aim for the Concessionaires is to provide an individually metered and billed water service connection for each household.” Open communities are defined as areas where thoroughfares and roads are maintained by the city or municipality, while depressed areas (also called impoverished areas) refer to communities where the poor or low income members of society live, usually described by the lack of urban planning, social amenities and livelihood opportunities (MWSS RO, 2005). This policy also states that the bulk water supply scheme with community water operators, also referred to as People’s Organizations, should eventually be converted to individual concessionaire connections for the last phase of water provision. More than 10 years after the policy was formulated, despite ongoing efforts by the two concessionaires to implement this policy, MWCI still has around 256 community water systems (MWCI, 2014h) supplying water to informal settlers while MWSI currently has about 832 of such water supply arrangements (MWSI, 2014h).

### **6.4.2 Recommendations**

#### **6.4.2.1 Develop Implementing Guidelines for Informal Settlements**

Undoubtedly, the task of converting households served by these water systems into regular residential customers of the two concessionaires is quite difficult, specifically in the absence of any property rights over the piece of land that these households occupy. As these issues take a long time to get resolved, I recommend that the MWSS RO craft policies that will

enable the provision of direct water service connections to households in these communities. I anticipate that there will be many issues that the regulatory agency must address, particularly those that pertain to the legal aspects of this endeavor. However, I assume that MWSS, with the backing of the national government, will be able to institute measures allowing the concessionaires to directly serve the informal settlers, especially those occupying government lands, without unduly compromising the legal issues surrounding the contested property rights. Under these premises, I offer the following policy recommendations as regards the conversion of these bulk metering schemes into individual direct network connections for informal settlers.

Currently, the conversion efforts of the two concessionaires are guided by implementing rules and regulations for the interconnection and turn-over of residential subdivisions (MWSS official, MWCI managers, MWSI managers, Personal Interviews, December 3, 2014, December 2, 2014, November 28, 2014). These guidelines (see MWSS RO, 2008) are difficult to implement for informal settlements because of major differences in the physical configuration of their water reticulation systems and the socio-economic profiles of their customers. While there are several provisions that are similarly not applicable as regards the takeover of these community water systems, two provisions particularly stand out. The current guidelines require that the “construction of (the) reticulation system shall conform to the MWSS standards and specifications and if not, it shall be brought to a level acceptable to MWSS/Concessionaires at the cost of the applicant.” Likewise, the “subdivision’s NRW level shall be maintained at a level not to exceed 20% during the observation period (of six months)” (MWSS RO, 2008, p. 6). Nonetheless, despite the absence of more suitable and appropriate guidelines, I would like to point out that the concessionaires have been able to convert numerous community water systems into individual connections, the progress of such conversions being monitored by the MWSS RO

on a quarterly basis. Hence, there is reason to believe that the regulatory office may have been lenient on the implementation of these guidelines. Yet, without a specific set of guidelines for the takeover of community water systems, the use of current subdivision guidelines may also serve as a good excuse for the concessionaires to maintain the status quo for these water systems. It is essential that the MWSS RO draw up implementing rules and regulations that specifically address the conversion to individual water service connections.

#### **6.4.2.2 Implement the Temporary Supply Facility Option**

As part of the company's rehabilitation program from 2005 to 2006, MWSI implemented the "3-R Project Approach" to address concerns on Non-Revenue Water and billed volume growth. Essentially, this approach recovers water from areas with high NRW levels, reallocates the recovered water and resells it in areas with low NRW levels and high consumption rates (MWSI, 2005, pp. 31-33). During those years, the government had already taken over the west concession after its return by the original sponsors, and was providing the service for the west zone. With the reputation of its privatization program at stake, the government wanted to re-privatize this concession at the earliest possible time and therefore, needed to implement programs that would fast track the company's path towards financial and operational viability. One such program, the Temporary Supply Facility [Temfacil], was instituted by Dr. Fiorello Estuar, then MWSI President/CEO. This approach is a cost-effective technical solution to address problems of water leaks and illegal connections. Temfacil makes use of galvanized iron pipes laid above ground and acts as a temporary reticulation system while the permanent water distribution system is being installed. Implemented at an area in the west zone covering over 30

hectares with 3,000 households, the Temfacil approach was able to reduce NRW level from 90% to 10% at a total installation cost of only ₱40 million (US\$727,000.00) (Estuar, 2005, pp. 42-43).

Further to the conversion policy for informal settlements, the MWSS RO must consider the Temfacil set up as an alternative water reticulation system for these communities. I agree with McIntosh (2014) that this system is suitable for environments where the standard piped delivery service is not a viable or cost-effective option. As the Temfacil system is easy to install as well as dismantle, and is designed to last 5 years or more, it is ideal for informal settlements where houses may be relocated or demolished depending on the outcome of discussions or legal proceedings regarding the properties in question. In its accomplishment report for 2009 to 2011, the MWSS RO (2012c) stated that they discouraged MWSI from further implementing Temfacil projects and recommended that only permanent facilities be pursued. However, looking at the current distribution system of community water operators, the pipes that were used are made of synthetic plastics which are easier to get punctured than galvanized iron. As such, the use of the current piping materials increases the probability of water contamination which ultimately leads to higher health risks for these communities. Moreover, these communities are situated in environments that are difficult, unique and require innovative solutions to water-related concerns. In this regard, the MWSS RO must keep an open mind and consider out-of-the-box solutions for water delivery.

#### **6.4.2.3 Provide Assistance to Displaced Community-Based Water Operators**

With the takeover of community water systems, the concessionaires would now be responsible for activities related to NRW, billing, and collection, which were previously handled by the community-based water operators. Although the head of a community water system

(Personal Interview, December 2, 2014) said that they are willing to return to the concessionaire the provision of water services in their neighborhood, she sees the concessionaire having problems on leakage, pilferage, and collection. Considering that the heads of such water systems are usually barangay officials or local community leaders, they are able to exercise moral suasion over members of their communities, thereby reducing NRW and collection problems. To address these problems later on, the concessionaires should appoint these community-based organizations as their billing and collection agents in lieu of the regular service companies that they use for these activities. As their billing and collection agents, these organizations are in a better position to make sure that NRW levels are low and collection efficiencies are high, being mindful that payments for services rendered will be based on water billings they are actually able to collect. Additionally, the concessionaires should help these community-based organizations to diversify into other business endeavors similar to the manufacture of water meter protectors, bollards, and board ups (supplied to MWCI) by an east zone community-based organization, and hand soaps and home care products by a west zone organization. The concessionaires may also offer livelihood training programs, seminars and workshops, and even loans for start-up capital for new business ventures that will replace their previous water-related income generating activity.

In establishing new guidelines for the takeover of community water systems, the MWSS RO should consider the use of Temfacil systems, the appointment of community-based organizations as billing and collection agents, and the provision of various support programs that help these organizations diversify into other business ventures. Likewise, the process must include consultations with the parties that are likely to get affected by the new guidelines (e.g. concessionaires, community-based organizations/operators, property owners, local government

officials). Coupled with the use of corollary water service coverage formula, these new guidelines will help ensure that the government is able to address conditions of water inequity for impoverished communities in networked areas that are able to avail of concessionaire water only through their “sub-contractors” for the last phase of water provision.

## **6.5 Building the Southern Water Infrastructure System**

### **6.5.1 Background**

The North to South water supply infrastructure for Metro Manila has resulted in the general concentration of unconnected households in its southern periphery. In these non-networked areas, the Class E households have very few supply options, consuming water below the minimum daily requirement while paying high water prices. Properly planned and designed, any new water infrastructure project that delivers water to these southern fringes would benefit these impoverished communities the most.

Even prior to privatization, MWSS had already envisioned the development of a new water source and treatment facility in the southern portion of its service area. During the MWSS privatization bidding phase, one of the technical and business assumptions that the concessionaires were asked to use for their financial projections was the availability of this water source and treatment facility ten years after the privatization’s commencement date. In preparation, the concessionaires had to build the necessary distribution systems to be able to sell the additional supply of treated water from these facilities (MWSS, 1997a, 1997b, p. E-1). This project did not push through due to a confluence of external and unforeseen events such as the Asian financial crisis in 1997 and the severe El Niño occurrence in 1998. The Asian financial crisis brought about a 62% peso devaluation against the US dollar and increased interest rates of

up to 30% per annum (see Albuero, 1999, p. 446). Its lingering effects in the years to follow made borrowing difficult for both the government and the private sector. The severe El Niño event further exacerbated the situation, even forcing the original west zone concessionaire to return the concession to the government in 2003.

More than 18 years into the privatization program, MWSS is finally bidding out via the PPP process, a 600 MLD reservoir project worth P18.72 billion (US\$416 million) (MWSS, 2015). Using the Metro Manila Water Demand Study and looking at several supply and demand scenarios, MWSS determined that the new major water source would be needed by 2020 (MWSS, 2012a, pp. 14-16; MWSS & PPP Center, 2014, p. 5). Since this new reservoir is projected to cover Metro Manila's water supply requirements only up to 2027, MWSS will subsequently develop another water source that is capable of supplying an additional 1,800 MLD of water for the metropolis (MWSS & PPP Center, 2014, p. 5). These two reservoir projects will enable the concessionaires to supply the water requirements of all households in their service areas as well as provide better water security for Metro Manila, which currently sources 97% of its domestic water requirements from Angat Dam.

### **6.5.2 Recommendations**

Admittedly, the additional water supply will benefit all households, especially if the required distribution systems are in place by the time the new reservoir is operational. Nevertheless, I believe that the decision making process for major investments such as these new water sources should also involve an assessment similar to the one I have undertaken for this research. Examining the water-related experience across all socio-economic classes of households that are within and outside the concessionaires' networks provides additional inputs

to the general approach normally used in such a decision-making process. I am convinced that such an assessment may have hastened the implementation schedule for Metro Manila's new water sources or pushed for the implementation at a much larger scale of the concessionaires' projects that currently source water from Laguna de Bay, a freshwater lake in the southern part of the metropolis. While the treatment cost for water from this lake is relatively higher than that for Angat water, I am hopeful that this will not pose a hindrance to the implementation of the interim projects, as the overall effect on the tariff will not be significant once the additional cost is distributed across all customers in the east and west zones through the tariff adjustment mechanism.

Upon completion of the new water supply and distribution systems that will deliver water to the southern fringes of Metro Manila, MWSS must ensure that Class E households in these areas are able to get connected to these systems in order to fully address conditions of water inequity surrounding these households. However, the regular service connection fee of P8,220.03 (US\$182.67) (MWSI, 2015c, p. 1) may not be affordable for these households, given that the consumer survey results show that 62% to 71% of the Class E respondents in the unconnected areas have expressed unwillingness to pay for these fees (see Appendix E). While the concessionaires have allowed amortized payment of connection fees in certain instances, only substantially long amortization periods would be a viable option for extremely poor households. As an alternative, MWSS can explore the use of output-based aid from the Global Partnership on Output-Based Aid [GPOBA] to fund in full or a major portion of the service connection fees for the impoverished households. Such a program may be similar to the one implemented by MWCI in 2008 for which GPOBA provided a grant in the amount of US\$1,050,000.00 to subsidize 78% of the total service connection fee for select low-income households. Under this arrangement,

each household paid for the meter and guaranty deposits in 36 monthly amortizations while GPOBA reimbursed the cost of connecting the household to the network after independent verification by a third party. This output-based aid project was intended to provide individual connections for 21,000 households of targeted impoverished communities in the east zone (GPOBA, 2009, pp. 2-3, MWCI, 2007, p. 2). To reduce the state of water inequity for these households, MWSS must always work for direct water service connections to the concessionaires' networks at the soonest possible time and the lowest possible cost.

## **6.6 Implementing a Modified PAWS Program**

### **6.6.1 Background**

The Public Assessment of Water Services program was developed by the UP National Engineering Center, a unit of the College of Engineering, University of the Philippines, which undertakes continuing engineering education, research and development, technical consultancy, and publications related to the engineering field (UP NEC, 2010a). As a regulatory instrument for monitoring and evaluating the performance of the two Metro Manila water concessionaires, PAWS was designed by the UP NEC to provide valuable information to help guide the MWSS RO in decision-making, assist the concessionaires on matters related to operations and business planning, and inform the public on the level of water services extended by the concessionaires (UP NEC, 2011e). From 2000 to 2010, UP NEC conducted 5 assessment activities for the MWSS RO, initially covering only 100 barangays and later on, expanding to 1,509 barangays (UP NEC, 2011e, p. 5). For assessing the concessionaires' performance, PAWS uses network quality, water quality, and service quality as major performance indicators and uses the results of pairwise ratings to come up with single indices to measure concessionaire performance for each

major indicator as well as for overall performance. Until 2008, the overall PAWS ratings were derived from results of consumer surveys and reports of the concessionaires on the selected performance indicators. After 2008, the next two PAWS programs moved towards independence from concessionaire-supplied information and relied on data loggers installed at select households for field information on water supply and water pressure (UP NEC, 2011e, pp. 8-9). According to the UP NEC (2011e), the possible future expansion for the PAWS program lay towards the integration of household surveys in the unconnected areas of the Rizal and Cavite provinces, a survey for commercial and industrial customers, and an assessment program for sewerage and sanitation services.

### **6.6.2 Recommendations**

In the last five years, there has been no new PAWS program implemented. It is my strong belief that the MWSS RO should continue with the PAWS program as part of its performance evaluation and monitoring functions for the Metro Manila water privatization. However, future PAWS programs should include consumer surveys in non-networked areas, similar to the consumer survey conducted for the Metro Manila Water Demand Study. As requested by the concessionaires, past PAWS surveys have not included respondents in unconnected areas despite the fact that these localities are also part of the concessionaires' service areas. Thus, previous results reflect only the performance of private water firms in areas where they have their networks in place. A comprehensive assessment of the state of water provision for Metro Manila also requires an investigation of the daily water experience of unconnected households. Furthermore, future PAWS surveys must include questions that provide information on the respondent's socio-economic profile to pave the way for the examination of the results and

trends across the different socio-economic classes. Only when the MWSS RO assesses the conditions of water provision for all households, both within and outside of the water networks as well as for each socio-economic class, are they truly able to determine the conditions of water inequity across the entire Metro Manila water system. Only then will they be able to implement programs that reduce and hopefully, eliminate all the factors that contribute to the existence of water inequity in its different forms.

## **6.7 Conclusion**

Ongoing water inequity in Metro Manila is fundamentally associated with access and affordability problems for various communities, particularly for Class E households. As a general rule, MWSS and the concessionaires must work towards providing access to piped water supply for these households at a price that is affordable to them. While significant strides have been achieved towards increasing water service coverage, there is still much work needed to provide these households with direct network connections. Moreover, the notion of tariff structure reform as a means to make current water tariffs more equitable has not been discussed and looked into, although it is within MWSS's authority to do so and is allowed under the concession agreement. In essence, this may be due to the complexity of the work that this activity entails and the sensitivity of tariff-related issues, considering that almost all arbitration cases (which tend to be very controversial and expensive) are related to such issues. I am hopeful that my research will provide more clarity and understanding on Metro Manila's major privatization concerns, especially as they pertain to the water needs of the poor. Through my research, I also hope to address certain questions and concerns that were raised during my meetings in Metro Manila (November, 17, 2014 and December 1, 2014) with key NGO officials

who keep an open mind on the idea of privatization, provided that this program benefits the urban poor. Furthermore, I am hopeful that MWSS and the concessionaires will find merit in my policy recommendations and realize that they are meant to further improve current levels of service, based on a balance between efficiency and equity.

## Chapter 7: Conclusion

Lack of access to improved drinking water sources and sanitation facilities is still a critical issue that the global community must direct much attention to, given the UN General Assembly's recognition of the "right to safe and clean drinking water as a human right that is essential for the enjoyment of life and all human rights" (UN, 2010, p.2). In the Philippine context, the Philippine Water Supply Sector Roadmap, the government's guide to achieving the country's MDG targets, explicitly states that "water is a human right and the government has an obligation to respect, protect, and fulfill the enjoyment of the right to water" (NEDA, 2010, p. 3).

The scenario mentioned above is similar for other basic services such as electricity and all-weather roads where many people (1.2 billion people and 30% of the global population, respectively) also have no access to such services (IFC, 2016, p. 1). For Asia alone, the ADB and ADB Institute (2009, p. 10) estimate that the region will require aggregate investments of US\$8.0 trillion for national infrastructure from 2010 to 2020. Based on the oft-used reasons of operational efficiency and access to private capital (see ADB, 2014b; WB, 2012), the Asian Development Bank and the World Bank are increasingly promoting and supporting the development of public infrastructure using the PPP approach. Identifying the private sector as a vital component in meeting Asia's development needs, ADB sees private sector operations and development accounting for 50% of the bank's activities by 2020 (ADB, 2014b, p. 1). From 2002 to 2012, the World Bank has increased its support to PPPs threefold (from US\$900 million to US\$ 2.9 billion) by way of investments, lending and guarantees, and intends to further intensify its involvement in these projects (WB, 2012, p. 2). Thus, in the years to come, there will be a proliferation of PPP projects aimed at building the necessary public infrastructure, specifically in the developing world where the state's capacity is generally constrained by

problems of a growing population, an aging infrastructure, and rapid urbanization (see IFC, 2016).

## **7. 1 Focus and Argument**

This research deals primarily with water privatization, an alternative mode to public sector provision of water supply and sanitation. My intention is not to examine the public-private provision debate aimed at determining which option is better or more suitable for urban water provision.<sup>60</sup> Instead, I suggest that water privatization/PPPs must be designed for the public good and implemented in line with national interests, should the state decide to pursue such policy option. Specifically, I use the Metro Manila water privatization, one of the largest and longest running water privatization programs to date (see Dumol, 2000), as a case study to review the general model, the current situation of access and provision in the metropolitan region, as well as the parameters typically used to gauge “success.” Whether public or private provision of water, this dissertation highlights institutional and governance issues as a key focus for these discussions, especially as they relate to the capacity of the state to perform multiple roles, such as policy maker, service provider, or regulator.

The research views urban water systems as physical embodiments of past policies and decisions made by both public and private actors involved in the provision of water services (see Bakker, 2003). As such, I examine the political-economic background and the history of water governance in Metro Manila to better foreground my discussions on the Metro Manila water privatization program. Several authors (i.e. Stanley, 1974; Constantino & Constantino, 1978;

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<sup>60</sup> For some of these debates, please see (ADB, 2004a; Araral, 2009; Bakker, 2003; Bakker, 2007; Bakker et al., 2008; Budds & McGranahan, 2003; Castro, 2007; Goldman, 2007; Hall & Lobina, 2006, 2007; IFC, 2010; Franceys, R., & Jacobs, J., 2008; Kikeri & Nellis, 2004; Laquian & Argo, 2004; Marin, 2009; Mehta, 2000; Peck & Tickell, 2002, Swyngedouw, 2005).

Doherty, 1982; Hutchcroft, 1991, 1998, 2000; Rivera, 1996) attribute the weakness of the Philippine political and economic foundations to the continuing presence and influence of a ruling elite, the traditionally big landowners that eventually expanded into commerce, manufacturing and finance. To this, Hutchcroft (1998) and Rivera (1996) suggest that the Philippine government implemented neoliberal reforms, which included water privatization, during the 1990s to counteract centuries of rent-seeking efforts by the oligarchic business class. Such notions deviate from the usual reasons of tapping private expertise and capital normally attributed to the implementation of such programs (see ADB, 2004a; IFC, 2010; Franceys & Jacobs, 2008; Kikeri & Nellis, 2004; Marin, 2009). Whether or not programs of liberalization, which includes water privatization, are indeed deterrents to the particularistic tendencies of the local oligarchs is a matter subject to further debate and study.

The history of water governance in Metro Manila reveals that the state has instituted several reforms in the past, including the localization and nationalization of water services, as well as the on-going program of water privatization in more recent decades. For the Metro Manila case, the scorecards typically used by observers of the program (i.e. Fabella, 2011; IFC, 2010; MWSS RO, 2004; Wolf, 2007, Wu & Malaluan, 2008) present a bright scenario, one that showcases a 24-hour supply of water that is of high pressure and good quality. While these results illustrate significant improvements for the Metro Manila water services, there is still further need to determine if such progress has been equitably shared and experienced by all consumers. Of major interest to policy makers is an understanding of how poor households have fared in relation to other socio-economic classes.

I examine the political-economic background and water governance history of Metro Manila to also highlight the need for a robust regulatory environment for urban water provision,

particularly in negotiating contracts, crafting regulatory guidelines, monitoring compliance with service targets, and assessing overall concessionaire performance. Regulatory policies should not only reward concessionaires for improving operating efficiencies, but also for ensuring equitable water provision for all consumers. It is in this light that I offer the concept of Social-Hydrological Systems for assessing and monitoring the performance of Metro Manila's water concessionaires, as explained more fully in Chapters 2 and 3. In this context, I view the city's water system as coupled consumer-technological systems influenced by the state's governance capacity, concessionaires' technical expertise, enabling laws and regulations, politics, climate change, economic conditions, and other influencing factors.

Unlike assessment programs for water utilities that base performance on productivity and efficiency (see Corton & Berg, 2009; De Witte & Marques, 2010; Mbuvi et al., 2011; Abbot et al., 2012), the SHS framework identifies conditions of inequitable water provision in an urban setting for the purpose of defining policies that reduce if not eliminate these conditions. To be more specific, these water inequity conditions arise when water service needs of impoverished communities are not adequately addressed. Across the Metro Manila waterscape, various states of water inequity exist, which are caused by different underlying factors. Identifying these different states, as well as their causes, necessitate information on the consumers and the built environment. For this research, I sourced the necessary information from the Metro Manila water demand survey of 53,773 residential customers and direct field measurements by the private concessionaires. Using these field data, I analyzed the parameters of service coverage, water pressure, supply duration, quality, and affordability across the different socio-economic classes. Finally, the results of the study were contextualized and cross-referenced with interviews of

major privatization stakeholders, primary documents as well as literature on water governance and privatization, together with other topics relevant to my research.

As fully discussed in Chapter 4, getting households connected to the concessionaires' networks is a critical step towards the promotion of equity and social justice, considering that all connected households, regardless of socio-economic class, have experienced nearly 24 hours of clean water at a pressure of 7 psi. Along the "North to South" water supply corridor, varying states of water provision have developed different levels of access and affordability, spawning different water inequity scenarios for extremely poor households. For directly connected households, water inequity may be attributed to an outdated lifeline volume that no longer meets the tariff's equity objectives due to increased water consumption levels brought about by the conveniences of water access. For households served by community water systems, water inequity arises from the absence of property rights, a requirement to get direct household connections. For unconnected areas, water inequity is caused by the absence of the concessionaires' networks and a complex regulatory scenario arising from alternative water provision modes regulated by different government agencies. State intervention policies that properly address the many faces of urban water inequity require policy makers to identify and focus on factors and circumstances that propagate these scenarios. Towards this end, I propose two general guidelines upon which my policy recommendations in Chapter 6 are based – MWSS and its regulatory agency must ensure the provision of water service connections to all households and implement a tariff rate structure that promotes a level of affordability for all connected households. Moving forward, the regulatory agency must periodically assess the concessionaires' performance as regards their adherence to these guidelines.

As explained in Chapter 5, I argue that a complete equity assessment for the Metro Manila water system also requires a recognition of the rural-urban equity nexus arising from competing uses of rural farmers and Metro Manila consumers, especially during periods of long dry spells. Such a linkage does not seem to be recognized in studies or official documents on Angat Dam (i.e. JICA et al, 2013; MWSS, 2012b, 2014e, 2014f; MWSS et al., 2013; NWRB, 2004, 2006, 2009; Ortega, 2011; Pascua, 2007; PSALM, 2010; Tabios & David, 2004; UP NEC, 2011a). Operational inefficiencies and inequitable urban water provision make it difficult to justify current water allocation protocols that divert irrigation water supply to Metro Manila. Without just and adequate compensation, only the equitable provision of urban water can properly rationalize the hardships farmers face during extremely scarce water conditions.

## **7.2 Future Research Directions**

While I have extensively examined equity issues related to the Metro Manila water privatization, there are other concerns regarding this program that still need further study. I have barely scratched the surface on the issue of whether or not market oriented reforms, specifically the entry of large multinationals, can counteract the power and influence of the Philippine oligarchic business class which has spanned more than 400 years. Similarly, women and gender issues related to new service connections may be investigated, particularly in connection with increased household productivity and improved health conditions.

With the implementation of a modified PAWS survey, it would be very interesting to compare the results of a new residential consumer survey with those of the 2011 MMWDS consumer survey to determine the spatial and temporal shifts that may have occurred between the two survey periods. Another interesting but more controversial study would be a review of the

current water tariff policy vis-à-vis the operational efficiency and profitability of the two concessionaires to determine whether the existing tariff water adjustment mechanisms equally balance the interests of the concessionaires and the consumers, or are biased in favor of one party. More importantly, in the near future, a new study must be initiated to assess the equitable provision of sanitation and sewerage services, which can actually be linked to the water inequity assessment model offered by this research. This will complete the performance assessment for all services provided by the two concessionaires. While intended for equity considerations, particularly as it relates to the sanitation and sewerage tariff formula currently in place, this study also ensures that the concessionaires meet their sanitation and sewerage service targets which will ramp up in the coming years, thus ensuring environmental protection for the country's primate city.

### **7.3 Contributions to Policy and Academic Research**

On its own merits, my research offers a better understanding of the state of equitable water provision for Metro Manila, almost nineteen years into the water privatization program. As such, the research informs policy and guides the regulatory practices of MWSS towards the provision of quality water service for all consumers, regardless of socio-economic class. Since the Metro Manila water privatization program is often used as a model for private sector participation in the Philippines, the lessons learned from this research may be used to guide future private sector participation in the provision of water and other basic services. Indeed, an equity lens is a paramount consideration for any evaluation or discussion of success, although some of these issues have been underplayed in performance evaluation frameworks to date.

As emerging economies intensify private sector participation in infrastructure development through Public-Private Partnerships, with the backing of multilateral agencies such as the Asian Development Bank and the World Bank, my dissertation presents a regulatory and governance framework for future PPP programs related to basic services provision. This dissertation espouses the need to include pro-poor strategies in these programs, and provides a methodology for assessing the attainment of these strategies. The use of this approach may help institutionalize the balance between equity objectives of the state and profit motives of private firms. Such a balance is necessary for the success of the PPP program as a major national development strategy, given that civil society, consumer groups, and NGOs are exceedingly concerned and continue to push for equity considerations in such programs.

With respect to the broader literature on water privatization and governance, environmental justice, human rights to water, and water inequity, my dissertation applies the principles of social-ecological systems and coupled human and natural systems to evaluate the empirical privatization results in Metro Manila. Policies that address different water inequity scenarios also address environmental justice and human rights issues that should also be given much attention when regulating large water privatization programs.

My research has identified certain gaps in information usually associated with water privatization results and suggests the need to examine such results across the entire socio-economic spectrum. In this regard, there is need to gather information on the consumers' water-related experiences to augment the usual field measurements on which these results are based. Likewise, my dissertation has identified related areas for further research, which contributes to the general knowledge on water privatization/PPPs. Furthermore, my dissertation opens up new avenues for research by applying a similar SHS framework or equity principle to other basic

services, whether for privatization/PPP schemes or for other provisions that nonetheless require an explicit equity evaluation.

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## Appendix A. Consumer Survey Coverage

### Appendix A.1. West Zone (MWSI)

Connected Areas	No. of Barangays	No. of Respondents
<i>National Capital Region</i>		
Caloocan	181	4,221
Las Pinas	11	312
Makati	4	146
Malabon	21	584
Manila	767	15,680
Muntinlupa	6	211
Navotas	14	385
Paranaque	16	449
Pasay	199	3,983
Quezon City	60	1,804
Valenzuela	30	799
<i>Cavite Province</i>		
Bacoor	48	771
Cavite City	80	1,524
Imus	28	311
Kawit	22	401
Noveleta	13	179
Rosario	11	139
<b>Total</b>	<b>1,511</b>	<b>31,900</b>

Unconnected Areas	No. of Barangays	No. of Respondents
<i>National Capital Region</i>		
Caloocan	5	29
Las Pinas	8	220
Makati	2	5
Malabon	0	0
Manila	50	523
Muntinlupa	6	224
Navotas	0	0
Paranaque	3	37
Pasay	8	48
Quezon City	4	31
Valenzuela	2	49
<i>Cavite Province</i>		
Bacoor	64	1,096
Cavite City	0	0
Imus	94	2,127
Kawit	20	227
Noveleta	15	213
Rosario	18	441
<b>Total</b>	<b>299</b>	<b>5,270</b>

Note: A total of 183 barangays were common to both survey groups in the west zone.

Tables developed by Author (2015) using data from UP NEC (2011a). The MMWDS residential consumer survey for the west zone covered 31,900 respondents in 1,511 networked barangays and 5,270 respondents in 299 non-networked barangays.

## Appendix A.2. East Zone (MWCI)

Connected Areas	No. of Barangays	No. of Respondents
<i>National Capital Region</i>		
Makati	24	770
Mandaluyong	26	782
Manila	91	2,642
Marikina	16	482
Paranaque	1	30
Pasig	29	882
Pateros	10	384
Quezon City	80	2,415
San Juan	20	627
Taguig	28	837
<i>Rizal Province</i>		
Angono	7	215
Antipolo	14	364
Baras	9	248
Binangonan	13	296
Cainta	7	387
Jala-Jala	3	77
Rodriguez	8	243
San Mateo	14	346
Taytay	5	310
<b>Total</b>	<b>405</b>	<b>12,337</b>

Unconnected Areas	No. of Barangays	No. of Respondents
<i>National Capital Region</i>		
Makati	1	29
Mandaluyong	1	5
Manila	1	30
Quezon City	1	30
<i>Rizal Province</i>		
Angono	6	228
Antipolo	8	117
Baras	7	138
Binangonan	34	772
Cardona	18	476
Jala-Jala	11	329
Morong	8	395
Pililla	9	371
Rodriguez	11	199
San Mateo	11	128
Tanay	19	569
Taytay	2	71
Teresa	9	379
<b>Total</b>	<b>157</b>	<b>4,266</b>

Note: A total of 46 barangays were common to both survey groups in the east zones.

Tables developed by Author (2015). The MMWDS residential consumer survey for the east zone covered 12,337 respondents in 405 networked barangays and 4,266 respondents in 157 non-networked barangays

## Appendix B. Sample of Pairwise Ratings from a Previous PAWS Survey

BRGYCODE	Network Quality			Water Quality				Service Quality				Overall		
	Continuity	Daytime Pressure	Nighttime Pressure	Taste	Color	Smell	Foreign Bodies	Billing	Customer Service	Water Interruption	Effectiveness	Network Quality	Water Quality	Service Quality
2103012	63.5%	36.5%	0.0%	27.8%	19.0%	30.2%	23.0%	23.8%	19.0%	27.0%	30.2%	44.4%	54.0%	1.6%
3901029	47.6%	41.3%	6.3%	29.4%	18.3%	33.3%	14.3%	20.6%	10.3%	26.2%	38.1%	34.9%	39.7%	20.6%
3901033	58.7%	36.5%	4.8%	23.8%	25.4%	31.0%	19.8%	22.2%	15.9%	28.6%	33.3%	41.3%	49.2%	9.5%
3901034	39.7%	33.3%	3.2%	23.8%	7.9%	20.6%	23.8%	19.0%	9.5%	27.0%	20.6%	33.3%	38.1%	4.8%
3901042	44.4%	30.2%	1.6%	16.7%	9.5%	29.4%	20.6%	16.7%	11.9%	32.5%	15.1%	41.3%	34.9%	0.0%
3901049	46.0%	25.4%	4.8%	23.8%	15.1%	26.2%	11.1%	15.9%	13.5%	31.0%	15.9%	33.3%	39.7%	3.2%
3901070	50.8%	25.4%	0.0%	15.9%	16.7%	27.0%	16.7%	9.5%	10.3%	30.2%	26.2%	31.7%	31.7%	12.7%
3901079	47.6%	27.0%	1.6%	33.3%	10.3%	19.0%	13.5%	23.8%	8.7%	23.0%	20.6%	42.9%	30.2%	3.2%
3901096	60.3%	38.1%	1.6%	36.5%	19.0%	32.5%	11.9%	13.5%	10.3%	38.1%	38.1%	38.1%	57.1%	4.8%
3901105	76.2%	46.0%	1.6%	42.9%	34.1%	29.4%	17.5%	43.7%	15.9%	29.4%	34.9%	66.7%	46.0%	11.1%
3901107	46.0%	39.7%	9.5%	24.6%	21.4%	28.6%	20.6%	15.9%	13.5%	27.0%	38.1%	38.1%	42.9%	14.3%
3901110	46.0%	42.9%	11.1%	24.6%	11.9%	36.5%	27.0%	15.1%	17.5%	33.3%	34.1%	34.9%	42.9%	22.2%
3901119	54.0%	44.4%	1.6%	27.8%	23.8%	34.1%	14.3%	26.2%	11.9%	23.8%	38.1%	49.2%	46.0%	4.8%
3901129	49.2%	39.7%	6.3%	29.4%	23.0%	28.6%	14.3%	26.2%	23.8%	18.3%	27.0%	39.7%	46.0%	9.5%
3901151	50.8%	25.4%	0.0%	23.0%	18.3%	23.0%	11.9%	15.9%	8.7%	27.0%	24.6%	41.3%	25.4%	9.5%
3901155	65.1%	34.9%	0.0%	31.7%	15.1%	23.8%	29.4%	14.3%	8.7%	38.9%	38.1%	58.7%	27.0%	14.3%
3901168	47.6%	34.9%	12.7%	25.4%	22.2%	29.4%	18.3%	17.5%	17.5%	31.7%	28.6%	42.9%	34.9%	17.5%
3901189	47.6%	27.0%	1.6%	31.0%	18.3%	19.0%	7.9%	20.6%	9.5%	30.2%	15.9%	28.6%	38.1%	9.5%
3901193	46.0%	27.0%	3.2%	30.2%	7.9%	21.4%	16.7%	15.9%	11.1%	23.8%	25.4%	31.7%	39.7%	4.8%
3901197	42.9%	30.2%	3.2%	11.9%	9.5%	29.4%	25.4%	12.7%	16.7%	17.5%	29.4%	30.2%	36.5%	9.5%
3901200	58.7%	41.3%	0.0%	42.9%	20.6%	29.4%	7.1%	31.0%	5.6%	38.1%	25.4%	41.3%	58.7%	0.0%
3901220	50.8%	25.4%	0.0%	23.0%	11.1%	26.2%	15.9%	23.0%	7.9%	21.4%	23.8%	20.6%	44.4%	11.1%
3901224	47.6%	28.6%	0.0%	12.7%	13.5%	28.6%	21.4%	10.3%	19.0%	22.2%	24.6%	31.7%	39.7%	4.8%
3901229	55.6%	34.9%	4.8%	31.7%	22.2%	29.4%	11.9%	16.7%	23.8%	35.7%	19.0%	47.6%	28.6%	19.0%
3901244	50.8%	25.4%	0.0%	17.5%	10.3%	25.4%	23.0%	13.5%	12.7%	27.0%	23.0%	30.2%	39.7%	6.3%
3901259	47.6%	28.6%	0.0%	19.0%	11.1%	21.4%	23.8%	12.7%	5.6%	28.6%	29.4%	33.3%	36.5%	6.3%

Source: UP National Engineering Center. (n.d.). Year 1 pairwise data and weights. Quezon City. *(Reproduced with permission)*  
 Pairwise ratings obtained by the UP NEC in previous PAWS surveys were used to generate the unified scores for water pressure and water quality.

## Appendix C. Sample Questions for Water Supply, Pressure, Quality, and Affordability

### *Filipino Version*

#### **Water Supply**

Ilang oras sa isang araw kayo karaniwang may suplay ng tubig mula sa Maynilad? \_\_\_\_\_ (oras)

#### **Water Pressure**

Base sa normal na daloy ng inyong tubig (hal. hindi ginagamit ang booster pump, kung meron man), gaano kalakas ang daloy nito?

		Malakas	Katamtaman	Mahina	Wala	Hindi alam
Daytime Pressure	mula 6 am – 12 noon?					
	mula 12 noon – 6 pm?					
Nighttime Pressure	mula 6 pm – 12 midnight					
	mula 12 am – 6 am?					

### *English Version*

#### **Water Supply**

How many hours in a day do you get supply of water from Maynilad? \_\_\_\_\_ (hours)

#### **Water Pressure**

Based on normal water flow (e.g., without the use of a booster pump, if you have one), how strong is the flow of water in your household?

		Strong	Moderate	Weak	No Pressure	No Comment
Daytime Pressure	from 6 am – 12 noon?					
	from 12 noon – 6 pm?					
Nighttime Pressure	from 6 pm – 12 midnight					
	from 12 am – 6 am?					

### Water Quality

Maliban sa posibleng amoy ng chlorine, may amoy ba ang tubig ninyo?

- Mayroong amoy
- Walang amoy
- Iba pa \_\_\_\_\_

Malinaw ba ang tubig na dumadaloy sa gripo ninyo?

- Oo
- Hindi
- Iba pa \_\_\_\_\_

Nakakita na ba kayo ng anumang tining sa inyong tubig?

- Hindi
- Oo
- Iba pa \_\_\_\_\_

Maliban sa posibleng lasa ng chlorine, may iba pa bang lasa ang inyong tubig?

- Mayroon
- Walang lasa
- Iba pa \_\_\_\_\_

### Water Quality

Aside from the possible smell of chlorine, does your water have an unusual odor?

- Has unusual odor
- No unusual odor
- Other \_\_\_\_\_

Is the water coming out of your faucet clear?

- Yes
- No
- Others \_\_\_\_\_

Do you see any foreign body in the water that comes out of your faucet?

- Yes
- No
- Others \_\_\_\_\_

Aside from the possible taste of chlorine, does your water have an unusual taste?

- Has unusual taste
- No unusual taste
- Others \_\_\_\_\_

**Affordability**

Upang laging mapanatili ang ganitong uri ng serbisyo, kayo po ba ay pumapayag na magbayad ng karagdagang halaga sa inyong buwanang singil sa tubig?

- Oo       Hindi

**Kung ang sagot ay Oo:** Magkano ang nais ninyong ibayad na karagdagang halaga sa inyong karaniwang buwanang singil sa tubig? \_\_\_\_\_

**Kung ang sagot ay Hindi:** ano ang iyong dahilan?

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Kung sakaling ang halagang inyong nabanggit ay hindi sapat upang laging mapanatili ang ganitong uri ng serbisyo:

Kayo ba ay papayag na magbayad ng karagdagang ₱20.00 sa binanggit ninyong halaga?

- Oo       Hindi

Kayo ba ay papayag na magbayad ng karagdagang ₱50.00 sa binanggit ninyong halaga?

- Oo       Hindi

**Affordability**

In order to continue enjoying good quality water service, would you be willing to pay an additional amount on top of your usual monthly water bill?

- Yes       No

**If the answer is Yes:** How much are you willing to pay on top of your usual monthly water bill?

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**If the answer is No:** please state your reasons.

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Should the amount you mentioned above not be sufficient to continue enjoying good quality water service:

Are you willing to pay an additional US\$0.43 to the amount you mentioned above?

- Yes       No

Are you willing to pay an additional US\$1.06 to the amount you mentioned above?

- Yes       No

Kayo ba ay papayag na magbayad ng karagdagang ₱75.00 sa binanggit ninyong halaga?

Oo       Hindi

Kayo ba ay papayag na magbayad ng karagdagang ₱100.00 sa binanggit ninyong halaga?

Oo       Hindi

Kayo ba ay papayag na magbayad ng higit pa sa ₱100.00 sa binanggit ninyong halaga?

Oo       Hindi

Are you willing to pay an additional US\$1.60 to the amount you mentioned above?

Yes       No

Are you willing to pay an additional US\$2.13 to the amount you mentioned above?

Yes       No

Are you willing to pay an additional amount of more than US\$2.13 to the amount you mentioned above?

Yes       No

Adopted from: UP National Engineering Center. (2013). Sample PAWS survey questionnaire. Quezon City: UP National Engineering Center. Sample questions used for generating data for water supply, water pressure, water quality, and affordability.

## Appendix D. Water Service Coverage Formula

$$\text{Water Service Coverage} = \frac{\text{Population Served with Water}}{\text{Total Population}} \times 100\%$$

Where:

$$\text{Population Served with Water} = [(a + b + c) \times d] + e$$

Note:

a = Billed individual domestic water services (residential and semi-business accounts only)

b = Temporary disconnected individual domestic water services at the time of computation of coverage target (residential and semi-business accounts only)

c = Equivalent connections of billed and temporary disconnected bulk water services (number of official bulk service excluded); only residential and semi-business units of the bulk water services will be included

d = Person per connection per city or municipality shall be used based on the 2010 UP National Engineering Center Water Demand Study

e = Communal faucet (previously known as Public Faucet) accounts shall refer to the number of households x average number of persons per household (based on NSO 2010 Census). Updating of the average number of persons per household shall be done every rate rebasing exercise.

Adapted from: Metropolitan Waterworks and Sewerage System Regulatory Office. (2013c). *Policy guidelines in the computation of service coverage targets*. Quezon City, Metropolitan Waterworks and Sewerage System.

**Appendix E. Summary of MMWDS Residential Customer Survey Results Based on Socio-Economic Class**

		SOCIO-ECONOMIC CLASSES					$\delta$	P-Value*	$\lambda^2$
		AB	C	D	E	Ave			
<b>CONNECTED HOUSEHOLDS</b>									
<b>Water Supply Availability, hours</b>	<b>West - C</b>	21.4	22.3	22.6	22.1	22.5	3.7	0.000	
	<b>East - C</b>	24.0	24.0	24.0	23.9	24.0	0.6	0.804	
<b>Water Pressure</b>									
<i>Overall Rating</i>	<b>West - C</b>	2.1	1.8	1.7	1.6	1.7	0.8	0.000	
	<b>East - C</b>	1.3	1.2	1.2	1.2	1.2	0.5	0.908	
<i>Qualitative Rating</i>	<b>West - C</b>	Good	Good	Good	Good	Good			
	<b>East - C</b>	Very Good	Very Good	Very Good	Very Good	Very Good			
<b>Water Quality</b>									
<i>Overall Rating</i>	<b>West - C</b>	1.5	1.3	1.3	1.4	1.3	0.7	0.009	
	<b>East - C</b>	1.2	1.2	1.1	1.1	1.2	0.5	0.111	
<i>Qualitative Rating</i>	<b>West - C</b>	Very Good	Very Good	Very Good	Very Good	Very Good			
	<b>East - C</b>	Very Good	Very Good	Very Good	Very Good	Very Good			

\*Based on single factor ANOVA

	SOCIO-ECONOMIC CLASSES					$\delta$	P-Value	$\lambda^2$
	AB	C	D	E	Ave			
<b>ALL HOUSEHOLDS</b>								
<b>Affordability</b>								
<i>Per Capita Consumption<sup>1</sup> (liters/day)</i>	<b>West - C</b>	202	148	125	106	130		
	<b>West - U</b>	89	76	57	42	60		
	<b>East - C</b>	252	176	146	146	153		
	<b>East - U</b>	79	111	82	56	83		
<i>Number of Residents / Household</i>	<b>West - C</b>	6.5	6.4	7.5	9.0	7.2	7.4	0.000
	<b>West - U</b>	5.7	5.2	5.5	5.4	5.4	3.0	0.035
	<b>East - C</b>	6.4	6.5	8.3	10.6	7.9	5.4	0.000
	<b>East - U</b>	4.6	5.1	5.1	5.4	5.2	2.8	0.504
<i>Monthly Water Consumption (cubic meters)</i>	<b>West - C</b>	40	29	28	29	28	23	0.000
	<b>West - U</b>	15	12	9	7	10	10	0.000
	<b>East - C</b>	49	35	36	46	36	27	0.000
	<b>East - U</b>	11	17	13	9	13	17	0.000
<i>Average Water Price<sup>2</sup> (₱ / cubic meter)</i>	<b>West - C</b>	32	28	28	31	28		
	<b>West - U</b>	37	51	55	80	55		
	<b>East - C</b>	26	22	23	26	23		
	<b>East - U</b>	28	27	29	29	29		

<sup>1</sup> Computed from Monthly Water Consumption and Number of Residents per Household

<sup>2</sup> Computed from Monthly Water Expenditures and Monthly Water Consumption

		SOCIO-ECONOMIC CLASSES					$\delta$	P-Value	$\lambda^2$
		AB	C	D	E	Ave			
<b>ALL HOUSEHOLDS</b>									
<b>Affordability</b>									
<i>Monthly Water Expenditures (₱)</i>	<b>West - C</b>	1,247	811	776	876	790	1,216	0.000	
	<b>West - U</b>	560	606	514	540	534	508	0.001	
	<b>East - C</b>	1,272	771	838	1,225	829	993	0.000	
	<b>East - U</b>	309	455	372	258	377	330	0.000	
<i>Monthly Household Income (₱)</i>	<b>West - C</b>	41,488	26,879	18,768	12,188	20,977	20,396	0.000	
	<b>West - U</b>	28,494	21,073	13,487	8,529	14,822	16,026	0.000	
	<b>East - C</b>	76,946	31,241	19,154	12,073	22,479	19,391	0.000	
	<b>East - U</b>	18,333	21,537	12,887	7,414	13,369	12,022	0.000	
<i>Total Monthly Household Expenditures (₱)</i>	<b>West - C</b>	32,631	19,508	14,671	10,955	15,999	11,857	0.000	
	<b>West - U</b>	19,302	17,877	11,789	8,588	12,910	8,253	0.000	
	<b>East - C</b>	36,230	21,318	14,570	11,849	16,405	9,911	0.000	
	<b>East - U</b>	11,471	15,731	10,099	6,893	10,438	6,471	0.000	
<i>Agreeable to Price Increase (% of respondents)</i>	<b>West - C</b>	25%	23%	20%	20%	21%			0.000
	<b>West - U</b>	40%	38%	40%	44%	40%			0.152
	<b>East - C</b>	11%	16%	15%	14%	15%			0.001
	<b>East - U</b>	58%	40%	45%	42%	44%			0.216

		SOCIO-ECONOMIC CLASSES					$\delta$	P-Value	$\lambda^2$
		AB	C	D	E	Ave			
<b>ALL HOUSEHOLDS</b>									
<b>Affordability</b>									
<i>Acceptable Price Increase<sup>3</sup></i> <i>(₱)</i>	<b>West - C</b>	92	55	51	38	52	55	0.109	
	<b>West - U</b>	116	118	68	58	82	459	0.204	
	<b>East - C</b>	151	145	137	133	139	119	0.365	
	<b>East - U</b>	79	120	135	152	135	105	0.035	
<i>Acceptable Price Increase<sup>4</sup></i> <i>(₱ / cubic meter)</i>	<b>West - C</b>	3	2	2	2	2			
	<b>West - U</b>	10	12	15	20	14			
	<b>East - C</b>	2	3	2	1	2			
	<b>East - U</b>	7	7	11	17	10			
<b>Bottled Water</b>									
<i>Monthly Consumption</i> <i>(cubic meters)</i>	<b>West - C</b>	0.31	0.26	0.22	0.19	0.24	0.30	0.000	
	<b>West - U</b>	0.42	0.36	0.44	0.22	0.41	0.88	0.000	
	<b>East - C</b>	0.29	0.24	0.20	0.14	0.21	0.25	0.000	
	<b>East - U</b>	0.20	0.32	0.45	0.17	0.42	1.38	0.371	
<i>Monthly Expenditure</i> <i>(₱)</i>	<b>West - C</b>	471	371	317	274	333	271	0.000	
	<b>West - U</b>	359	373	339	255	331	261	0.000	
	<b>East - C</b>	526	371	310	238	329	268	0.000	
	<b>East - U</b>	375	352	308	203	313	255	0.007	

<sup>3</sup> Acceptable price increase to maintain or improve the level of service

<sup>4</sup> Computed from Acceptable Price Increase (in ₱) and Monthly Water Consumption

		SOCIO-ECONOMIC CLASSES					$\delta$	P-Value	$\lambda^2$
		AB	C	D	E	Ave			
<b>ALL HOUSEHOLDS</b>									
<b>Bottled Water</b>									
<i>Average Water Price<sup>5</sup> (₱ / cubic meter)</i>	<b>West - C</b>	1,506	1,420	1,414	1,439	1,417			
	<b>West - U</b>	846	1,041	765	1,133	812			
	<b>East - C</b>	1,790	1,562	1,545	1,714	1,554			
	<b>East - U</b>	1,875	1,101	683	1,216	737			
<b>UNCONNECTED HOUSEHOLDS</b>									
<b>Connection to Concessionaires' Networks</b>									
<i>Agree to Connect (% of respondents per class)</i>	<b>West - U</b>	80%	81%	81%	82%	81%			0.917
	<b>East - U</b>	75%	83%	91%	97%	90%			0.000
<i>Agree to Pay Connection Fees (% of respondents per class)</i>	<b>West - U</b>	67%	61%	57%	38%	56%			0.000
	<b>East - U</b>	25%	36%	36%	29%	35%			0.098
<i>Needed Service Improvements (% of respondents per class)</i>	<b>West - U</b>								
	Household Connection	38%	39%	40%	46%	40%			
	High Water Pressure	16%	14%	17%	15%	16%			
	Good Water Quality	25%	26%	25%	20%	25%			
	Low Water Tariff	13%	16%	15%	16%	15%			
	Others	8%	5%	3%	3%	4%			
	Total	100%	100%	100%	100%	100%			

<sup>5</sup> Computed from Bottled Water Monthly Expenditure and Consumption

		SOCIO-ECONOMIC CLASSES					$\delta$	P-Value	$\lambda^2$
		AB	C	D	E	Ave			
<b>UNCONNECTED HOUSEHOLDS</b>									
<b>Connection to Concessionaires' Networks</b>									
<i>Needed Service Improvements (% of respondents per class)</i>	<b>East - U</b>								
	Household Connection	32%	21%	33%	51%	33%			
	High Water Pressure	18%	12%	15%	16%	15%			
	Good Water Quality	27%	21%	21%	19%	21%			
	Low Water Tariff	14%	19%	16%	7%	16%			
	Others	9%	27%	15%	7%	15%			
	Total	100%	100%	100%	100%	100%			
<i>Sources of Water (% of households per class)</i>	<b>West - U</b>								
	Local Government	4%	3%	10%	11%	8%			
	Deep well	36%	33%	27%	21%	28%			
	Other Private Co.	4%	10%	5%	0%	6%			
	Water Refill Stn.	51%	47%	43%	36%	44%			
	Others	4%	6%	15%	32%	14%			
	Total	100%	100%	100%	100%	100%			
	<b>East - U</b>								
	Local Government	22%	39%	30%	14%	30%			
	Deep well	30%	10%	18%	38%	19%			
	Other Private Co.	0%	3%	5%	1%	4%			
	Water Refill Stn.	26%	35%	24%	8%	24%			
	Others	22%	13%	23%	39%	23%			
	Total	100%	100%	100%	100%	100%			

	SOCIO-ECONOMIC CLASSES						$\delta$	P-Value	$\lambda^2$
	AB	C	D	E	Ave				
<b>UNCONNECTED HOUSEHOLDS</b>									
<b>Connection to Concessionaires' Networks</b>									
<i>Sources of Water (% of households per class)</i>	<b>East - U</b>								
	Local Government	22%	39%	30%	14%	30%			
	Deep well	30%	10%	18%	38%	19%			
	Other Private Co.	0%	3%	5%	1%	4%			
	Water Refill Stn.	26%	35%	24%	8%	24%			
	Others	<u>22%</u>	<u>13%</u>	<u>23%</u>	<u>39%</u>	<u>23%</u>			
	Total	100%	100%	100%	100%	100%			
<i>Sources of Water (% of consumption per class)</i>	<b>West - U</b>								
	Local Government	6%	5%	17%	18%	14%			
	Deep well	80%	59%	49%	40%	52%			
	Other Private Co.	8%	27%	12%	0%	15%			
	Water Refill Stn.	3%	3%	4%	2%	3%			
	Others	<u>3%</u>	<u>6%</u>	<u>17%</u>	<u>40%</u>	<u>15%</u>			
	Total	100%	100%	100%	100%	100%			
	<b>East - U</b>								
	Local Government	55%	80%	61%	26%	62%			
	Deep well	40%	9%	18%	46%	18%			
	Other Private Co.	0%	2%	5%	1%	5%			
	Water Refill Stn.	1%	1%	1%	0%	1%			
	Others	<u>5%</u>	<u>8%</u>	<u>14%</u>	<u>27%</u>	<u>14%</u>			
	Total	100%	100%	100%	100%	100%			

Tables developed by Author (2015) using data from UP NEC (2011a, 2011b), showing the major results of the Metro Manila Water Demand Study residential consumer survey.

## Appendix F. Comparative Data for Number of Persons per Household

LGU*	Metro Manila Water Demand Study (Connected West Zone)**			PSA ***
	Families / Household	Persons / Household	Persons / Family	Persons / Family
Bacoor	1.5	6.8	4.6	4.4
Caloocan	1.6	7.1	4.5	4.3
Cavite City	1.4	6.2	4.3	4.4
Imus	1.3	5.5	4.2	4.4
Kawit	1.3	5.7	4.4	4.4
Las Pinas	1.6	7.4	4.7	4.3
Makati	1.7	8.2	4.8	4.2
Malabon	1.5	6.8	4.6	4.3
Manila	1.6	7.3	4.7	4.2
Muntinlupa	1.4	5.9	4.3	4.2
Navotas	1.6	6.8	4.3	4.2
Noveleta	1.3	5.8	4.3	4.4
Paranaque	1.6	7.3	4.7	4.3
Pasay	1.8	8.0	4.5	4
Quezon City	1.6	7.5	4.7	4.3
Rosario	1.4	6.0	4.4	4.4
Valenzuela	1.7	7.6	4.4	4.2

\* LGU - Local Government Unit \*\* A household refers to a household connection, with the possibility of more than one family sharing a connection \*\*\* PSA – Philippine Statistics Authority

Table developed by Author (2015) using data from UP NEC (2011a); PSA (2015.)

### Sample Computation to Reconcile MWSS and PSA Figures: Bacoor

Metro Manila Water Demand Study:

Persons per family = Person per household connection / Families per household connection

$$\begin{aligned} \text{Persons per family} &= 6.8 / 1.5 \\ &= \underline{4.6} \end{aligned}$$

Compare with PSA data: 4.4

## Appendix G. Measuring Affordability as a Percentage of Household Income

As Africa's (2011) estimates for household income levels assume one family per household (similar to that of the Philippine Statistics Agency), these estimates were adjusted to conform to the number of families per household which were derived from the consumer survey (Appendix E). The estimated household income from the two sources are provided below.

### Appendix G.1. Estimated Monthly Household Income Levels

	Modified Africa Estimates					Metro Manila Water Demand Study				
	AB	C	D	E	Average	AB	C	D	E	Average
<b>West-C</b>	194,961	70,483	26,063	10,536	27,140	41,488	26,879	18,768	12,188	20,977
<b>West-U</b>	165,804	65,215	28,192	11,711	28,361	76,946	31,241	19,154	12,073	22,479
<b>East-C</b>	197,553	60,409	18,868	6,020	20,400	28,284	20,856	13,242	8,362	14,518
<b>East-U</b>	154,750	50,250	15,917	5,167	17,167	18,333	21,537	12,887	7,414	13,369

Table developed by Author (2015) using data from Africa (2011) and UP NEC (2011a, 2011b). Comparing figures from these two sources, AB (rich/extremely rich) and C (middle income) households have relatively large differences between income estimates while the D and E estimates track each other. This may be due to the hesitancy of AB and C households to divulge their true levels of income during actual interviews.

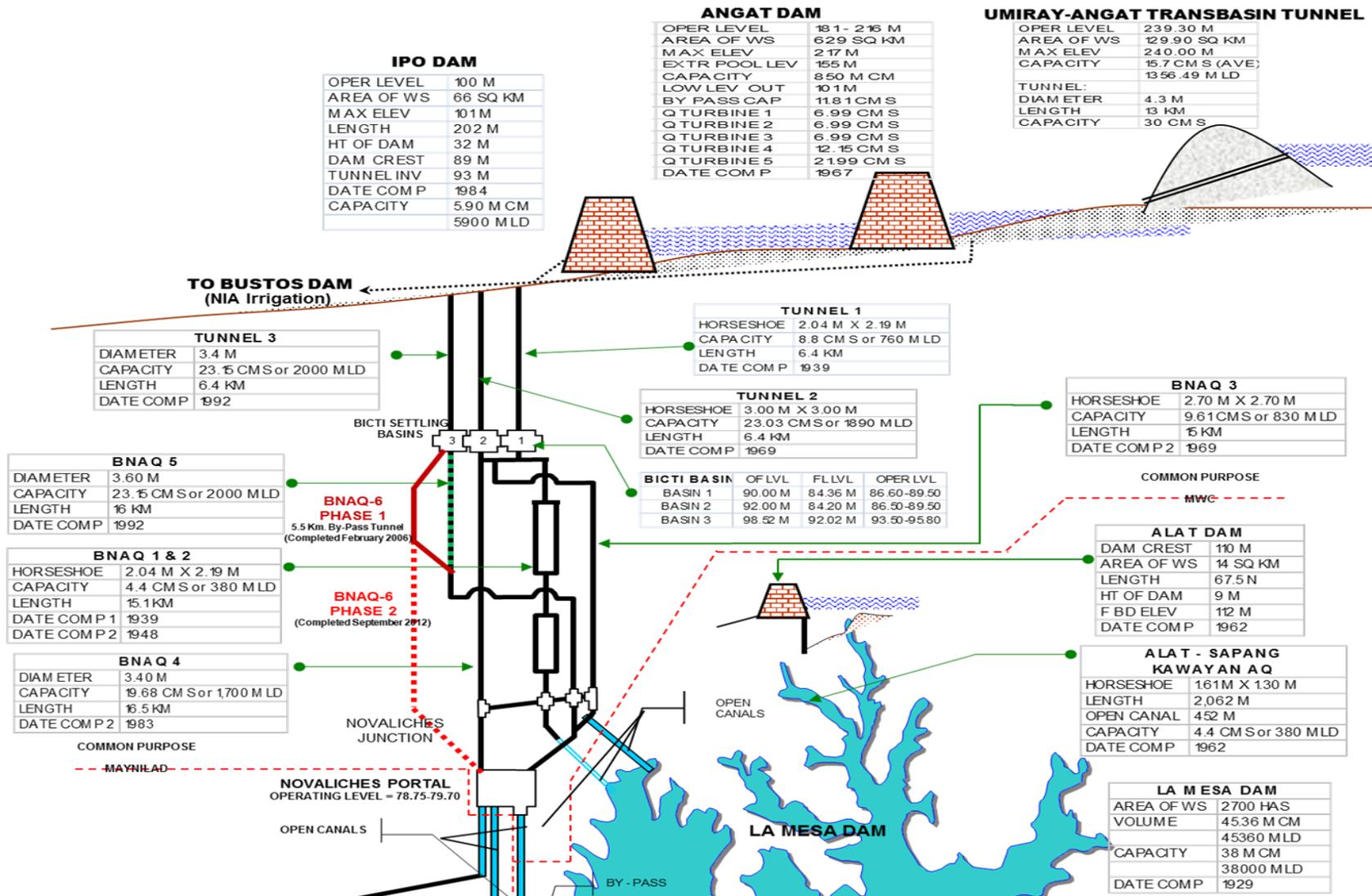
Affordability levels, as a percentage of household income, are computed as follows:

### Appendix G.2. Affordability Levels

	Modified Africa Estimates					Metro Manila Water Demand Study				
	AB	C	D	E	Average	AB	C	D	E	Average
<b>West-C</b>	1%	1%	3%	8%	3%	3%	3%	4%	7%	4%
<b>West-U</b>	0.3%	1%	3%	9%	3%	2%	3%	4%	6%	4%
<b>East-C</b>	1%	1%	3%	10%	3%	2%	2%	4%	10%	4%
<b>East-U</b>	0.2%	1%	2%	5%	2%	2%	2%	3%	3%	3%

Table developed by Author (2015) using data from Figure 19 and Appendix G.1. This dissertation reports a range of affordability levels for the different socio-economic classes.

## Appendix H. MWSS Headworks



Source: Metropolitan Waterworks and Sewerage System. (2014d). MWSS headworks. Quezon City: Metropolitan Waterworks and Sewerage System. (Reproduced with permission) Schematic diagram for Metro Manila's water supply system.

## Appendix I. 2011 Basic Water Rate Schedules for MWCI and MWSI

BASIC WATER CHARGE	MWCI	MWSI		MWCI	MWSI
<b>RESIDENTIAL</b>			<b>SEMI-BUSINESS</b>		
I. Consuming 10 m <sup>3</sup> or less					
Discounted Monthly					
Water Bill	P 72.45 /conn.	P 70.00 /conn.			
II. Consuming more than 10 m <sup>3</sup>					
First 10 m <sup>3</sup>	P 89.25 /conn.	P 119.3 /conn.	First 10 m <sup>3</sup>	P 89.25 /conn.	P 119.31 /conn.
Next 10 m <sup>3</sup>	10.89 /m <sup>3</sup>	14.58 /m <sup>3</sup>	Next 10 m <sup>3</sup>	18.22 /m <sup>3</sup>	24.45 /m <sup>3</sup>
Next 20 m <sup>3</sup>	20.65 /m <sup>3</sup>	27.70 /m <sup>3</sup>	Next 20 m <sup>3</sup>	22.48 /m <sup>3</sup>	30.13 /m <sup>3</sup>
Next 20 m <sup>3</sup>	27.19 /m <sup>3</sup>	36.38 /m <sup>3</sup>	Next 20 m <sup>3</sup>	28.55 /m <sup>3</sup>	38.20 /m <sup>3</sup>
Next 20 m <sup>3</sup>	31.76 /m <sup>3</sup>	42.49 /m <sup>3</sup>	Next 20 m <sup>3</sup>	33.27 /m <sup>3</sup>	44.43 /m <sup>3</sup>
Next 20 m <sup>3</sup>	33.27 /m <sup>3</sup>	44.43 /m <sup>3</sup>	Next 20 m <sup>3</sup>	34.76 /m <sup>3</sup>	46.50 /m <sup>3</sup>
Next 50 m <sup>3</sup>	34.76 /m <sup>3</sup>	46.47 /m <sup>3</sup>	Next 50 m <sup>3</sup>	36.25 /m <sup>3</sup>	48.54 /m <sup>3</sup>
Next 50 m <sup>3</sup>	36.25 /m <sup>3</sup>	48.54 /m <sup>3</sup>	Next 50 m <sup>3</sup>	37.75 /m <sup>3</sup>	50.59 /m <sup>3</sup>
Over 200 m <sup>3</sup>	37.75 /m <sup>3</sup>	50.59 /m <sup>3</sup>	Over 200 m <sup>3</sup>	39.34 /m <sup>3</sup>	52.59 /m <sup>3</sup>
<b>BUSINESS GROUP I</b>			<b>BUSINESS GROUP II</b>		
First 10 m <sup>3</sup>	P 405.62 /conn.	P 542.21 /conn.	First 10 m <sup>3</sup>	P 438.88 /conn.	P 586.71 /conn.
Next 90 m <sup>3</sup>	40.61 /m <sup>3</sup>	54.48 /m <sup>3</sup>	Next 90 m <sup>3</sup>	44.16 /m <sup>3</sup>	59.05 /m <sup>3</sup>
Next 100 m <sup>3</sup>	40.84 /m <sup>3</sup>	54.63 /m <sup>3</sup>	Next 100 m <sup>3</sup>	44.40 /m <sup>3</sup>	59.42 /m <sup>3</sup>
Next 100 m <sup>3</sup>	40.96 /m <sup>3</sup>	54.79 /m <sup>3</sup>	Next 100 m <sup>3</sup>	44.74 /m <sup>3</sup>	59.88 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.06 /m <sup>3</sup>	54.98 /m <sup>3</sup>	Next 100 m <sup>3</sup>	45.08 /m <sup>3</sup>	60.27 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.28 /m <sup>3</sup>	55.15 /m <sup>3</sup>	Next 100 m <sup>3</sup>	45.30 /m <sup>3</sup>	60.68 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.40 /m <sup>3</sup>	55.42 /m <sup>3</sup>	Next 100 m <sup>3</sup>	45.66 /m <sup>3</sup>	61.10 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.54 /m <sup>3</sup>	55.66 /m <sup>3</sup>	Next 100 m <sup>3</sup>	46.00 /m <sup>3</sup>	61.50 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.77 /m <sup>3</sup>	55.83 /m <sup>3</sup>	Next 100 m <sup>3</sup>	46.22 /m <sup>3</sup>	61.87 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.87 /m <sup>3</sup>	56.02 /m <sup>3</sup>	Next 100 m <sup>3</sup>	46.57 /m <sup>3</sup>	62.32 /m <sup>3</sup>
Next 100 m <sup>3</sup>	41.99 /m <sup>3</sup>	56.19 /m <sup>3</sup>	Next 100 m <sup>3</sup>	46.93 /m <sup>3</sup>	62.68 /m <sup>3</sup>
Next 200 m <sup>3</sup>	42.21 /m <sup>3</sup>	56.45 /m <sup>3</sup>	Next 200 m <sup>3</sup>	47.16 /m <sup>3</sup>	63.10 /m <sup>3</sup>
Next 200 m <sup>3</sup>	42.32 /m <sup>3</sup>	56.62 /m <sup>3</sup>	Next 200 m <sup>3</sup>	47.49 /m <sup>3</sup>	63.48 /m <sup>3</sup>
Next 200 m <sup>3</sup>	42.44 /m <sup>3</sup>	56.90 /m <sup>3</sup>	Next 200 m <sup>3</sup>	47.72 /m <sup>3</sup>	63.95 /m <sup>3</sup>
Next 200 m <sup>3</sup>	42.67 /m <sup>3</sup>	57.06 /m <sup>3</sup>	Next 200 m <sup>3</sup>	48.07 /m <sup>3</sup>	64.27 /m <sup>3</sup>
Next 200 m <sup>3</sup>	42.79 /m <sup>3</sup>	57.21 /m <sup>3</sup>	Next 200 m <sup>3</sup>	48.40 /m <sup>3</sup>	64.73 /m <sup>3</sup>
Next 500 m <sup>3</sup>	42.91 /m <sup>3</sup>	57.37 /m <sup>3</sup>	Next 500 m <sup>3</sup>	48.63 /m <sup>3</sup>	65.12 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.13 /m <sup>3</sup>	57.69 /m <sup>3</sup>	Next 500 m <sup>3</sup>	48.98 /m <sup>3</sup>	65.50 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.24 /m <sup>3</sup>	57.87 /m <sup>3</sup>	Next 500 m <sup>3</sup>	49.32 /m <sup>3</sup>	65.89 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.36 /m <sup>3</sup>	58.08 /m <sup>3</sup>	Next 500 m <sup>3</sup>	49.55 /m <sup>3</sup>	66.36 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.59 /m <sup>3</sup>	58.19 /m <sup>3</sup>	Next 500 m <sup>3</sup>	49.90 /m <sup>3</sup>	66.70 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.71 /m <sup>3</sup>	58.43 /m <sup>3</sup>	Next 500 m <sup>3</sup>	50.25 /m <sup>3</sup>	67.17 /m <sup>3</sup>
Next 500 m <sup>3</sup>	43.82 /m <sup>3</sup>	58.68 /m <sup>3</sup>	Next 500 m <sup>3</sup>	50.47 /m <sup>3</sup>	67.53 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.06 /m <sup>3</sup>	58.82 /m <sup>3</sup>	Next 500 m <sup>3</sup>	50.82 /m <sup>3</sup>	67.90 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.16 /m <sup>3</sup>	59.05 /m <sup>3</sup>	Next 500 m <sup>3</sup>	51.17 /m <sup>3</sup>	68.36 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.28 /m <sup>3</sup>	59.26 /m <sup>3</sup>	Next 500 m <sup>3</sup>	51.38 /m <sup>3</sup>	68.78 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.40 /m <sup>3</sup>	59.42 /m <sup>3</sup>	Next 500 m <sup>3</sup>	51.73 /m <sup>3</sup>	69.15 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.63 /m <sup>3</sup>	59.65 /m <sup>3</sup>	Next 500 m <sup>3</sup>	51.96 /m <sup>3</sup>	69.63 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.74 /m <sup>3</sup>	59.88 /m <sup>3</sup>	Next 500 m <sup>3</sup>	52.32 /m <sup>3</sup>	69.94 /m <sup>3</sup>
Next 500 m <sup>3</sup>	44.86 /m <sup>3</sup>	60.07 /m <sup>3</sup>	Next 500 m <sup>3</sup>	52.65 /m <sup>3</sup>	70.42 /m <sup>3</sup>
Next 500 m <sup>3</sup>	45.08 /m <sup>3</sup>	60.27 /m <sup>3</sup>	Next 500 m <sup>3</sup>	52.88 /m <sup>3</sup>	70.78 /m <sup>3</sup>
Next 500 m <sup>3</sup>	45.18 /m <sup>3</sup>	60.48 /m <sup>3</sup>	Next 500 m <sup>3</sup>	53.23 /m <sup>3</sup>	71.21 /m <sup>3</sup>
Over 10000 m <sup>3</sup>	45.30 /m <sup>3</sup>	60.68 /m <sup>3</sup>	Over 10000 m <sup>3</sup>	53.56 /m <sup>3</sup>	71.58 /m <sup>3</sup>

Table developed by Author (2015) using publicly available data from MWCI (2011); MWSI (2012d). MWCI and MWSI basic water rate tables for all categories of users.