

THE DYNAMICS OF PIPED-WATER AND SEWER DEVELOPMENT IN JAKARTA,
INDONESIA (1945-2015): A CASE STUDY USING MULTILEVEL PERSPECTIVE

Nur 'Aisyah Nasution

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Approved by:

Dale Whittington

Jamie Bartram

Pete Kolsky

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ABSTRACT

Nur 'Aisyah Nasution: The Dynamics of Piped-Water and Sewer Development in Jakarta, Indonesia (1945-2015): A Case Study using Multilevel Perspective
(Under the direction of Dale Whittington)

Inadequate access to water and sanitation has been characterized as a challenge to developing infrastructure and public health in Jakarta, Indonesia. Access to piped-water network has only increased from 10% to 48% between 1975 to 2015. Sewer coverage, which is only available to 2% of population, has been mostly stagnant since 1989. Drawing on interview, documentation approaches and the application of a multilevel perspective, we documented factors that contributed to water and sanitation from 1945 to 2015. We found that there has been no substantial change in piped-water and sewer coverage in Jakarta. This is because regime actors have not changed their cognitive routines, formal rules, or norms despite political and economic changes that occurred as Indonesia moved from a centralized to decentralized system. This case study found that decentralization does not improve piped-water and sewer performance. Future studies should address the multi-regime dynamics between piped and non-piped systems.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank.
Ausaid	Australian Agency for International Development.
Bappenas	Badan Perencanaan Pembangunan Nasional (Indonesian National Development Planning Board).
BNA	Basic Needs Approach.
BPAL	Badan Pengelola Air Limbah (Jakarta Wastewater Enterprise).
BPKP	Badan Pengawas Keuangan Pemerintah (Board of Supervisors Finance and Development)
BPLHD	Badan Pengelola Lingkungan Hidup Daerah (Jakarta Environmental Management Agency).
BPS	Badan Pusat Statistik (Indonesian Statistics Board).
BPPSPAM	Badan Pendukung Penyediaan Sistem Air Minum (Water Supply System Support Board).
CBO	Community Based Organization.
CPI	Corruption Perception Index.
DEWATS	Decentralized Wastewater Treatment.
DKI Jakarta	Special Region of Jakarta.
GDP	Gross Domestic Product
IBRD	International Bank for Reconstruction and Development.
IBT	Increasing Block Tariff.
ICW	Indonesian Corruption Watch.
IDWSSD	the International Drinking Water Supply and Sanitation Decade.
IUWASH	Indonesia Urban Water, Sanitation and Hygiene.

IPA	Instalasi Pengolahan Air (Water Treatment Installation).
ITB	Institute Technology of Bandung.
JICA	Japan International Cooperation Agency.
JUDP	Jakarta Urban Development Project.
JWSRB	Jakarta Water Supply Regulator Body.
ITN	International Training Network.
IUIDP	Integrated Urban Infrastructure Development Plan.
KIP	Kampungs (village) Improvement Program.
KMMSAJ	Koalisi Masyarakat Menolak Swastanisasi Air Jakarta (People Coalition against Jakarta Water Privatization)
KemenPUPR	Kementerian Pekerjaan Umum dan Perumahan Rakyat (Ministry of Public Works and Public Housing).
KPK	Komisi Pemberantasan Korupsi (Corruption Eradication Commission).
LCWSS	Low-Cost Water Supply and Sanitation.
MDGs	Millennium Development Goals.
MLP	Multilevel Perspective Framework.
NRW	Non-Revenue Water
NSG	National Sanitation Strategy and Guidelines.
OECD	Organization for Economic Co-operation and Development.
PAM Jaya	Perusahaan Air Minum Jaya (Jaya Water Supply Corporation).
PDAM	Perusahaan Daerah Air Minum (Local Government Owned Company for Water Supply).
PDPAL Jaya	Perusahaan Daerah Pengolahan Air Limbah Jaya (Jakarta's Company for Wastewater Treatment).
PJSIP	PAM JAYA System Improvement Project.

Pokja AMPL	Kelompok Kerja Air Minum Penyehatan Lingkungan (Water and Sanitation Working Group).
PPP	Public Private Partnership.
PPSP	Percepatan Pembangunan Sanitasi Perkotaan (Acceleration of Urban Sanitation Development).
PTO	Penyesuaian Tarif Otomatis (Automatic Tariff Adjustment).
RCA	Restated Cooperative Agreement.
REPELITA	Rencana Pembangunan Lima Tahun (Five-Year Development Plans).
Riskesdas	Riset Kesehatan Dasar (National Basic Health Research).
RPJMD	Rencana Pembangunan Jangka Menengah Daerah (Regional's Midterm Development Plan).
SDGs	Sustainable Development Goals.
SII	Standar Industri Indonesia (Indonesia Industrial Standard).
SSK	Strategi Sanitasi Kota (City Sanitation Strategies).
UNDP	United Nations Development Programme.
USAID	United States Agency for International Development.
UNICEF	The United Nations Children's Emergency Fund.
WHO	World Health Organization.
WSP	Water and Sanitation Program East Asia Pacific-The World Bank.
WTP	Water Treatment Plants

CHAPTER 1 : INTRODUCTION

Water and sanitation are fundamental to life and are important basic human needs. Over the past few decades, providing “water and sanitation for all” has become one of the central international development goals included in the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs). While critical end-goals, there are many challenges to achieving universal access to water and sanitation including institutional weaknesses (Gandy, 2008); corruption and rent seeking (Davis, 2004; Lovei and Whittington, 1993); insufficient regulation (Johnstone, 2014), colonial legacy (Kooy and Bakker, 2008), lack of investment (Hutton and Bartram, 2007), and governance failure (Bakker et. al., 2008).

Jakarta, the capital city of Indonesia has experienced substantial economic growth since the-1990s. However, its piped water and sewer coverage has been much slower to improve. There are many households, both poor and rich, that do not have access to piped water or a sewer network. Piped-water and sewer coverage in Jakarta are much lower than in other large Indonesian cities, such as Surabaya, Medan and Banjarmasin as well as in other Southeast Asian countries.

Inadequate access to water supply and sanitation has challenged the development of Jakarta since the mid-1970s. Attempts to ameliorate this condition have been implemented, but results were unsuccessful. Today, of the 10 million people living in Jakarta, only 48% have access to piped water and less than 2% are connected to a sewer network. The estimated economic impact resulting from lack of water and sewerage access is Rupiah (Rp.)16.2 trillion

(US\$1.4 billion) per year, which was approximately 1.3% of Jakarta's gross domestic product (GDP) in 2012. This amount is the equivalent to approximately Rp.1.7 million (US\$139) per person per year, which is three times more than the cost for the rest of the country (Water and Sanitation Program [WSP], n.d.). These statistical trends, however, cannot fully explain the delays in piped water and sewer system improvement in Jakarta.

The human right to have proper water and sanitation is a complex issue, and each country has had different degrees of development over time. For example, the success of developed countries in providing water supply and sewer services was highly related to the emergence of germ theory (Hamlin, 1992, 1998; Melosi, 2000, 2011; Tarr *et al.*, 1984). Furthermore, the history of water and sewer development in developed countries, such as the United States, United Kingdom, the Netherlands, and Japan has important implications. For example delays in water and sewer development caused a series of waterborne epidemics to occur in the early 19th century (Geels, 2005, 2006; Goshu, 2014; Hamlin, 1992, 1998; Melosi, 2000, 2011; Tarr *et al.*, 1984). As a result, many lives were lost and other public health threats hindered economic growth in the developed countries listed above.

The history of water supply, sanitation, and public health has been well-documented in developed countries using descriptive approaches to present the chronological order of water supply and wastewater system evolution. From these descriptive studies, it is known there are many different factors that contribute to the transformation from non-piped water and sanitation system to piped system: (i) the interplay between the change in scientific theories, engineering practice, technological designs, and their perceived impacts and cost to cities (Tar, 1996); (ii) the role of science and states in decision making (Hamlin, 1998); (iii) the presence of new

technological urban sanitary and organizational systems (Melosi, 2000); and political power and control of society over water sources (Melosi, 2011).

Although pathways to the development of water and sanitation infrastructure have been well-documented in developed countries, such documentation has not occurred in Jakarta. Western scholars have attempted to explain the lack of water development in Jakarta as a failure in governance (Bakker et. al., 2008), poor outcome of colonial and post-colonial governmentality (Kooy and Bakker, 2008), absence of sufficient regulations (Braadbaart, 2007; Jensen, 2005), urbanization (Chifos and Suselo, 2000), or corruption (Crane, 1994; Lovei and Whittington, 1993; Server, 1996). However, these studies only analyzes one or two factors at a time, thus in-depth studies regarding water and sanitation development in Jakarta are still needed.

Throughout Indonesia, the amount of literature on water and sanitation history is limited. There is only one study, led by Kooy (2008), that has attempted to analyze water supply development in Jakarta over a longer period of time, from the colonial era to the late of 1990s. Her major conclusion is that Jakarta's fragmented urban water supply had been present since the colonial era, thus providing a centralized system that may not be ideal for urban populations in modern Jakarta. Although Kooy provides detailed and comprehensive historical case studies regarding water supply in Jakarta over a longer timeframe (1873-2007), her analysis only focuses on the role of the government and the political mindset that contributed to the water supply system change. There is little information about other aspects such as the political and economic condition and international development agendas that affect many development initiatives in Indonesia as a whole and Jakarta specifically. Nevertheless, Kooy's dissertation is the only available literature in English that presents a comprehensive history of water supply development in Jakarta. No scholars have yet studied the history of sewer development in Jakarta.

While Hamlin (1998), Melosi (2000 and 2011), and Tarr (1996) use descriptive approaches to describe historical case studies on water, sanitation, and public health sectors and factors that contribute to the transformation of these sectors, there are other approaches to describe historical case studies that focus on socio-technological transition. Such literature uses multi-level perspectives (MLP) to present the socio-technical transition of sewer, water supply, and personal hygiene in the Netherlands (Geels, 2005, 2006). MLP has become one approach to understanding the challenges and possibilities of achieving a more developed socio-technological system (Lawhon and Murphy, 2012) and gives structure to the description of historical case studies. Key principles in MLP are (i) taking a multi-actor approach in a long-term perspective, (ii) analyzing the learning process at a niche level, and (iii) identifying problems that span in multiple domains, levels, and actors. MLP used three different levels of analysis to describe factors that contribute to system transformation: (i) landscape such as economic and political condition; (ii) regime such as regulations, normative, and cognitive¹ aspect of actors including problems in organizational level that hamper the improvement of the system; and (iii) niche where R& D, innovation and learning process occur.

To understand why slow progress of piped-water and sewer development has occurred in Jakarta as well as respond to the lack of literature describing such development in this city, this thesis aims to explain and analyze the dynamic of piped-water and sewer development in Jakarta from 1945 until 2015 using the MLP framework, using Geels' MLP work as a model (2005, 2006). Taking a historical perspective can help explain the chronological shifts of water and sanitation development in Jakarta over a longer time span. Furthermore, historical case studies

¹Cognitive are actors' routines and capabilities that are based on particular understandings about how things should be done. Cognitive routines are subject to actors' interpretation (Eggers and Kaplan, 2013).

are essential to produce evidence-based analysis to prevent poor policy-making (Sadoff et al., 2015). Thus, analysis within the context of a country's historical setting is crucial.

To explain the slow improvement of piped-water and sewer development in Jakarta and to analyze the factors that enabled and constrained its development from 1945 (when Indonesia gained its independence) to 2015, three different levels of analyses were used: landscape, regime, and niche (Geels 2005, 2006). The dynamic of piped-water and sewer development will be presented in three development phases based on the changes in the Indonesian government system (landscape) particularly the political and economic systems. The first development phase is from 1945-1966 when Indonesia was ruled by President Soekarno. The second development phase is from 1966 to 1998 when President Soeharto led the country. The third development phase is during the Reform Era from 1998 to 2015. Table 1 describes the definition of the level of analysis as used in this thesis.

Table 1. Definition of Each Level of Analysis in Multi-Level Perspective

Level	Definition as described in Geels (2005)	Practical definition as used in thesis
Landscape	Socio-technical landscape or exogenous environment that is beyond the direct influence of actors such as economic development, broad political coalitions, cultural and normative values	<ul style="list-style-type: none"> • Landscape is an environment beyond the direct control of water and sanitation development actors in Indonesia that can influence the improvement of water and sanitation provision. • Landscape is analyzed specifically on political, economic, social and health condition, and international policy on water and sanitation development that influence the development of water and sanitation in Jakarta • International development policy is analyzed only in the period of 1966-1998 since it is the period when international policy affects the water and sanitation development in Jakarta. After 1998, water supply provision in Jakarta is managed by private operator thus international development policy particularly that comes from donors no longer can

		intervention the policy making for water supply provision policy in Jakarta. While for sanitation sector, there is no international development policy has been affecting the policy of sanitation development in Jakarta since 1998.
Regime	Socio-technical regime where institutional arrangements and formal regulations are created and where engineers and designers share their cognitive routines such as roles, way of thinking, and way of doing. Regime is situated at the level of organizational field which show the behavior, perception, and action of actors as part of communities.	<ul style="list-style-type: none"> • Regime level refers to the dominant practices, technologies, and rules embedded at an organizational level (institutions and infrastructure) which shape technological innovation. Regime provides stability and reinforcement to the prevailing socio-technical systems including factors that enable and constrain the improvement of water and sanitation in Jakarta such as government and donor policies and activities, regulation, problem in organizational level, etc. • Regime level in this thesis will mostly describe government and donor policies and activities. They are the dominant actors in water and sanitation provision in Jakarta.
Niche	Technological niche and the locus of radical innovations around new system may develop	<ul style="list-style-type: none"> • Niches is the level or area that can facilitate the interactions between actors that support radical innovation and experimentation. Niche act as safe environments in which breakthrough development can grow, different from the selection process that occurs at regime level. • A regime can be a place to generate niche (innovations) and to challenge the status quo.

CHAPTER 2 : METHOD

2.1. Case Study

A single-case study was employed as a research strategy. The case study strategy is especially conducive to understanding the transformation of technology and society (Geels, 2005). The case study in this thesis aims to describe and analyze how water and sanitation conditions in Jakarta have changed over time. The rationale for selecting single-case study design rather than a multiple-case design is based on the characteristic unique to Jakarta. For example, Jakarta is the only province in Indonesia where 100% of its population lives in urban areas, it is home to all of the approximately 300 ethnicities in Indonesia, and its GDP accounts for 17% of Indonesia's GDP. Additional reasons for using a single-case study are replication logic. The period of analysis for this paper is 1945 to 2015. The year 1945 was chosen as the starting point of analysis because this was the year Indonesia gained its independence.

2.2. Data Collection

The sources data collected for this paper are: documentation, archival records, and interviews.

1. Documentation

According to Yin (2003), the reason to use documents for case studies is to corroborate and augment evidence from other sources. The variety of documents used in this paper includes:

written reports, administrative documents of governments and donors, formal water and sanitation studies in Indonesia as a whole and/or Jakarta specifically, and articles in mass media.

2. Archival records

Archival records are used to present precise and relevant quantitative data (Yin, 2003). Archival records used in this paper include: organizational records such as population, water and sanitation access, and budget over a period of time; list of foreign aid projects; and survey data such as census records or data previously collected about Jakarta and/or Indonesia as a whole. For this case study, national and regional survey and census data from the Indonesia National Statistical Bureau are used.

3. Interviews

Interviews are an essential source of evidence for case studies because key respondents share facts and their insights and opinions about events and situations.

a. Selection process

Key respondents from governmental and non-governmental arenas were interviewed. The potential respondents were identified previously during the writer's experience working in water and sanitation in Indonesia. To minimize bias, respondents were chosen from different institutions or organizations involved in decision making, policy planning, and advocacy of water and sanitation in Indonesia and/or Jakarta. These individuals are knowledgeable about current situations and past situations about the development of water and sanitation in Jakarta over the period covered by this study. Because this paper aims to describe water and sanitation history over a long period of time, most of the interviewees are senior water and sanitation experts in Jakarta and/or Indonesia.

b. Respondents

Of the 27 key respondents that were contacted, 8 respondents were from the government and 19 respondents were from non-government arenas (see APPENDIX I for The List of Interviewee). Respondents from the government include central and local governmental officials while non-government respondents were donors, a water supply operator and its private partner, a water supply regulator, a sewer operator, and a consulting firm. Nineteen respondents were interviewed and 8 respondents could not be reached or declined to participate.

c. Interview designs

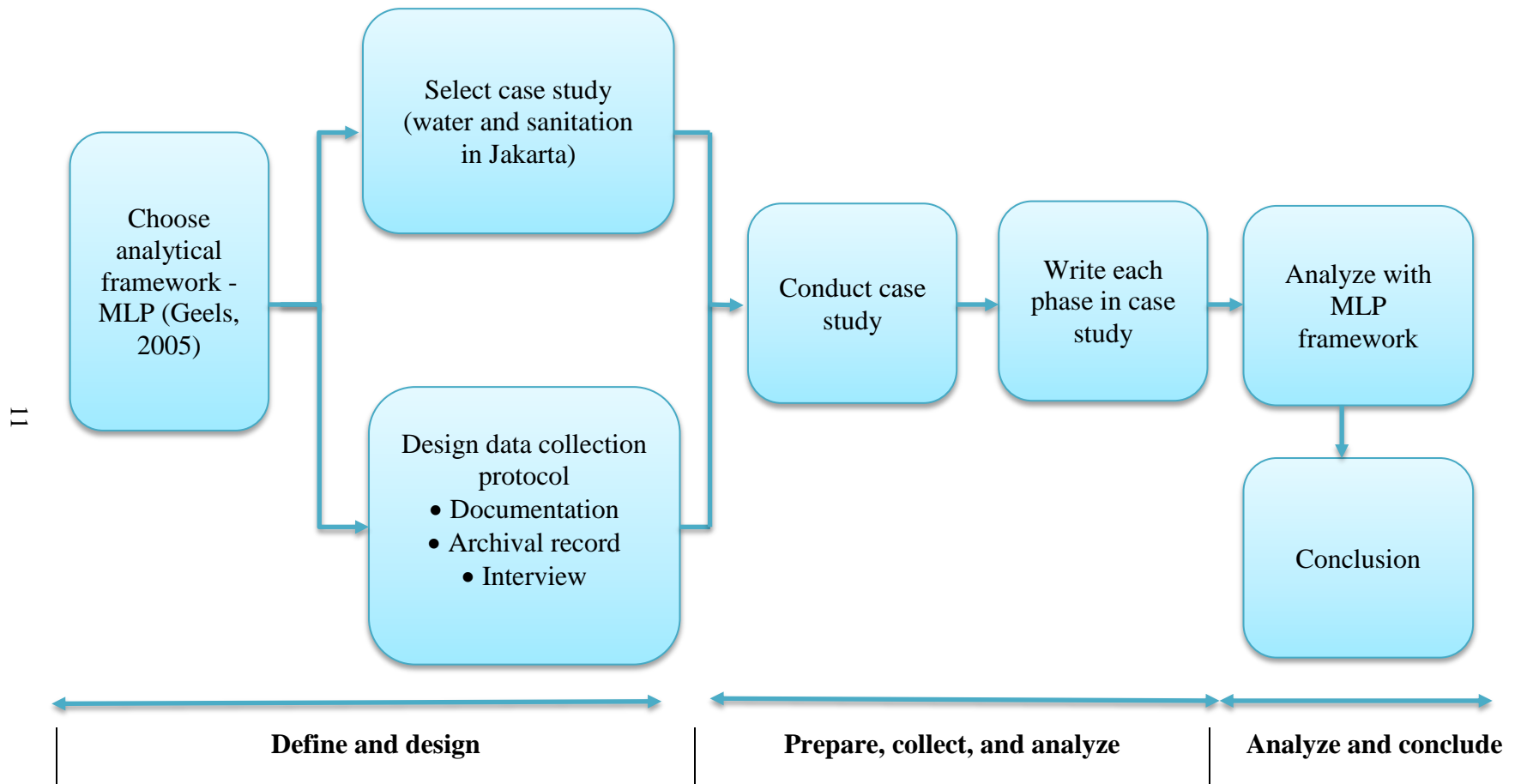
A semi-structured interview consisting of a series of open-ended questions and probes was designed by the writer. The guide addressed the main research objective of determining the dynamic of water and sanitation development in Jakarta. A semi-structured interview format was used to elucidate facts and/or opinions of interviewees on water and sewer development situations and events in Jakarta. The interviews also sought to identify factors or barriers that prevent water and sewer expansion in Jakarta. The interviewer first asked the interviewees to describe the condition of water and sanitation systems when they were in charge assisting water and sewer development at their respective institution. The interviewer then asked the interviewees about major issues in water and sewer development in Jakarta and policies that had been used to improve development followed by question about what aspects of the policies, in their opinion, do or do not work. The interviewees were also asked about what major events contributed to the changes in water and sewer development policies. Finally, the interviewer asked how the interviewees would respond if they have been given the chance to reform water and sewer development in Jakarta. Respondents were given the

option to ask questions or to say anything that was on their minds not previously covered during the interview. This study was reviewed by The University of North Carolina at Chapel Hill Institutional Review Board (study number: 15-2943) and it was determined that the study did not require IRB approval.

d. Interviews

In-depth semi-structured interviews were conducted by phone or Skype for 30 to 120 minutes per person after obtaining their verbal consent. Some follow up questions were also asked to solicit specific responses. Interviews were conducted from November 2015 to March 2016. One interview was conducted in English and 18 interviews with Bahasa Indonesia. Interviews were recorded using a tape recorder and were transcribed together with notes taken during the discussions with respondents, providing the corpus of data for text analyses. The small number of respondents made it feasible to carry out the analysis without using computer tools for coding. The interview transcripts were read to identify statements on specific topics including factors, issues, and events influencing water and sewer development in Jakarta. Then, the interview results were used in combination with the data and information found in documents and archival records. This approach was used to avoid bias and to ensure the triangulation as corroboration of the findings. Selected interview quotes appear in-text to show authenticity or reveal the perspective of actors on particular issues or events in water and sanitation development in Jakarta. Figure 1 illustrates the case study method of this paper.

Figure 1. Case Study Method



Source: author adopted from COSMOS Corporation cited in Yin, 2003

.3 Data Analysis

- **Multilevel Perspective as Analytical Framework**

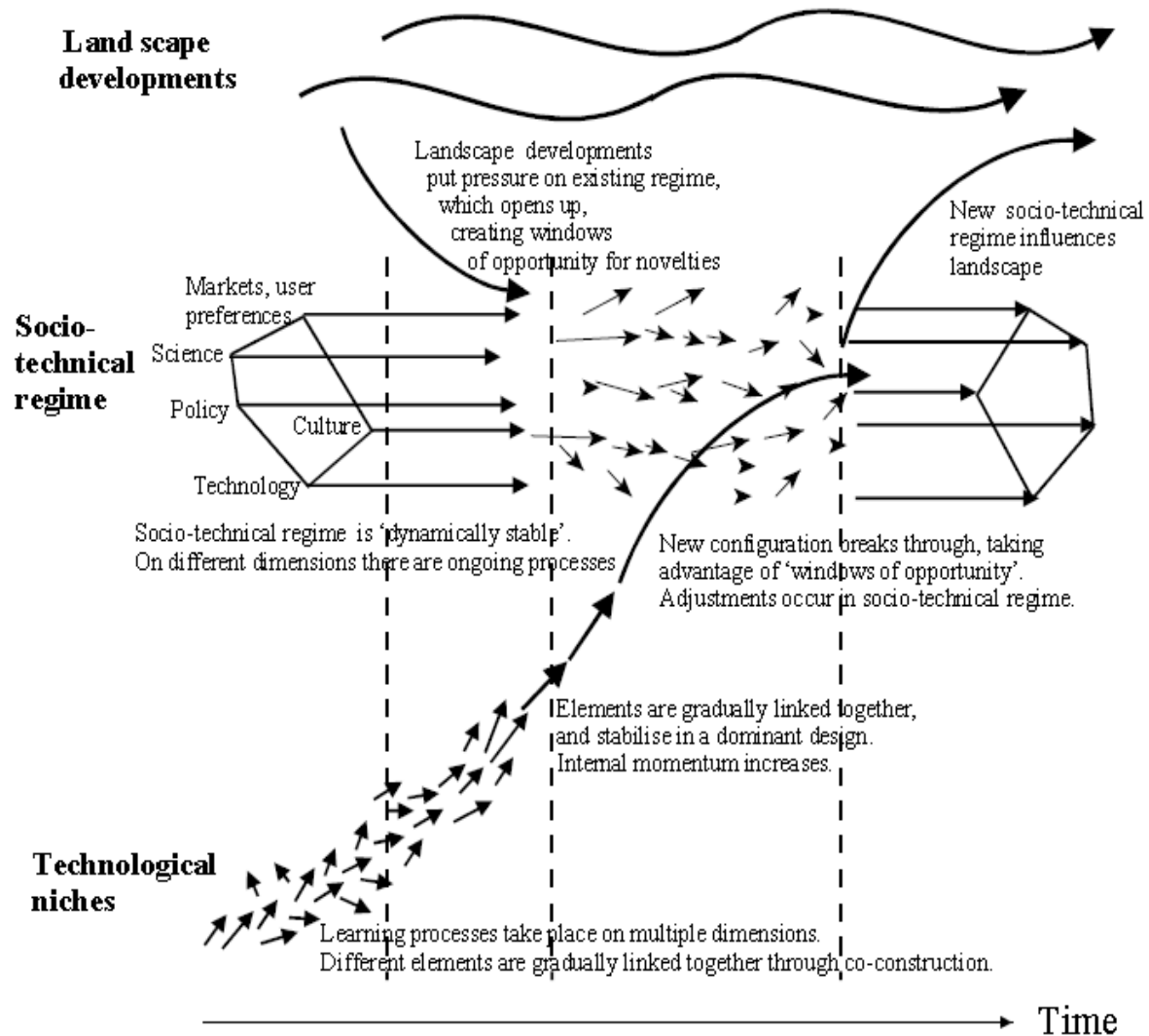
A multilevel perspective (MLP) framework was used to both analyze the information collected and to present the case study on water and sanitation development in Jakarta. The MLP has been used in similar historical case studies to analyze the transition of water supply and hygiene in the Netherlands (Geels, 2005) and the transition of cesspools to sewer systems in the Netherlands (Geels, 2006). The MLP is the most relevant framework to describe the case study because it allows the writer to frame many factors that contribute to the dynamic and changing processes of water and sanitation in Jakarta at broader aggregation levels and in the desired time interval (1945-2015). Therefore, the MLP was expected to reveal key stages and changes in water and sanitation development in Jakarta. The framework aims to capture, organize, and examine various factors that directly or indirectly contributed to water and sanitation development pathways in Jakarta.

The MLP stresses ‘no simple cause or driver in system transitions’ (Geels and Kemp, 2007:444). The key point of MLP is that system innovations come about through the interplay between dynamics processes at three levels in different development phases (Geels, 2006). According to Geels (2006), it was necessary to meet a set of conditions for regime transformation - from cesspool to sewer system - as what occurred in the Netherlands. These conditions include: (i) regime insiders change their cognitive beliefs, behavioral norms, and regulations and (ii) increased pressure from outsiders. Figure 2 illustrates the dynamic at three different level of analysis in MLP.

Factors that contributed to the system change process were framed at three different levels (landscape, regime and niche level) with the definition as described in Table 1.

Furthermore, analyses were also conducted based on type of transition pathways (Table 2) as described by Geels and Kemp (2007). Table 2 summarizes the type of transition pathways based on main actors and type of interactions that contribute to regime transformation.

Figure 2. A Dynamic Multi Level Perspective on System Innovation



Source: Geels, 2002

Table 2. Main Actors and (Inter) Actions in Transition Pathways

Transition pathways	Main actors	Type of (inter) actions	Key words
Transformation	Regime actors and outside groups (social movements)	Outsiders voice criticism. Incumbent actors adjust regime rules (goals, guiding principles, search heuristics)	Outside pressure, institutional power struggles, negotiations, adjustment of regime rules
Technological substitution	Incumbent firms versus new firms	Newcomers develop novelties, which compete with regime technologies	Market competition and power struggles between old and new firms
Reconfiguration	Regime actors and suppliers	Regime actors adopt component-innovations, developed by new suppliers. Competition between old and new suppliers	Cumulative component changes, because of economic and functional reasons. Followed by new combinations, changing interpretations and new practices
De-alignment and re-alignment (transition)	New niche actors	Changes in deep structures create strong pressure on regime. Incumbents lose faith and legitimacy followed by emergences of multiple novelties. New entrants compete for resources, attention and legitimacy. Eventually one novelty wins, leading to re-stabilization regime	Erosion and collapse, multiple novelties, prolonged uncertainty and changing interpretations, new winner and stabilization

Source: Geels and Schot, 2007

The following chapters present the development phases of piped-water and sanitation in Jakarta based on the change in landscape level (political and economic condition) in Jakarta from 1945 to 2015. There are four conditions at the landscape level that described each development phase: (i) political condition; (ii) economic condition; (iii) social and health condition; and (iv)

international development policy on water and sanitation development. The latter was only described in the development phase from 1966 to 1998 since this is the only period where international agenda affected water and sanitation development in Jakarta. Regime and niche level factors present enabling and constraining factors for water and sanitation development in Jakarta.

CHAPTER 3 : CASE STUDY : THE DYNAMIC OF WATER AND SANITATION DEVELOPMENT IN JAKARTA FROM 1945 TO 1966

3.1 Landscape Level

3.1.1 Political Condition

The political system under the Old Order Era² was known as Demokrasi Terpimpin or Guided Democracy (1958-1966), which is a democratic government with increased autocracy. After Indonesia gained its independence from Japan in August 17th, 1945, The Government of Indonesia focused its efforts on political development, with 70% of the Indonesian national budget allocated to the military (Yazid, 2014). As the new government primarily focused on growing the military sector, water and sanitation development received low priority. Nevertheless, the first development of piped-water supply in Jakarta happened under the direction of President Soekarno (1945-1966) as an attempt to create political stability and to create a new image of Indonesia through the development of Jakarta as the capital city of Indonesia.

² The period between 1945 until 1966 is known as Old Order, a term when President Soekarno ruled Indonesia.

3.1.2 Economic Condition

Indonesia experienced modest economic progress in the early years of independence (Hill, 1996). However, the economy did not expand from 1961 to 1964 and inflation reached 600% (Hill, 1996). Poor economic growth, high inflation rate, political instability and an inability to wipe out colonial economic legacies led to many negative effects, including infrastructure maintenance neglect. Consequently, there was serious damage to infrastructure including water supply networks that had been built during Dutch colonial era (Ravestejin and Kop, 2008).

3.1.3 Social and Health Condition

Health, water, sanitation, and hygiene development had low political priority during Soekarno's presidential era. The central government only spent approximately Rp.416.5million per year (US\$2.1million per year) for health development, roughly 5.2% of the national budget. The goal of health development under President Soekarno was to abolish the different treatment received by native versus non-native Indonesians (Hill, 1996).³ Policies to improve public health involved implementing curative actions such as building health care facilities and increasing the number of doctors. Preventive actions for the development of water and sanitation were not considered a priority, despite high mortality rates in infants and adults during this period. Table 3 illustrates the health condition in Indonesia from years 1948-1949 and 1960-1961.

³ As a result of different treatment to native and non-native Indonesians (The Dutch, The Chinese and The Arab), in 1961, calories intake of Indonesian people was 1,816 per capita/day and there was 68.1% of population with no schooling background and only 0.1% of population with tertiary education (Hill, 1996).

Table 3. Health Conditions in Indonesia in 1948-1961

Health Indicators	1948-1949	1960-1961
Number of hospital beds (number per 1,000 people)	0.8	0.8
Number of doctors (number per 1,000 people)	0.016	0.028
Infant mortality (number per 1,000 people)	115 to 300	125
Maternal mortality (number per 1,000 people)	12 to 16	N.A
Crude death rate (number per 1,000 people)	10 to 15	21
Crude birth rate (number per 1,000 people)	20 to 30	N.A

Source: Leimena, 1953, World Bank, 1974, Hill, 1996

3.2 Regime Level

As developing water and sanitation systems was not a priority during President Soekarno's era, urban condition in Jakarta deteriorated with little money invested for urban management (Ravestejein and Kop, 2008). Electricity connections were limited, piped water networks were broken, drainage and canals were clogged with sewage and solid waste, and no maps were available to locate and repair the water network system (Argo, 1999; Kop, 2008b). Sanitation was viewed as a private business or household responsibility (World Bank and Ausaid, 2013).

By the end of 1960s, the proportion of households using flush toilets was 54% (30% were private toilets and 24% were shared and public toilets) and the proportion of households using non-flush toilets was 46% (5% were private toilets, 28% were shared and public toilets, and 13% used other type of toilets) (World Bank, 1974). While flush toilets improved overall sanitation and hygiene for Indonesians, none of these toilets were connected to a piped sewer network. Rather, all flush toilets discharged to household holding tanks, requiring household or private services to maintain.

3.2.1 Enabling Factors for Water and Sanitation Development at Regime Level

- **The Government of Indonesia's Development Policy to Develop Sizeable Projects**

President Soekarno guided development policies in an effort to create an Indonesia that was different from the colonial East Indies. This included molding Jakarta into a town different from Batavia⁴ and developing it into the greatest city possible (Cybriwsky and Ford, 2001). To achieve this development goal, the Government of Indonesia developed sizeable projects such as constructing large water treatment facilities in several big Indonesian cities, including in Jakarta, to support economic development. During President Soekarno's era, Indonesia increased its water production capacity from 3.000 l/s in 1945 to 9.000 l/s in 1968. Piped-water supply (private and shared) coverage increased from 8% to 19% (KemenPUPR, 2015) during the same time period.

As a way to obtain international recognition and modernize Jakarta, President Soekarno wanted to build a water supply network that could support his plan to host the 1962 Asian Games (Hill, 1996).⁵ At the same time, the Major of Jakarta, Sjamsurizal, felt that water supply had become one of the main problems in Jakarta due to rapid population growth and the increasingly ruptured water supply network (interview, government official).

To implement the vision of the President and to tackle water supply problems, the Major with the assistance of the Ministry of Health planned to build a 1,000 l/s water supply treatment plant, called Instalasi Pengolahan Air (IPA) Pejompongan I.⁶ The government realized that to

⁴ Batavia is the name of Jakarta during the colonial period of Indonesia (before 1945).

⁵ The plan also included to host Conference of New Emerging Forces (CONEFO) in 1966. However, this event was never held.

⁶ During the colonial era the Dutch had established *Gemeentelijk Waterleiding Bedrijf* (town water supply enterprise) in several municipalities in East Indies including Jakarta. Since the water supply enterprise was a government enterprise, all the cost was bear by the government. The supervision of water supply enterprises was

implement such a big and modern water project, it would need a reputable contractor (interview, government official). Due to the lack of water supply engineers in Indonesia, Degremont, a company from France was chosen as the planner and the executor for the project (interview, government official).

- **The Establishment of Environmental Health Units under Ministry of Public Works**

The Government of Indonesia established an Environmental Health Unit under Directorate General of Water Resources in Ministry of Public Works to carry out the project of Pejompongan I in 1952 (KemenPUPR, 2015). Ir. Lie Tjong Hian was assigned to be the head of the Environmental Health Unit. His main responsibility was to carry out the development of IPA Pejompongan I project, the first water supply project in Indonesia after independence of the nation (KemenPUPR, 2015). Because water and sanitation development was of low interest among Indonesian engineers, he only had six staff members, to help him implement water supply projects until 1961.

One of the reasons why there was limited interest among engineers could be explained by a lack of understanding of environmental health and sanitary engineering at the time (KemenPUPR, 2015). Due to the lack of engineers, many large piped-water systems in big Indonesian cities including in Jakarta were developed with the assistance of Degremont (KemenPUPR, 2015).

under *Department van Volksgezondheid* (Ministry of Health). The main concern of the Netherlands to put water supply under Ministry of Health was related to the assurance of water quality and public health concern.

3.2.2 Constraining Factors for Water and Sanitation Development at Regime Level

- **The Dual Function of Water Supply Operators as Mandated in Law No.5/1962**

The Government of Indonesia issued Law No.5/1962 on Local Government Companies during Soekarno's era as the fundamental legal basis for the establishment of local water supply companies (PDAMs) including the establishment of PAM Jaya, a water supply operator for Jakarta. According to the law, PDAM is a company that belongs to the local government. Its fundamental arrangement is determined by local regulation, or in other words, by the Mayor/Regent or local legislature.⁷ Generally, the Mayor/Regent appointed a civil servant with no business experience as managing director of a PDAM, while the local government intervened with the day-to-day management of PDAMs (World Bank, 2006).

PDAM has three obligations: to provide water supply services, to act as a public utility, and to provide money for local revenue (Law No.5, 1962). These obligations have put PDAMs in difficult situations, particularly because most local governments do not want to allocate their money to the expansion of PDAM services (particularly for the expansion of distribution networks which is the main responsibility of local governments) while they have to provide basic services to the community through cross subsidies with limited ability to draw on local government funds. (interview, government official). Furthermore, the full cost of recovery is not emphasized. The trend of making PDAMs a source of local revenue complicates how they provide their services.

The management of PDAMs is quite complex as many central government agencies are responsible for their operation (see APPENDIX II for Institutional Framework in Water and Sanitation in Indonesia). Technical aspects such as the development of infrastructure and the

⁷ In the case of Jakarta, it is determined by Governor of Jakarta.

provision of raw water are the responsibility of the Ministry of Public Works. Managerial and institutional aspects are the responsibility of the Ministry of Home Affairs, financial and investment aspects are under the jurisdiction of the Ministry of Finance, and quality drinking water assurance is the responsibility of the Ministry of Health (see APPENDIX II).

- **Lack of Health Education and Preventive Action**

Curative action was more prioritized than preventive action during Soekarno's presidential era. J. Leimena, a physician who served as the first Minister of Health for Indonesia (1946-1956) had noted the necessity of good sanitation for gaining better public health and controlling communicable diseases that were endemic to Indonesia such as malaria and hookworm.⁸ In his plan, he stressed the integration of curative and preventive action to improve public health (Leimena, 1953; Murakami, 2015).

While the Government of Indonesia was aware of that, because of such issues, greater attention was paid to curative actions as they more readily repaired damage sustained from wars (increasing the number of doctors, building hospitals, and other health care institutions, etc.). Preventive action to improve public health during President Soekarno era relied on conventional medical wisdom emphasizing the same techniques of courteous coercion, regulation, and reliance on curatives previously used by the Dutch government in the colonial era (Gouda, 2009).

⁸ From colonial era until Soekarno's era, sanitation sector was defined as water supply, sewerage, refuse disposal, sanitation in the field of malaria, and rat proofing of houses in the plague endemic areas (Mertonegoro, 1953).

3.3 Niche Level

3.3.1 Enabling Factors for Water and Sanitation Development at Niche Level

- **Development Aid and Technical Assistance from France**

Many large water treatment plants (WTP) in Indonesia use material and technology from the country of France, as both the French Government and the French-based company Degremont have been involved in many water supply projects in Indonesia since 1957. Projects include the development of IPA Pejompongan I in Jakarta as well as several WTP projects in the capitals of provinces such as Bandung, Semarang, and Banjarmasin (KemenPUPR, 2015).

Due to political instability in the 1950s, only the Government of France was willing to provide loans for the development of IPA Pejompongan I. The company Degremont acted as a liaison to convince the Government of France to fund IPA Pejompongan I project. Degremont also constructed all but the smallest water treatment plants in Jakarta and WTP Cisadane in Tangerang (Martijn, 2005). While the type of technology used in IPA Pejompongan I was conventional compared to similar projects in developed countries, it was considered modern technology for Indonesia (KemenPUPR, 2015).⁹ Due to the heavy influx of migrants to Jakarta, in 1962 the Government of Indonesia invested in the development of the second largest water supply treatment in Jakarta, IPA Pejompongan II, with a capacity of 1,000 l/s.¹⁰

⁹ The raw water came from Ciliwung River which routed through the city from Banjir Kanal Barat (West Flood Canal, built by the Dutch in 1923) then it pumped to water treatment plant in Pejompongan, Karet in Central Jakarta. From pipe transmission, the water is treated in coagulation unit (baffled channel) and flocculation unit (tube settler) before distributed to consumers.

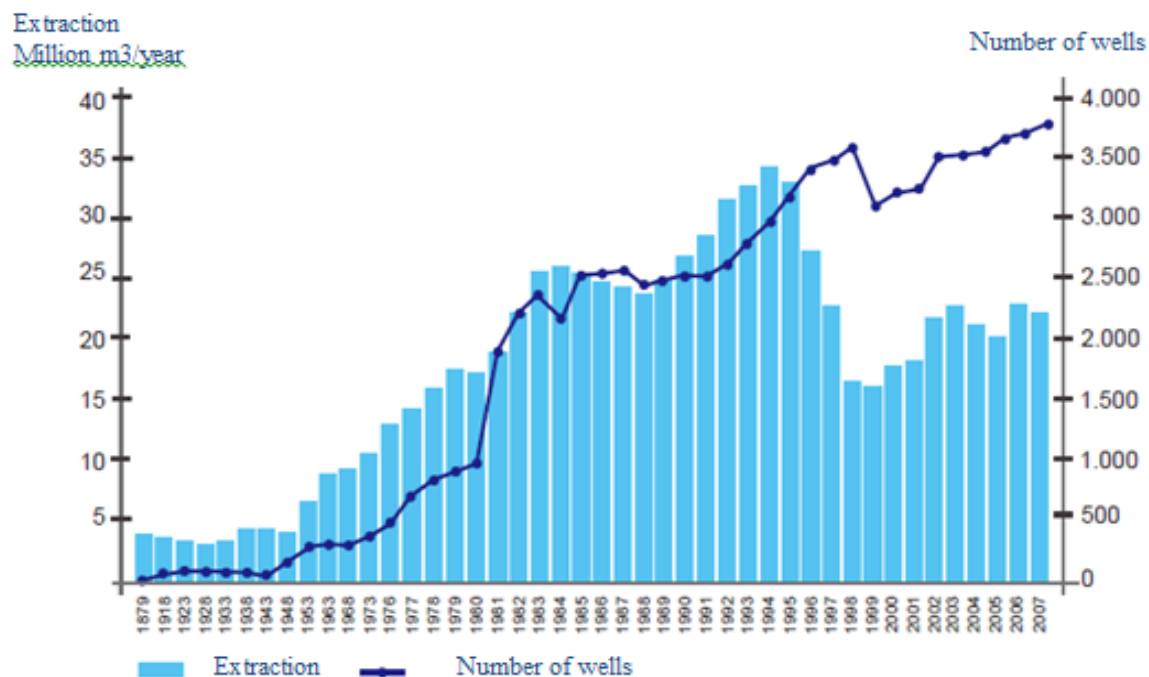
¹⁰ The technology used in Pejompongan II was a slightly more modified than Pejompongan I. Pejompongan II has “pulsator” system for coagulation and flocculation with separation of flocs occurring by the creation of a vacuum rather than by gravity. It was considered good technology for the time and continued to be applied in other big cities in Indonesia (Martijn, 2005).

3.3.2 Constraining Factors for Water and Sanitation Development at Niche Level

- **Lack of Sanitary Engineers and Ill-Suited Engineering Approach**

During the 1950's and 1960's there was insufficient number of Indonesian engineers and urban planners (Van Roosmalen, 2008). Furthermore, after transfer of power from the Netherlands to Indonesia in 1957, the number of Dutch's urban experts, city administrators and sanitary engineers decreased creating insufficient control and maintenance of public works infrastructure including water supply networks (Van Roosmalen, 2008). The condition of existing water networks further deteriorated due to a lack of spare parts, as the water system built during the Dutch during colonial period had been manufactured in Germany (Argo, 1999). To cope with the failing piped water system, people increasingly relied on ground water supplies. By 1950 the number of registered wells had grown to approximately 90 wells (Argo, 1999; Kementerian Koordinator Bidang Perekonomian, 2014) (Figure 3).

Figure 3. Groundwater Extraction and Number of Registered Wells in Jakarta (1879-2007)



Source: Kementerian Koordinator Bidang Perekonomian, 2014

Beside insufficient numbers of Indonesian engineers and planners, another constraining factor for water and sanitation development during the early stages of independence was the lack of capacity for engineers and urban planners. This lack of capacity was caused by difference in civil engineering works in Indonesia verses the Netherlands (Ersten, 2008). Most public works projects in Indonesia were executed under direct control of the government. Engineers were not only responsible for implementing technical designs, but also for managing non-technical aspects of the project, such as labor recruitment and organizing worker accommodations. In contrast, engineers in the Netherlands were only responsible for implementing technical designs (Ersten, 2008). These non-technical skills, were not adequately covered for Indonesian engineers at Bandung Technical College.¹¹ Furthermore, a senior Dutch urban planner, Thijsse in Ersten (2008), mentioned that the lack of competence of personnel correlated with inadequate education and lack of publications and manuals on city planning applicable to the Indonesian context. Ersten had frequently proposed plans to improve the capacity of Indonesian planners by adding a sanitation and hygiene course to the urban development curriculum in Indonesia. However, the civil engineering curriculum continued to be based on that of the Technical College in Delft, Netherlands (Van Roosmalen, 2008).

- **The Growth of Informal Water Vending**

The water vending industry first grew in the northern part of Jakarta in response to a lack of clean drinking water. Previously, the northern communities of Jakarta satisfied their domestic water needs by taking water from ponds as ground water in the area was brackish and unfit to drink (Susantono, 2001). Beginning in 1952, people who lived in the Tanjung Priok port, North

¹¹ Bandung Technical College was the former of Institute Technology of Bandung (ITB), the first technical college in Indonesia.

Jakarta had to buy water from vendors at prices ranging from Rp.0.33 (US\$0.0016) to Rp.200 (US\$1) per jerrican (1 jerrican = approximately 20 liters) depending on the distance required to deliver the water (Bappenas, UNICEF, and Yayasan Dian Desa, 1990). Vendors bought water from the PAM center or public hydrants at prices ranging from Rp.0.083 (US\$0.0004) to Rp.6.25 (US\$0.03) per jerrican. The vendor then ported around 12-20 jerricans worth of water with a single-axle handcart and visited neighborhoods in need of their services. These vendors, mostly immigrants from Central Java, came to Jakarta in search of sanctuary and jobs during the Darul Islam movement at the beginning of the 1950s (Bappenas, UNICEF, and Yayasan Dian Desa, 1990). While vendors lived scattered across Jakarta, many settled in North Jakarta, where the proportion of household using vended water was the largest compared to other areas of Jakarta. These vendors had few marketable skills because they had been farmers in the past but were willing to do anything to survive (Susantono, 2001).

Informal water vending continued to grow in Jakarta not only to fill the gap left by formal services but also to provide better perception of water in the areas where piped-water was available. With subsidies from the central government, public hydrants were developed to give the poor access to water, particularly to those who lived in North Jakarta.¹² However, due to the rapid expansion of Jakarta's population, hydrants were not always available where needed. This is where water vendors filled the gap, by transporting water from hydrants to houses in need (Susantono, 2001).

¹² A public hydrant is a hydrant owned by an individual or an institution that paid for its construction after getting approval from Lurah. Public hydrants are under-ground reservoirs with capacity of 2-6 m³ made of concrete and facilitated by an electrical pump to draw water. The reservoirs are designed to anticipate emergency situation when PAM Jaya cannot meet the schedule to deliver water as well as anticipate peak consumption. Hydrants were built so that households were able to fetch water themselves within walking distance.

3.4 Summary of Water and Sanitation Development during 1945-1966

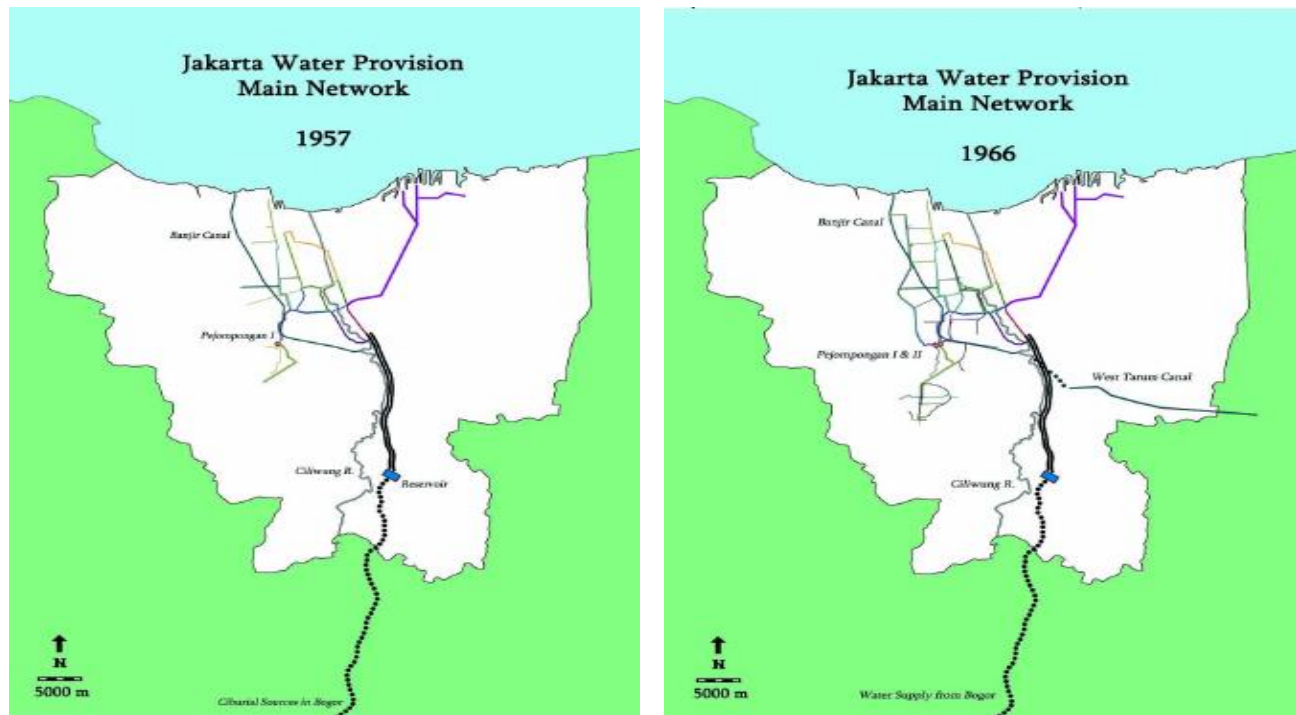
By the end of the Soekarno era (1966), the water production capacity in Jakarta had increased tenfold from 315 l/s to 3,315 l/s. However, only 12% of the population had access to a piped-water supply, although the volume of water supply available in Pejompongan I was considered adequate to meet city demand (Kooy, 2008). Water use was unmetered. A flat rate of Rp.100-200 per month (US\$0.241-0.482) was applied (Kooy, 2008). The combination of high water use, lack of metering, and the flat tariff contributed to the financial burden of water operations (PAM Jaya) especially after the enactment of Law No.5/1962 on Local Companies (KemenPUPR, 2015). The poor bore much of the burden in that they had no piped-water access. Poor households were served by only 230 public hydrants. They had to buy water from a vendor or rely on shallow wells or exposed sources such as polluted canals and drainage ditches (World Bank, 1974).¹³ Figure 4 illustrates the location of Pejompongan I and II water treatment plants and their distribution pipelines.

The development of IPA Pejompongan I is regarded as one of the greatest achievements of water supply development in Indonesia although its services were only enjoyed by specific groups of people (Kooy and Bakker, 2008).¹⁴ Investment made by the central government to increase water production capacity was not accompanied by an investment from PAM Jaya and/or the central government to expand distribution networks and improve non-technical aspects of piped-water supply provision in Jakarta.

¹³ The water tariff was a flat rate without metering of Rp.100-200 per month (US\$0.241-0.482) or about Rp.10-20 per m³ (US\$0.024-0.048 per m³). In contrast, water from vendors could reach up to Rp.440 per m³ (US\$1.06 per m³). Some households in North and East Jakarta ended-up paying water vendors 5 to 44 times the flat rate water tariff or more than 10% of their household income (World Bank, 1974).

¹⁴ These groups of customers are household in the city suburb (Kebayoran Baru), hotels and buildings along Jalan Thamrin-Jalan Sudirman and Asian Games complex in Senayan.

Figure 4. Pejompong I and II Water Treatment Plants and Its Distribution Line



Source: Martijn, 2005

Historical documentations suggest that several factors contributed to water and sanitation development in Jakarta during the Soekarno era. Factors that support the development of water supply in Jakarta are: (i) the Government of Indonesia's policy to develop sizeable projects; (ii) the establishment of Environmental Health Unit under Ministry of Public Works; and (iii) development aid and technical assistance from France. Factors that hampered water supply development in Jakarta are: (i) lack of sanitary engineers and use of Dutch engineering curriculums that did not meet the real conditions of Jakarta and Indonesia; (ii) lack of health education and preventive action; (iii) the dual function of water supply operators as mandated in Law No.5/1962; and (iv) the growth of informal water vending. Table 4 summarizes the water supply and sanitation development from 1945 to 1966.

Table 4. Summary of Water and Sanitation Development during 1945-1966

Landscape Level	Regime Level		Niche Level		Water Supply Coverage in 1966	Sanitation Coverage in 1966
<p>Political: guided democracy (a democratic government with increased autocracy)</p> <p>Economic: economy did not expand and inflation reached 600%</p> <p>Social and health: Health, water, sanitation, and hygiene development had low priority</p> <p>International policy on water and sanitation development:-</p>	<p>Enabling factors for water and sanitation development</p>	<p>Constraining factors for water and sanitation development</p>	<p>Enabling factors for water and sanitation development</p>	<p>Constraining factors for water and sanitation development</p>	<p>Piped-water: approximately 10% households; (ii) flat tariff; (iii) water tariff: Rp.200 (US\$0.67-1) per month per HH</p> <p>Non-piped water: 25% use private well, 42% use common well, 19% use carried water, and 4% use other sources</p>	<p>Flush toilet: 30% of HHs use private toilet, 24% of HHs use shared and public toilet</p> <p>Non-flush toilet: 5% of HHs use private toilet; 28% of HHs use shared and public toilet; and 13% of HHs use other type of toilets</p>
	<p>Policies to develop sizeable projects including large water treatment plants</p> <p>The establishment of Environmental Health Unit under Ministry of Public Works</p>	<p>The dual function of water supply operators as mandated on Law No5/1962</p> <p>Lack of health education and preventive action to improve public health</p>	<p>Development aid and technical assistance from France</p>	<p>Lack of sanitary engineers and ill-suited engineering approaches</p> <p>The growth of informal water vending</p>		

CHAPTER 4 : CASE STUDY: THE DYNAMIC OF WATER AND SANITATION DEVELOPMENT IN JAKARTA FROM 1966 TO 1998

4.1 Landscape Level

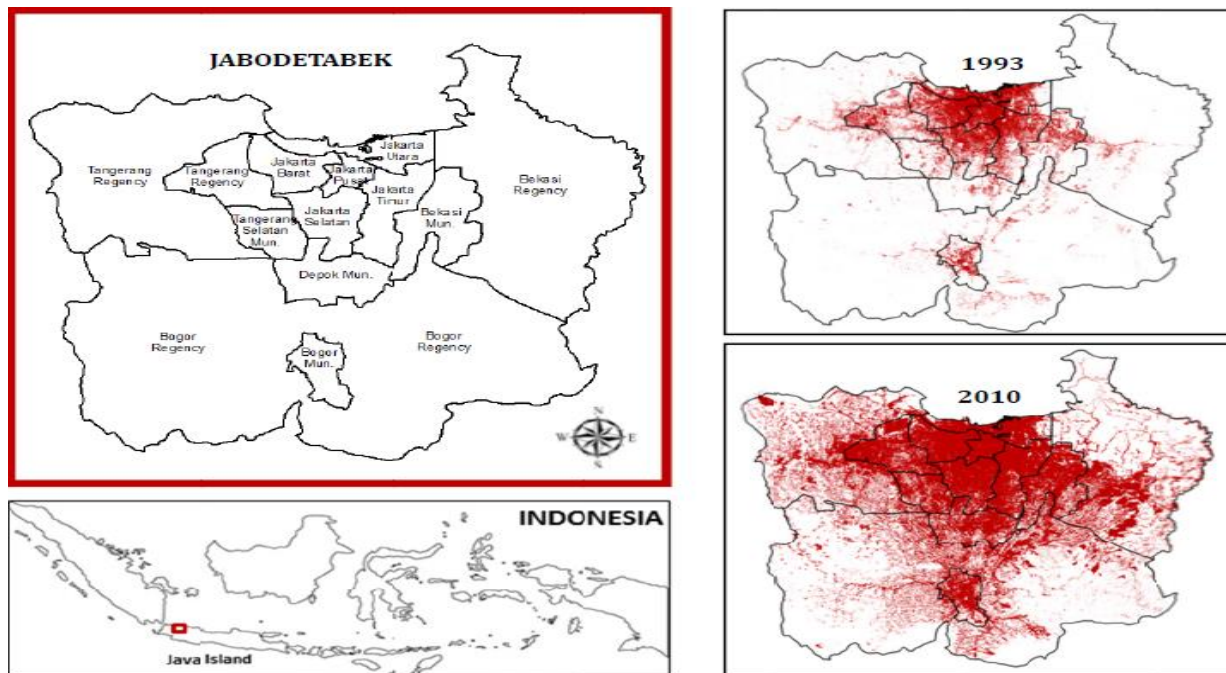
4.1.1 Political Condition

The macro political culture under the President Soeharto era was characterized by authoritarian rule. After the “Old Order” of Soekarno, the political focus changed from political development to economic and social development under “New Order” of Soeharto. Defense through the achievement of political stability, economic development, and equity were pivotal concepts under the New Order cultural policy, known as The Development Trilogy. The government implemented numerous development programs with the continued use of foreign aid money including the development of water and sanitation infrastructure.

The authoritarian system was highly centralized with the main financial and policy making responsibilities at the central government level in Jakarta. The central government provided 80% of the investment for development (World Bank, 1984) and was the height of its power. There were high levels of corruption, nepotism, and collusion in governmental circles which affected the delivery of services to communities. The local government often had a substantial amount of money granted to them through lobbying and collaboration with different agencies. In the late 1990s, Indonesia was among the top five countries with the highest corruption perception index (CPI) (Transparency International, 2015).

Under the Soeharto era, the modernization of Jakarta initiated during the Soekarno era continued but with altered goals. The development of Jakarta in an effort to foster national prestige under President Soekarno changed to an effort to enable economic growth under President Soeharto (Cybriwsky and Ford, 2001). Figure 5 shows the urban expansion of Jakarta from 1993 to 2010 which affected the growth of its peripheral areas by form in Greater Jakarta (aka Jabodetabek, an acronym that stands for Jakarta, Bogor, Depok, Tangerang and Bekasi regencies). This extensive growth further threatened the public infrastructure conditions in Jakarta.¹⁵

Figure 5. Administrative Map of Jabodetabekk and Its Urban Expansion (1993-2010)



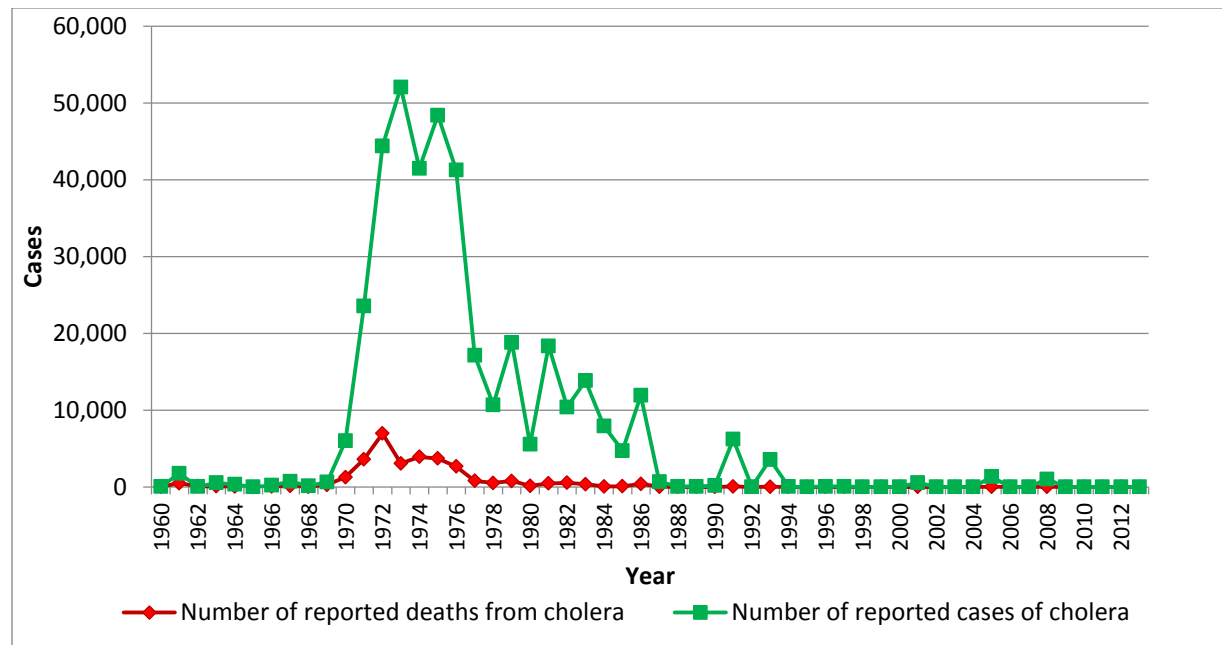
Source: Pravitasari et. al., 2015

¹⁵ Jabodetabek is considered the second largest megacity in the world after the Tokyo metropolitan area. It covers 6,392 km², only 0.3% of Indonesia's total area. However, its population is about 11.3% of the Indonesia population, with an annual growth rate of 2.6% over the period 2000-2010. During the period of 1967-1998, Jabodetabek's share in foreign and domestic investment in Indonesia accounted for about 44% and 42%, respectively (Firman, 1998). Jabodetabek contributed 24.8% of national GDP in 2010 (Pravitasari et. al., 2015).

4.1.2 Economic Condition

The Indonesian economy continued to grow rapidly during the Soeharto era without much improvement in water and sanitation services, where GDP grew by an average of 5-7% annually from the late 1960s to the late 1990s (BPS, 2000). Water, sanitation, and health sector did not receive much attention during the beginning of New Order era with high incidence of cholera in the beginning of the 1970s (Figure 6). The proportion of the national budget spent on the water and sanitation sector from 1968 to 1973 was Rp.16billion (US\$50million) or about Rp.698 (US\$2.13) per capita (Presidential Decree No.319, 1968).

Figure 6. Number of Reported Deaths and Number of Reported Cholera Cases in Indonesia



Source: WHO, 2015

4.1.3 Social and Health Condition

Despite a high degree of centralization, the health and social sectors were subsequently improved under the era of President Soeharto, especially in the 1970s and 1980s. Life expectancy rose from 48 years in 1950 to 65 years in 1997 and infant mortality decreased from 200 per 1,000 in 1950 to 52 per 1,000 in 1997 (BPS, 2015a and Kristiansen and Santoso, 2006). Death rates in children younger than 5 years old fell from 218 to 60 between 1971 and 1999 (BPS, 2015a). Poverty incidence declined 50-60% during the 1960s (Hill, 1996) to 24% in 1998 (Aulia, F., personal communication, September 4, 2015). Limited room for dissenting in policy-making and policy implementation was considered to be a key in alleviating poverty and health improvements (Indonesia Investment, 2016).

4.1.4 International Development Policy for Water and Sanitation Development

The Mar Del Plata Action Plan in 1977 and the impetus of the International Drinking Water Supply and Sanitation Decade (IDWSSD) encouraged the Government of Indonesia to accelerate water and sanitation development. As a response to the IDWSSD and in parallel with the implementation of the equity principle of trilogy development (political stability, economic growth, and equity), the Government of Indonesia formulated a new policy for urban water supply and sanitation known as the Basic Needs Approach (BNA). This approach provided a basic quantity of safe water and basic sanitation facilities to as many people and as rapidly as possible (World Bank, 1985a). BNA was a new type of government policy in which special attention was given to speedy implementation of infrastructure development, low-cost construction, and tariffs that the poor could afford.

The investment required to achieve IDWSSD in urban areas was estimated to be approximately US\$1.7 billion or 3-fold higher than the national budget during 1974-1979 (REPELITA II). Given the government's limited resources, the financial gap was to be funded through multilateral developmental bank loans and water tariff improvements (World Bank, 1983).

Beside BNA the Government of Indonesia also established a new policy in the mid-1980s to improve the use of local government resources in the development of urban infrastructure. This urban development reform was known as the Integrated Urban Infrastructure Development Plan (IUIDP). Reforms carried out under the IUIDP to increase local revenue included improvement in the property tax and PDAM accounting systems, as well as changes in tariff mechanism for water supply and electricity (World Bank, 1987). Under these reforms, the water tariff in Jakarta was increased from Rp.235 per m³ (US\$0.14) in 1987 to Rp.516 (US\$0.31) per m³ in April 1988 (World Bank, 1990b). PAM Jaya also retained and reinvested their share of profits in the piped-water supply system expansion in Jakarta.¹⁶

4.2 Regime Level

The city of Jakarta experienced an even greater population growth in the 1960s and early 1970s (approaching 6% annually), which caused a considerable strain on its already inadequate water and sanitation services. Jakarta had a housing stock of 486,000 units and only a few houses had electricity in 1969 (World Bank, 1974). Of these dwellings, 68% had no private sanitation facilities, only 32% of households had a private toilet (albeit with sub-standard pit privy or septic

¹⁶ Based on Law No.5/1962 on Local Government Companies, PDAMs have to return 55% of their profit to local government and the other 30% of profit could be distributed among PDAM staffs, leaving only 15% to be used as capital, operation, and maintenance expenditure.

tanks) and only 35% of households had access to private piped-water connections and/or private well (World Bank, 1974).

There are three main drinking water sources in Jakarta: (i) piped water (private and public taps); (ii) vendor-supplied water; and (iii) private and public wells. Only 10% of households in the city had private piped water supply in their homes, 40% of the households bought water from water vendors at a relatively high-price and more than 50% of the population relied on groundwater wells, which were often contaminated by sewage seepage and increasing salinity due to depletion of the fresh water aquifer (World Bank, 1974). By the late 1980s, 32% of households relied on vendors for drinking water and more than 40% of these households belonged to the low income households (income less than Rp.130,000 per month or US\$78 per month) (Kooy, 1998). At the end of 1988, there were 1,100 public hydrants in Jakarta, delivering on the average 13.6 m³ per day per hydrant (Martijn, 2005).

Groundwater with high salinity was commonly found in the northern part of Jakarta where the majority of poor people resided (BPS, Jakarta 2015).¹⁷ Affluent households opted to connect to piped water if their groundwater was saline, but poorer households generally bought drinking water from vendors while continuing to use well water for other purposes (Alberini et al., 1996). Ninety-eight percent of households in North Jakarta depended on water vendors. More affluent households living in Central Jakarta had the highest proportion of households with piped water supplies. In 1973, the water tariff was flat without metering and was Rp.100-200 per month (US\$0.241-0.482). At the same time water from vendors was Rp.440 per m³ (US\$1.06 per m³). Approximately 40% of the households living in North and East Jakarta bought water from vendors at rates 5 to 44 times more per m³ than the piped-water tariff or more than 10% of their

¹⁷ The northern part of Jakarta has been estimated to be part of Jakarta where high percentage of low income resides and migrants from various ethnic background firsts settle (BPS Jakarta, 2015).

household income (World Bank, 1974). Average water use was estimated to be 80l/capita/day while poor households living in kampungs consumed about 45 l/capita/day (World Bank, 1974).

Because there were no sewer systems, middle, and upper income households had privies or septic tanks, the majority of which the majority were substandard or simply functioning as holding tanks for sewage. One-half of the population already used flush toilets although only 32% of the population owned a private toilet (World Bank, 1976). Most of the effluent of the sub-standard septic tanks was deposited directly into open canals and drainage ditches. Poor households in kampungs used rivers or canals for bathing, washing, and defecating as very few public toilets were available. Subsequently, canals and rivers were heavily polluted with sewage and solid waste.

4.2.1 Enabling Factors for Water and Sanitation Development at Regime Level

- **The Government of Indonesia's Development Policy on Low Cost Technology to Provide Water and Sanitation Access to the Poor**

Aware of water-borne diseases, the Government of Indonesia initiated the Water Supply and Sanitation Sector Study with funding from WHO/IBRD in 1971-1977. One of the recommendations was to create a list of priority projects to address water and sanitation conditions, of which many were related to housing and kampung development and through the application of low cost engineering solutions. A study conducted by UNDP for sanitation in Jakarta also recommended an immediate establishment of sanitation program that would focus on the provision of pit latrines and septic tanks through kampung improvement (World Bank, 1976). The public water taps and communal toilets for kampungs, private water taps, pit privies, septic tank and seepage pits for formal low-cost housing were the targeted interventions

presented as solutions. These recommendations were incorporated into several project designs during the 1970s and 1980s. This program is known as Kampung Improvement Program (KIP) and the majority of funding came from the World Bank. The strategy of KIP was rooted in the colonial slum cleaning activities that were received and expanded in 1969 by Ali Sadikin, the Governor of Jakarta (Chifos, 1996).

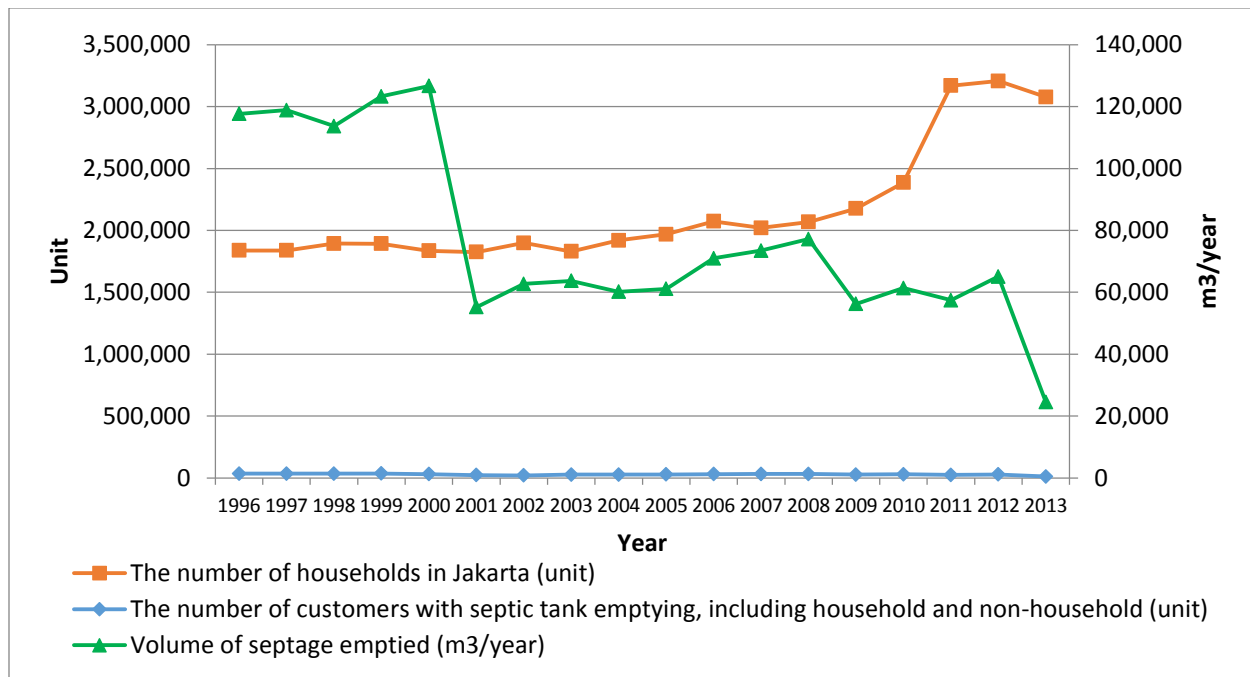
The government chose an “appropriate technology” policy or low cost technology solution as a way to provide basic infrastructure and implement the trilogy development policy of Soeharto (political stability, economic development, and equity) particularly the equity principle. In other words, the government chose to accelerate the provision of water and sanitation services throughout the country and to ensure national resources were distributed evenly across income groups and regions. The policy objective was to lower investment costs and make the technology more affordable to the poor while also providing low cost services to poor customers (World Bank, 1994). The low cost principle was applied until the 1980s when the Government of Indonesia embarked upon BNA and IUIDP approaches. There were no technical guidelines or standard for developing low cost water and sanitation options when the government implemented KIP in the 1970s and 1980s. While the World Bank realized that the standards used for the KIP were not ideal solutions, this option was thought to be a vast improvement over the existing conditions (World Bank, 1976).

Around 31,000 additional units of leaching pits were built via KIP I and III in 1980.¹⁸ There was no sewage treatment plant in Jakarta at that time. In the absence of any rational standards governing the pit privy design in Indonesia, little was known on how pit privies or septic tanks generated biological and chemical pollution into ground and surface waters (World

¹⁸ KIP I 25,000 units and KIP III 6,312 units. KIP III also built 3 mini water supply plants and 1 deep well.

Bank, 1976). It was hoped that sewage would be treated via anaerobic and aerobic bacterial decomposition in a 2 m³ pit volume for a 5-year life time period (World Bank, 1976). Later in 1984, the government built the first sewage treatment plant in Pulo Gebang with a capacity of 300m³/day to serve the eastern part of Jakarta. The second, sewage treatment plant was built in Duri Kosambi in 1995 for the western part of Jakarta with capacity of 300m³/day (Japan International Corporation Agency, JICA, 2009).¹⁹ These two treatment plants treated less than one-third of their planned capacity, with only 30% of septic tanks and pits in Jakarta emptied as a consequence (WSP, n.d.) (Figure 7).

Figure 7. Volume of Septage Emptied and Number of Customers with Septic Tank Emptying (1996-2013)



*Estimated number of septic tanks and/or pits in Jakarta in 2015 is 2.17 million (WSP, n.d.)
Source: BPS Jakarta, 2000-2014

¹⁹ Pulo Gebang was planned to serve the whole of East Jakarta and 50% each of West Jakarta, South Jakarta, North Jakarta, and Central Jakarta. Duri Kosambi on the other hand was planned to serve the whole of West Jakarta along with 50% each of East Jakarta, South Jakarta, North Jakarta, and Central Jakarta.

- **The Enactment of Law No.11/1974 on Irrigation: The First Law Governing the Water Sector**

An important regulatory achievement established by the water sector during the Soeharto era in 1974 was the enactment of Law No.11/1974 which stated irrigation and water use priorities. The first priority was for domestic water purposes such as drinking water, flushing, etc.; the second priority was agriculture and irrigation. Under this law, water was considered a social good and was managed in a partial-fragmental approach with the government as the dominant actor.

- **The Separation of Regulator and Operator Function of Water Supply in Jakarta**

The water regime in Jakarta began to rise in late 1960, marked by the separation of management between regulators and water supply operators (PAM Jaya) initiated by the Governor Ali Sadikin in 1968. This separation was also in response to the enactment of Law No.5/1962. Prior to 1968, Jakarta's water supply operator was under the management of Jakarta's Public Works Agency. In 1973, Jakarta's Water Supply Company-PAM Jaya was established as a regional water supply enterprise for the Jakarta province responsible for the management and operation of production facilities and for generating revenue for operation and maintenance of the system.

The establishment of PAM Jaya as a semi-autonomous water operator was an effort to encourage local government to operate and manage the distribution system and service connections already built by central government. However, many corruption issues within PAM Jaya such as tendering chemical processing and overpricing household connections that hindered the implementation of good governance to increase piped-water supply access in Jakarta (ICW, 2000). For example, households paid Rp.500,000 (US\$56.8) to establish a private piped-water

connection in their home while the true connection fee was only Rp.200,000-Rp.300,000 (US\$22,7-34,1) (ICW, 2000).

After PAM Jaya became a semi-autonomous operator, the old management practice changed from un-metered and low charges for water to metered water and a cost-recovery (covering operation and maintenance costs) based tariff structure. A new regulation known as “meterisasi” or metering program was imposed during the 1970s to introduce meter and monitoring devices. The “meterisasi” program was also introduced as a result of the central government program for expanding the distribution pipe line for IPA Pejompongan I and II in the beginning of 1970s (interview, government official). Integrated records of actual consumption and numbers of customers were maintained and an actual list of customers was recorded for the first time in 1975 (Bakker et al., 2006). Around 90,000 meters were installed by 1975 (Kooy, 2008). Furthermore, a new water tariff structures was introduced in 1975. This structure changed from a flat tariff of Rp.200 per month (US\$0.48) to Rp.2,000-3,000 per month (US\$4.8-7.2 per month) based upon the actual volume consumed by customers (Kooy, 1998). In 1974, non-revenue for water was estimated to be 40% of total water supply (World Bank, 1974).

4.2.2 Constraining Factors for Water and Sanitation Development at Regime Level

- **Lack of Public Health Approach in Water and Sanitation Provision**

The low cost development policy through the implementation of KIP faced many problems. KIP suffered from poor physical planning and link to the city-wide infrastructure. The evaluation of KIP after 20 years showed sanitation received low priority and that the use of public sanitation facilities was limited due to the top-down approach of the program (Haryatiningsih, 1996; World Bank, 1994). Furthermore, its technical design did not meet local

conditions and needs. There was failure to involve households in location planning, lack of maintenance training programs, and there no financial or in-kind contributions (Haryatiningsih, 1996; World Bank, 1994). One of national government officials conceded that “*We realized we needed to generate community demand before building sanitation facilities, however, many times we were too impatient to implement such a community based-program*” (interview, government official).

The knowledge taught to sanitary engineers during education was among the reasons why the decentralized system suffered from poor physical planning and lack of ties to the centralized system. The education of sanitary engineers in Indonesia mostly incorporated the technologies and approaches used in developed nations with only the hardware aspects of these technologies taught at universities (Slamet, 1991). Most engineers did not prioritize non-technical aspects of low cost technology, nor did they believe public health considerations were their responsibility, but the responsibility of the Ministry of Health (Ouano, 1980). Regarding the roles of sanitary engineers and public health practitioners, a senior government official explained that the effort to integrate sanitary engineering and public health in water and sanitation development projects had been attempted since the government established the National Policy Development of Community-Based Water Supply and Environmental Sanitation in 2003. This policy mainly aimed to better implement water supply and sanitation provision in rural areas. However, the role of engineers in providing water and sanitation systems in urban areas was still the dominate role compared to the role of a public health specialist. The same government official stated that “*This condition [the dominant role of engineers in urban areas] happens since government policy is still mainly focused on technical outputs [shown by the number of infrastructure that has been built]. It [the technical output] is a populist choice for politicians and governments to attract*

public attention” (interview, government official). The national budget for water supply and sanitation provisions was much higher for the Ministry of Public Works than for the Ministry of Health. The condition has affected the number of public health practitioners in Indonesia.

- **Reliance on Donors’ Assistance to Develop Water and Sanitation Infrastructure and Policy**

Based on considerations by donors and the government, water was prioritized over sanitation as water is a prerequisite for adequate sanitation. The provision of water can also reduce water-borne disease (World Bank, 1984).²⁰ The sewer regime in Jakarta was still in its infancy in the 1970s. However, communities, particularly the poor started to realize their need for sanitation, as reflected in the household survey for the KIP I project where communal toilets were ranked high among other basic infrastructure needs (along with roads, footpaths, water, solid waste, and drainage) (World Bank, 1974).

While water supply was prioritized over sanitation, the first wastewater master plan in Jakarta was being prepared by Nihon Suido from Japan from 1972 to 1977 with investments from UNDP and WHO. The plan recommended the construction of a conventional sewer system at an estimated cost of US\$500million (World Bank, 1983) with plans to serve 900,000 people living in the affluent regencies of Setia Budi and Gambir. The plan covered the development of a sewerage network where untreated sewage would be disposed-off in the Java Sea in the northern part of Jakarta. After subsequent review by the Government of Indonesia, the plan was not implemented due to its high cost and questionable justifications of using a sewer system when lower-cost solutions appeared feasible (World Bank, 1983).

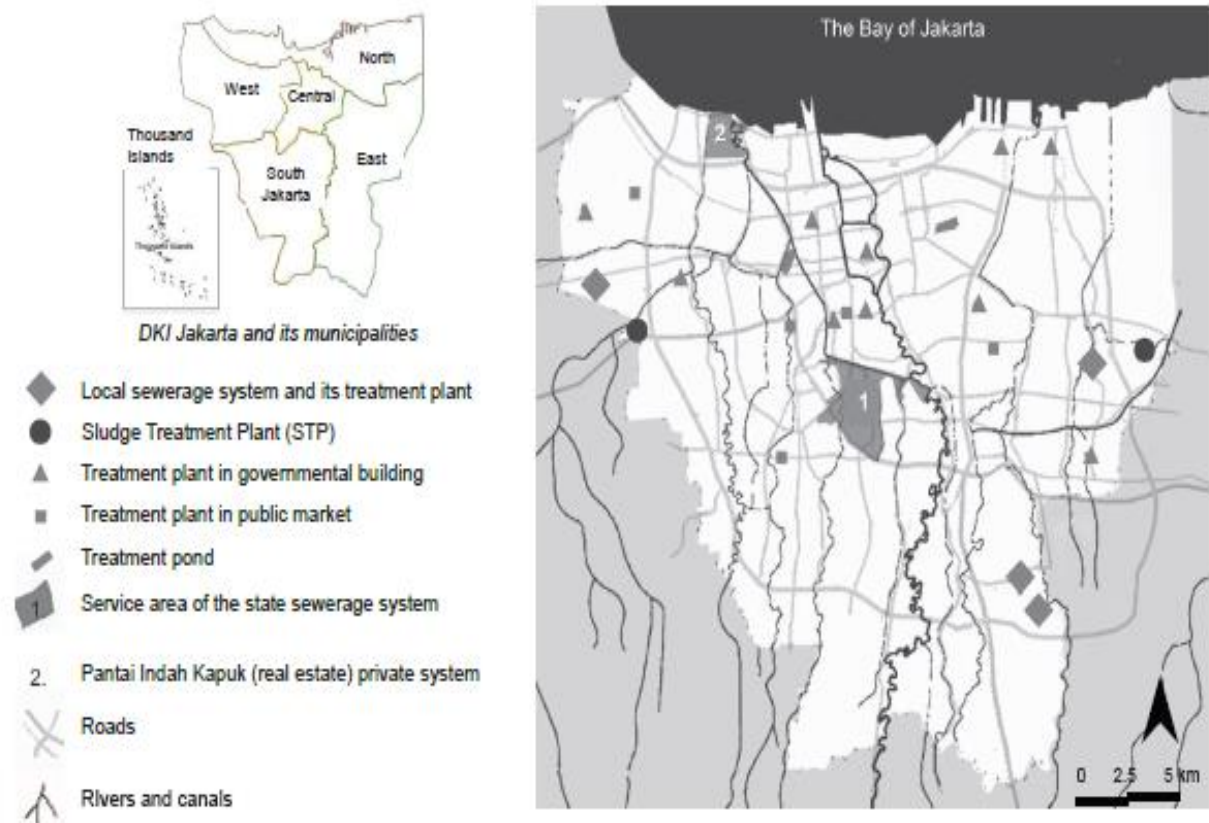
²⁰ The proportion of budget in KIP III for water and sanitation was 23% for water and 7% for sanitation.

The Government of Indonesia sought another approach through assistance from the World Bank to improve sanitation condition in Jakarta. The government requested assistance from the World Bank to finance a plan and to find a more appropriate approach for sewage disposal in Jakarta. The proposed project would use separate sewer systems and combine the use of on-site systems (septic tank, pit privies, and other low cost sanitation options) with the sewer system. It was agreed to implement conventional sewer pilot project in 1983 by installing interceptors in Tebet and Setia Budi with central government funding through the World Bank loan. Tebet and Setiabudi were selected because both have a mix of high, middle, and low income areas (interview, non-government).²¹ Lower-income households would use septic tanks, while affluent households would be served through the collection of liquid wastes in drains (interceptor) connected to major sewers. It was hoped that by serving all different types of consumers; the sewer system could generate adequate revenue to cover operating and maintenance costs and could recover an appropriate share of capital cost (World Bank, 1983).

Based on the statement from a senior government official, the decision to not provide private sewer connections for the poor was made based on experiences from sewer pilot project in other cities (Bandung and Tangerang). In these cities, sewer connections became stagnant because poor communities were given priority to connect to the sewer. This experience had a psychological effect on the central government leading to them not prioritize poor households in future sewer development projects including in Tebet and Setiabudi (interview, government official). Figure 8 illustrates the location of the areas to be served by the sewerage system and other existing wastewater treatment facilities in Jakarta.

²¹ Tebet was a mix of kampung and middle income residential areas. Setia Budi had existing and projected commercial and industrial development area. Some of the existing industries in Setia Budi were home-based industries such as tempeh, tofu, and batik industry and cattle husbandry which contributed to high organic pollutant loads to the Krukut River, which flows directly to the city's intake water supply.

Figure 8. Wastewater Infrastructure in Jakarta



*Beside 2 sludge treatment plants in Duri Kosambi and Pulo Gebang and sewerage system in Setia budi, Jakarta also has 35 individual wastewater treatment plants (ITPs). 55% of ITPs are not operating (JICA, 2009; WSP, n.d.). Tebet and Setiabudi are located in the shaded area #1.

Source: Putri, 2014

Obstacles existed in the implementation of the project such as the change in planning and design, the limited capacity of the Ministry of Public Works, the Government of Jakarta, and consulting firm, the requirement to return revenue from wastewater operation to the Ministry of Finance, issues in establishing a semi-autonomous body (PDPAL Jaya) to operate the sewer system, and the financial difficulties faced by the government amid falling oil prices (World Bank, 1993). These issues created a delay in the implementation of the project. The original plan was to be finished in 1988 but it was delayed until 1991. The end result of project was also

different from its initial plan. Of the 3,000 leaching pits and 30 public toilets planned for the on-site sanitation component, 778 pits and 80 toilets were built (World Bank, 1993). The lack of willingness to pay and lack of community participations were among the lessons learned by the donor for the non-achievement of leaching pits and the over achievement of public toilets.

The original goal for the sewer system was to serve 700,000 people by 1996. However due to the miscalculated financial projection for the hydraulic maximum capacity of the aerated lagoons, the system could only serve 38,880 m³/day or equivalent of approximately 175,000 people (World Bank, 1993). A government representative mentioned that the lesson learned from implementing the sewerage project is that community awareness and participation is needed before implementing sanitation projects (interview, government official).

There are lessons learned based on the experience of World Bank and JICA in providing assistance to sewerage development in Jakarta. The lessons learned became a consideration for donors to further assist the Government of Indonesia in developing sewer projects as a representative of the International Non-Government Organization (INGO) mentioned that *“It is not easy to convince our peers [within donor organization] to conduct sewer projects in Indonesia. Even though we have already assessed the feasibility of the project, colleagues from different countries will weigh-in on their perspectives and experiences in conducting sewer projects in their respective countries. Donors usually consider sewer projects as a high risk project”* (interview, non-government). Improper planning and design, difficulties in finding land for wastewater treatment plants, weak institutional capacity, and financial issues limit the expansion of sewer network in Jakarta. The absence of initiative from the central government and development aid projects delayed the improvement of human resources. The same INGO representative further explained that *“This lack of initiative slowed down the knowledge*

transfer from donors and central government to operators and to the local government. It also prevented capacity improvement of local consulting firms. Currently, it is difficult to find national consulting firm that are capable in doing sewerage project” (interview, non-government).

- **Increasing Block Tariff as a National Water Tariff Standard**

Another water development policy that came from donor’s suggestion is the use of Increasing Block Tariff (IBT) as a national water tariff standard. In January 1984, Minister of Home Affairs and Minister of Public Works issued a joint decree on National Water Rate Structure as a way to implement Integrated Urban Infrastructure Development Plan (IUIDP) in the water sector (Table 5).²² Following the policy of IUIDP to implement cost-recovery tariffs and a cross-subsidy policy, PAM Jaya changed its water tariff mechanism set in 1975 to a cross-subsidy tariff system in 1983 (Table 6).

Table 5. National Water Rate Structure Issued in 1984

Classification	Type of consumers	Monthly consumption range			
		0-10 m ³	11-20 m ³	21-30 m ³	Over 30m ³
IA	Public hydrants, public bath-house, public toilets	0.8A	0.8A	0.8A	0.8A
IB	Social-government clinic and hospitals, places of worship	0.8A	1.0A	1.5A	2.0A
IIA	Residential	1.0A	1.5A	2.0A	3.0A
IIB	Government	1.0A	1.5A	2.0A	3.0A
IIIA	Commercial-small	2.5A	2.5A	5.0A	5.0A
IIIB	Commercial-big	4.0A	4.0A	8.0A	8.0A
IVA	Industry-small	3.0A	3.0A	6.0A	6.0A
IVB	Industry-big	5.0A	5.0A	10.0A	10.0A
V	Special (ports)	15.0A	15.0A	15.0A	15.0A

* The base factor “A” refers to the selling price of water per m³ for residential consumers using 0-10 m³ per month.

Source: World Bank, 1985

²² Kepmendagri No. 4 Tahun 1984 tanggal 23 Januari 1984 atau Keputusan Bersama Mendagri and Menteri PU No.27/Kpts/1984 and Kepmendagri No. 5 Tahun 1984 tanggal 23 Januari 1984.

Table 6. PAM Jaya Water Tariff in 1975 and 1983

Category	Year	Water tariff based on consumption per month (Rp.)			
		0-15 m ³	16-30 m ³	31-50 m ³	> 50 m ³
Household	1975	25	50		
	1983	40	80	300	
Commercial (industry, shop, company, restaurant, bank, factory, hotel, etc)	1975	125			
	1983	100-600 (depends on the type of industry)			
Small businesses (at household level)	1975	50	100		
	1983	There is no category for small business in water tariff structure in 1983			
Non-commercial (government hospital, government office, school, barracks, private hospital, etc)	1975	40-60			
	1983	180-250 (depend on the type of non-commercial customers)			
Places of worship	1975	10	25		
	1983	50			
Orphanages and sport institutions	1975	25			
	1983	180			
Public hydrant/network and water truck	1975	60			
	1983	300 (this tariff only applies to water trucks as public hydrants were no longer indicated on tariff list)			
Tanjung Priok Harbour	1975	300			
	1983	1,250			
Municipality of Bogor	1975	25			
	1983	PAM Jaya no longer sell water to municipality of Bogor			

Before 1975, a flat tariff was applied (for household customers: Rp.200 per month)

1US\$ in 1975=Rp.415 and 1US\$ in 1983=Rp.970

Source: Martjin, 2005

The cross-subsidy through the implementation of IBT was chosen as a national water rate standard. This principle was adopted to achieve cost recovery and to generate revenue for local governments. Furthermore, it was thought IBT could extend the availability of water and reduce waste water (World Bank, 1985a). While the World Bank realized the IBT would provide limited realibility of production and consumption estimates, the tariff was still proposed as a national

standard for achieving cost recovery of PDAM. This rate structure had to be adopted by all regional water enterprises responsible for setting tariffs. Unfortunately, the IBT scheme served as a disincentive to connect poor households, as poorer communities would pay less while consume more, thus leading to financial losses for water supply operators. The imbalance in pay versus consumption would also establish barriers for the poor to benefit from the IBT scheme (Whittington, 1992; Boland and Whittington, 2000; Whittington, 2003; Fuente et. al., 2014).

- **Lack of Investment to Expand Distribution Network**

While investments in building water treatment plants substantially increased from 1966 (production capacity 3,000l/s) to 1990 (1,050l/s), a limited amount of money was invested in increasing household connections (see APPENDIX III for Water Supply and Sanitation Development in Jakarta during Old and New Order Era). Piped water coverage which covered 10% of the population in the 1970s, only slightly increased to 14% by 1990. While efficiency of low water distribution and non-revenue for water reached 50%, PAM Jaya was still financially profitable with an annual net surplus of about Rp.2billion (US\$3.2million) in 1981-1983 (World Bank, 1985b). PAM Jaya had shared between Rp.3-10billion (about US\$1.5-5million) of its revenue with Jakarta's government annually (ICW, 2000). Between 1990 and 1995, PAM Jaya's total profit distribution to the Jakarta government was Rp.30.6billion (about US\$15million) (Martijn, 2005) (see APPENDIX IV for the PAM Jaya Share to Jakarta government).

4.3 Niche Level

4.3.1 Enabling Factors for Water and Sanitation Development at Niche Level

The author did not find any important factors at niche level that contributed to the development of water and sanitation during the Soeharto era.

4.3.2 Constraining Factors for Water and Sanitation Development at Niche Level

- **Backlog of Sanitary Engineers and Paradigm Shift in Sanitary Engineering**

Educational System

During the Soeharto period, the Ministry of Public Works dominated the water supply and sanitary regime. Many of its employees were sanitary engineering graduates of ITB. During the 1960s and 1970s, one-third of ITB alumni were working at the Directorate of Sanitary Engineering. These engineers were the pioneers of water and sanitation development in Indonesia. The remaining of the graduates were working in local governments, the water supply enterprise, and at universities (KemenPUPR, 2015). During the 1970s and 1980s, water and sanitation development in Indonesia focused on providing centralized and decentralized water supply and wastewater systems. However, the material taught at ITB heavily focused on providing piped-water and sewer networks with limited practical knowledge on how to implement such systems in previously developed locations (interview, non-government). There was limited teaching material for ground water management, septic-tank and communal water or sanitation facility provisions. Impractical knowledge on centralized systems was taught until recent years (interview, non-government).

By 1980, Indonesia had only 50% of the sanitary engineers required to provide to achieve water and sanitation development targets based on the IDWSSD goals. There were only about 220 sanitary engineers including foreign graduates and civil engineers in the country with post graduate degrees in sanitary engineering. Most of these graduates occupied administrative positions in government offices and private companies. Consequently, few had practical knowledge of water and sanitation infrastructure development. These graduates also opted to work in the Ministry of Public Works rather than in the Ministry of Health, as job responsibilities

under the Ministry of Health were much less attractive than the former. The Ministry of Public Works, responsible for the technical aspects of water and sanitation offered higher pay and greater opportunities for career advancement than the Ministry of Health which was responsible for non-technical aspects (Ouano, 1980).

Beginning in 1984 there was a paradigm shift in the Department of Environmental Health Engineering in ITB, a technology-oriented university in Indonesia which focused on meeting industry demands and provided 80% of the country's water and sanitary engineers. From then on, the program not only offered specialization in water and sanitation engineering but also focused on industrial occupational subjects. The student's practical and in-depth knowledge on water and sanitation engineering gradually shifted toward environmental and occupational safety. After graduation, most students chose to work in the oil and gas industry, as it offered higher salaries (interview, government official). Although there were 47 Indonesian universities offering undergraduate degrees related to environmental or sanitary engineering in 2012, the number of students pursuing this degree every year was less than maximum capacity. Only approximately 25% of graduates went on to work in the sanitation sector as consultants or contractors (Ausaid, Bappenas, and WSP, 2012).

- **Lack of Public Health Practitioners**

The national development target for the urban water and sanitation sector from the time of Soekarno until the present day has only focused on technical aspects such as the development of water treatment plants, transmission and distribution networks and the provision of a communal sanitation system (see APPENDIX V for Theme of the Five Year Plans). These policies support the dominant role of engineers rather than public health experts in the

development of water and sanitation in Indonesia. As stated by one senior government official: *“Our policy is heavily oriented in increasing technical output [how much water and sanitation infrastructure has been built] rather than on public health outcome. This orientation occurred because it is the more popular choice for politicians and policy makers. Furthermore, we also have a much greater budget [national and local budget] for the Ministry of Public Works [to build infrastructure] than for the Ministry of Health [to focus on non-technical aspects]. All of these impacted the focus of the higher education market in Indonesia where people are more interested to become an engineer rather than a public health specialist. It is hard to find an engineer in Indonesia who understands and of non-technical aspect of water and sanitation development such as implementing behavioral changes in populations”* (interview, government official). The low demand for public health specialists has been affecting the achievement outcomes of water and sanitation development.

- **The Growth of Water Vending Industry**

While the central government and PAM Jaya increased water production capacity through the development large water treatment plants, the provision of public water hydrants also increased substantially. Public hydrants –particularly increased in North Jakarta where ground water is brackish, the majority of households are poor and there is no water supply pipeline (Susantono, 2001). By 1991, there were 1,874 public hydrants in Jakarta (Crane, 1994). These public hydrants allowed water vending market to grow, which provided water to about 8,000 water vendors and served approximately 21.7% of Jakarta’s population (Crane, 1994). Although the official piped water price was Rp.350 (US\$0.17) for each of the first 15m³ per month,

consumers of water vending often paid higher prices, at around Rp.1,000-Rp.4,000 per m³ (US\$0.48-1.9 per m³) (Crane, 1994).

To abolish the thriving informal vending market, the government announced a deregulation policy in mid-1990s which allowed all households with a metered connection to legally sell water to any party (Crane, 1994; Lovei and Whittington, 1993). Before this policy took effect, all water vendors had to have permits from PAM Jaya (Susantono, 2001). The deregulation policy was terminated after its 3-year trial period for institutional and technical reasons including the contradiction between PAM Jaya regulations on the deregulation policy and the Jakarta Provincial Government No.6/1988 which did not allow households to resell water to other users (Lukito, 1994). Table 7 illustrates the price of vended water in Jakarta from 1952 to 2014. The table shows that there is no significant improvement in water supply provision in Jakarta where households particularly the poor still buy vended water as their drinking water source.

Table 7. Water Price of Vended Water (constant price based on 2000)

Year	Price Paid by Distributing Vendor to Operators (Rp. per m ³)	Price Paid by Household to Distributing Vendors (Rp. per m ³)	
1952 ^{*)}	4.15-312.5 (US\$0.02-1.56)	16.5-1,000 (US\$0.08-5)	Vendor bought water at price per 20 L (jerrican)
1973	228.9-457.7 (US\$0.55-1.1)	457.7-10,070.1 (US\$1.1-24.26)	40% of HHs used vended water as their primary drinking water source. About 10% of HHs income was used for buying drinking water.
1988 ¹⁾	2,527.4-3159.3 (US\$1.52-1.90)	12,637.0-22,114.8 (US\$7.61-13.32)	32% of HHs used vended water as their primary drinking water source.
1991	152.5-889.3 (US\$0.08-0.46)	2541.0-10,163.7 (US\$1.30-5.20)	27% of HHs used vended water as their primary drinking water source.
1994	US\$0.53	US\$2.5	32% of HHs used vended water as their primary drinking water source.
2007 ²⁾	984.2-13,123.3 (US\$0.06-0.08)	23,434.5-117,172.6 (US\$0.57-3.57)	49% of HHs used bottled and refilled water (including vended water). Low income HHs spend about 10%-14% of income on drinking water.
2014 ²⁾	2,017.7-26,902.8 (US\$0.17-2.26)	48,040.8-240,203.8 (US\$4.04-20.22)	71% of HHs used bottled and refilled water (including vended water)

*) Price in 1952 is in real price.

* Price paid by distributing vendors depends on where the vendors buy the water (public hydrant, water tanker, small domestic business or individual house connections). Price paid by household to distributing vendors depends on the distance to transport water from sources where vendors buy the water from households.

Vendors bought water from individual households at price of Rp.150 (US\$0.09) per m³ (before deregulation policy effective in 1990)

The tariff of PAM Jaya for public hydrant is Rp.1,050 (US\$0.11, kurs in 2007) and for kiosk or small domestic business is Rp.5,000 (US\$0.55, kurs in 2007) per 0.36 m². Households buy vended water from water vendors that bought water from public hydrant, kiosk, or small domestic HHs.

Source: author, with information drawn from multiple sources

• The Rise of Bottled and Refilled Water

Because the Government of Indonesia did not invest much in the expansion of water distribution networks and because piped-water is not potable, the bottled water industry filled the

gap to address the demand for drinking water. In 1973, PT Aqua Golden Mississippi, the leading bottled water companies in Indonesia was established (Kurniati, 2007).²³ In parallel to the growing number of bottled water companies, the existence of public hydrant and water terminals created a business opportunity for the water vending industry particularly in the northern and western parts of Jakarta where groundwater is brackish (Susantono, 2001).

In 1995, entrepreneurs started to run informal water businesses that offered similar services to bottled water at cheaper prices (Darandono, 2003 as cited in Prabaharyaka, 2014). This refilled water industry created business models different from the bottled water industry where they relied on small-scale water depots that treated raw water on site (Darmawan, 2009). As the bottled and refilled water industries continued to grow, they eventually became different regimes in the country's water supply industry managed by the Ministry of Industry (see APPENDIX VI for The Growth of Bottled Water Industry and Growth of Refilled Water in Indonesia).

Due to the increased use of bottled and refilled water, the proportion of households in Jakarta who boiled their drinking water decreased from 85% in 2007 to 46% in 2010 (Depkes, 2017, 2010). To this day, the government cannot stop the use of bottled and refilled water, especially considering that the piped-water supply cannot consistently deliver potable water. Furthermore, the regulation of bottled and refilled water is managed by the Ministry of Industry which is a different regime that of the piped-water supply (interview, government official).

²³ Tirto Utomo is a former journalist and head of the legal department in Pertamina (the state-owned national oil company of Indonesia). He is responsible for building partnership with foreign investor. Utomo almost failed in sealing contract with an investor from the United States as the wife of the investor experienced diarrhea after drinking piped water in Indonesia. Utomo also noticed that a colleague of him from Japan always brought bottled water with him, as he is afraid to drink the unhygienic piped-water in Indonesia. The poor quality drinking water in Indonesia encouraged Utomo to develop the company PT Aqua Golden Mississippi (Kurniati, 2007).

- **The Increase of Groundwater Extraction**

In addition to the growing consumption of bottled and refilled water, the amount of groundwater extracted in Jakarta had also increased alarmingly (Figure 3). Although President Soeharto favored industry development in the city, an inadequate piped water supply led to the over-utilization of groundwater resources through excessive pumping. In 1995, more than 70% of industries in Jakarta used ground water (Colbran, 2009). The Ministry of Public Works was unable to control the extraction of ground water, as its regulation was the responsibility of the Ministry of Energy and Mineral Resources. Furthermore, representatives from both central and local government stated that local governments issued permits allowing groundwater extraction as a source of local revenue (interview, government official).

4.4 Summary of Water and Sanitation Development during 1966-1998

Piped-water did not increase substantially during the New Order Era. In the late 1990s, the number of individual water connections only covered approximately 29% of the total population of Jakarta. Seventy percent of the Jakarta's population still relied on groundwater as their primary drinking water source with total groundwater consumption reaching 11.6m³/s (Susantono, 2001). Fewer than 3% of Jakarta's households used bottled and refilled water. These households were mainly affluent households and expatriates because the price of a bottled water could be more than 100 times that of piped water (Sidharta, 2007). More than 50% of households relied on hydrants with vending prices five times higher than the price of piped water for poor households (Adzan, 2001).

By 1990, there were only 965 sewer connections that served below 1% of Jakarta's population. That same year JICA gave another technical assistance to PDPAL Jaya to develop a

new master plan for waste water and drainage in Jakarta (JICA, 1991)²⁴. However, during loan negotiation in 1994/1995, the Minister of Public Works cancelled the proposed project because only 5% of the total implementation budget was to be used to fund Indonesian manpower. A representative from non-government mentioned that the 5% of total budget would only cover the payment for adriver, office boy, and surveyor (interview, non-government).

During the era of President Soeharto, factors that supported the development of water supply and sanitation in Jakarta were: (i) the Government of Indonesia policy on low cost technology to provide water and sanitation access to the poor; (ii) the enactment of Law No.11/1974; and (iii) the separation of regulator and operator function of water supply in Jakarta. Factors that hampered water supply development in Jakarta were: (i) the backlog of sanitary engineers and paradigm shift in the sanitary engineering educational system; (ii) lack of public health practitioners; (iii) lack of public health approach in water and sanitation provision; (iv) reliance on donor's assistance to develop water and sanitation; (v) increasing block tariff as a national water tariff standard; (vi) lack of investment to expand distribution networks; (vii) the growth of water vendors; (viii) the rise of bottled and refilled water; and (ix) the increase of groundwater extraction. Table 8 summarizes the water supply and sanitation policy adopted from 1966-1998 and its output indicators.

²⁴ The plan divided Jakarta into 9 zones of multiple small scale on-land treatment system which would be integrated into 3 central sewerage zones, one in each of the western, central, and eastern parts of Jakarta, with a total capacity of 1,348,000m³/day. The master plan continued with the preparation of preliminary detail design of the wastewater treatment plant in Pluit serving the central part of Jakarta (JICA, 1990).

Table 8. Summary of Water and Sanitation Development during 1966-1998

Landscape Level	Regime Level		Niche Level		Water Supply Coverage in 1998	Sanitation Coverage in 1998
<p>Political: authoritarian rule Economic: economy grew rapidly by an average of 5-7% social and health: health and social sectors were improved International policy on water and sanitation development: The Mar Del Plata Action Plan and the International Drinking Water Supply and Sanitation Decade (IDWSSD)</p>	Enabling factors for water and sanitation development	Constraining factors for water and sanitation development	Enabling factors for water and sanitation development	Constraining factors for water and sanitation development	<p>Piped-water: In 1975: (i) 10% of households had piped-water connections (ii) Water tariff: Rp.25 per m³ or US\$0.05 per m³) with no differentiation in the socio-economic status of HHs In 1998: (i) 31% of households had piped water connections in 1998; (ii) Average water tariff was Rp.682 per m³ (US\$0.4 per m³) in 1990 and Rp.1,491 per m³ (US\$0.6 per m³)</p>	<p>Off-site coverage: increase from 0.01% in 1983 to 0.05% in 1998.) On-site coverage: increase from 30% in 1970 to 57% in 1998</p>
	<p>Development policy on low cost technology to provide water and sanitation access to the poor The enactment of Law No.11/1974 on Irrigation The separation of regulator and operator function for water supply operator</p>	<p>Lack of public health approach in water and sanitation provision Reliance on donors' assistance to develop water and sanitation infrastructure Increasing block tariff as a national water tariff standard Lack of investment to expand distribution networks</p>		<p>Backlog of sanitary engineers and paradigm shift in sanitary engineering educational system Lack of public health practitioners Growth of water vending industry Rise of bottled and refilled water Increase in groundwater extraction</p>		

CHAPTER 5 : CASE STUDY: THE DYNAMIC OF WATER AND SANITATION DEVELOPMENT IN JAKARTA FROM 1998 TO 2015

5.1 Landscape Level

5.1.1 Political Condition

An important landscape development was the collapse of the centralization era when President Soeharto resigned on May 21, 1998. New constitutions on decentralization i.e. Law No.22/1999 and Law No.25/1999 were enacted and marked the rise of decentralization or the Reform Era.²⁵ One of the immediate impacts of the Reform Era was the change in important political decisions making which started being made at the legislative level. Another immediate impact was an increased demand for freedom of expression and speech. Popular issues for reform were brought and generated primarily by the media combined with demand from communities (Jones, 2012).

Governance performance also improved during the Reform Era. From 1996 to 2014, all governance performance indicators had increased except for the regulatory quality indicator (World Bank, n.d.).²⁶ The effort to eradicate corruption has grown since the Corruption Eradication Commission (KPK) was established in 2002. The Corruption Perception Index (CPI) increased from 32 in 2012 to 36 in 2015 (Transparency International, 2015) (Figure 9). Corruption is still found in the public and private sector and at every tier of governmental

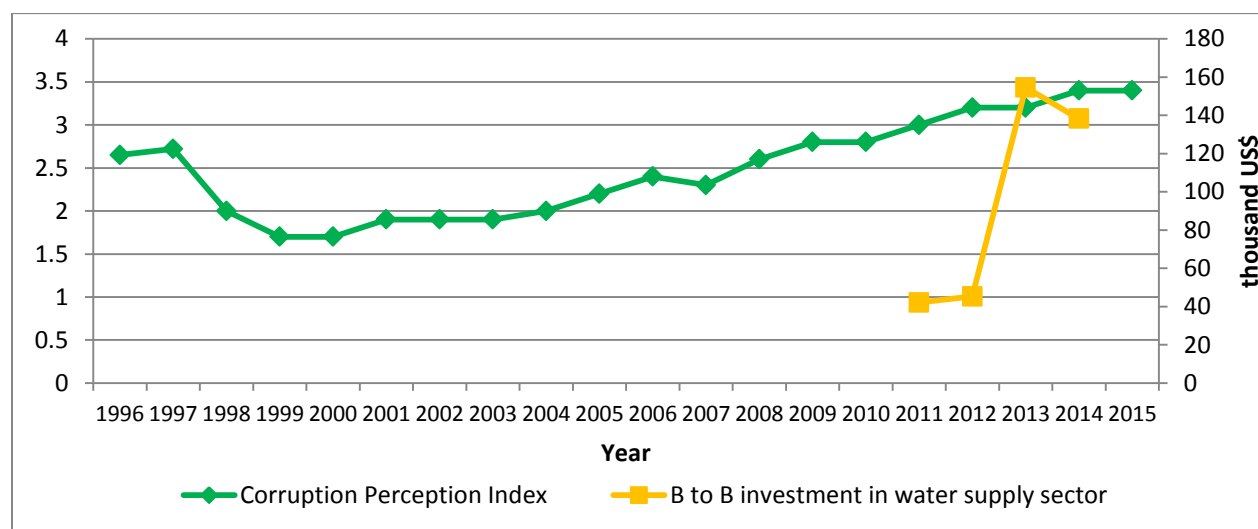
²⁵ Law No.22/1999 on Local Administration and Law No.25/1999 on Balanced Fiscal between Central and Local Government

²⁶ Voice and accountability rises from 23.6% to 53.2%, political stability increases from 13% to 31.1%, government effectiveness increases from 37.1% to 54.8%, and rule of law increases from 39.7% to 41.8%. However, regulatory quality indicator decreases from 57.4% in 1996 to 49% in 2014 (World Bank, 2014).

authority (KPK, 2004, 2015). Unfortunately, the improvement in the governance system did not bring many changes in water and sanitation development.

There has been no substantial improvement in private water sector investment in recent years (Figure 9). In addition to endemic corruption, regulatory risks, legal uncertainties from unclear or conflicting laws and delayed regulation and law changes, a corrupt judicial system was also identified as a risk and challenge in doing business in Indonesia (KPMG, 2015). These conditions also hamper investment in the water sector particularly from the private sector where it takes several years for private companies to prepare the criteria for implementing water business in Indonesia. To date, there have been only nine private investors involved in water supply PPP in Indonesia (BPPSPAM, 2016).

Figure 9. Corruption Perception Index in Indonesia (1996-2015) and B to B Investment in Water Supply Sector (2011-2014)



Source: Transparency International, 2015 and BPPSPAM, 2016

Administrative power to manage water and sanitation service was changed after the implementation of decentralization. In the decentralization era, the central government does not

have direct control over water and sanitation provision. After reform began in 1998, water and sanitation were among the responsibilities transferred from the central to the local government.²⁷ According to law and regulations, the central government was excluded from implementing water supply and sanitation projects, except for regional or national strategic water and sanitation infrastructure projects. However, in practice, the central governments still plays a major role in planning, executing, and financing water supply and sanitation projects. Almost 80% of total urban water and sanitation expenditure comes from the central government budget, with – much of it coming through Ministry of Public Works (Presidential Regulation No.7/2005; No.5/2010, and No.2/2015). The central government still invests more than local governments by constructing and rehabilitating water supply and sanitation infrastructure in urban and rural areas. However, in the city of Jakarta this is not the case, it has the highest fiscal capacity in Indonesia. Its GDP is about 17% of Indonesia's GDP.

5.1.2 Economic Condition

Economic growth has been maintained between 5% to 6% annually from 2004 to the present. At the beginning of Reform Era, the Indonesian economy was hit by a crisis and its full impact was felt in 1998. Inflation rose to more than 80% (Thee, 2012). This deep “twin crises” that occurred both economics and politics from 1997-1998 was a watershed period in Indonesia history (Basri and Hill, 2011). After the crisis, political instability continued until 2003. Political normalization took root in 2004 when President Susilo Bambang Yudhoyono became the sixth President of Indonesia. Since then the macroeconomic condition has generally been stable. In

²⁷ Law No.32/2004 on Regional Governance, Law No.33/2004 on Fiscal Balance and Government Regulation (PP) No.38/2007 on Specific Allocation Function between Central, Provincial, and Local Government, and PP No.19/2007 on The Role of Provincial Government are the current regulations that specify the responsibility for investment in municipal infrastructure and provision of basic services has been transferred to local governments.

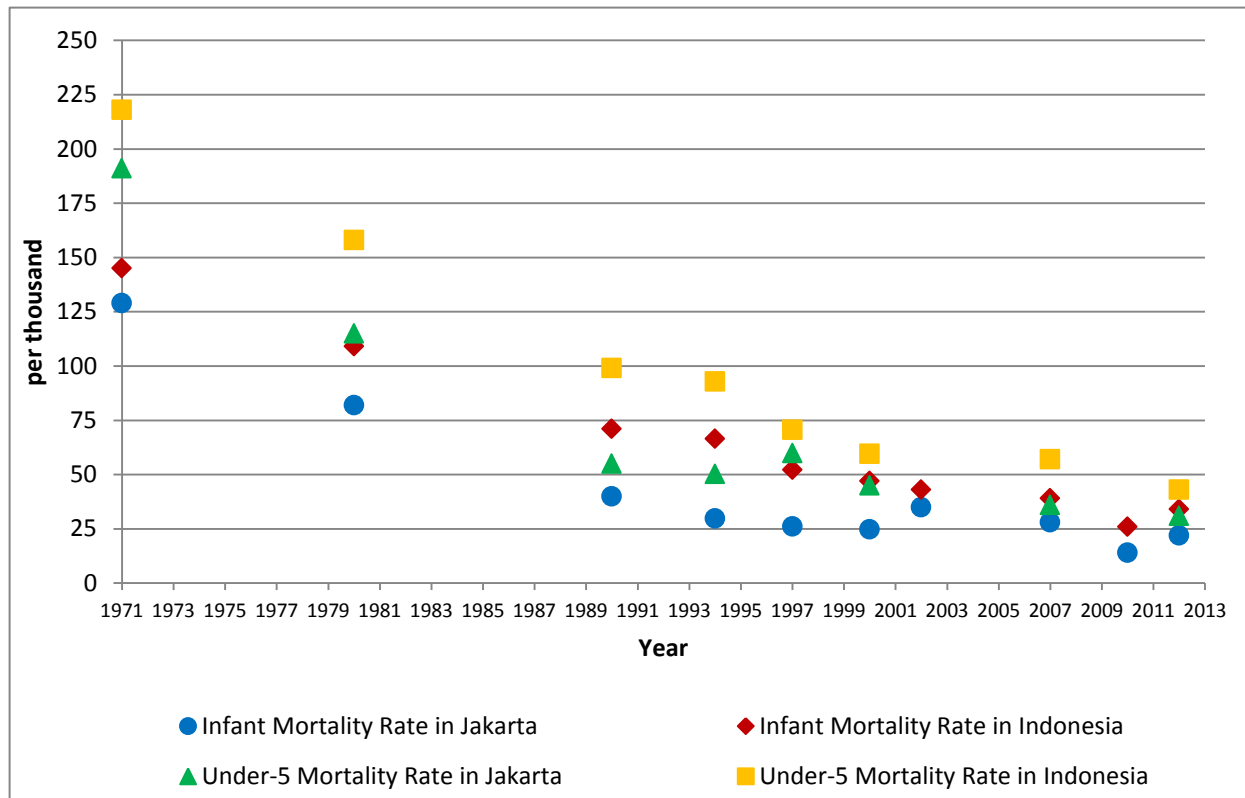
2009, Indonesia was the third fastest-growing economy in the G-20 group, behind only China and India (Basri and Hill, 2011).²⁸

5.1.3 Social and Health Condition

While decentralization provides faster response and more appropriate policies, there were some disadvantages for social and health development. In the centralization era, central government provided 80% of the total public budget on health (Thabrany, 2008). The central government health expenditure in the decentralization era has been stagnant at levels below US\$4-6 per capita per year, with health services standards dependent on the amount of money allocated by local governments (Bappenas, 2016; Thabrany, 2008). Furthermore, inadequate infrastructure remains a major impediment to poverty reduction in Indonesia where infrastructure investment fell from an average of US\$400 million in the 1990s to under US\$45million in 2005. Another way to look at the changes in investment is that infrastructure investment was about 5-6% of GDP before 1997, 1-2% in 2000 and 3.4% in the mid-2000s (Ehrhardt et al., n.d.).

²⁸ G-20 is an informal international forum for the governments and central bank governors from 20 major economies in the world (19 countries and the European Union).

Figure 10. Infant and Under-5 Mortality Rate in Indonesia and Jakarta (1970-2012)



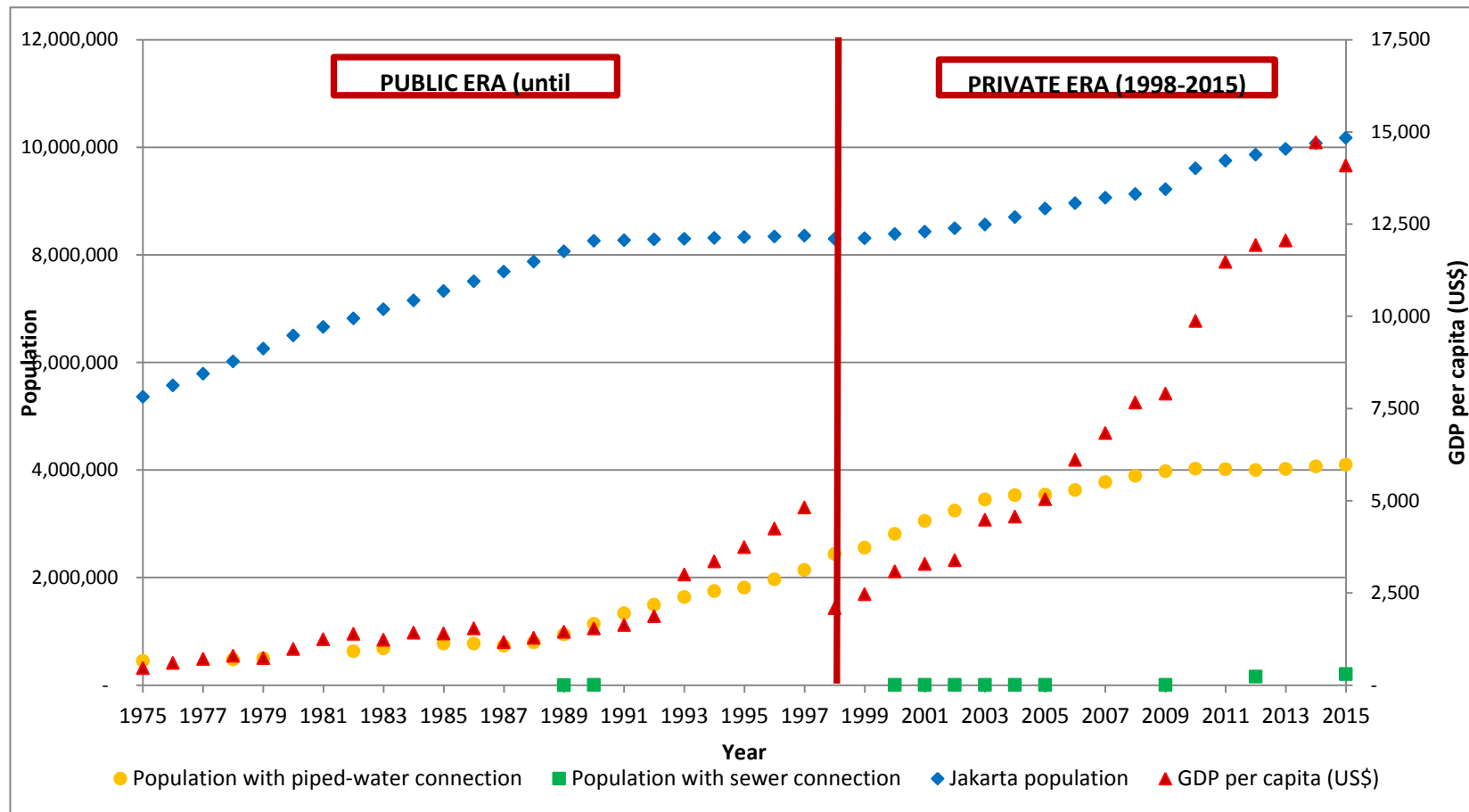
Source: BPS, 2015

Health status has been slowly improving since the late-1990s (Figure 10). Life expectancy rose slightly from 67.8 years in 2000 to 70.1 years in 2015 (BPS, 2015b). Between 2000 and 2012, infant mortality rate decreases from 47 per 1,000 to 34 per 1,000, with the under-5 years old mortality rate falling from 60 per 1,000 to 43 per 1,000 (BPS, 2015a). In terms of social development, poverty incidence declined from 24% in 1998 to 11% in 2014 ((Aulia, F., personal communication, September 4, 2015).

5.2 Regime Level

The growth of piped-water and sewer in Jakarta cannot keep up with the population growth per capita income (Figure 11). The number of piped-water connections increased from approximately 560,000 in 2000 to 820,000 in 2015 (piped-water coverage increase from 34% in 2000 to 40% in 2015) while the number of sewer networks increased slightly from 954 to 1,852 during the same period (sewer coverage increase from 0.05% in 2000 to 2% in 2015). By 2015 about 40% of Jakarta's population (or approximately 4.1 million people) has a piped-water connection but less than 2% are connected to sewers (or approximately 0.21 million people). However, in terms of households with improved access to water and sanitation, the numbers are much higher in recent times. In 2014, approximately 93.7% households have access to an improved water source and there were 88.5% households with access to improved sanitation facilities (BPS Jakarta, 2015) (Figure 12 and Figure 13).

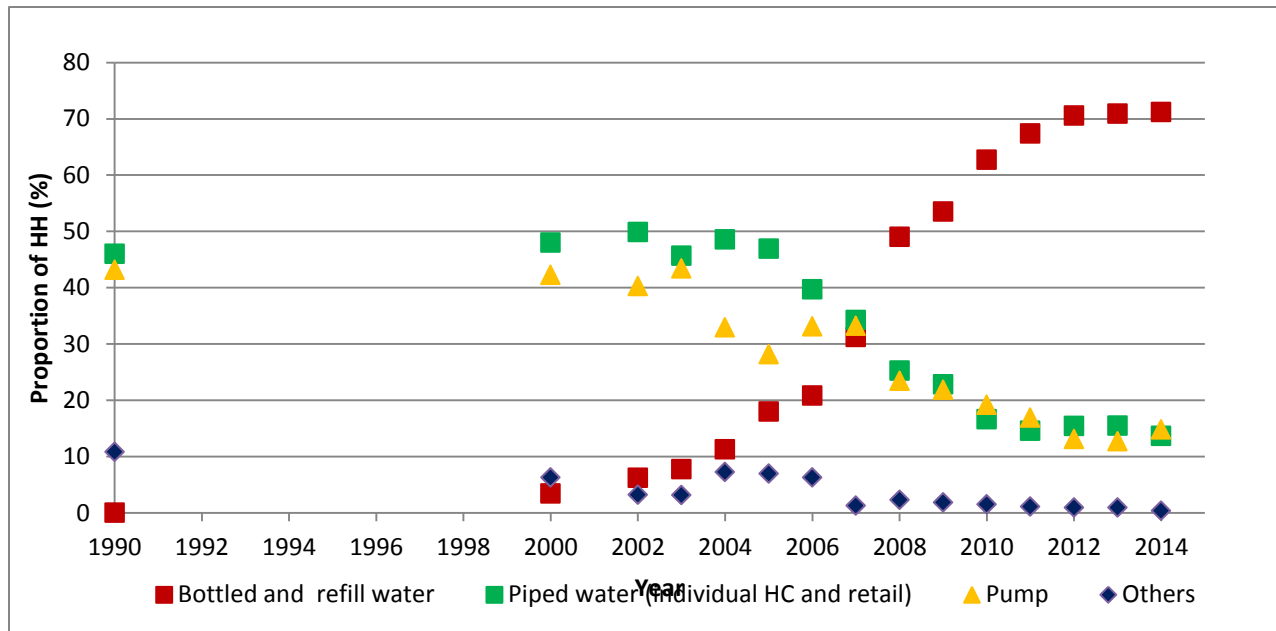
Figure 11. Jakarta Real GDP per Capita, Population of Jakarta, Population with Piped-Water Connection, and Population with Sewer Connection (1975-2015)



There is an Asian economic crisis in 1998.

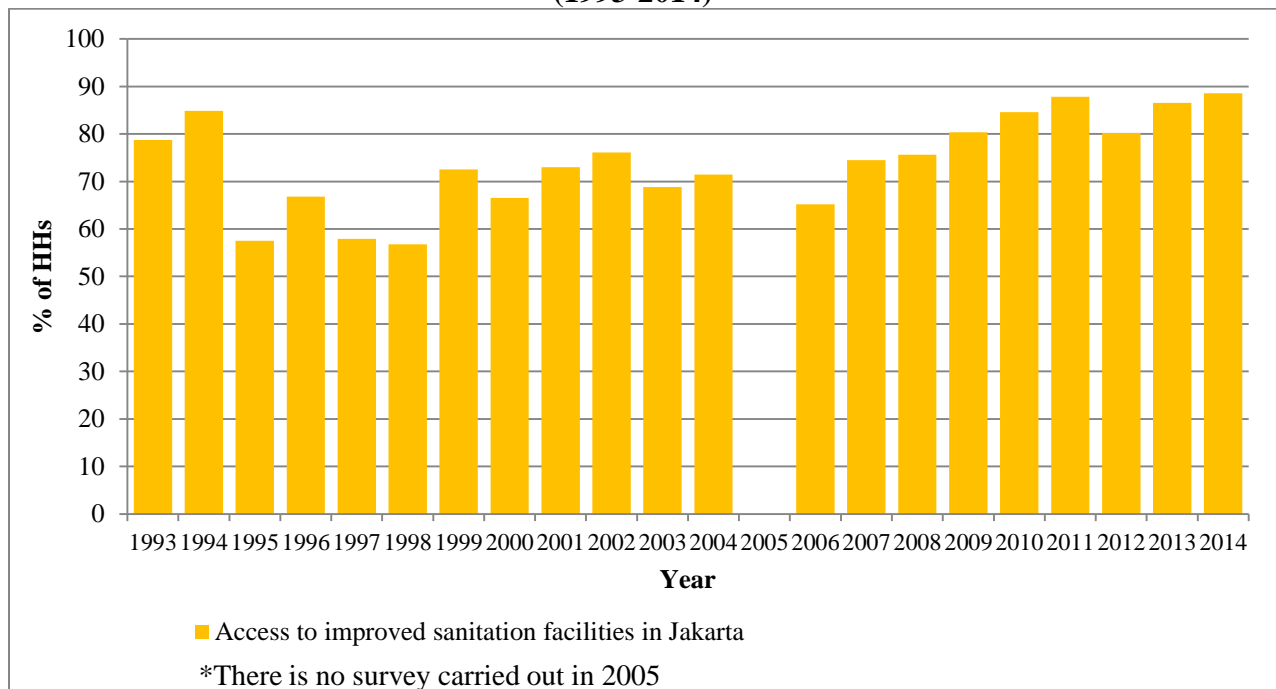
Source: author, with information drawn from multiple sources

Figure 12. Proportion of Jakarta's Households with Access to Main Drinking Water Source (1990-2014)



Source: BPS Jakarta, 2000- 2015

Figure 13. Proportion of Jakarta's Households with Access to Basic Sanitation Facilities (1993-2014)



Source: BPS Jakarta, 2000-2015

Perhaps due to poor water and sanitation conditions, there has been an increase in households buying bottled and refilled drinking water. The number of households who buy their drinking water sources (bottled and refill water) increased from 3.4% in 2000 to 71.2% in 2014. Additionally, 60% of total domestic water consumption per year was provided by shallow ground water (BPS Jakarta, 2015; Local Government Regulation No.1, 2008). Poorer households bore the brunt burden by paying much higher prices to buy drinking water. Low income households in Jakarta used multiple water sources with average expenses about Rp.182,000 (US\$18.7) per household (HH) per month (Mungkasa, 2006).²⁹ Water expense accounts for about 6.6% of the average poor household income (Rp.79,000 or US\$8.2). In developed countries, water costs are considered expensive if they exceed 3% of the average HH income (Water Academy, 2004 as cited in Mungkasa, 2006). Table 9 summarizes the trend of water expenses of household in Jakarta.

²⁹ The detail of expenses per HH per month is Rp.68,620 (US\$7) to buy bottled and/or refilled water; Rp.86,419 (US\$8.9) to pay piped-water; Rp.21,766 (US\$2.2) to buy vended water; and Rp.5,266 (US\$0.5) to fetch water from neighbor (Mungkasa, 2006).

Table 9. Water Expenses by Income Group, as a Proportion of Income

Income group	Water Expenses as Percentage of Income (%)			
	1975 ¹⁾	1994 ²⁾	2008 ³⁾	2011 ⁴⁾
Low	3-5	9.8	5-14	5.0
Middle		4.8	2-5	4.7
High		4.2	1	5.4

Average income group in 1975: Rp.66,400 (US\$160) per month

Income group in 1994: Low income: Rp.250.000 (US\$119) per month; Middle income: Rp.450.000 (US\$214) per month; and High income: Rp.800,000 (US\$380) per month

Income group in 2008: Low income: <Rp.1.5million (US\$160) per month; Middle income: Rp.1.5million-Rp.6million (US\$160-645) per month, and High income: > Rp.6million (US\$645) per month

Income group in 2011: Low income: < Rp.1.7million (US\$180) per month; Middle income: Rp.1.7million-Rp.2.8million (US\$180-298) per month, and High income: >Rp.5.5million (US\$579) per month

Source: ¹⁾ Martijn, 2005; ²⁾ Cestti, et al., 1994 as cited in Adzan, 2001, ³⁾ Kooy, 2008, ⁴⁾ author with the information drawn from PAM Jaya. However, the data only for Aetra customers (households live in eastern part of Jakarta).

About 92% of households in Jakarta had private toilets by 2009 (JICA, 2009). The number of pit latrines is estimated to have increased from about approximately 1.6 million (Miller, 2006 as cited in Putri, 2014) to about 2.17 million pits. However, only 30% of these pits had been emptied in the last 5 years and only 14% of total fecal sludge had been safely disposed (WSP, n.d.). It is estimated that about 1.3 million people in Jakarta are still practicing open defecation (Pokja Sanitasi DKI Jakarta, 2012). Due to poor sanitation, a reported 90% of shallow ground water sources has been polluted by E. Coli (Soegijoko, 1995; BPLHD, 2013) and 13 rivers in Jakarta monitored by BPLHD have been contaminated by E.Coli (Steinberg, 2007) (see APPENDIX VII for Water Quality of River and Groundwater in Jakarta). Contamination affects the urban poor more than affluent households by causing a higher incidence of diarrhea illnesses (Agtini et. al., 2005; Alberini et. al., 1996).

Sewer coverage in Jakarta has been stagnant, covering less than 2% of the population (Figure 11). The number of sewer connections only increased from 954 house connections (HCs) to 1,852 HCs from 2000-2015. Jakarta has the lowest number of connections compared to other big cities in Indonesia such as Bandung (99,454 HCs), Medan (14,872 HCs), Yogyakarta (14,329 HCs), Surakarta (12,620 HCs), and Banjarmasin (5,242 HCs) (Direktorat Air Limbah, personal communication, November 3, 2015). During this period of sewer stagnancy, PDPAL Jaya ran its business successfully although its performance cannot be compared with other cities, because it serves many high rise buildings in the business district of Jakarta where 15% of PDPAL Jaya customers are industrial and commercial (USAID, 2006). PDPAL Jaya also applies a cross-subsidy tariff mechanism (see APPENDIX VIII for Service Tariff and Connection Fee in PDPAL Jaya). PDPAL Jaya has achieved an operation and maintenance cost recovery tariff (133%) , which is the highest operation and maintenance cost recovery compared to other cities (Bandung, Medan, Yogyakarta, Surakarta, and Banjarmasin). However, PDPAL Jaya's collection efficiency is only between 60%-80%, (USAID, 2006).³⁰

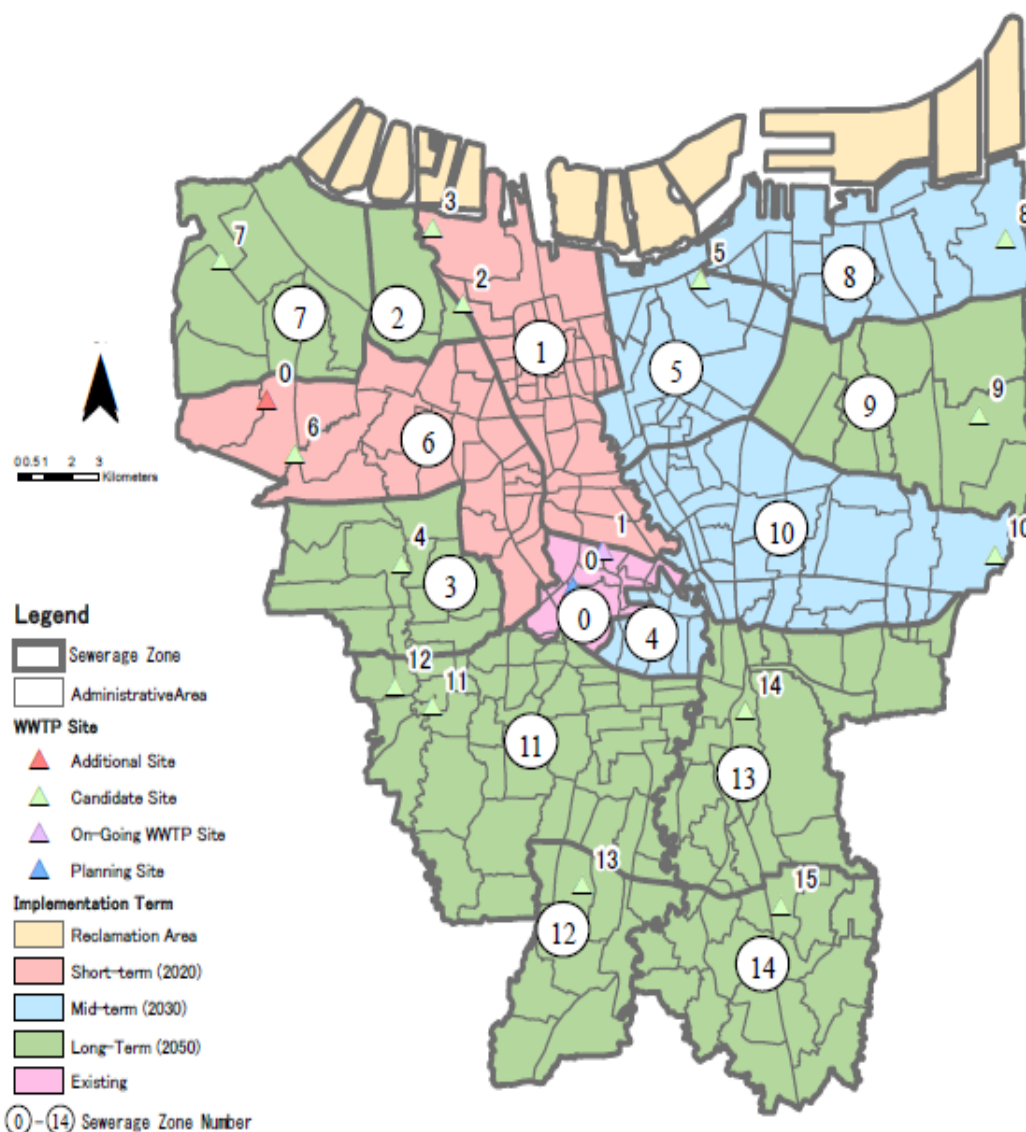
One of the contributing factors of slow progress of sewer expansion in Jakarta is due to the lack of investment. The last master plan for wastewater development in Jakarta for the period of 1991-2010 was finalized in 1991 with assistance from JICA. However, no projects were implemented by the central government and/or donors to improve sewer connections from 1991 until 2011 as stated in the master plan. The newest master plan for 2012-2050 was created in 2011 through a grant from JICA. The goal of sewer development in the master plan from 2012-2050 is to achieve 20% coverage by 2020 and 80% by 2050 (JICA, 2012). Department of Public Works and JICA has presented the new master plan to Governor of Jakarta and Jakarta's

³⁰ The efficiency for a household's bill collections is 60% while for high rise buildings it is 80% (USAID, 2006).

legislature. However, the Governor and the legislature stated that there is another foreign investor who is willing to invest their money through PPP. Regarding Jakarta's government response to the new master plan, one national government official stated: "We [the Ministry of Public Works] were very upset about their comments [the Governor and legislature]. We planned to cover half of the funding through a central government loan, however they [the Governor and legislature] thought the investment was expensive and there was a better opportunity through PPP where the local government did not have to invest their money" (interview, government official).

Another contributing factor to the slow progress of sewer development in Jakarta is related to the lack of transparency of donor data and information sharing with stakeholders. A representative from Sanitation Partners Group (SPG) in Indonesia mentioned: "*We cannot access the master plan, we aimed at helping them [JICA] by providing funding and technical assistance to the government. [To achieve 20% sewer coverage by 2020], the plan would need a huge amount of money and we are willing to help, however, it seems the master plan can only be accessed by the government*" [interview, non-government]. Currently, the central government, the Jakarta government, and JICA are preparing to develop a waste water treatment plant for zone 1 (as planned in master plan to improve sewerage coverage by up to 23% in 2020) with a total investment of US\$17.5million (Mardikanto, A., personal communication, January 5, 2016).

Figure 14. Sewerage Zones for Each Target Development Year



Source: JICA, 2012

5.2.1 Enabling Factors for Water and Sanitation Development at Regime Level

- **The Substitution of Law No.11/1974 with Law No.4/2004**

An important achievement in the water sector in Reform era was the substitution of Law No.11/1974 with Law No.4/2004 on Water Resources which marked the water resources management reform. This law introduced a more integrated and comprehensive policy

framework in managing water , and was prepared by the government with the assistance from the World Bank. In the previous Law (Law No.11/1974), water resource management was heavily controlled by the government and water use was not distributed equally among sectors. The Law No.4/2004 is the only national law pertaining to wastewater policy. The concept of water as an economic good was introduced.³¹ The law is in line with the spirit of decentralization and also acknowledges the participation of community and private sectors in water resources management. Despite this achievement, the law was overruled by Indonesia's Constitutional Court in February 2015, as it was deemed that the law allowed the private sector to monopolize water resources. The Court has reinstated the previous regulation, Law No.11/1974 as the controlling legislation until a new law is adopted.

5.2.2 Constraining Factors for Water and Sanitation Development at Regime Level

- Lack of National and Local Government Attention to Water and Sanitation Provision in Jakarta

The water and sanitation regime at the central level has been dominated by the Ministry of Public Works (currently Ministry of Public Works and Public Housing) with the National Development Planning Agency (Bappenas), Ministry of Health, and Ministry of Home Affairs being responsible for preparing non-technical aspects such as advocacy, promotion for sanitation and hygiene and capacity of local government development (see APPENDIX II). Although more than half of Indonesia's urban population (55%) continued to depend on non-piped water systems, the attention of most actors at the national level in the water supply regime shifted towards the provision of individual piped water connections. With respect to sanitation, the

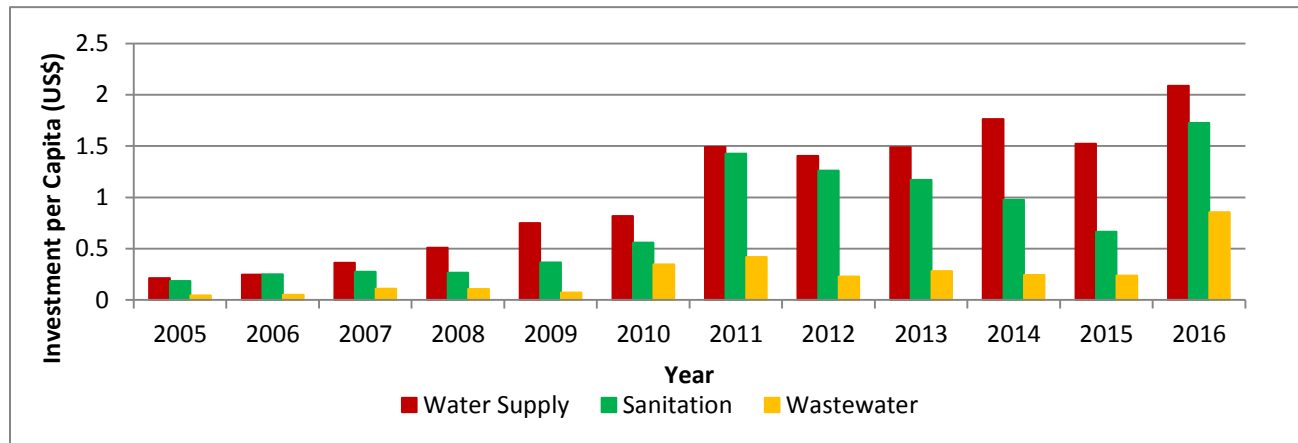
³¹ The law is further complemented with PP No.16/2005 on Water Supply Provision.

majority of urban households in Indonesia in 2013 still used septic tanks with over 60% of the urban populations having flush toilets discharging to septic tanks (World Bank and Ausaid, 2013). Only 1% of the urban population had access to sewer and only 4% had access to safe sewage collection and disposal (World Bank and Ausaid, 2013). The attention of most actors in the sanitation sector was on the provision of Decentralized Wastewater Treatment (DEWATS) or communal sanitation facilities.

The Government of Indonesia increased its national-level interest in water and sanitation in 2000 along with the government's commitment to the Millennium Development Goals (MDGs). The increased interest had a considerable impact on refocusing public investment on water and sanitation provision once they began lagging behind. Figure 15 shows that there has been increased investment per capita for water and sanitation since 2005. While an improvement, this investment is still small compared to the magnitude of water and sanitation problems in Indonesia. The estimated investment to achieve 100% urban water supply access is US\$11.7 billion per year (based on the projection in 2012) and to achieve 100% urban sanitation access is US\$11.2billion (based on the projection in 2015) (World Bank, Ministry of Public Works, and Water Partnership Program, 2012; Bappenas, 2014).

Figure 15. Water Supply and Sanitation (Wastewater, Solidwaste, and Drainage)

Investment per Capita from Central Budget (2005-2016)



Source: Presidential Regulation No.7/2005; No.5/2010, and No.2/2015

The central government also started to prioritize the development of sanitation. The central government realized sanitation had been long regarded as a private business and had been a lower priority than water supply development. The central government became more aware of sanitation after the Water and Sanitation Program (WSP). The World Bank conducted a study to measure local government awareness on sanitation in 2005 and after a study by WSP on Economic of Sanitation Initiatives in 2008. The result of the 2005 study showed that local governments could identify the general impact of sanitation but that they had limited knowledge and awareness of the benefits from better sanitation and hygiene (Akademika, 2006). The economic impact due to poor sanitation as shown by the WSP study in 2008 promoted greater attention to sanitation issues from the central and local government.

Jakarta already had a water supply operator (PAM Jaya) and a wastewater supply operator (PDPAL Jaya). The water regime in Jakarta was dominated by PAM Jaya and its private partners and the sewer regime was dominated by PDPAL Jaya. Central government shifted its attention to other cities and districts of Indonesia due to the high fiscal capacity of Jakarta. The

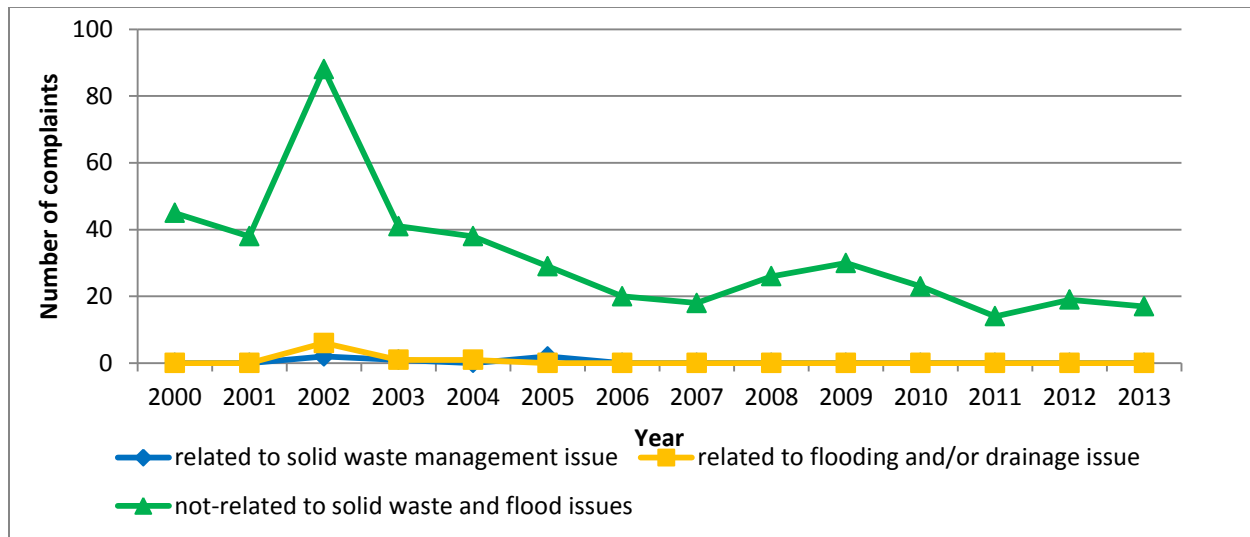
central government diverted its attention from Jakarta because other big cities in Indonesia such as Medan and Surabaya also faced similar urban problems (high population growth, poor raw water quality, etc) and had proven that they could solve their water and sanitation problems without heavy reliance on central government initiatives (interview, government official).

The Government of Jakarta did not pay much attention to water and sanitation because the regulatory function for water supply and sanitation development was only managed by the Section Head or by a lower working unit under the Jakarta Public Work Agency. The unit was dissolved in 2008 based on Regional Regulation No.10/2008 on Regional Organization. From 2008 water and sanitation provision in Jakarta had been managed under BPLHD (Jakarta Environmental Management Agency). However, this agency had also heavily focused their attention on regulating groundwater extraction particularly after the Government of Indonesia issued Government Regulation No.43/2008 on Groundwater. The BPLHD had also been increased their attention on groundwater particularly on deep well extraction as a source of revenue for the local government.

The responsibility of managing sanitation facilities was transferred from the Public Work Agency to BPLH when the Jakarta Public Work Agency was abolished in 2008. However, because BPLHD is essentially a regulatory department, it did not have the ability to construct and manage sanitation facilities (JICA, 2012). The result was that allocating budget funds to water supply and sanitation in Jakarta was a low priority. PAM Jaya and PDPAL Jaya were treated like other public corporations run on a self-paying basis and did not get money from Jakarta's budget. Jakarta paid more attention and allocated much more funds to managing flood control and traffic and transportation construction. It is possible that the city government's prioritization of drainage and transportation sectors aligned with household's preferences when

communities paid more attention to flooding and traffic jam issues (Figure 16). The working unit for water and sanitation was reactivated in 2014 under the Water Management Agency. The agency is currently adjusting and preparing activities to improve water resources in Jakarta for the water and sanitation sector.

Figure 16. Community Complaints Reported to the Legislature of Jakarta (2000-2013)



Source: BPS Jakarta, 2000-2013

- **Lack of Public Awareness on Water and Sanitation Issue**

In concordance with a lack of attention from local governments, the public also recognized sanitation as a private rather public responsibility. This is why in general, households self-service their toilets and septic tanks and are generally unwilling to connect or to pay for wastewater services which could have a bigger impact on the whole community (World Bank and Ausaid, 2013). These generally poorer households often choose non-piped water services such as water vending and ground water, even in areas where piped-water networks and services are available. Perceived water quality and price were the two most important factors behind households' decisions to use non-piped water services (Bappenas, UNICEF, and Yayasan Dian

Desa,1990; Susantono, 2001). Poor households choose non-piped water sources possibly because the poor cannot afford to pay for piped-water connection fees and transaction costs ((Bakker et. al., 2008). Furthermore, housing and residence status, water availability and perceptions of water quality may also play a role in the decision to not connect to piped-water networks (Bakker et. al., 2008; Susantono, 2001).

Among water supply, wastewater, solid waste management, and drainage issues, public and governmental agencies in Jakarta paid more attention to solid waste management and drainage issues (Figure 16). Of 40-50 community complaints reported to Jakarta's local parliament every year, none were related to water and sanitation between the periods of 2000-2013. The public demanded better solid waste and cleanliness management but not improved water and sanitation services (BPS Jakarta, 2000-2013). Furthermore, the campaigns and promotions that did relate to water and sanitation that frequently drew community attention were solid waste and cleanliness (61.5%); water supply (3.2%); drainage (1.8%); and wastewater (1.5%). The remaining 32% of the communities did not know what topic they were interested in (Pokja Sanitasi, 2012).

Although the majority of communities did not understand the importance of sanitation, a 2014 study by USAID-IUWASH in Pademangan Barat, North Jakarta showed that after sanitation campaigns, the proportion of households who said they did not need septic tank desludging decrease from 57% to 4% (IUWASH, 2015). This study implied that community education can increase demand for sanitation. However, governments have not paid much attention to conducting community campaigns or implementing water and sanitation demand studies. Furthermore, those who demanded better water and sanitation services were usually poor (interview, government official and non-government). One representative from INGO stated that

“[While] actually, there is demand from the community, this demand is low and is not a top priority listed in community consultations on development planning (Musrenbangdes).

Furthermore, those who may want to demand better water and sanitation are usually voiceless [the poor community]” (interview, non-government).

Media interest in covering water and sanitation was also low. Of the 1.644 news articles related to the water and sanitation sector in 2013-2014, only 6% were related to wastewater. Forty-two percent were related to water scarcity, 38% to solid waste management, and 15% to drainage issues (personal documentation from Sekretariat Pokja AMPL, 2014). In summary, there is a general lack of household demand for better water and sanitation services in Jakarta.

- **Corruption in the Preparation of PPP in Water Supply in Jakarta**

The initiative to implement Public-Private Partnership (PPP) in Indonesia began in the early 1990s. The Government of Indonesia started the discussion on the involvement of the private sector in water supply provision in Indonesia, including Jakarta. The government realized PDAMs in Indonesia needed to improve their performance and that a huge amount of money was needed to create piped-water supply large enough to support the growing urban population (interview, government official). PAM Jaya had already started to conduct a study on finding alternative financing from non-government resources (interview, non-government). Multilateral development banks such as the World Bank and JICA recommend the involvement of the private sector as one of the main policy framework in enhancing urban water supply in Indonesia (interview, government; Lucossol, 1997). Through the Indonesia Urban Water Supply Framework (IWSPF), World Bank gave 6 recommendations of urban water policy reform including PPP.

International water companies were keenly interested in investing their money in Indonesia, an emerging country with low piped water coverage. With the PAM Jaya System Improvement Project (PJSIP) loan in place, it was easy for the private companies to penetrate the water supply market in Jakarta. The World Bank was among the advocates who convinced the government to open the water market to foreign investor (Bakker, 2007; Harsono, 2003; Kooy, 2008). However, advocates of PPP (World Bank, JICA and ADB) were not involved in the preparation of water supply PPP in Jakarta (interview, non-government).

There is corruption behind decision-making to implement PPP in water supply in Jakarta. In the beginning of the 1990s, President Soeharto asked the Minister of Public Works, Radinal Mochtar, to improve water supply services in Jakarta because he was surprised that the water running to his house, Istana Negara, was high in turbidity (interview, non-government). The Minister further received guidance from the President to establish PPP with foreign investment in Jakarta to accelerate the provision of drinking water considering budget and capacity limitation of PAM Jaya (Lanti, 2006; interview, non-government). However, the existing law at that time, Law No.1/1967 on Foreign Investment prohibited foreign investor involvement in drinking water supply (ICW, 2000; Argo and Firman, 2011).³² To prepare the implementation of PPP in Indonesia, the Government of Indonesia issued Government Regulation No.20/1994 on Share Ownership in Companies Established for Foreign Investment. This regulation stipulated that the drinking water sector is among the sectors that can receive foreign direct investment with the involvement of local investors (ICW, 2000).

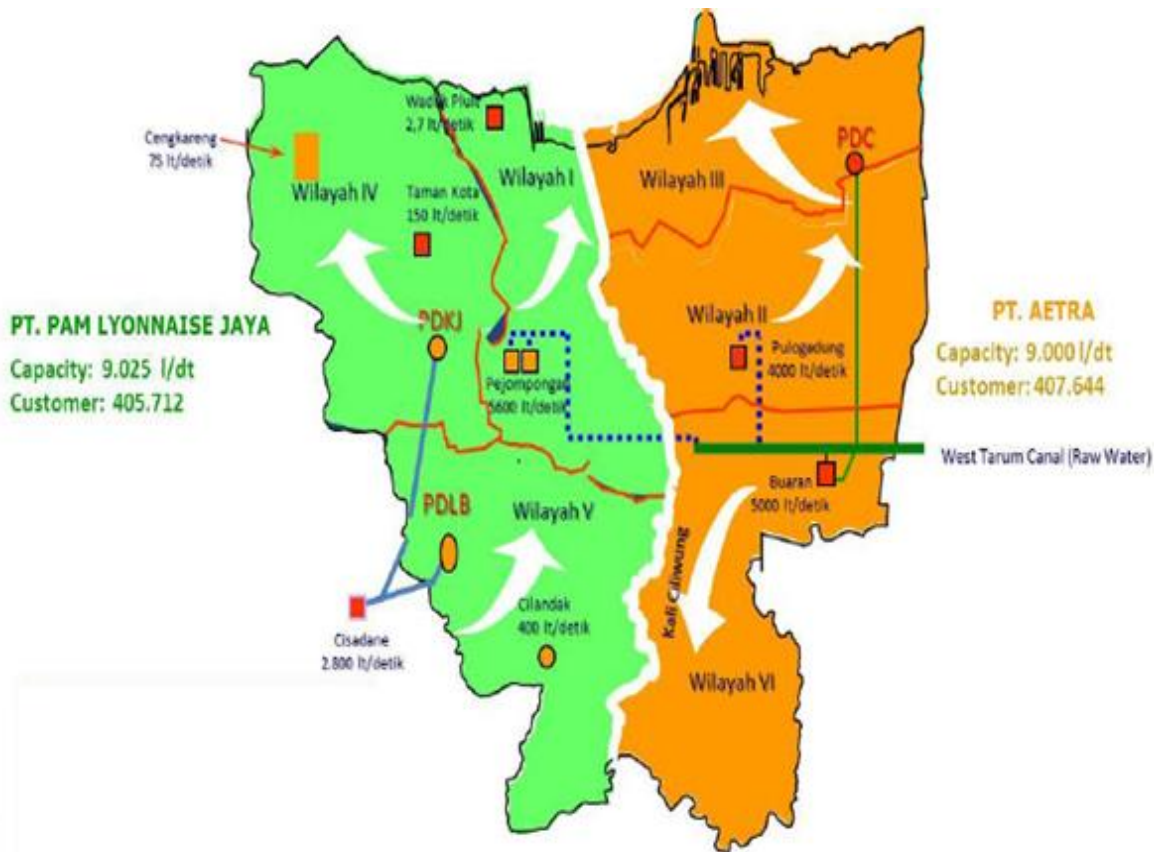
³² Jakarta consists of 6 districts (North, East, Central, South, and West Jakarta and Thousand Island Regency). The service area for PPP does not include Thousand Islands District which is located in separated island with other 5 cities in Jakarta.

Following instructions from President Soeharto, the Minister of Public Work issued two Letters of Intent (LoI) to two international investors, one to Thames Water International to manage water supply provision in the eastern Jakarta and the other to Lyonnaise des Eaux for part of western Jakarta in the mid-1995 (Lanti, 2006) (Figure 17). The process of selecting these two foreign investors was without public tendering as there was no legal basis in Indonesia for PPP at that time (for details of contract negotiation see Harsono, 2003 and Lanti, 2006).

During the negotiation, the Minister of Home Affairs issued Decree No.21/1996 stating that using an unsolicited process in water supply concession in Jakarta was permissible due to the non-existence of laws and regulations on PPP in Indonesia (Lanti, 2006). According to Government Regulation No.20/1994, every international investor had to establish a partnership with an Indonesian firm as a prerequisite to operate the utility network (Bakker, 2005). Conveniently, the chosen local firms were owned by President Soeharto's eldest son's company (PT Kekar Pola Airindo partner with Thames Water International) and Soeharto's crony, Salim group (PT Garuda Dipta Semesta partner with Lyonnaise des Eaux).

Many parties already knew there was obvious conflict of interest in the effort to privatize water supply in Jakarta. However, since it was a directive from the President Soeharto, no one could object to the President's instruction (interview, government official and non-government). The sudden directive from President Soeharto was a shock for PAM Jaya considering there was no discussion between the government and PAM Jaya about the transfer of management and operation of Jakarta's water supply (interview, government official and non-government). Furthermore, PAM Jaya was also still working on the implementation of physical project of its large water treatment projects (PJSIP) funded by World Bank and OECF loan (interview, non-government).

Figure 17. Service Area of PALYJA and AETRA



Source: PAM Jaya, 2016

The process to prepare the PPP agreement was tedious, with negotiations between the two private investors taking over a year to settle. During negotiation preparations, PAM Jaya and its partner (consulting firms) asked for guidance from the former Governor of Jakarta, Ali Sadikin (1966-1977), who is well-known in Indonesia as the best governor of Jakarta. PAM Jaya asked the Governor to advise President Soeharto to cancel the plan to privatize Jakarta's water supply. According to a representative from non-government, the Governor declared that *"if there is any part of President Soeharto's policy that we should agree with, this part is it"* (interview, non-government).

The plan to privatize water supply in Jakarta was endorsed by Ali Sadikin as it would both improve and accelerate water supply provision in the city, especially considering the

limited capacity of PAM Jaya (interview, non-government). Some representatives from PAM Jaya also went to Manila to learn about how the Government of Manila prepared its PPP contracts. One of the main differences that PAM Jaya staff found between the PPP contract in Manila and in the proposed contract of Jakarta was the clause of a safety net, which stated that if there would be a force majeure situation, if the country's inflation rate increased above 12% per year (interview, non-government). As a follow up visit to Manila, PAM Jaya and other government agencies held a meeting with Ministry of Finance. PAM Jaya brought up their Manila finding during the meeting and asked central government to add the safety clause of a force majeure situation and protect PAM Jaya in the future, the proposed first party for the PPP in Jakarta. However, no one considered the input an important issue since inflation never reached double digits during President Soeharto's era (interview, non-government). The negligence to consider a safety net clause in the agreement became a major issue of PPP implementation until the present time particularly considering that private companies requested to be paid in US dollar currency.

- **The Conflict with the Implementation of PPP in Water Supply in Jakarta**

In June 1997, two 25-years cooperative agreements were awarded for the provision of water services in Jakarta with PAM Jaya acting as the first party and Lyonnaise des Eaux (later known as PALYJA) and Thames Water International (later known as TPJ) as the second parties. Total investment of PALYJA and TPJ set in this contract was US\$250million and US\$225million respectively (Sukarma, 2003). Initially, an investment schedule was not part of the target set in the contract, as it was planned to be negotiated every 5 years.

There are two major uncommon mechanisms set in the PPP agreement between PAM Jaya and its two private partners. First, the arrangement of PAM Jaya as the first party is unusual

where in Indonesia it was usually the respective local government who acts as the first party for PPP (interview, non-government). Second, there was the use of water charge where the customer tariff was explicitly delinked from the private operator's remuneration. Private entities were paid based on a volumetric water charge (multiplication between the volume of water billed and the water charge) that was set in the PPP contract adjusted every semester regardless of the performance of private operators.

The concessionaire parties chose a volumetric water charge mechanism based on the assumption that the local government can set water bills to the customers based on service performance, affordability, and efficiency of the business. Therefore, if the water charge is lower than the water bills, the government could still have a profit margin (Nugroho, 2011). The water charge would be levied by the government to customers based on volumetric charges, fixed charges and meter charges (Shofiani, 2003). The use of water charge is different with the common PPP model where usually the service fees are set based on the user fee (Nugroho, 2011). A representative from non-government stated that *“This mechanism (water charge mechanism) was chosen because the local government could freely set tariffs and change it as they see fit, while private operators did not have to be afraid of incurring losses as all produced water would be bought by PAM Jaya”* (interview, non-government).

The government intention to apply volumetric water charge indicated that the government treats water supply as an economic resource. The mechanism of volumetric water charge allows the Government of Jakarta to fully guarantee the loss of the private company by implementing water charge per volume water sold. Adjusting the water charge should be in line with the realization of finance and expenditures of private operators. The more the expenses the private operators incur, the higher the water charges (interview, non-government).

When the Asian economic crisis hit in 1998, the two local private companies decided to resign and sell most of their shares to the foreign partners. Inflation rose to more than 80% during the crisis, leaving local private companies with only 5% of shares left (Lanti, et. al., 2008). Foreign investor convinced the central government to continue the partnership after separating themselves from Indonesian partners. The government and PAM Jaya decided to return to the agreement and renegotiate contracts due to fear of troublesome litigation and decreasing interest of foreign investors in Indonesia (interview, government official and non-government).

The new cooperation agreement “Restated Cooperative Agreement” (RCA)” was signed in October 2001 where PAM Jaya and its private partners renegotiate the contract for three years (Lanti, 2006). During the renegotiation, private investors insisted that they cannot meet the original technical target due to increased US dollar exchange rates and high national inflation rates (interview, non-government). The new targets, therefore, were revised several times and set lower than the original target (see Appendix IX for Technical Target of Aetra and PALYJA). Private investors also insisted that the government had escalated their investment plan five times higher than the original contract (interview, non-government), especially considering the value of the Rupiah per US\$ rose from Rp.2,400 to Rp.13,000 during the crisis. In reality, the price of pipes and their fixtures declined due to decreased of construction sector performance during the economic crisis (interview, non-government). However, limited capacity of the government and PAM Jaya hindered the process of renegotiation of rate-rebasing (interview, non-government).

The signing of RCA in 2001 brought some reform for the implementation of PPP in Jakarta. One of the important reforms was the establishment of the Jakarta Water Supply Regulator Body (JWSRB). The study and the design of JWSRB were initiated by World Bank

assistance. The Bank adopted institutional arrangements of PPP in Australia for the design of JWSRB. The main responsibility of JWSRB was to propose new tariff adjustments to local governments. JWSRB acts as mediator, facilitator, and regulator as well as maintains a balanced interest between the customers and the parties under the contract agreement. When the first PPP agreement was signed in 1997, there was no regulator body that carried out general supervision of the agreement implementation. Thus, there was no party that could ensure the obligation of each party was met nor facilitate and mediate disputes between contracting parties.

Since the collapse of President Soeharto's regime, there has been no political support for the PPP in Jakarta to move forward. Tedious discussions have taken place between the central government and Jakarta government on which party should issue the JWSRB regulations. JWSRB has not been able to strongly influence concessionaire parties due to insufficient authority. JWSRB was established based only on a Governor Decree and its operating fund comes from private parties and PAM Jaya (interview, non-government). Since 2001, there have been several times when JWSRB has been off-duty thus leaving no party to act as a mediator for PAM Jaya and its private partners. *"JWSRB is now temporarily in-active [in December 2015-January 2016] since the Governor Decree to elect a new member of JWSRB for the period of 2016-2018 has been delayed by the Jakarta government"* (interview, non-government). It was decided that the JWSRB will be established under Governor Decree No.95/2001 (interview, non-government).

- **The Absence of Water Tariff Adjustment, the Continual Use of Increasing Block Tariff, and Lack of Investment**

There are persistent issues in the implementation of PPP in Jakarta. These problems existed before the PPP. First, the problem on water tariff adjustment. Because of the severe

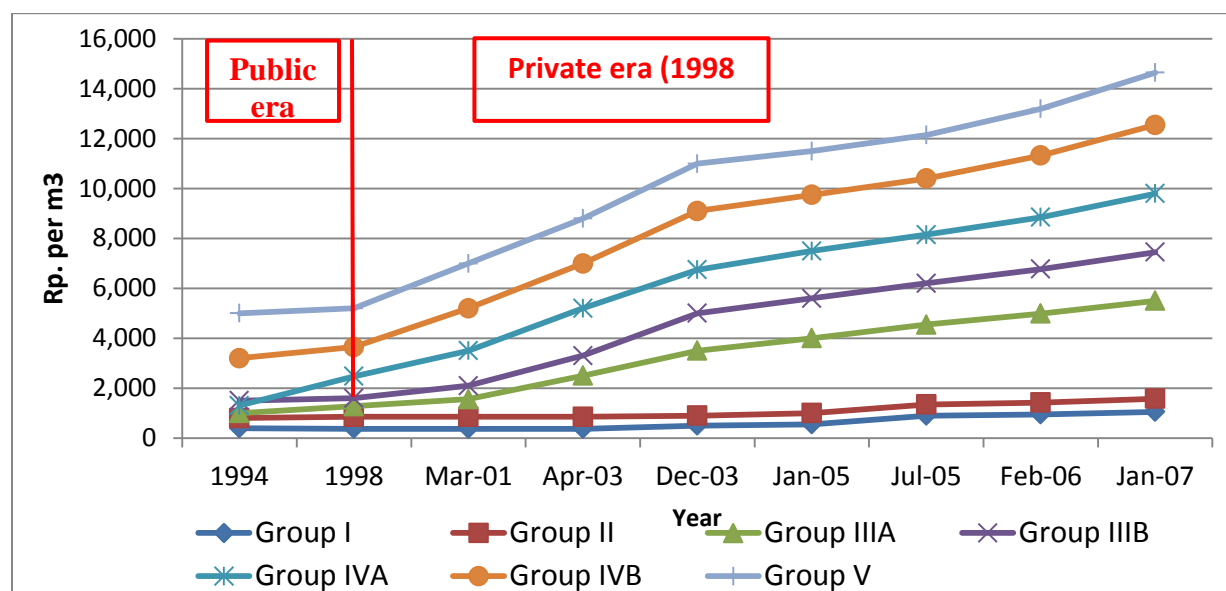
economic crisis in 1998, the Governor of Jakarta was unwilling to adjust the water tariff for inflation.³³ Many times the Governor of Jakarta was unwilling to increase the tariff due to political reason and due to the dissatisfaction with the private operators' performance. The Governors of Jakarta, Fauzi Bowo (2007-2012) and Basuki Tjahaja Purnama (2014-to date) have opposed tariff adjustments since there was social resistance and complaints from communities with poor water services from private operators (interview, non-government).

Because the absence of tariff adjustments the water charge (payment from PAM Jaya to private operators based on shared revenue adjusted every six months in accordance to their realized financial and expenditure program) is above the tariff several times. In this situation, it is PAM Jaya who bear the burden, as they have to pay the gap between the water charge and water tariff. The total gap that should be compensated to private operators from the gap between water tariff and water charge in 2015 is about Rp.400billion (US\$30million), excluding the debt PAM Jaya owes to the central government (PJSIP loan) (interview, non-government).³⁴ In order to catch up with inflation from 1998, tariffs were adjusted for the first time in April 2001 (Figure 18). Since 2007, the Governor and Jakarta regional parliament has been reluctant to increase the water tariff.

³³ In the original contract, the water charge for Aetra was fixed at Rp.1,305 per m³ but in 1998 it increased to Rp.1,619 per m³, and reached Rp.3,326 per m³ in 2003 (Shofiani, 2003).

³⁴ The shortfall PAM JAYA for AETRA is Rp.31.02billion (after rate rebasing has been revised in master agreement in 2012 and water charge is capped about 1-1.5% per year. This is not inflated by annual inflation rates and is not adjusted every 6 months). Without a master agreement rate rebasing amounted to about Rp.330billion. The shortfall PAM Jaya for PALYJA is Rp.403.58billion (PAM Jaya, 2016). Furthermore, the total debt of PAM Jaya to World Bank (for PJSIP loan) is about Rp.800billion (PAM Jaya, 2016), however ICW stated the amount of PAM Jaya debt is Rp.4trillion (ICW, 2000). This should also be paid by PAM Jaya to Ministry of Finance. However this debt will be fully paid in 2016 (PAM Jaya, 2016).

Figure 18. Water Tariff Adjustment in Jakarta, 1994-2007 (for water consumption >20m3 per month)



Customers are classified based on their housing condition (for household customers) or type of services and the magnitude of the service they provide (for non-household customers).

Before privatization (1994): Group I: public hydrant, public toilet, water terminal, social institutions, very poor HHs, private and public school, orphanages, public hospital, and religious facility; Group II: low and middle income HHs, embassies, consulates, government offices, foreign representatives; Group IIIA: non-commercial bodies, kiosk, small-scale business, and small domestic business; Group IIIB: importer and exporter; agent, broker, commissioner, supermarket, private hospital, gas station, public and private swimming pool, small trading distributor, night club, bar, tailors, hotel, restaurant, workshop, and private commercial bodies; Group IVA: small scale industries; Group IVB: big scale industries; and Group V: special Tanjung Priok Harbour.

After privatization (1998-2007): Group I: social institutions, orphanages, religious facility, and public hydrant; Group II: public hospitals, very poor HHs, water storage tanks and tanks; Group IIIA: low income HHs and simple flat; Group IIIB: middle income HHs and flats, non-commercial bodies, kiosk, small workshops, small-scale business, and small domestic business; Group IVA: upper-middle income HHs, embassies, consulates, government offices, foreign representatives, private commercial bodies, schools, training centers, military facilities, medium class workshops, barbershops, tailors, small restaurants, private hospitals and laboratories, clinics, law offices, small hotels, small industries and superb apartments; Group IVB: stars hotels, beauty salons, night clubs, banks, large scale, workshops, large tradings, sky scrapers buildings, factories, amusement parks, fantasy lands; and Group V: special Tanjung Priok Harbour.

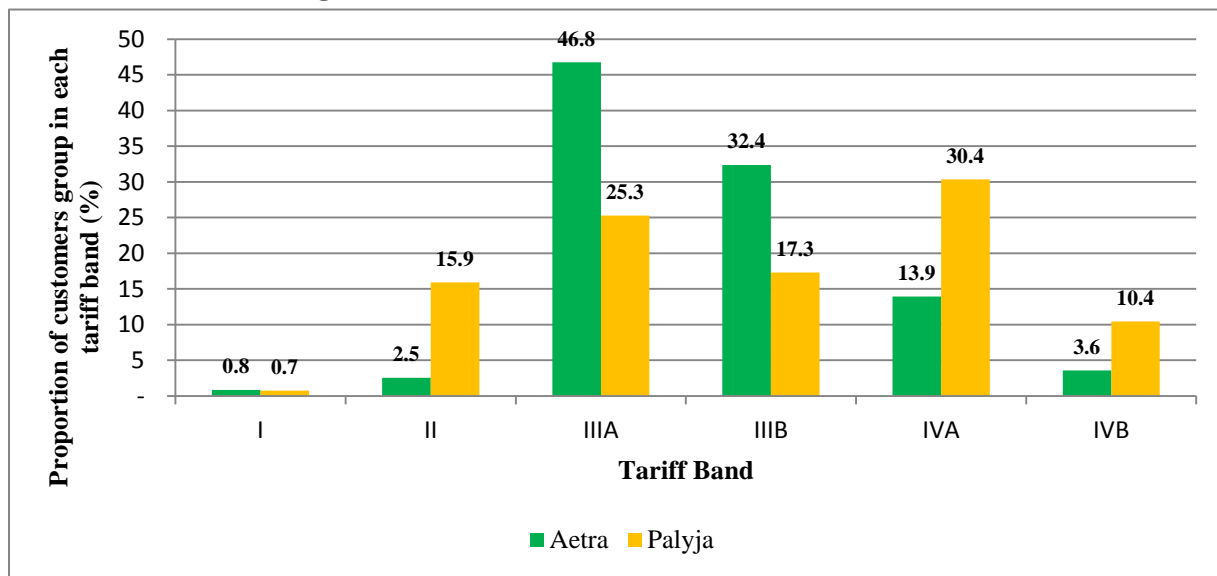
Source: Martijn, 2005; Local Government Regulation No.11/1993; and PAM Jaya, 2016

Furthermore, the use of increasing block tariff (IBT) for tariff setting has created an imbalance in revenue for all parties. A cross subsidy mechanism is applied where tariffs for the first and second group of customers is much lower than the tariff for non-households.³⁵ However, water tariffs for some non-household customers such as small scale businesses, hospitals, and offices are also lower than the real operating cost to produce piped-water. The real operating cost is estimated at Rp.12,000 per m³ (US\$0.9 per m³) in 2015 (interview, non-government).

A very low tariff of the first and second group of customers has created problems for revenue generation (interview, non-government). Figure 19 illustrates the proportion of customer connections in each tariff band in 2015 where the majority of Aetra's customers are in group IIIA (low income households) and the majority of PALYJA's customers are in group IVA (affluent households and businesses). Figure 20 illustrates the trend on the type of customer connections from 2000 to 2014.

³⁵ Group I pays about 7.7% of the real operating cost of water per m³

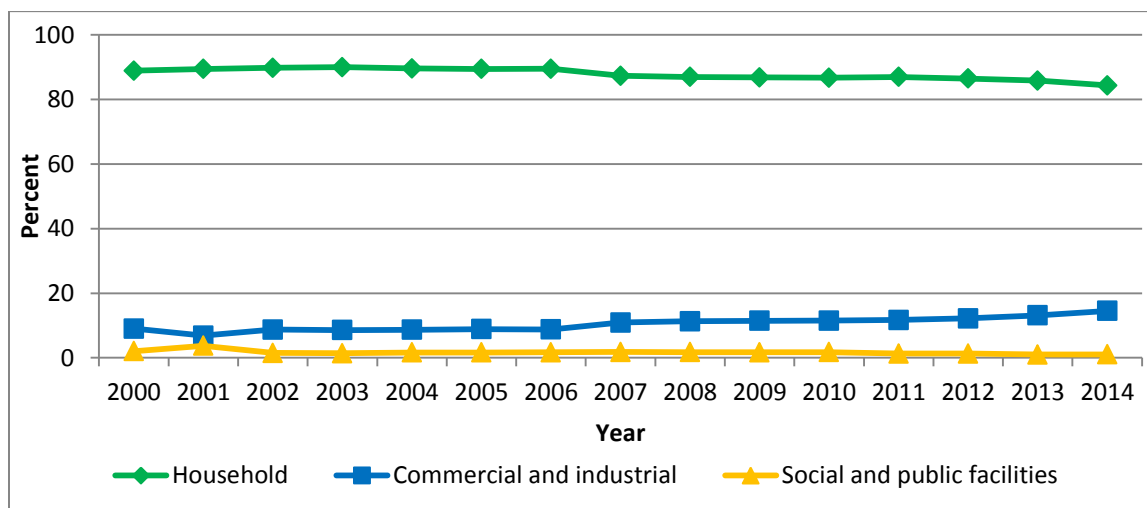
Figure 19. Customer Connections and Tariff Band



Group I: social institutions, orphanages, religious facility, and public hydrant; Group II: public hospitals, very poor HHs, water storage tanks and tanks; Group IIIA: low income HHs and simple flat; Group IIIB: middle income HHs and flats, non-commercial bodies, kiosk, small workshops, small-scale business, and small domestic business; Group IVA: upper-middle income HHs, embassies, consulates, government offices, foreign representatives, private commercial bodies, schools, training centers, military facilities, medium class workshops, barbershops, tailors, small restaurants, private hospitals and laboratories, clinics, law offices, small hotels, small industries and superb apartments; Group IVB: stars hotels, beauty salons, night clubs, banks, large scale, workshops, large tradings, sky scrapers buildings, factories, amusement parks, fantasy lands; and Group V: special Tanjung Priok Harbour.

Source: PAM Jaya, 2016

Figure 20. Trend on the Proportion of PAM Jaya Customers (2000-2014)



Source: BPS Jakarta, 2000-2015

PPP in Jakarta has been not supportive of poor communities as seen in Figure 19 where the majority of customers are non-poor households. Furthermore, there is also a decreasing trend of the proportion of households as the customers of PALYJA and Aetra (Figure 20). One of the possible reasons for the decrease of household customers is the continuation of the use of IBT mechanism and the absence of tariff adjustments since 2007. One non-government representative stated that the current tariff mechanism imposes a very low tariff for households and some of non-household customers. This makes private water operators see this group of customers as less appealing to connect to the piped-water network.

The applications of IBT and cross-subsidy tariffs are applied based on the Minister of Home Affairs Decree No.23/2006 on Guidelines for PDAM tariff setting (Table 10). The regulation of water tariffs has become one of the most important issues in water supply development in Indonesia. A donor and representative from the national government stated that: *“The regulation of the Minister of Home Affairs on Water Tariffs for Each PDAM Customer Group is a major issue for us [Ministry of Public Works and PDAMs] to increase the performance of PDAMs”* (interview, government official and non-government). *“We have raised this issue to the Ministry of Home Affairs to revise the regulation, but there has been no response”* (interview, government official).

Table 10. The Water Tariff for Each PDAM Consumer Group

Consumer Classification	Minimum Daily Basic Need Consumption	>10 m ³ /month
Group 1	Subsidized tariff	Break-even tariff
Group 2	Break-even tariff	Full-cost tariff
Group 3	Full-cost tariff	Full-cost tariff
Special group	Based on agreement	Based on agreement

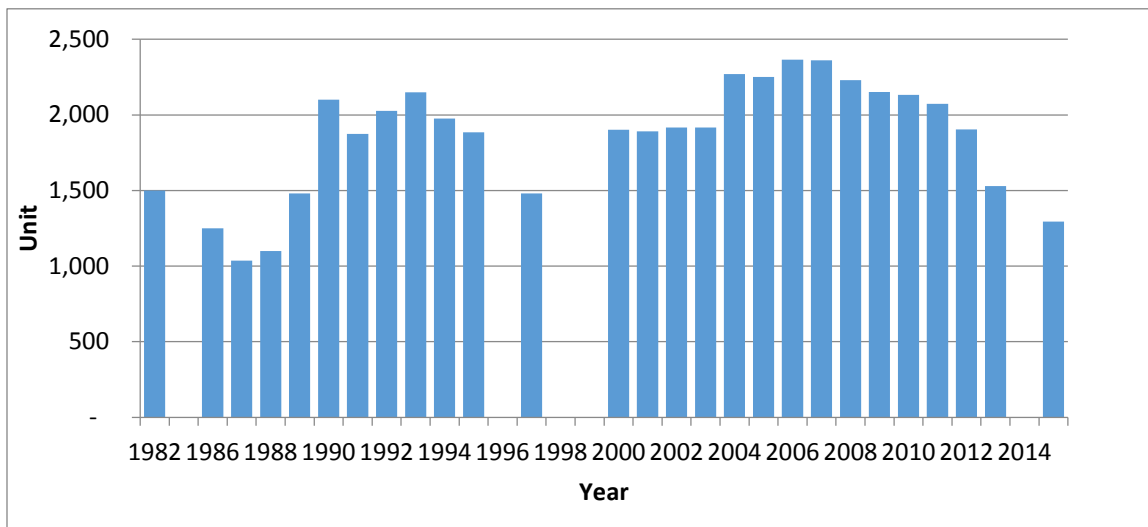
* Subsidized tariff: tariff is set lower than the cost to produce clean water; Break-even tariff: a tariff at which water operators will earn zero profits on water sale (tariff=cost); Full-cost tariff: tariff is set higher than the cost to produce clean water.

Source: Minister of Home Affairs Decree No.23, 2006

The issue of water tariff mechanisms as specified in Minister of Home Affairs Decree No.23/2006 prevents PALYJA and Aetra from prioritizing low income households as every connection for the poor causes a loss in revenue (interview, non-government). As a result, the proportion of households compared to non-household customers decreased from 88.9% in 2000 to 66.5% in 2015 (BPS, 2015) (Figure 20). From 2003 to 2015, the percentage of subsidized customer groups (group I, II and III) had been decreasing from 58.2% to 54.1% while the proportion of non-subsidized customers groups (group IV) had been increasing from 37.5% to 44.93% (Bakker et. al.,2006).

There was also an increase in the number of zero customers (the customers who do not use piped-water although they have piped-water connection) from 2006 to 2012 from 14.28% (110,000 customers) to 16.25% (129,000 customers) respectively (Lanti et. al., 2008). Furthermore, public hydrant brought by the government during the Old and New Order Era to provide water to poor households had been decreasing from 1,902 hydrants in 2000 to 1,294 hydrants in 2015 (BPS Jakarta, 2000, 2015; PAM Jaya, 2016) (Figure 21). A representative from non-government mentioned that perhaps the decreasing number of public hydrant in Jakarta is due to private parties particularly Aetra, as it has been developing a distribution pipeline to all its service areas. This could explain why public hydrants which were introduced by the government as an interim solution are now gradually decreasing (interview, non-government).

Figure 21. The Number of Public Hydrants (1982-2015)



**The number of public hydrants has fluctuated due to the different sources of data and the high incidents of non-operating public hydrants*

Source: BPS, 2000-2015, Martijn, 2005, PAM Jaya, 2016

Public hydrants are seen as a service that constituted financial losses for private operators since its tariff is the cheapest (group I) (interview, non-government). Governor Decree No.10/2016 on the Revision of Governor Decree No.11/2007 on Automatic Tariff Adjustment (PTO) Semester I has instructed to limit the use of water consumption of group I and II (public hydrants and very poor households) to a maximum of 10 m³ per month.³⁶

Revenue constraint from lack of tariff adjustment and the use of IBT have pushed private operators, particularly PALYJA to shut down a few mini water treatment plants. Its high operation and maintenance costs could no longer be recovered from revenue (interview, non-government). Another obstacle to the expansion of the water supply network in Jakarta is the lack of raw water supplies. Urban sprawl and poor sanitation in Jakarta and its neighboring cities (Bogor, Depok, Tangerang, and Bekasi; see Figure 5) have become major constraints to finding

³⁶ Water consumption above 10 m³ per month for each public hydrant or very poor household should be further justified with the proof of citizen identity card and assessment from water operators.

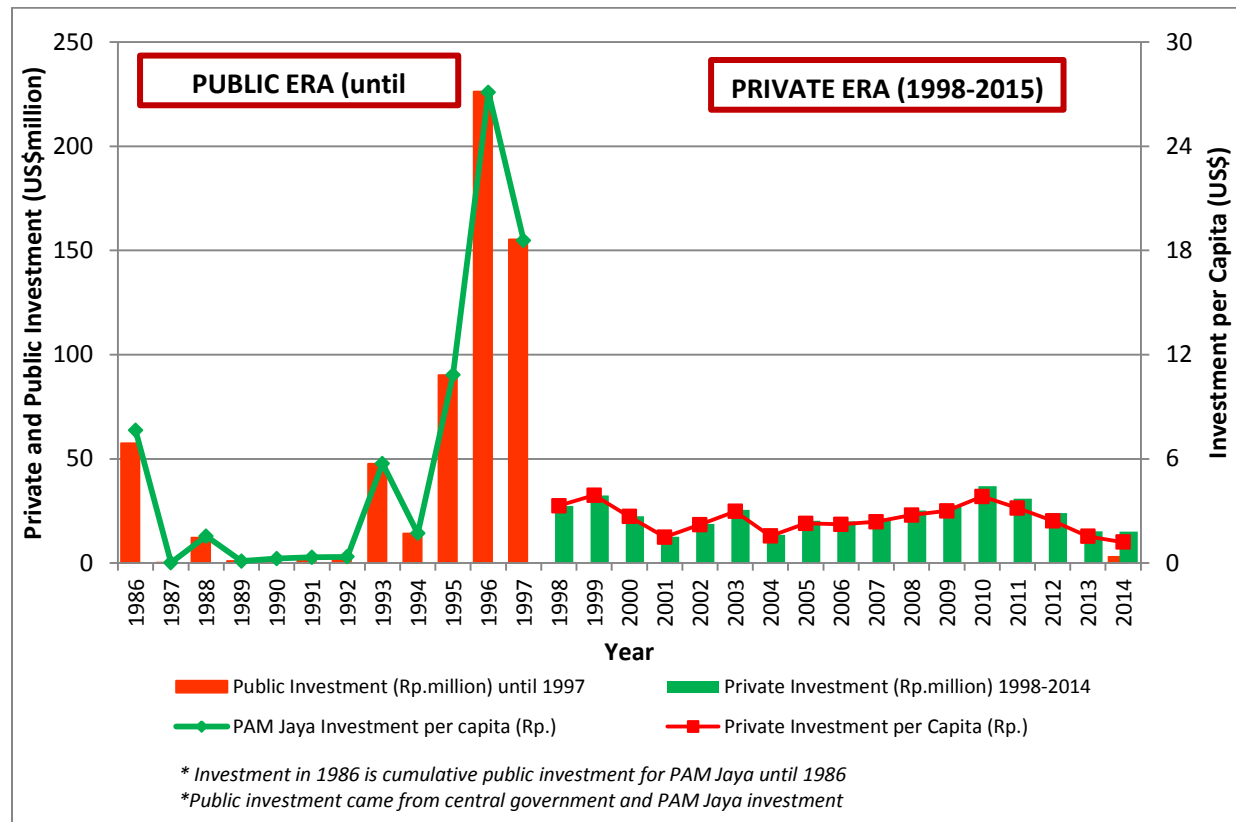
additional raw water resources. In 2000, there were 14 water treatment plants in operation. However, by 2015 the number of plants had decreased to 11 (BPS, 2015). Poor raw water quality coming from the rivers in Jakarta has escalated the cost of clean water production particularly for mini water treatment plants which use raw water from canals and/or river in Jakarta. Average production cost both for PALYJA and Aetra have increased from Rp.8,000 per m³ (US\$0.8 per m³) in 2005 (Bakker, 2005) to around Rp.12,000 per m³ (US\$0.9 per m³) in 2015 (interview, non-government). Until to date, private operators only managed to produce about 18.000 l/s (including 3,000 l/s treated water bought from PDAM Tangerang), even with all water treatment plants built before PPP (APPENDIX III).

Lack of investment is also a persistent problem for water supply development in Jakarta along with the issues of no tariff adjustments and use of IBT mechanism (Figure 22). Since the implementation of PPP, investments of PALYJA and TPJ on average are around US\$2.5 per capita per year (1998-2015) while in public era (1986-1997), investments for water supply development in Jakarta were around US\$6 per capita per year on average.

The initiative to improve drinking water access to poor urban households had been brought by World Bank in their pilot project Global Partnership for Output Based Aid (GPOBA) in 2005 in Jakarta and Surabaya. GPOBA was implemented through the provision of grants to local governments (and in the case of Jakarta private operators) to reimburse partial cost of new piped water connection for poorer households. PALYJA and Aetra approached World Bank for support in piloting OBA approach including informal or slum communities in Jakarta. However, the program was only implemented by PALYJA since the Aetra proposed area failed to meet program requirements (Zakaria, 2009). From initial target of 11,630 connections as set out in the 2005 contract between World Bank and PALYJA, the achieved target in 2009 was only 6,500

HCs (Zakaria, 2009). From 2009 until 2015, the connections of GPOBA only slightly increased from 1,384 HCs to 2,845 HCs (Zakaria, 2009; PAM Jaya, 2016).

Figure 22. Water Supply Investment in Jakarta (1986-2014)



Source: author, with information drawn from multiple sources

Based on the experience and lessons learned of GPOBA in 2009, the Government of Indonesia (Department of Public Works together with Bappenas) embarked on a new type of national water policy for poor urban households known as Water Hibah Program.³⁷ Despite this, PAM Jaya and its private operators have never shown interest into participating in this program,

³⁷ Water Hibah is regulated under Minister of Finance Decree No.168/2008 and No.129/2008. The GPOBA approach was further adopted by Ausaid as one of the component in their infrastructure grant “Indonesia Infrastructure Initiative (IndII)” known as Water Hibah Program. The amount of grants provided to each local government who interested in the program was amounted as Rp.20-25billion (US\$2-2.5million) during the period of 2010-2014 (World Bank, Ministry of Public Works, and Water Partnership Program, 2012).

as the recipient of the program will be low income households with low tariffs, which indicate a loss of revenue for private operators for every household connection made (interview, government official). *“Since 2015, we [Ministry of Public Works] have received a substantial amount of funding from Ministry of Finance in the amount of Rp.800billion (US\$59billion) to fund Water Hibah but we do not see any interest from Jakarta to participate in this program”* (interview, government official). Despite this, private operators are now continuing the OBA approach as they see it as a win-win solution to eradicate illegal water connections and fight the water mafia (interview, non-government). The water mafia consists of existing informal water suppliers, including public hydrant “owners” and informal local leader who gain highly profitable revenues from selling water from public hydrant to its neighbors (Menzies and Setiono, 2010). The water mafia has been one of the major constraints for expanding private water networks particularly in North Jakarta where the business of vended water existed for a very long time now (interview, non-government).

There are conflicting views between government, PAM Jaya, and private operators regarding the absence of tariff adjustments and the lack of investments. These viewpoints are stated by representatives from government and non-government, including:

- *“Rather than increasing water tariffs to increase revenue, PAM Jaya and its private partners could reclassify the tariff band of the customers. I think there will be no issues particularly for the poor to be categorized as group III [rather than group I or II] since they already pay much higher for their drinking water [buying from water vendors or the water mafia]”* (interview, government official).
- *“The absence of central and local government investment in water supply provisions in Jakarta has sent the wrong signal to private investors. It is signaling that the government*

does not pay attention to water supply provision in Jakarta. If this is the case, why should investors invest their money in these efforts if the government does not” (interview, non-government).

- *“We have asked them [PAM Jaya] to invite us [Ministry of Public Works] when they [PAM Jaya] have meetings with private operators to establish performance targets or to renegotiate contract agreements. We can help them in improving the performance of PPP. However, to date, we have never received any invitations from PAM Jaya. How can we help them when no one is asking for our advice? In this decentralized era, we [the central government] cannot directly involve ourselves in local government business especially if there are already private parties involved in water supply provision” (interview, government official).*
- *“During negotiations, the government and private entities had a certain feeling that the existing water treatment plants could serve all of Jakarta’s population” (interview, non-government).*
- *“In the beginning of the concessionaire, it seems that the private operators achieved their target. However, in reality, they just invested their money in the distribution pipeline, while we [PAM Jaya] invested the money [PJISP and OECF loans for the new water treatment plants to be ready in the late 1990s]” (interview, non-government).*
- *“The government [particularly the local parliament of Jakarta and the Governor of Jakarta] still does not have a clear understanding about what PPP is and how to implement it. They do not understand the concept of dividends, which is the basis for private entities to run their business” (interview, non-government).*

The absence of tariff adjustments, the continual use of IBT, and lack of investment has created poor outcome for water supply provision in Jakarta. These problems are aggravated with the issue of transparency where private parties are not transparent about the real condition of piped-water supply in Jakarta as well as the progress that has been achieved in improving this water suppl. As stated by one representative from a non-government stakeholder:. *“We [KMMSAJ] have already filed a law suit regarding public information disclosure to Central Jakarta District Court. Even though we won the case, the data [about the progress of piped-water provision] that we got is still limited and came from the Government of Jakarta not directly from private operators”* (interview, non-government).

In 2012, Kruha (People’s Coalition for the Right to Water) made a coalition under the KMMSAJ (People Coalition against Jakarta Water Privatization) which comprised city residents, NGOs, trade unions, water justice activist, and community organization to initiate a petition against private water management in Jakarta. They took strategies including legal actions “citizen law suits” filling corruption cases between PAM Jaya and its private partners. The lawsuit was filed for the violation of human right to water as stipulated in 1945 Constitution of the Republic Indonesia, article 33: *“The land, the waters and the natural resources within shall be under the powers of the State and shall be used to the greatest benefit of the people”*. The KMMSAJ filed a lawsuit in order to correct the government policy on PPP and water supply in Jakarta.

On March 24th, 2015, the Central Jakarta District Court issued a decision which declared the cooperation agreements to bear null and void. The decision was issued based on a lawsuit brought forward by 12 individuals under KMMSAJ against the President of the Republic of Indonesia, the Vice President of the Republic of Indonesia, the Minister of Public Works, the

Minister of Finance, the Governor of Jakarta, the Jakarta House of Representatives and PAM Jaya as defendants and PALYJA and Aetra, as the co-defendants (Soesabdo, 2015). The court noted that the private operators were "negligent in fulfilling the human right to water for Jakarta's residents, while PAM Jaya, the city-owned partner in the water agreement, had lost Rp1.17trillion (about US\$90 million) since PPP began in 1998, because the structure of the agreement favored the private firms" (Johnson, 2015).

One of the main factors that court judges considered to arrive at their decision is that PAM Jaya should have signed the agreements based decisions made by its own management, rather than be influenced by and follow instructions from President Soeharto (interview, non-government). Furthermore, the court also held that the concession agreement is conflicted with the prevailing Regional Provincial Regulation No.13/1992 on the Jakarta Water Supply Enterprise (PAM Jaya). According to the regulation, the main responsibility of PAM Jaya is to improve public welfare, increase regional income, and to develop the provision and distribution of water in Jakarta (article 5) and PAM Jaya has to receive approval from the Governor if they want to establish PPP in water supply provision in Jakarta (article 15). This regulation still remains as law even though the PPP has been ongoing since 1998. The role of PAM Jaya as stated in this regulation is in line with the concept that water is a social good as stipulated in the 1945 Constitution of the Republic Indonesia.

The decision that water provision in Jakarta should not be privatized has sent shockwaves through many Indonesian infrastructure sectors, especially since the central government desires promote private investment in infrastructure developments across the country (interview, government official). The government has not made any preparations to buy back the concessions, which remain in place pending a final court decision (interview, non-government).

Central government agencies and private operators have appealed to Jakarta's High Court. A further court stage process continues, while the Governor, Jakarta's representative and PAM Jaya accept the decision. They accept the decision due to the fear of termination fee as stipulated in the contract agreement where the first party (PAM Jaya) is obliged to pay the basic price of termination (see Hadipuro and Ardhanie, no date). The central government appealed to the High Court since the decision may disturb the creation of a stable climate for water supply investment in Indonesia particularly remembering that Suez [the major shareholders in PALYJA] is one of the biggest water investors in the world (interview, government official and non-government). *"Actually, we [the Ministry of Public Works] agree with the court decision to end the contract. However, in the inter-ministerial meeting, it seems other central government agencies do not have the same agreement with us, thus, we cannot proceed with our decision"* (interview, government official). Private operators have argued that the plaintiffs are actually not part of the agreement, as the legal complaint is made by non-contracting parties (KMMSAJ), and therefore the contract cannot be nullified (interview, non-government). To date, the current decision is still not executed. The finality and binding effect of the decision has not yet occurred.

5.3 Niche Level

5.3.1 Enabling Factors for Water and Sanitation Development at Niche Level

The author did not find any important factors at niche level that contributed to the development of water and sanitation during the Reform Era.

5.3.2 Constraining Factors for Water and Sanitation Development at Niche Level

- **Lack of Capacity of Water and Sanitary Engineers**

There are several underlying reasons behind the lack capacity of water and sanitary engineers in Indonesia. First, the ill-suited water and sanitation material taught in universities, which mainly focus on engineering design of centralized systems and on industrial occupational and safety systems. There are a few engineers in Indonesia who understand and are able to design water and sanitation facilities that suits local conditions and needs such as for coastal communities and remote islands (interview, non-government).

Second, during New Order Era, university roles were limited to serving the government. This compelled researchers to act more like technocrats than scientists. Although there was educational reform during the Reform Era, Indonesian academics mainly focused on doing commercial research projects that generated income for their institution with no requirement to publicly disclose how the university manages its funds (Rakhmani, 2016).

Third, there was a mismatch between supply and demand for academic research. Academic performance goals in Indonesia were to publish as many as papers in international journals as possible, while on the other hand, the demand from public policy makers was for research addressing local policy needs (Soepriyanto, 2016).

Fourth, there is currently limited room for engineers to be innovative while implementing R & D to adapt to local conditions. There are many permits that must be obtained by engineers and academia before and after conducting R & D (interview, non-government and government). Furthermore, R & D is regulated under different institution R & D is the responsibility of Ministry of Research, Technology, and Higher Education while water and sanitation is mainly the responsibility of the Ministry of Public Works.

One government official stated: “*Our partners is technical ministry [Ministry of Public Works], thus it is difficult to establish a connection between R & D with technical government activity*” (interview, government official). In addition, a senior sanitary engineer in Indonesia stated that he has created a prototype of a compact fecal sludge treatment plant which can reduce the land requirements from 5,000m² to 200m². However, it is difficult to further implement this project by the Ministry of Public Works as the Indonesian procurement system is complex. Finally, the same Engineer also noted that his previous inventions such as a vacuum motorcycle to empty and transport fecal sludge and a mobile sewer system with a capacity of 10m³ have low uptake from governments and donors. “*I have been marketing my innovation to government institution and donors but it seems they prefer to use technology from overseas*” (interview, non-government).

- **Public Health as a Less Appealing Sector**

Although the Government of Indonesia had increased its attention on water and sanitation issues, public health concerns in Indonesia still receive limited attention from society. Urban health problem are still mainly solved through the provision of medicine and treatment (Jakarta Post, 2000). There is lack of joint effort between the government, medical sector, and universities to solve urban water and sanitation problems.

There are a few medical doctors who pursued further graduate studies in the public health sector because public health still is considered less appealing job sector. Furthermore, most of the doctors in Indonesia prefer to work in private hospitals rather than in public hospitals and Puskesmas (community clinics). Even the doctors in Puskesmas have been reluctant to involve themselves in community-based activities and health education activities since they consider these activities unprofitable (Surjadi, 2012).

5.4. Summary of Water and Sanitation Development during 1998-2015

During Reform Era, piped-water connection increased from approximately 560,000 in 2000 to 820,000 in 2015 while for sewer networks only improved slightly from 954 to 1,852. In 2015, only around 40% of Jakarta's population was connected to piped-water, while less than 2% was connected to sewer.

There are many constraining factors at regime and niche level that hamper the expansion of piped-water and sewer connections in Jakarta: (i) lack of national and local government attention to water and sanitation provision in Jakarta; (ii) lack of public awareness on water and sanitation issue; (iii) corruption in the preparation of water supply PPP in Jakarta; (iv) the conflict with the implementation of PPP in water supply in Jakarta; (v) the absence of water tariff adjustments, the continuation use of IBT, and lack of investment; (vi) lack of capacity of water and sanitary engineers; and (vii) public health as a less appealing job sector. Table 11 summarizes water supply and sanitation policies adopted during 1998-2015 and its output indicators.

Table 11. Summary of Water and Sanitation Development during 1998-2015

Landscape Level	Regime Level		Niche Level		Water Supply Coverage in 2015	Sanitation Coverage in 2015
<p>Political: the rise of democracy Economic: economic growth has been maintained between 5-6% annually Social and health: Health status has slowly improved since the late-1990s International policy on water and sanitation development: -</p>	Enabling factors for water and sanitation development	Constraining factors for water and sanitation development	Enabling factors for water and sanitation development	Constraining factors for water and sanitation development	Piped-water: By 2015, only 48% of household had piped water connection. Water tariff: average tariff in 2015 is Rp.8,395 per m ³ (US\$0.63 per m ³) for PALYJA and Rp.7,441 per m ³ (US\$0.56 per m ³) for Aetra	Off-site coverage: Increase from 0.05% in 1998 to 2% in 2015 On-site coverage: Increase from 57% in 1998 to 88% in 2015
	The substitution of Law No.11/1974 with Law No.4/2004	Lack of national and local government attention to water and sanitation provision in Jakarta Lack of public awareness on water and sanitation issue Corruption in the preparation of water supply PPP in Jakarta Conflict with the implementation of PPP in water supply in Jakarta The absence of water tariff adjustment, continuation of IBT, and lack of investment	-	Lack of capacity of water and sanitary engineers Public health as a less appealing sector		

CHAPTER 6 : ANALYSIS

Why has the piped-water and sewer systems in Jakarta only slowly improved since Indonesian independence in 1945? How have system dynamics been shaped between the periods of 1945-2015? To answer these questions, we applied key characteristics of the MLP framework in the case study of piped-water and sanitation in Jakarta to analyze interactions and linkages between the piped-water and sewer system and political, economic, social and health conditions, regulations, and outside pressure aspects over a long time scale (1945-2015).

Clearly, from our findings in the case study there were both major and minor policy changes that enabled and constrained water supply and sewer development in Jakarta (Table 4, Table 8, and Table 11). However, these policy changes did not substantially improve the expansion of piped-water and sewer networks in Jakarta as piped-water supply coverage only increasing from 10% in 1975 to 48% in 2015 and sewer coverage remaining largely stagnant at less than 2% during the same time frame (Figure 11, Figure 12, and Figure 13). Households, particularly poor ones, still use about 5-14% of their income to buy water (Table 9). Roughly, 13% of Jakarta's population still practice open defecation.

6.1 The Interplay between Three Multiple Levels (Landscape, Regime, and Niche)

The MLP emphasizes both external landscape pressures and internal niche dynamics that are important for wider breakthroughs and diffusion of socio-technological systems. The case studies make it possible to identify the dynamic interplay between landscape, regime, and niche levels in

the piped-water and sewer system in Jakarta. Based on dynamics noted among the case study, we found that a key point of MLP, interplay or interaction between multiple levels (landscape, regime, and niche) during different development phases was not happening in Jakarta. This lack of interplay and interaction may explain why progress in expanding the piped-water and sewer network in Jakarta has been so slow. Further explanations for the slow progress of piped-water and sewer in Jakarta go as follows:

- **Lack of landscape pressure**

The change in political and economic system in Indonesia had not been accompanied by substantial changes of public perception on the importance of having adequate water and sanitation services (Figure 11). Demand from communities for water and sanitation remains low (Figure 16). One of the underlying reasons for the low demand is the availability of substitute services such as bottled and/or refilled water, ground water and septic tanks which are not adequately regulated or strictly enforced. Although the government has created regulations to control the use of ground water and manage bottled and/or refilled water, the government cannot directly stop the utilization of these water sources;

“The permit to use ground water and to utilize spring water [as a raw water supply for bottled and refilled water company] is managed under different Ministries. The one who gives the permit to use ground water and spring water is the local government. We cannot control them, since we’ve realize that we still cannot deliver a good quality piped-water supply. It [ground water, bottled, and refilled water] is also one of the main sources of local taxes, thus it will be hard to regulate since the local government is still in need of local revenue” (interview, government official).

The availability of substitutes affects the demand for goods and services (Pindyck, 2009). There is increasing use of bottled water as the main drinking water sources for households in Jakarta (Figure 12). Furthermore, households in Jakarta are still relying on septic tanks for sewage disposal (Figure 13). Another explanation of low pressure from the landscape level is due to improvement in social, health, and economic condition in Indonesia which have been achieved without substantial improvements in water and sanitation. This finding shows that there is a difference between water and sanitation regime transformations in Jakarta versus developed countries. The transformation of non-piped to piped systems in developed countries was supported by public protests through media and social unions. In rich countries, the effort to manage water and the desire to improve living conditions grew as the level of economic development increased (Briscoe, 2014). Furthermore, in developed countries there are clear linkages in activism between water, sanitation, hygiene, public health, and social issues (Geels, 2005, 2006; Gosho, 2014; Hamlin, 1992, 1998; Melosi, 2000, 2011; Tarr *et al.*, 1984). In contrast, outsider actors, communities, and the media in Jakarta have not paid much attention to water and sanitation issues in the city and to the issue linkages connecting water and sanitation with economic and social issues.

- **Stable-sets of rules (regulation, normative, and cognitive) of regime insider actors**

A set of conditions based on Geels (2006) that allows for regime transformation are (i) the change of cognitive belief, behavioural norms, and formal regulation of insider actors and (ii) increased pressure from outsiders. With regard to the first characteristic, we found that there are no important regulative, normative, and cognitive changes in piped-water and sewer regime in Jakarta.

- a. **Regulation aspect:** The functioning law for water supply and wastewater operators has remained the same since 1962 (Law No.5/1962). In the wastewater sector, since 1945 until today there has been no law to regulate the sanitation sector in Indonesia. This shows that sanitation is viewed as non-priority sector in this country. While, there is a substitution of law to regulate the water sector from Law No.11/1974 to Law No.4/2004, the latter was revoked and replaced by Law No.11/1974 in 2015. This shows that the public still demand water to be treated as a social good and must be managed under full responsibility of the government. The inadequate regulations to implement PPP are also a contributing factor to the failure of PPP in Jakarta. This finding suggests that decision on PPP infrastructure projects are typically long term investment. Therefore, policy makers need to think and act carefully including in regulatory and institutional settings as many decisions will survive across different regime.
- b. **Cognitive aspect:** The view of water as a social good is strengthened by the citizen law suit filed in 2012 where KMMSAJ (The Coalition of Jakarta Residents Opposing Water Privatization) opposed the continuation of PPP in Jakarta. They demanded that water resources be controlled and allocated for public benefit and that private companies cannot monopolize rights over water sources. Therefore, piped-water supplies in Jakarta should be managed by PAM Jaya, under government control. However, the government has not sent a strong and unequivocal message and action in this water conflict is still pending.

Although the public demands that water to be treated as social good, in reality, water and wastewater are treated as economic goods PAM Jaya and PDPAL Jaya should contribute to local government revenue (as mandated in Law No.5/1962) even though they are lacking investments to expand their services. Cross-subsidy tariff and cost recovery have been the

leading rational for piped-water and wastewater tariff determination. There are several changes in Ministry of Home Affairs Decree for the establishment of water tariff, but the principle is still the same, cross-subsidy and operation and maintenance cost recovery with the implementation of IBT.

The continuation of the tariff structure has persistently created disputes between PAM Jaya and its private operators. Disputes regarding rate-rebasing between PAM Jaya and its private partners have occurred since the beginning of the concession and have disrupted PPP implementation. The absence of any water tariff adjustments since 2007 has aggravated the situation of increasing investments in network expansions. Additionally, the development of piped-water and sewer in Jakarta has never favoured the poor they have always been left behind or served with low cost technology options. Rather, first priority has always been to provide piped-water and sewer services to affluent households and commercial customers.

“One thing that the government should have ensured is integrated services for both rich and poor, the government should not have provided fragmented services. If we provide, service by clusters, [differential service by the level of income, individual piped-water for affluent households and public taps and/or non-piped system for non-affluent households] one day the system will collapse [drinking water and sanitation]. I think it is the task of government, to bear the overhead cost [for providing service to the poor]. Financial return should not always be the criteria of the government to provide basic services to its people.”
(interview, government official).

This finding is consistent with previous studies that show piped-water supply in Jakarta is implemented in a fragmented approach (Bakker et. al, 2008) and is implemented with lack

of incentives for the poor (WSP, 2015). The driving force for the development of piped-water and sewer network in Jakarta has not been for achieving public health goals.

Economic and financial motives continued to be a rationale for the provision of piped-water and sewer both under public and private management.

- c. **Normative aspect:** There are reforms in political and economic system in Indonesia as well as reform in the role of government, particularly the role of central government. However, these reforms do not transform government practices in providing water and sanitation. Each government remained slow to reconfigure their mandates and allocate tasks among their institutions to execute much-needed water and sanitation reform. For instance, piped-water regimes have failed to integrate piped and non-piped. water service. There are numerous government agencies that deal with water and sanitation provision, for piped-water, groundwater, bottled and refilled water, sanitation, and sewer systems. This condition has been happening since New Order Era (APPENDIX II). For instance, ground water is managed under the responsibility of Ministry of Energy and Mineral Resources and bottled and refilled water under the Ministry of Industry (APPENDIX II). There is no integrated and robust planning prepared by the government with many policy changes occurring during the New Order Era simply “window dressing” for donors. Many major and minor policy initiatives were implemented based on donor suggestion. As an example, the diffusion of septic tanks or pit latrines in the implementation of KIP projects during 1970s-1980s was based on the recommendation of donors. Furthermore, there is a general lack of investment for non-technical aspects of water and sanitation. Rather, investment focus during the Old and New Order Eras was to build water production treatment plants with limited investment in expanding distribution pipelines or

decreasing NRW (APPENDIX V and APPENDIX X). The policy was implemented with rely on foreign aid money. The dominant actor responsible for the project was also the central government (Ministry of Public Works), not the Government of Jakarta or PAM Jaya.

More severe conditions have happened during the Reform Era with a lack of private operator' investments (Figure 22). Regarding this condition, one of the private water operators in Jakarta stated that their distribution network has covered the entire concessionaire area, but that it still needs a tremendous effort to increase household connections, increase household demand, and decrease NRW (interview, non-government).

The sewer network in Jakarta has long been stagnant (Figure 12). Sanitation in Indonesia has been long regarded as a private business with central and local governments investing very small amount of their budgets for sanitation provision. The only “sizeable” investment was made in the mid of 1980s when the Government of Indonesia implemented a pilot project on sewerage development for several big cities in Indonesia including Jakarta (APPENDIX III).

Government failure might be one of the explanations for the poor drinking water and sewer condition in Jakarta. However, findings from the case study also suggest there are market and donor failures which contribute to the slow progress of piped-water and sewer in Jakarta. Private operators have not met their performance indicators (APPENDIX IX) and there is on-going conflict between PAM Jaya and its private operators. There is asymmetric information between private operators, PAM Jaya and public as a whole. Donors have tended to focus on capital works rather than on governance issues such as

better planning of non-technical aspects of infrastructure (tariff mechanisms, community education, etc). These findings are in agreement with the other studies on the failure of PPP in Jakarta (Bakker et. al., 2008; Braadbaart, 2007; Jensen, 2005, Nugroho, 2011) and on the failure of the World Bank in providing urban water supply in less-developed countries (Bakker, 2012).

As documented in this case study, there are several explanations as to why the progress of piped-water and sewer in Jakarta has been so slow. These explanations include, that regulations have not been fundamentally changed, the role of government remains the same, communities show low demand for better water and sanitation, the public still perceives water as a social good, the public still expects the government to be dominant actor in controlling water, and the government does not alter their activities fundamentally from regime to regime.

- **Lack of innovation in niche**

There are four important reasons why little innovation emerges from niche actors. Firstly, there has been a backlog of sanitary engineers in Indonesia as well as a lack of comprehensive water and sanitary engineering training that is suited to local conditions. Since the Old Order Era, there has been low interest from society to learn more about water and sanitary engineering. This condition is aggravated by other factors, such as the reality that water and sanitation education at universities is based on a developed country approach. The water and sanitary engineering curriculum that is introduced at universities based on Dutch engineering and technical knowledge. While at times, it represented urban modernization, it also introduced the disintegration of services for affluent and poor households. In Jakarta and Indonesia, there has been a massive use of decentralized systems such as ground water and septic tanks.

The utilization of non-piped systems and low-cost technology have become major policies for water and sanitation development in Indonesia since the colonial era. However, Indonesian universities have paid limited attention to bringing the real condition of Indonesian cities to the classroom (interview, non-government). Furthermore, many water and sanitary engineers work in government agencies which primarily deal with administrative issues thus creating limited knowledge on practical solutions that suit local condition.

The lack of public health practitioners is another reason why little innovation emerges from niche actors. Medical doctors view public health as a less appealing job sector while most water and sanitary engineers feel that the public health aspect of this sector is not of their concern. Unlike the development path of water and sanitation in developed countries, there has been no influential public health experts that accentuate the issue linkage between water, sanitation, hygiene, and public health. Technical water and sanitary engineering knowledge counts more in policy making in Jakarta than public health viewpoints.

Thirdly, there is little incentive in Indonesia for engineers and scientists to innovate and create pilot projects. From institutional setting to nationwide regulations, there is no clear linkage between technical ministries and R & D which is the responsibility of the Ministry of Research, Technology, and Higher Education.

Finally, lack of interaction between inside and outside actors is another reason behind low innovation. The role of external regime actors (outsiders) and its interaction with regime actors (insiders) is critical to create changes (Geels and Kemp, 2007). Interactions between inside and outside actors through conflicts, contestations, and power struggles are some of the mechanisms that can create substantial changes in identity, role perceptions, and investment patterns of regime insiders (Geels, 2006). Despite this, there is poor coalition between inside and

outside actors in Jakarta, particularly between government and societal groups such as NGOs, community organization, and water activists. Only recently during the Reform Era (1998-2015) have outsiders started decrying regime insider practices when KMMSAJ (People Coalition against Jakarta Water Privatization) filed a lawsuit for the change of PPP of piped-water supply in Jakarta.

In summary, our findings suggest that a backlog of sanitary engineers and public health experts, little incentive for R & D, and lack of interaction between insiders and outsiders are reasons why outside actors have not pushed the water and sanitation agenda. Table 12 summarizes the dynamic of piped-water and sewer development in Jakarta between 1945 and 2015.

Table 12. Summary of Water and Sanitation Development during 1945-2015

	Phases		
	1945-1966	1966-1998	1998-2015
	The introduction of piped water supply system	The diffusion of interim solutions	The stagnancy of piped water and sewer network
Landscape	<p>Political: guided democracy (a democratic government with increased autocracy)</p> <p>Economic: economy did not expand and inflation reached 600%</p> <p>Social and health: health, water, sanitation, and hygiene development had low priority</p> <p>International policy on water and sanitation development: -</p>	<p>Political: authoritarian rule</p> <p>Economic: economic grew rapidly by an average of 5-7%</p> <p>Social and health: health and social sectors were improved</p> <p>International policy on water and sanitation development: The Mar Del Plata Action Plan and the International Drinking Water Supply and Sanitation Decade (IDWSS)</p>	<p>Political: the rise of democracy era</p> <p>Economic: economic growth has been maintained between 5-6% annually</p> <p>Social and health: health status has slowly improved since the late-1990s</p> <p>International development policy on water and sanitation development: -</p>
Regime	<p>Enabling factors:</p> <p>Development policy to develop sizeable projects including large water treatment plants</p> <p>The establishment of environmental health unit under Ministry of Public Works</p>	<p>Enabling factors:</p> <p>Development policy on low cost technology to provide water and sanitation access to the poor</p> <p>Enactment of Law No.11/1974 on Irrigation</p> <p>The separation of regulator and operator function for water supply operators</p>	<p>Enabling factors:</p> <p>The substitution of Law No.11/1974 with Law No.4/2004</p>

	<p>Constraining factors:</p> <p>The dual function of water supply operators as mandated by Law No.5/1962</p> <p>Lack of health education and preventive action to improve public health</p>	<p>Constraining factors:</p> <p>Lack of public health approach in water and sanitation provision</p> <p>Reliance on donor' assistance to develop water and sanitation infrastructure</p> <p>Increasing block tariff as a national water tariff standard</p> <p>Lack of investment to expand distribution network</p>	<p>Constraining factors:</p> <p>Lack of national and local government attention to water and sanitation provision in Jakarta</p> <p>Lack of public awareness on water and sanitation issues</p> <p>Corruption in the preparation of water supply PPP in Jakarta</p> <p>The conflict with implementation of PPP in water supply in Jakarta</p> <p>Absence of water tariff adjustment, continuation of IBT, and lack of investment</p>
Niche	<p>Enabling factors:</p> <p>Development aid and technical assistance from France</p>	<p>Enabling factors:</p> <p>-</p>	<p>Enabling factors:</p> <p>-</p>
	<p>Constraining factors:</p> <p>Lack of sanitary engineers and ill-suited engineering approach</p> <p>The growth of informal water vending</p>	<p>Constraining factors:</p> <p>Backlog of sanitary engineers and paradigm shift in sanitary engineering educational system</p> <p>Lack of public health practitioners</p> <p>The growth of water vending industry</p> <p>The rise of bottled and refilled water</p> <p>The increase of groundwater extraction</p>	<p>Constraining factors:</p> <p>Lack of capacity of water and sanitary engineers</p> <p>Public health as a less appealing sector</p>

6.2 The Application of MLP in Jakarta

We found that the MLP was helpful in describing the dynamics of piped-water and sewer in Jakarta. The application of MLP in Jakarta provided a picture of the causes, factors, and interactions between insiders and outsiders that contribute to the slow progress of piped-water and sewer development. The MLP has allowed the author to analyze many contributing factors that determine the dynamic of piped-water and sewer in Jakarta. Previous studies in Jakarta have focused only to specific factors such as rapid urban growth outpacing urban infrastructure development (Chifos and Suselo, 2000), insufficient regulations of public and private service providers (Braadbaart, 2007; Jensen, 2005, Lanti, 2006), governance failure (Bakker et. al, 2008), private service provider failure (Nugroho, 2011), the existence of economic rent (Crane, 1994; Lovei and Whittington, 1993), and splintered urbanism (Kooy and Bakker, 2008). The case study in this paper shows that there are persistent problems which cannot directly be controlled by regimes such as lack of R & D to solve local water and sanitation problems, the continuation of IBT tariff, backlog of sanitary engineers and public health experts, lack of planning, and donor' contributions to state failure. Although, MLP has been applied in developed country settings, differences in socio-political contexts between developing and developed countries do not make the application of MLP not useful when studying less-developed countries.

There are challenges to applying MLP in Jakarta since the piped-water and sewer system have not been well-developed. MLP has been applied in cases where transformation from non-piped to piped systems had been occurred. Therefore, it is the author's perspective that a case study using MLP will better match if the socio-technological system is already well-developed. In the case of Jakarta, piped-water and sewer is still developing and there are competing regimes

(ground water, bottled and refilled water) which should be further analyzed. The existence of non-piped services also makes analysis more challenging.

6.3 Typology of Change on Piped-Water and Sewer System in Jakarta

Based on five typologies of sociotechnical transition pathways developed by Geels and Schot (2007), Jakarta has been following a “reproduction process” whereby the change in landscape particularly on the political and economic scale (from Guided Democracy to Authoritarian Rule to Decentralized Era and the change from an agricultural to industrial economy) have not generated enough pressure on regimes to reorient the way regime actors act and make regulations. Furthermore, there is also limited innovation at the niche level. Consequently, there are dynamics at regime level but no dynamic interactions among regime, landscape, and niche levels.

Reproduction process is a commonly observed change in socio-technical system (Geels and Kemp, 2007). However, this type of change does not create radical changes observed in other types of changes (such as transformation, de-alignment, re-alignment/(transition), technological substitution, and reconfiguration pathway). This is due to limited pressure from outside actors as well as landscape and niche levels. In reproduction process, the dominant actor is the incumbent regime actors and the orientation and knowledge base of actors (regulation, normative, and cognitive) do not change fundamentally. The regime remains stable and continues to direct their activities within the same rule-sets (thus little variation in developing visions and goals, technical problem agendas, guiding principles, and laws) (see Table 4, Table 8, and Table 11).

There are two criteria used to determine the typology of transition pathways as explained in the Geels and Schot (2007). These are the timing of interactions and the nature of interactions. Based on our previous explanation of the interplay between three multiple levels, there is no strong relationship between landscape development, and niche-innovation that create pressure for regime change.

Table 13 illustrates the different mechanism between reproduction, transition and transformation pathways. Transition and transformation pathways are chosen as a comparison to reproduction processes as these pathways are what occurred in the water supply and sanitation sectors of developed countries (i.e. the United States, UK, The Netherlands, and Japan). According to Geels and Kemp (2007) these changes are also more complex processes. The changes in piped-water and sewer system in Jakarta have followed the changes that occurred in developed countries, as incremental changes in the regime have not coalesced with changes in landscape and have not been supplemented with niche-innovation.

Table 13. Mechanism in Change Processes

	Reproduction	Transformation	Transition
Levels involved	Regime dynamics	<ul style="list-style-type: none"> • Pressure from landscape • Adaptation and reorientation in regime 	<ul style="list-style-type: none"> • Pressure from landscape • Increasing problems in regime and attempts at re-orientation • New innovation in niches that eventually break through
Role of actors	Incumbent regime actors	<ul style="list-style-type: none"> • Pressure from outsiders • Incumbent regime actors respond through re-orienting innovative trajectories 	<ul style="list-style-type: none"> • Pressure from outsiders • Incumbent actors fail to solve regime problem • Outsiders develop new innovations

Source: Geels and Kemp, 2007

CHAPTER 7 : CONCLUSIONS

The case study in this project examined the dynamics of piped-water and sewer development between 1945 and 2015 in Jakarta, Indonesia. Each case study presented findings from interviews and documentation approaches, followed by interpretation using a MLP framework. The findings contribute to the growing discourse regarding the slow progress of piped-water and sewer development in Jakarta, where piped-water coverage has only increased 10% to 48% from 1975 to 2015. During this period, the development of sewer network has been stagnant, providing access to less than 2% of Jakarta's population.

This study has shown the changes and even improvements in the economy, politics, and health in Jakarta can be achieved without much progress in water and sanitation. Although Indonesia has initiated a decentralisation and privatisation reform which reduces the power of the central government and gives more authority to local government and private actors, local governments and the public have failed to make water and sanitation an important aspect of development. This has occurred both in the centralized eras (Old and New Order) and the decentralized era (Reform). A main finding of this research, which is based on qualitative methodology, is that decentralization does not substantially increase government and public responsiveness to water and sanitation issues. The change of water supply management from public (PAM Jaya) to public-private partnership (PALYJA and Aetra) in Jakarta also did not bring about substantial improvements in providing piped-water access. In summary, we suggest

that the central government not assume that local governments and private water operators are fully capable of satisfying national water and sanitation needs.

This case study shows that water and sanitation performance is better when it is managed by the central government, such as during in the centralistic eras. Therefore, to accelerate the achievement of universal access, water and sanitation should be managed centrally. Special consideration should be taken to prioritize the poor and ensure their improved welfare, equity, and access to basic needs. Also, current policy makers should pay more attention and learn from the country's history of the authoritarian bureaucrats, corruption, and weak legislative systems. Awareness of past fallacies and weaknesses can help law makers avoid similar pitfalls during the process of implementing water and sanitation project in a decentralized system.

The key point of the MLP is to observe where the dynamics within landscape, regime, and niche levels become linked. However, in the case of Jakarta, there have only been limited interactions between landscape, regime, and niche levels in Jakarta. The lack of interactions between these three levels has prevented the expansion of piped-water and sewer systems in Jakarta. There is some co-evolution in landscape events but not in niche and regime actors. The insider regime actor (i.e. the government) has overall been resistant to changes, with limited innovations implemented to solve water and sanitation problems. Furthermore, there have been inadequate interactions between inside and outside actors. Our findings show that the Jakarta piped-water and sewer systems have not been substantially influenced by technological innovations or by environments outside the technology sector, such as macro-politics, macro-economics, and societal behaviour.

The MLP is a fruitful starting point allowing for the identification of interrelated of dynamics within piped-water and sewer systems in Jakarta. However, the study of multi regime

dynamics (ground water, bottled/refilled water, piped water, sewer and on-site sanitation) needs more emphasis. The slow progress of piped-water and sewer has two major implications for Indonesia and other developing countries that aim to improve their systems. First, to accelerate the achievement of universal access to drinking-water and sanitation, strong leadership from the government in planning and implementing infrastructure is essential. The government needs to create a dynamic between landscape and niche. The government ought to seek out more opportunities for innovation and adaptation to local conditions. Second, the government should promote integration between cultural behaviour and water and sanitation development. The historical, political, economic, and cultural contexts are decisive in water and sanitation development pathways (Briscoe, 2003). What worked in developed countries may not work in developing countries due to the differences of historical, social, and cultural conditions.

Three important limitations need to be considered. First, the author combined the development of piped-water and sewer as one single analysis. Because piped-water and sewer system development in Indonesia are managed under the same regime, these two factors were considered simultaneously. However, future studies should focus on only one at a time or should compare and contrast the progress of each, as they may behave differently even when managed under the same regime. The second limitation is the length of the period of the analysis from 1945 to 2015. Although this paper focused on analysing changes in piped-water supply and sewer development from 1945 to 2015, the provision of water supply (using ground water as a raw resource) in Jakarta had begun as early as in 1843 (PAM Jaya, 2016). Furthermore, Indonesia has many rivers and springs. Some people may have relied more heavily on water from rivers and canals for drinking, bathing, and defecating. Thus, more information could have been collected by extending the time frame of focus. The third limitation is related to interviews

and the selection of literature. Interview subjects may be biased, have poor memories, or provide inaccurate testimonies. The experience of the author working in government agencies in Indonesia may also introduce biases in the interview process. The interviewee was selected from a broad range of actors in order to minimize selection bias. However, due to the inability of the author to travel to Jakarta, the study could be improved if the author was able to interview more people, such as public health experts, bottled and refilled water businessmen, etc. A thorough literature search was conducted; however, some literature may have been missed with valuable insights on this topic. Due to inaccessibility or inability to analyse several important documentations because it was difficult to find in Indonesia and the United States, information from interviewers and from literature reviews were used to describe some findings.

Finally, there are five suggestions for future studies. First, a more complete MLP can be applied to conduct case studies in further depth including analyze the use of non-piped systems (i.e. groundwater, bottled and/or refilled water, and septic tanks). Secondly, a case study should be conducted on a longer time scale given that the development of piped-water in Jakarta had occurred during the colonial period. Third, future research should look beyond public officials and policy makers and seek to understand the position and viewpoints of non-governmental actors. It is important to understand the viewpoints of other outside actors on the development of water and sanitation systems. Fourth, future studies should compare and contrast piped-water and sewer systems between several big cities in Indonesia or between Indonesia and other developing countries. Jakarta is an outlier in many cases because its social, demographic, and economic conditions are very different from other cities in Indonesia. Thus, other cities in this nation may not follow the same pathway as Jakarta. However, at the same time a case study of Jakarta could be considered as a great example to show the real conditions of water and

sanitation in Indonesia. Fifth, further studies could also analyse indigenous water and sanitation practices that contribute to current water and sanitation conditions.

APPENDIX I : LIST OF INTERVIEWEE

No.	Respondent	Institution	Responsibility
1.	Rooswhita Simanjuntak	- PAM Jaya	Expert Staff for PAM Jaya
2.	Hidajat Edhy Liestianto	- PAM Jaya	Head for Planning Division
3.	Ati Angkasa	- PDPAL Jaya	Expert Staff for PDPAL Jaya
4.	Pratama S Adi	- PT. Aetra Air Jakarta	Corporate Secretary
5.	Risyana Sukarma	- Directorate of Water Supply, Ministry of Public Works (until 1996) - The World Bank	Senior Water and Sanitation Consultant at The World Bank (retired)
6.	Irma Magdalena Setiono	- PALYJA (until 2006) - USAID (2006-2008) - The World Bank (2008-to date)	Water and Sanitation Specialist at The World Bank
7.	Trigeany Linggoatmojo	- USAID (2001-to date)	Senior Project Management Specialist for Water and Sanitation
8.	Foort Bustraan	- USAID-IUWASH	Deputy Chief of Party of IUWASH
9.	Tomihara Takayuki	- JICA	Project Formulation Adviser
10.	Rudi Willem	- PT. Infratama Yakti	Director (Senior Water Supply Consultant)
11.	Winarko Hadi	- Ikatan Ahli Teknik Penyehatan dan Teknik Lingkungan Indonesia (IATPI) – The Indonesian Society of Sanitary and Environmental Engineers - PT. Jagad Rona Semesta	Head for Partnership for IATPI and Director for PT. Jagad Rona Semesta (Senior Wastewater Consultant)
12.	Arif Maulana	- Lembaga Bantuan Hukum (LBH) – Legal Aid Institute	Public Lawyers for LBH Jakarta
13.	Nugroho Tri Utomo	- BAPPENAS	Director for Housing and Settlement (2010-to date)
14.	Basah Hernowo	- BAPPENAS	Director for Housing and Settlement (2000-2007)
15.	Oswar Mungkasa	- DKI Jakarta Local Government	Deputy Governor of DKI Jakarta for Spatial Planning and Environment
16.	M. Fadly Haley	- DKI Jakarta Local	Section Head for Water,

	Tanjung	Government	Cleanliness, and Environment , Bappeda (Planning Agency of DKI Jakarta)
17.	Handy B. Legowo	- Ministry of Public Works	Deputy Director for Wastewater Development (retired)
18.	Danny Sutjiono	- Ministry of Public Works	Director for Water Supply Development (retired)
19.	Budiman Arif	- Ministry of Public Works	Director General for Human Settlements (retired)

APPENDIX II : INSTITUTIONAL FRAMEWORK IN WATER AND SANITATION IN INDONESIA (BASED ON THE CURRENT GOVERNMENT STRUCTURE FOR THE PERIOD OF 2015-2019)

Ministries	Responsibilities	Authority
Key Agencies		
Ministry of Public Works	<ul style="list-style-type: none"> • Directorate General of Human Settlements: Setting up policies and technical regulations (Norms, Standards, Guidelines, and Manuals) for water and sanitation at national level. Develop water and sanitation infrastructures and provide technical, financial, and managerial assistance to local government. • Directorate General of Water Resources: Setting up policies and technical regulations (Norms, Standards, Guidelines, and Manuals) for water resources at national level. Determine the allocation and issuance of raw water extraction permit. • BPPSPAM (Support Agency for Water Supply System Development): Assess the performance of Local Owned Water Supply Enterprise (PDAM) and give recommendations to the Minister of Public Works on the feasibility of Public Private Partnership in drinking water and sanitation provision 	Technical aspects
Ministry of Health	<ul style="list-style-type: none"> • Issuance, monitoring and inspection of drinking quality standards • Campaign, advocacy and promotion for water, sanitation, and hygiene • Capacity building for local governments in terms of disease prevention through the provision of water and sanitation 	Health aspects
Bappenas	<ul style="list-style-type: none"> • Prepares long, medium and annual term national water and sanitation development program and its budget. • Coordinates policies, strategies, and programs among related line ministries and donors • Monitoring and evaluation of national programs. 	Policy and planning aspects
Ministry of Home Affairs	<ul style="list-style-type: none"> • Setting up regulations for water and sanitation in local government level including (i) the mechanism for setting up the drinking water tariffs; (ii) PDAM management; (iii) 	Local management and financial aspects

	<p>management of loans and grants in local governance context; (iv) accounting management for local government; (v) local government's financial performance assessment and monitoring</p> <ul style="list-style-type: none"> • Monitoring, evaluation, and supervision of local government performance • Develop local governments capacity and support the performance of city/district/provincial Pokja AMPLs 	
Ministry of Environment and Forestry	Establish policy on water pollution control (wastewater effluent and raw water quality standard)	Environmental Pollution aspects
Other Relevant Agencies		
Ministry of Energy and Mineral Resources	Responsible for groundwater exploration as well as granting the ground water extraction permit	Technical aspects
Ministry of Education	Responsible for ensuring adequate water and sanitation facilities available in schools	Technical aspects
Ministry of Finance	Allocating fund for water and sanitation development through annual budget, loans, and grants.	Financial aspects
Ministry of Industry	Establish permit and standards for bottled and refilled water	Technical aspects
Coordinating Ministry of Human Development and Cultural Affairs	Oversee the performance of relevant ministries in water and sanitation development.	Coordination

Source: author, with information drawn from multiple source

**APPENDIX III : WATER SUPPLY AND SANITATION DEVELOPMENT IN JAKARTA
DURING OLD AND NEW ORDER ERA (1945-1998)**

Name of Project	Products	Year	Type of Funding	Funding (US\$ million)
Large Water Supply and Master Plan Projects				
Unknown ¹⁾	The development of 1 st large scale Pejompongan I WTP (2,000 l/s)	1953-1957	Loan, French government	Rp. 70 million (US\$ 2-7 million)*
Report on the Water Supply Extension Project for the City of Jakarta (Master Plan I) ²⁾	Technical assistance to formulate the first long term water sector development for Jakarta. This study can be regarded as the first master plan for Jakarta Water Supply System. The study did not lead to immediate project loan assistance but it did lay the foundation for future related assistance	1963	Grant, OECF/Japan	N.A
Unknown ³⁾	The development of 2 nd large scale Pejompongan II WTP (1,000 l/s)	1964-1966	Loan, French government	7.0
Extension Project of Jakarta Water Supply System and Master Plan for Jakarta Water Supply System (Master Plan II 1972-1980) ⁴⁾	The preparation of 2 nd Water and Wastewater Masterplan. All the planned projects were implemented: main T/D for Pejompongan II; upgrading Pejompongan II, the development of Pulo Gadung WTP and its main T/D pipeline.	1971-1972	Grant from UNDP & WHO (Executing Agency: Nihon Suido, Japan)	0.4
Emergency Project for Distribution Pipe ⁵⁾	Supervision work for pipe installation of Pejompongan II	1972-1973	Loan, OECF/Japan	1.56
Emergency Phase Project of Stage I	Construction of Distribution Main of	1973-1974	Loan, OECF/Japan	1.62

Development Program ⁶⁾	Pejompongan II			
The Final Stage of Pejompongan I Development ⁷⁾	Upgrading capacity of Pejompongan I from 2,000 l/s to 3,000 l/s	1975	Loan, OECF/Japan	N.A
Phase I Project of Stage I Development Program ⁸⁾	Detailed Design Work for Pulo Gadung WTP	1975-1976	Loan, OECF/Japan	0.79
Phase I Project of Stage I Development Program ⁹⁾	The development of 3 rd large scale Pulo Gadung WTP and upgrading Pejompongan II WTP from 1,000 l/s to 3,000 l/s and the development of Pejompongan II distribution main	1977-1982	Loan, OECF/Japan	9.32
Phase I Project of Stage I Development Program ¹⁰⁾	Detailed Design Work for WTP Pulo Gadung Expansion	1978-1979	Loan, OECF/Japan	0.49
Phase II Project of Stage I Development Program ¹¹⁾	The development of Pulo Gadung distribution main	1982-1985	Loan, OECF/Japan	11.87
Phase II Project of Stage I Development Program ¹²⁾	The expansion Pulo Gadung WTP and development of distribution main	1983-1987	Loan, OECF/Japan	13.93
Jakarta Water Supply Development Project ¹³⁾	The preparation of 3 rd Water Masterplan and Feasibility Study 1985-2005. The proposed projects are the development of Buaran I WTP and its T/D pipeline; the development of Buaran II WTP, the development of Lebak Bulus I, II, and III WTPs and its T/D pipe line; the development of Cakung I, II, and III WTPs and its T/D	1983-1985	Grant, OECD/Japan	1.37

	pipeline;			
Phase II Project of Stage I Development Program ¹⁴⁾	The development of distribution main for Pulo Gadung WTP	1985-1990	Loan, OECF/Japan	22.92
West Tarum Canal Improvement Project ¹⁵⁾	Consultancy services and water pipeline development	1985-1992	Loan, World Bank	43.4
Immediate Phase Project of Stage II Development Program ¹⁶⁾	The development of 4 th large scale Buaran I WTP and its distribution main	1986-1992	Loan, OECF/Japan	18.75
Phase I Project of Stage II Development Program ¹⁷⁾	The development of 5 th large scale Buaran II WTP and its distribution main	1987-1995	Loan, OECF/Japan	45.51
SAPROF Study for PAM Jaya System Improvement Project (PJSIP) ¹⁸⁾	Pre-investment study for PJSIP and to supplement Stage II Development Program under Master Plan III (Distribution network improvement in zone 3 and 6)	1989-1990	Grant, OECF/Japan	0.24
Jakarta Water Supply Development Pipeline ¹⁹⁾	Improvement of water distribution network. The area covered by the project were divided between World Bank (zone 1,2,4 and 5) and JBIC (zone 3 and 6)	1990-1997	Loan, OECF/Japan	47.75
Jabotabek Urban Development Project II ²⁰⁾	Improvement of water distribution network. The area covered by the project were divided between World Bank (zone 1,2,4 and 5) and JBIC (zone 3 and 6)	1991-1996	Loan, World Bank	190.0
The Study on The Revise of Jakarta Water Supply Development Project ²¹⁾	The preparation of 4 nd Water Masterplan and Feasibility Study 1985-2019 (to review the progress of 3 rd Master Plan 1985-2005 and to assess new	1995-1997	Loan, OECF/Japan	N.A

	requirements until 2019). All the planned projects were not implemented due to PPP in 1998. The proposed projects are: The development of Buaran II WTP and its T/D pipeline; the development of Cipayung I WTP and its T/D pipeline; the development of Cisadane II WTP and its T/D pipeline; the development of Cipayung II and its T/D pipeline; and the development of Cisadane III and its T/D pipeline.			
Unknown ²²⁾	Development of Cisadane treated water transmission pipe line		Loan, French government	N.A
Sewerage Pilot and Septage Treatment Plant Project				
Jakarta Sewerage and Sanitation Project ²³⁾	Consultancy services and construction of sewerage system. The first project for sewerage development in Jakarta	1983-1993	Loan, World Bank	22.4
The development of septage treatment plant ²⁴⁾	Construction of septage treatment plant in Pulo Gebang (300 m ³ /day)	1984	National budget	N.A
The development of septage treatment plant ²⁵⁾	Construction of septage treatment plant in Duri Kosambi (300 m ³ /day)	1995	National budget	N.A
Water and Sanitation Project for Low Income Communities				
Jakarta Urban Development Project ²⁶⁾	Consultancy services and construction of KIP Program (water, sanitation, solid waste and drainage). The first project of water supply and sanitation provision for low income	1974-1979	Loan, World Bank	25.0

	communities			
Second Urban Development Project ²⁷⁾	Consultancy services and construction of KIP Program (water, sanitation, solid waste and drainage) for Jakarta and Surabaya	1976-1980	Loan, World Bank	52.8 (32% of the funding is for KIP Jakarta)
Third Urban Development Project ²⁸⁾	Consultancy services and construction of KIP Program (water, sanitation, solid waste and drainage) for Jakarta, Surabaya, and Ujung Pandang	1979-1983	Loan, World Bank	54.0 (27% of the funding is for KIP Jakarta)
Jabotabek Urban Development Project III ²⁹⁾	KIP Program (water, sanitation, solid waste and drainage) to improve environmental quality of low income areas-Kampung in Jakarta, Tangerang, and Bekasi	1991-1996	Loan, World Bank	61.0

Source: ¹⁾ KemenPUPR, 2015; ²⁾ JBIC, 2008; ³⁾ Martijn, 2005; ⁴⁾ JBIC, 2008 and World Bank, 1976; ⁵⁻¹⁴⁾ JBIC, 2008; ¹⁵⁾ World Bank, 1985; ¹⁶⁻¹⁹⁾ JBIC, 2008; ²⁰⁾ World Bank, 1990; ²¹⁾ JBIC, 2008; ²²⁾ World Bank, 1990; ²³⁾ World Bank, 1993; ^{24 & 25)} Ministry of Public Works, 2015; ²⁶⁾ World Bank, 1974; ²⁷⁾ World Bank, 1976; ²⁸⁾ World Bank, 1979; ²⁹⁾ World Bank, 1990a

* Due to fluctuated inflation during 1950s

** T/D: transmission and distribution

APPENDIX IV : WATER PRODUCTION FACILITIES IN JAKARTA

Year Started to Operate	WTP	Production Capacity (l/s)	Operator
1957	Pejompongan I	2,000 (uprating to 3,000)	PALYJA
1970	Pejompongan II	1,000 (uprating to 3,000)	PALYJA
1977	MP Cilandak	200 (uprating to 400)	PALYJA
1980	Pesing	5 (not in-operation)	-
1988	Pulo Gadung	4,000	AETRA
1982	MP Sunter	100 (not in-operation due to high operating cost)	-
1982	MP Cakung	25 (not in-operation due to high operating cost)	-
1982	MP Muara Karang	100 (not in operation due to high operating cost)	PALYJA
1982	MP Pejaten	5 (not in-operation due to high operating cost)	-
1982	P. Cengkareng	50 (not in-operation due to high operating cost)	-
1992	Buaran I	2,500	AETRA
1993	Cisadane (DCR-4)	2,000	PALYJA
1993	Cisadane (DCR-5)	1,000	PALYJA
1995	Buaran II	2,500	AETRA
1982	MP Taman Kota	200	PALYJA
1992	DCR-1 Cilincing	2.895	AETRA
	MP Condet	2 (not in-operation due to high flood risk in the area)	-
	MP Ciburial	20 (not in-operation because it is located in Bogor, different area from Jakarta)	-

Source: PAM Jaya, 2016; BPS Jakarta 2000, 2001, 2007

APPENDIX V : PAM JAYA SHARE TO JAKARTA GOVERNMENT

No.	Year	Amount (Rp.)	Amount (US\$)
1.	2006	3 billion	327,278
2.	2007	3 billion	328,359
3.	2008	5 billion	516,553
4.	2009	6 billion	577,014
5.	2010	7 billion	770,539
6.	2011	8.6 billion	979,556
7.	2012	11.6 billion	1,236,623
8.	2013	12 billion	1,148,175
9.	2014	17.6 billion	1,481,693
10.	2015	22.8 billion	1,702,513

Source: PAM Jaya, 2016

APPENDIX VI : THEME OF THE FIVE YEAR PLANS (1969-1999)

Plan	Years	Main Themes*	Water and Sanitation Development Goals	Water Supply Development Target in Urban Areas	Locus of Water Development in Urban Areas	Investment per Capita for Water Supply	Output	Sanitation Development Target in Urban Areas
Long Term National Development Plan I (1969-1994): Economic Development								
REPELITA I	1969-1974	Stability	Rehabilitation of the existing water infrastructure and new development of water treatment plants	To increase existing water production capacity by 8,000 l/s	Large cities	Rp.134 (US\$0.35)	Water production capacity increased from 9,000 to 15,000 liter per second	-
REPELITA II	1974-1979	Economic growth	Development of water production facilities and expansion through first and minimal level of improvement (the provision of public water taps, public toilets, pit privies, leaching pits, and septic tanks)	To increase water production capacity by 12,000 l/s	Large cities	Rp.1,166 (US\$2.8)	Water production capacity increased from 15,000 to 20,000 liter per second	Basic sanitation provision particularly for rural areas
REPELITA III	1979-1984	Equity	Basic National Approach (BNA) to achieve minimal standard (continuation in public water taps, public toilets, pit privies, leaching	To provide a standardized water treatment plant units in 150 medium and small cities	Medium and small cities/towns	Rp.2,467 (US\$3.94)	Water production capacity increased from 20,000 to 35,000 liter per second	-

			pits, and septic tanks)					
REPELITA IV	1984-1989	National resilience	Initial effort for the integration of water and sanitation (pre-articulation of IUIDP)	To provide a standardized water treatment plant units in 350 big cities and 150 medium and small cities	Large cities	Rp.5,220 (US\$4.74)	Water production capacity increased from 35,000 to 51,000 liter per second with only 836,000 house connections	Basic sanitation provision for urban and rural areas Sewerage pilot projects for metropolitan and big cities
REPELITA V	1989-1994	Preparation for take-off	The implementation of Integrated Urban Infrastructure Development Plan (IUIDP)	To expand distribution network, to increase the number of house connection and public hydrant, to decrease the NRW	Large, medium, and small cities	Rp.6,591 (US\$3.37)	Water production capacity increased from 51,000 to 66,000 liter per second (which served for 27.6 million people or 36% of urban population)	Provision of basic sanitation (pit latrines and public toilets) in 200 big cities and 5,000 villages The continuation of sewerage pilot projects for metropolitan and big cities
Long Term National Development Plan II (1994-1999): Human Development								
Repelita VI	1994-1999	Consolidation for take-off	Improvement and continuation of IUIDP and emphasize on sustainable urban development	To expand distribution network by 30,000 l/s and to decrease NRW to 25%-30%	Large cities	Rp.9,060 (US\$3.89)	Water production capacity increased from 66,000 to 96,000 liter per second	Provision of basic sanitation (pit latrines and public toilets) in 9 big cities, 200 medium and small cities, and 7,000 villages The development of septage treatment plant in metropolitan and big cities

Source: author, with information drawn from multiple sources

APPENDIX VII : GROWTH OF BOTTLED WATER INDUSTRY AND GROWTH OF REFILLED WATER INDUSTRY IN INDONESIA

Growth of Bottled Water Industry in Indonesia (1990-2006)

Year	Number of companies	Production capacity (1,000,000 litre)	Rate of growth from the preceding year (%)	Number of Aspadin Members
1973*	1	6	N.A	-
1983*	5	10	N.A	-
1990	5	399	-	-
1991	125	637	60	13
1992	132	1,321	107	36
1993	140	1,590	20	45
1994	165	1,832	15	45
1995	184	2,055	12	51
1996	184	2,215	8	51
1997	184	2,500	13	62
1998	184	2,000	-20	62
1999	184	2,400	20	62
2000	184	3,700	54	71
2001	246	5,400	46	71
2002	350	7,100	31	71
2003	413	8,100	14	108
2004**	426	9,100	12	141
2005**	440	10,100	11	150
2006**	480	N.A	-	165

Aspadin: the Indonesian Bottled Water Business Association

Source: *Kurniati, 2007; Hadipuro, 2010, and **Fudji, n.d..

Growth of Refilled Water Industry in Indonesia (1997-2008)

Year	Number of refill stations
1997	100
2000	900
2002	2,400
2005	6,000
2008	8,500

Source: Darmawan, 2009

APPENDIX VIII : WATER QUALITY OF RIVER AND GROUNDWATER IN JAKARTA

Rivers and Canals in Jakarta

No.	River/Canal	Length (m)	Area (m ²)	Purpose of Use
1.	Ciliwung	46,200	1,155,000	Urban business
2.	Krukut	28,750	172,500	Water source of drinking
3.	Mookervart	7,300	233,600	Water source of drinking
4.	Kali Angke	12,810	538,200	Urban business
5.	Kali Pesanggrahan	27,300	351,900	Fishery
6.	Sungai Grogol	23,600	165,200	Fishery
7.	Kali Cideng	17,800	234,810	Urban business
8.	Kalibu Timur	30,200	392,600	Urban business
9.	Cipinang	27,350	464,950	Urban business
10.	Sunter	37,250	1,080,000	Urban business
11.	Cakung	20,700	414,000	Urban business
12.	Buaran	7,900	158,000	Urban business
13.	Kalibaru Barat	17,700	177,000	Fishery
14.	Cengkarange Drain	11,200	672,000	Urban business
15.	Jati Kramat	3,800	19,000	Urban business
16.	Cakung Drain	12,850	771,000	Urban business
17.	Ancol	8,300	240,700	Urban business
18.	Banjir Kanal Barat (West Tarum Canal)	7,600	380,000	Fishery
19.	Banjir Kanal Timur (East Tarum Canal)	23,000	1,380,000	Fishery

Source: BPS Jakarta, 2014

Water Quality of River in Jakarta

Level of Water Pollution	Water Pollutant Index (%)					
	2004	2005	2006	2007	2008	2009
Very low	0	0	3	0	0	0
Low	3	4	9	0	0	9
Medium	16	16	10	6	12	9
High	81	79	78	94	88	82

Source: Badan Pengelola Lingkungan Hidup Daerah, n.d.

Quality of Shallow Groundwater in Jakarta

Level of Water Pollution	Water Pollutant Index (%)					
	2004	2005	2006	2007	2008	2009
Very low	18	16	7	25	23	23
Low	33	33	55	43	48	41
Medium	28	35	13	20	16	19
High	21	167	25	12	13	17

Source: Badan Pengelola Lingkungan Hidup Daerah, n.d.

APPENDIX IX : SERVICE TARIFF AND CONNECTION FEE IN PDPAL JAYA

NO	CUSTOMER CATEGORY	WASTE WATER SERVICETARIFF (Rp/m ²)	CONNECTION FEE *)	
			Unit	Rp
I	HOUSEHOLDS			
1	HOUSEHOLDS TYPE A	72	unit	10,000
2	HOUSEHOLDS TYPE B	90	unit	10,000
3	HOUSEHOLDS TYPE C	108	unit	10,000
4	HOUSEHOLDS TYPE D	126	unit	10,000
II	SMALL COMMERCIAL			
1	SHOPS	108	per m ²	1,000
2	OFFICE (UP TO 3 FLOORS)	108	per m ²	1,000
3	HAIR DRESSER	126	per m ²	1,000
4	CATERING	144	per m ²	1,400
5	RESTAURANT	180	per m ²	1,500
6	SMALL HOTEL	180	per m ²	1,500
7	OTHER	180	per m ²	1,500
III	LARGE COMMERCIAL			
1	HIGH OFFICE BUILDINGS	360	per m ²	1,750
2	HIGH OFFICE BUILDINGS INCL. RESTAURANTS AND/ OR FITNESS	396	per m ²	1,925
3	SHOPPING CENTRES/MALLS/ SUPERMARKETS/ SHOWROOM	396	per m ²	1,925
4	I, II, III - STARS HOTEL	396	per m ²	1,925
5	APARTMENT/CONDOMINIUM	540	per m ²	2,625
6	IV - STARS HOTEL	540	per m ²	2,625
7	ENTERTAINMENT CENTRES/BIG RESTAURANTS/ CAFE	576	per m ²	2,800
8	PRIVATE HOSPITALS	576	per m ²	2,800
9	V - STARS HOTEL	576	per m ²	2,800
10	OTHER	576	per m ²	2,800
IV	SOCIAL			
1	RELIGIOUS PLACES	40	per m ²	550
2	COMMUNITY HEALTH CENTERS	85	per m ²	1,100
3	SCHOOLS	108	per m ²	850
4	GOVERNMENT INSTITUTIONS	144	per m ²	1,100
5	OTHER INSTITUTIONS	144	per m ²	1,100
6	SCHOOLS Incl. DORMITORY	144	per m ²	1,100
7	SWIMMING POOLS	180	per m ²	1,100
8	GOVERNMENT HOSPITALS	216	per m ²	1,500
9	CLINIC	216	per m ²	1,500
V	INDUSTRY			
1	SMALL INDUSTRY	144	per m ²	1,000
2	MEDIUM INDUSTRY	432	per m ²	4,200
3	LARGE INDUSTRY	468	per m ²	4,300

*From standard pipe to control chamber.

Connection fee is Rp/unit and Rp/m² for non-domestic customers.

Source: USAID, 2006

APPENDIX X : TECHNICAL TARGET OF AETRA AND PALYJA

Technical Target According to the Cooperation Agreement (Aetra)

Technical Standard	Unaccounted for Water (%)		Number of Connection (units)		Service Coverage Ratio (%)		Volume of Water Billed (million m3)		Water Production (l/sec)	
	1997 ¹⁾	2001 ²⁾	1997 ¹⁾	2001 ²⁾	1997 ¹⁾	2001 ²⁾	1997 ¹⁾	2001 ²⁾	1997 ¹⁾	2001 ²⁾
Year 1	50.00	58.07	251,607	278,083	55	57	105.00	91.96	8343	8523
Year 2	47.00	51.74	281,607	285,753	59	57	121.00	105.90	8531	7828
Year 3	42.00	45.86	311,607	304,303	64	59	136.00	117.94	8531	7408
Year 4	38.00	45.03	341,607	315,126	65	60	153.00	121.83	8531	7282
Year 5	35.00	43.03	361,607	335,413	70	62	186.00	131.32	8531	7309
Year 10	25.00	34.03	-	-	75	74	-	-	-	-
Year 20	20.00	25.00	-	-	95	89	-	-	-	-
Year 25	20.00	25.00	-	-	100	100	-	-	-	-

First cooperation agreement issued in 1997

Restated cooperation agreement issued in 2001

Source: Shofiani, 2003

Technical Target According to the Cooperation Agreement (PALYJA)

Technical Standard	Number of Connection (units)		Service Coverage Ratio (%)	
	1997 ¹⁾	2001 ²⁾	1997 ¹⁾	2001 ²⁾
Year 5	395,522	301,048	70.00	45.00

First cooperation agreement issued in 1997

Restated cooperation agreement issued in 2001

Source: Bakker, 2007

Target vs Realization of Cooperation Agreement

Year	NRW				House connection				Coverage			
	PALYJA		AETRA		PALYJA		AETRA		PALYJA		AETRA	
	Target	Realization	Target	Realization	Target	Realization	Target	Realization	Target	Realization	Target	Realization
1998	58.63%	58.15%	58.08%	66.64%	209,895	209,895	278,083	278,083	44.00%	32.00%	55.00%	57.00%
1999	57.84%	57.48%	51.75%	57.94%	225,813	225,813	285,735	285,735	55.00%	33.00%	59.00%	57.00%
2000	51.27%	51.19%	45.74%	50.63%	257,952	257,952	304,303	304,303	63.00%	38.00%	64.00%	59.00%
2001	49.27%	47.74%	45.03%	53.39%	282,048	290,524	315,126	320,282	42.00%	48.27%	60.00%	60.97%
2002	47.72%	45.29%	43.03%	49.93%	301,048	312,879	335,413	336,550	45.00%	49.89%	62.00%	62.17%
2003	44.88%	44.93%	46.12%	45.60%	329,987	329,987	360,469	360,469	51.00%	52.18%	64.40%	65.59%
2004	42.48%	46.86%	50.12%	48.99%	340,987	337,640	368,250	368,250	57.00%	53.74%	66.59%	67.06%
2005	38.95%	50.58%	44.55%	50.21%	351,987	344,368	379,032	364,551	63.00%	54.55%	69.20%	66.45%
2006	37.15%	49.04%	42.58%	53.15%	361,987	351,230	387,158	374,211	69.00%	55.49%	71.60%	67.26%
2007	35.40%	47.60%	40.59%	53.43%	371,987	377,765	395,253	377,790	75.00%	58.99%	74.00%	66.08%
2008	45.00%	46.46%	51.50%	53.35%	391,987	398,557	380,116	379,487	61.00%	61.85%	62.35%	65.28%
2009	44.00%	44.54%	50.30%	50.57%	400,224	412,456	386,217	382,693	62.50%	63.93%	64.00%	59.67%
2010	43.10%	42.65%	49.00%	49.86%	408,460	419,776	391,554	385,377	64.00%	64.66%	65.77%	59.96%
2011	41.30%	40.19%	47.75%	46.78%	416,694	414,470	397,615	388,166	65.50%	63.90%	67.78%	59.26%
2012	40.00%	38.80%	40.29%	45.48%	424,924	407,459	404,621	392,240	67.00%	61.93%	63.38%	58.61%
2013	38.75%	40.02%	37.14%	42.88%	430,674	404,980	415,331	398,621	68.50%	61.00%	65.24%	57.06%
2014	37.50%	40.88%	35.58%	41.94%	436,368	405,712	426,041	407,644	70.00%	60.24%	67.06%	57.89%

**Target has been revised several times and it is lower than original target in cooperation agreement*

Source: PAM Jaya, 2016

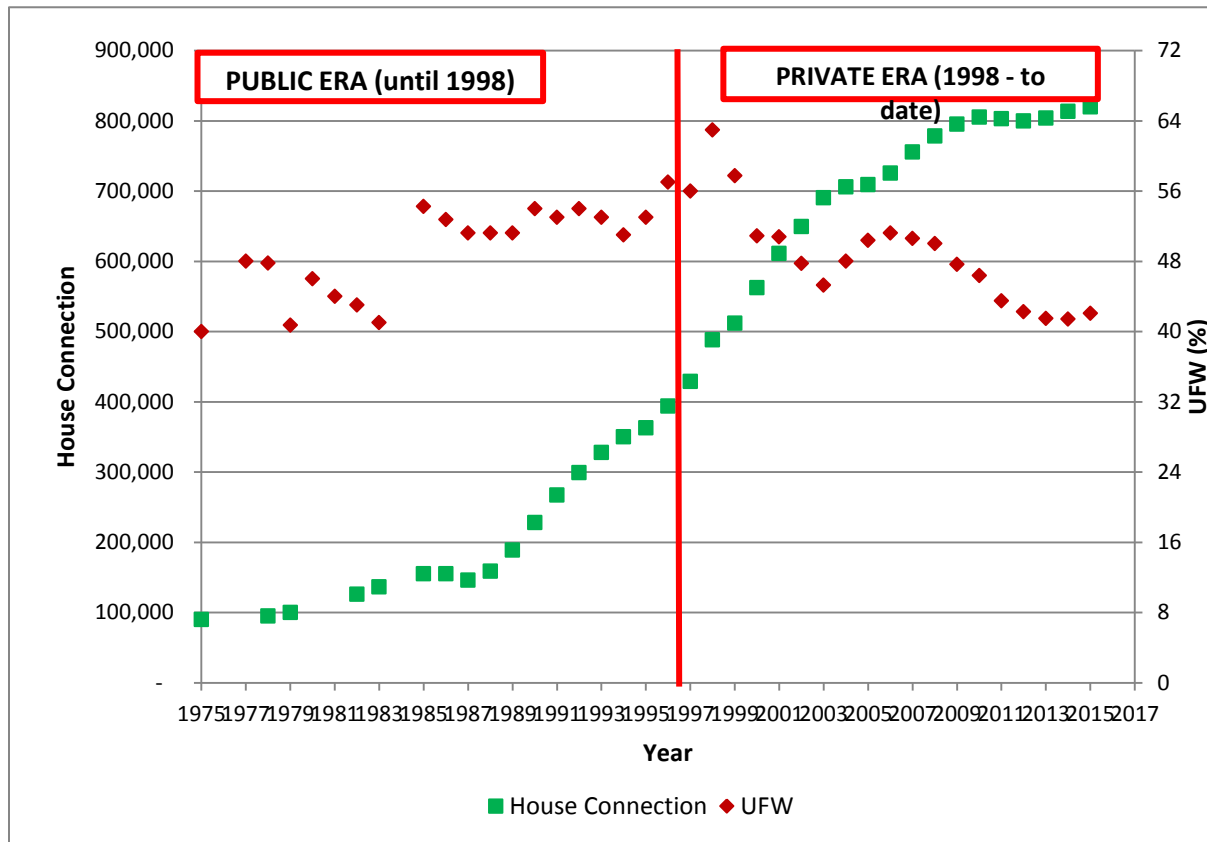
Target vs Realization of Cooperation Agreement

Year	Volume of Water Billed (m3/year)				Water Production (m3/year)				Water Distributed (m3/year)			
	PALYJA		AETRA		PALYJA		AETRA		PALYJA		AETRA	
	Target	Realization	Target	Realization	Target	Realization	Target	Realization	Target	Realization	Target	Realization
1998	89,165,168	89,165,168	105,189,856	91,962,344	150,451,285	150,451,285	245,990,000	245,962,515	215,505,120	213,079,342	250,930,000	275,648,276
1999	101,728,796	101,719,778	121,729,925	106,120,986	160,094,531	160,094,531	246,820,000	246,820,737	241,268,897	239,226,814	252,290,000	252,328,266
2000	110,405,290	110,405,290	129,621,714	117,944,722	147,442,950	147,442,950	234,270,000	234,270,208	226,548,828	226,198,373	238,890,000	238,889,366
2001	114,554,783	116,769,888	127,827,238	120,422,331	153,661,139	145,741,815	229,640,000	254,005,662	225,794,422	223,461,594	232,540,000	258,354,429
2002	118,730,298	126,200,288	131,321,547	128,950,799	160,991,280	153,760,331	230,510,000	253,300,643	227,090,146	230,687,269	230,510,000	257,554,856
2003	131,310,498	131,310,500	141,400,417	142,791,817	156,828,289	156,831,189	259,571,968	259,571,968	238,247,818	238,433,878	262,455,756	262,475,085
2004	134,400,000	127,338,770	140,388,792	143,569,487	151,447,112	153,101,722	279,402,640	279,402,640	233,663,352	239,615,489	281,474,936	281,474,934
2005	138,700,000	129,344,449	144,000,000	137,736,032	145,191,744	174,828,415	259,693,417	275,283,400	227,185,344	261,740,105	259,693,417	276,633,938
2006	143,000,000	130,037,937	146,278,348	131,818,196	145,538,640	168,162,640	254,751,563	280,761,592	227,532,240	255,184,856	254,751,563	281,365,056
2007	146,926,124	130,261,004	148,474,056	121,756,904	145,444,032	164,022,464	249,914,249	261,208,390	227,437,632	248,611,913	249,914,249	261,469,202
2008	134,316,522	134,509,658	125,190,000	124,429,644	157,487,858	163,593,255	258,080,000	266,640,080	244,211,858	251,216,518	258,130,000	266,720,660
2009	137,252,018	137,732,227	128,250,000	129,414,385	158,368,890	161,402,616	258,050,000	261,814,733	245,092,890	248,349,025	258,050,000	261,814,733
2010	140,507,936	147,277,544	131,748,300	136,687,954	160,214,376	170,025,096	258,330,000	272,637,470	246,938,376	256,800,571	258,330,000	272,637,470
2011	144,416,071	153,258,418	135,290,925	144,560,814	159,299,971	167,845,113	258,930,000	271,631,182	246,023,971	256,222,941	258,930,000	271,631,182
2012	147,286,254	159,811,122	161,378,217	150,438,576	158,753,090	171,955,912	270,270,000	275,949,470	245,477,090	261,139,203	270,270,000	275,949,470
2013	150,231,979	158,547,811	172,336,976	155,771,005	158,552,700	172,901,783	274,160,000	272,696,498	245,276,700	264,326,138	274,160,000	272,696,498
2014	152,795,989	159,075,389	181,020,200	162,061,468	157,749,582	179,555,368	281,000,000	279,134,217	244,473,582	269,056,000	281,000,000	279,134,217

**Target has been revised several times and it is lower than original target in cooperation agreement*

Source: PAM Jaya, 2016

APPENDIX XI : NRW AND PIPED-WATER CONNECTION IN JAKARTA (1975-2015)



Source: author, with information drawn from multiple sources

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