WATER AS A PUBLIC GOOD: A CRITICAL REVIEW OF WATER GOVERNANCE IN NAULI CITY

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ABBREVIATIONS & ACRONYMS

BAPPEDA	Badan Perencanaan Pembangunan Daerah (Regional Development Planning Agency)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BLUD SPAM	Badan Layanan Umum Daerah Sistem Penyediaan Air Minum (Regional Agency for Public Drinking Water Supply System)
BPK	Badan Pemeriksa Keuangan (State Audit Agency)
BPKP	Badan Pengawasan Keuangan dan Pembangunan (State Development Audit Agency)
BPPSPAM	Badan Pendukung Pengembangan Sistem Penyediaan Air Minum (Drinking Water Supply System Development Support Agency)
BPLHD	Badan Pengendalian Lingkungan Hidup Daerah (Regional Environmental Management Agency)
BPS	Badan Pusat Statistik (Central Bureau of Statistics)
CoP	Community of Practice
CSH	Critical Systems Heuristics
DAMIU	Depot Air Minum Isi Ulang (Water Refill Depot)
DGFB	Directorate General of Fiscal Balance
Dinas PU (also MPW)	Dinas Pekerjaan Umum (Ministry of Public Works)
DPPKAD	Dinas Pendapatan Pengelolaan Keuangan dan Aset Daerah (Regional Revenue and Asset Management Agency)
FCR Tariff	Full Cost Recovery Tariff
GR	Government Regulation (regulations that are issued by the President)
HHI	Herfindahl-Hircshman Index
JUG	Joined Up Government

MDG	Millenium Development Goal
MoF	Ministry of Finance
MoHA	Ministry of Home Affairs
NGOs	Non-Government Organisations
NRW	Non-revenue water (water losses)
PAMSIMAS	Penyediaan Air Minum Berbasis Masyarakat (Community Based Water Provision System)
PDAM	Perusahaan Daerah Air Minum (Local Government Owned Water Enterprise)
PDRB	Produk Domestik Regional Bruto (Gross Domestic Regional Product)
PK PAM	Pengembangan Kinerja Sistem Penyediaan Air Minum (Development of Water Provision Performance Program)
PPP	Public-Private Partnerships
PuPs	Public-Public Partnerships
Puskesmas	Pusat Kesehatan Masyarakat (Community Health Centre)
RISPAM	Rencana Induk Sistem Penyediaan Air Minum Blueprint for Water Provision
RPJMN	Rencana Pembangunan Jangka Menengah Nasional (National Medium-Term Development Plan)
SDG	Sustainable Development Goal
TDS	Total dissolved solids
UN	United Nations
UNDP	United Nations Development Program
WHO	World Health Organization
WoG	Whole of Governments
WPR	What's the problem represented to be?

ABSTRACT

Conflict has arisen as local governments and local water companies quarrel over access to business opportunities to commodify water and to transform water from a common good into a product.

The thesis makes the case that the Indonesian constitution (signed 18th August 1945), which stresses that water, is an inalienable right needs to be upheld. Details of the way in which service delivery has been neglected are core themes of this thesis.

Proliferation of local governments following the implementation of the decentralisation law in Indonesia has resulted in the creation of silos in governments and public services. This thesis focuses on a case study of the social, economic and environmental challenge of water management in Nauli City, one of the driest and poorest areas in Indonesia. It makes a contribution to public administration and public policy by detailing the wicked problem of water provision by using Werner Ulrich's Critical System Heuristics (CSH) to address the current issues and to make policy recommendations based on exploring the nature of the problem. Finally, the thesis proposes a policy analysis to inform the improvement of water delivery.

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Chapter IV of this thesis is already published as Simbolon (2017) titled *Critical Systems Thinking Review On Decentralised Drinking Water Management In Nauli City, Indonesia* in two publications: (i) the proceedings of the 60th Annual Meeting and Conference of the International Society for the Systems Sciences (ISSS) 2016 in Colorado, USA, and (ii) the Systems Research and Behavioral Sciences (SRBS) Journal. Permission was granted for this paper to appear as a chapter in an edited collection based on papers from the International Systems Sciences and associated networks called *Balancing Individualism and Collectivism*, Springer, New York.

Chapter V is to be published (post submission of the thesis) under the title *What is the Problem Represented to Be: Water Scarcity, Water Mismanagement, or Misdirecting the System?* in an upcoming volume titled *Resourcing the commons* to be published by Springer.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed .....

Date: 28 March 2019

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CHAPTER 1. INTRODUCTION

1.1 Background

> "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." (Article 33, Indonesian Constitution 1945).

1.1.1 Protecting water as a common good

David Bollier (2011) defines the concept of commons as a social-system, wealth, knowledge, or sector of economy that has long-term stewardship with preserved shared values that must be passed on to the next generation with minimum reliance on the market or state. To a large extent, water is a commons as it is one of the basic needs for human life. Nations have to manage water as a commons because it is not merely a resource, but it carries with it culture, history, values and norms of local people, and authorities need to respect that (Bollier 2012).

Who owns the water? It is always difficult to answer this question in the modern context. For centuries throughout our history, water was, and will always be, considered *res omnium communes*, meaning that water is for all (Schelwald-van der Kley 2009, p. 88). However, nowadays, nations are now treating water more like a commodity which is provided by public or private companies.

On 28th of July 2010, the United Nations formally stated through a resolution that the UN: "recognizes the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights".[1] The UN also urged all countries and international bodies to provide all necessary support to further develop the water sector, especially in developing countries.

Debate as to whether water should be regarded as a public good or as a commodity have gone on for decades. Shiva (2002) claimed that people's right to water is a natural right which has been embedded in cultures for centuries. Shiva suggested that water should not be regulated by the state and added that, "water must be free for sustenance needs, free of cost," and making profit from water is harmful to the commons and to human beings (2002, p.20). Bakker (2003, p. 18) put it very clearly: water business regards water as a product, and treats citizen as individual customer rather than a collective. Meanwhile, others suggest that imposing a charge on water is needed so that water industries can maintain their service of water and, therefore, will be able to satisfy the human right to water (Gleick Peter H. 2013; Gray 2008, p. 3). Rogers, De Silva and Bhatia (2002) challenge the

[1] United Nations Resolution Number 64/292: The Human Right To Water and Sanitation. There is also a statement from the United Nations Committee on Economic, Cultural and Social Rights (2002): "Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity".

old view that water price will harm equality. They argued that full price policy integrated with economic, legal and environment management considerations will mean that water is utilised optimally and this approach improve equity and sustainability of supply.

Quilligan (2012) described that since the arrival of neoliberalism which seeks to define all goods as private goods, the term 'public' has shifted from referring to people to referring to the government. It means that the goods that are supposed to be acquired and organised collectively by communities are now controlled centrally by the government. Community empowerment to manage water is ignored, and the government merely chooses the simplest method of water management which is to sell it. The Indonesian constitution has explicitly mandated that water should be "controlled by the government," but with further restriction "for the maximum benefit of the people". Water can be a common good if the government encourages communities to be self-providing, with water shared by negotiating their own rules and norms, as access to drinking water can result in rivalry and competition for resources. This is aligned with the subsidiarity principle which recognises that individuals should be empowered to deal with and to overcome the problems that are affecting them. Subsidiarity in governance requires that organisations that are closest to individuals should be given the authority to make decisions and manage their own affairs, discourages centralisation and empowers local governments (Bosnich 1996; Evans Dr 2013).

As a market commodity, the pricing of water is a consequence which must be approached properly and carefully. Gleick mentions that "The failure to properly price water leads to inefficient use, overconsumption, environmental degradation, inadequate investment to maintain and expand services, and inappropriate subsidization of some users at the expense of others" (2013, p. 14). Public Citizen (2003) also provides insight into some cases around the world which suggest that applying too expensive a tariff will lead to discord from citizens and often riots.

Basically, in assuring good governance in water provision, the government should be guided by 'expanded pragmatism'. This is a mindset that considers the rights of others (human and non-human beings) and future generations, in contrast to narrow pragmatism which is individualistic and where decisions are driven by power and profit (McIntyre-Mills 2010, 2014b, 2016).

1.1.2 Water Provision system in Indonesia

According to the United Nations Development Program (UNDP) (2014, pp. 5, 85), providing access to adequate clean water is one of the basic social services[2] which sould be universally provided, and it is essential in order to strengthen the quality of life of the people especially in early stages of

[2] According to UNDP, basic social services are: education, health care, water supply and sanitation, and public safety.

development. Water scarcity is now a big problem for some countries, and it has to be addressed to ensure health security is improved. In formulating the 2013 Human Development Index, UNDP (2014, pp. 212-5) included the 'child mortality rate caused by unsafe water supply and unimproved sanitation' as a parameter, and it shows that even some of the countries in the very high human development index group (8 out of 49 countries) still experienced the unsafe water supply.[3] While Indonesia has globally ranked 16th in gross domestic product and has an abundance of water in the country, it unfortunately ranked 108th in terms of the Human Development Index (clustered as Medium Human Development), with 130 cases of water borne diseases per 100,000 deaths of children under five years of age.

It is generally accepted that public utilities, such as electricity, water, transportation, and waste collection, should be provided or at least controlled by the government (see da Cruz, Berg & Marques 2013; Drakakis-Smith 1995; Laffont 2004). The Indonesian Constitution clearly states that the government has the responsibility to provide water to the people. The government started to set up local water companies (*Perusahaan Daerah Air Minum*/PDAM) and has delegated the responsibility of water delivery to the PDAMs since the 1970s. The Ministry of Public Works issued Ministerial Decree no.3/PRT/1968 which is regarded as the starting point of nationally integrated water management. The ministerial decree was also supported by the Ministry of Home Affairs Decree (*Instruksi Menteri Dalam Negeri*) or Inmendagri 26/1975 which mandated the transformation of water management units in local Departments of Public Works (*Dinas PU*) to become PDAMs.

In the First Medium Term Development (Pelita I),[4] the Ministry of Public Works acted as the key player in organising water, investing in schemes across the country. The Ministry started by proposing 120 cities to the Ministry of Finance to receive funds from foreign loans. In the Second Medium Term Development (Pelita II, 1974-1978), the Ministry then expanded to convert local government water management units into PDAM. With responsibility for PDAMs had been handed over to subnational governments, each PDAM operates within a particular administrative area, hence there are Provincial PDAMs (only for two provinces: North Sumatera and Jakarta), City PDAMs, and District PDAMs. Subnational governments determine not only key policies in water provision, but financial and management matters of PDAMs as well.

[3] Deaths attributed to water borne diseases per 100,000 deaths of children under age 5: Denmark (1), Luxembourg (2), Czech Republic (1), Cyprus (13), Qatar (6), United Arab Emirates (10), Chile (1), and Cuba (1).

[4] *Pelita: Pembangunan Lima Tahun* (Medium Term Development). Pelita I ran from 1969 to 1973.

At the beginning of 1980s, there were only 12 PDAMs established in Indonesia with overall service coverage in urban areas at only seven per cent (Simbolon 2007a, pp. 4-5).[5] Within the next 50 years, hundreds of new PDAMs were established and performance measurement standards were also developed to assess affordability, quality and accessibility of water. Based on those standards, the performance of those PDAMs were unsatisfactory. Firstly, in relation to financial performance, the Water Supply System Development Support Body (BPPSPAM)[6] released the national recapitulation of PDAM performance, and in 2013, only 50 per cent of 350 PDAMs can be categorized as financially healthy, while the rest are less healthy and "sick" or financially at risk, as indicated in the Figure 1 below:

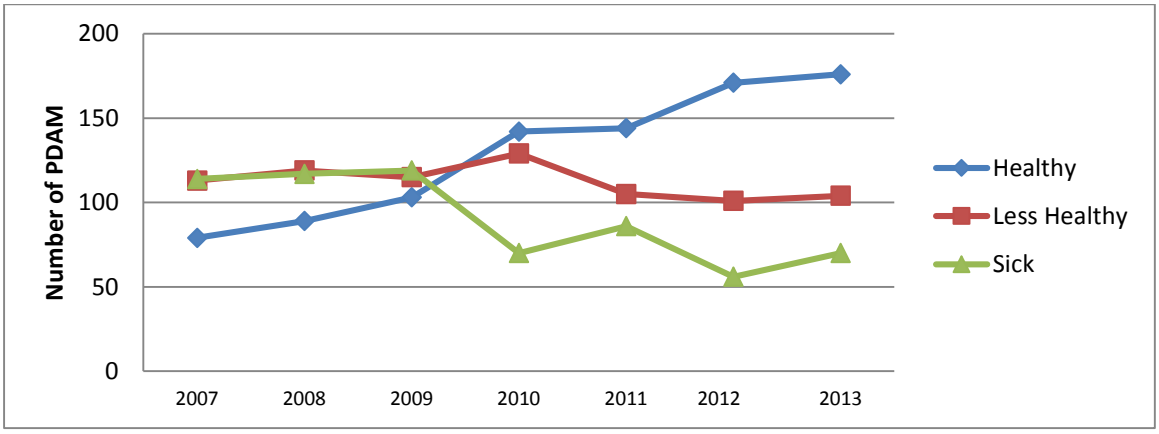


Figure 1: PDAM Financial Performance from 2007-2013
(BPPSPAM, 2014a)[7]

Secondly, by the end of 2011, PDAMs only had the capacity to service 55.04% of the population (13.94% in rural areas and 41.88% in urban areas) (Suara Pembaruan 2013), and to meet the target set by the Millennium Development Goals (MDGs)[8] on water access were to be achieved in Indonesia, it should provide 68.87% coverage by 2015 (DG Human Settlements 2009.

Hadipuro (2010) explains that in 2010 there were only three provinces (East Kalimantan, Central Kalimantan and Bali) in which more than thirty per cent of the population were served by piped water (BPS 2009).[9] BPPSPAM (2014a) also stated that 175 of 205 PDAMs did not have the capacity to repay debts. Last but not least, the quality and continuity of water that is provided by

[5] Some of these PDAMs were not in actuality established by the local government, since they had existed since the colonial era. Some of the oldest water companies were established in Medan (1905), Jakarta (1918), Makassar (1924) and Semarang (1911).
[6] BPPSPAM: *Badan Pendukung Pengembangan Sistem Penyediaan Air Minum*
[7] Financial performance category: Healthy: good financial performance; Less Healthy: Financially at risk (in terms of cash flow and debt repayment); Sick: Financially in trouble (poor cash flow and unable to repay loan)
[8] Millennium Development Goals (MDGs) Goal 7: Ensure Environmental Sustainability. Target 7C: Halved, by 2015, the proportion of the population without sustainable access to safe drinking water. Source: http://www.un.org/millenniumgoals/environ.shtml, retrieved 3 October 2014.
[9] Source: Survei Sosial Ekonomi Nasional Badan Pusat Statistik – National Social Economic Survey of the National Statistics Bureau (2009)

PDAMs is also poor (Bakker et al. 2008, p. 1896; Hadipuro 2010, p. 482). This condition is deteriorating as the local governments do not provide the necessary support to the PDAMs by not allowing tariff increases when necessary, and PDAMs are also obliged to contribute to local government income by paying dividends (Hadipuro 2010; Indonesia Infrastructure Initiatives 2013).

Overall, poor water management has resulted in over 100 million people in Indonesia not having access to safe water and more than 70% of the country's population of 260 million people rely on water obtained from potentially contaminated sources. This unsafe drinking water is a major cause of dysentry, which is the second biggest killer of children under five in Indonesia and it is the cause of twenty per cent of child deaths each year (Dursin 2006). Hadipuro states that the future of water management in Indonesia is in doubt, and it surely needs a better system (2010, p. 477) in order to achieve the National Medium Term Development Planning (RPJMN) that aims to achieve one hundred percent coverage for water access by 2019. The Sustainable Development Goals (Goal 6 in Water and Sanitation) stresses that, by 2030, universal and equitable access to safe and affordable drinking water for all.

1.1.3 From water management in Nauli to water governance: a case study

1.1.3.1 Background

The Nauli region consists of two neighbouring, autonomous local governments: District of Nauli and City of Nauli. Overall, the total area of this region is 5,478.4 km^2, of which 3.3% (180.27 km^2) falls under City of Nauli jurisdiction, and 96.7% (5,298.13 km^2) under Nauli District's administrative area. This province has a very different climate from those of western and upper parts of Indonesia as it has proximity to Australia (Schmidt & Ferguson 1951). The Statistics Body of Nauli City states that, geologically, the City of Nauli's landscape is very arid, rocky, mountainous and of non-volcanic matter (BPS Nauli City 2016). The picture below shows fencing made from stone which is very common for houses in rural areas of Nauli City.

Figure 2: Stone fencing in Nauli City (source: researcher)

This area has little precipitation. Rain falls predominantly between December and March, while from May to November the precipitation rate is almost zero (BPS 2014). Table 1 and Figure 3 below present the comparison between the total of days of rain and the volume of rain (mm) in 2015.

Table 1: Rainfall in 2014 and 2015 (source BPS, 2014)

	2014		**2015**	
	days	mm	days	Mm
January	25	470	26	460
February	21	498	24	208
March	14	103	14	332
April	11	67	8	20
May	5	27	4	5
June	3	3	0	0
July	3	14	2	3
August	1	0	0	0
September	1	0	0	0
October	0	0	0	0
November	9	113	2	7
December	23	186	23	170
Total	**116**	**1481**	**103**	**1205**

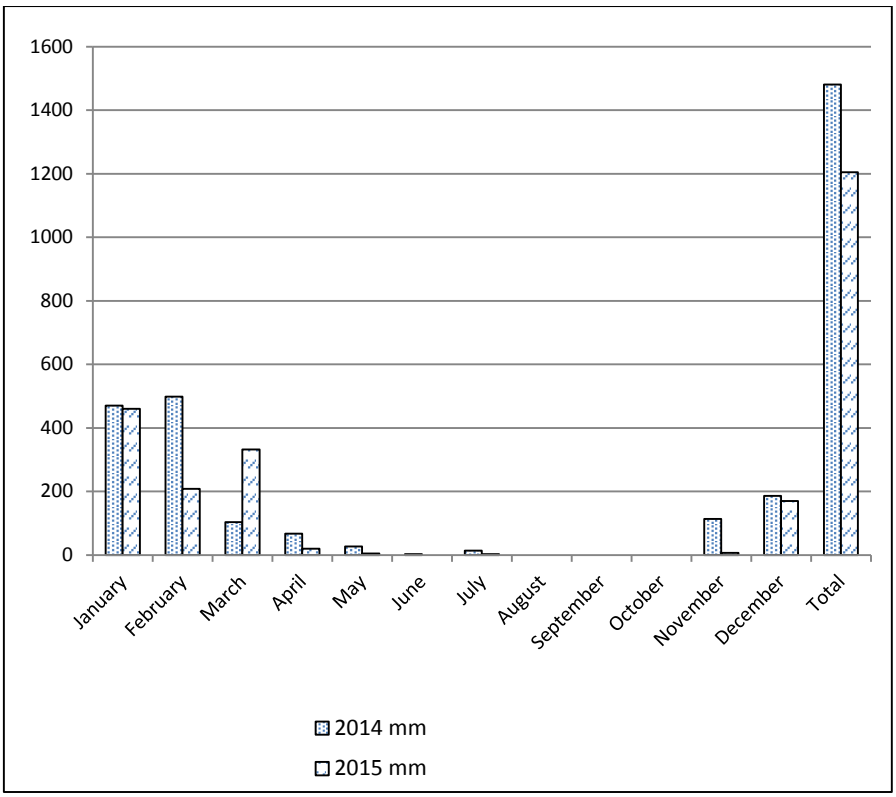


Figure 3: Comparison of rainfall in 2014 and 2015 (source BPS, 2014)

The table shows that Nauli City had much less rain in 2015 compared to 2014. The number of rainy days in 2015 was 103, 13 days fewer than in 2014, while the volume of rain decreased by 276 mm from 2014. Schmidt and Ferguson (1951) classified Indonesia's climate into two categories based on their intensity of rain: wet months and dry months. A month is considered as dry if the rainfall is below 60 mm because it is not sufficient to counter evaporation, whereas if it is over 60 mm then it is a wet month. Based on that parameter, Nauli City had four wet months and eight (very) dry months in 2015.

Nauli City and Samosir Province were amongst the poorest regions in Indonesia based on their PDRB (*Produk Domestik Regional Bruto*/Gross Domestic Regional Product) (BPS, 2015) as shown in the graphs below.

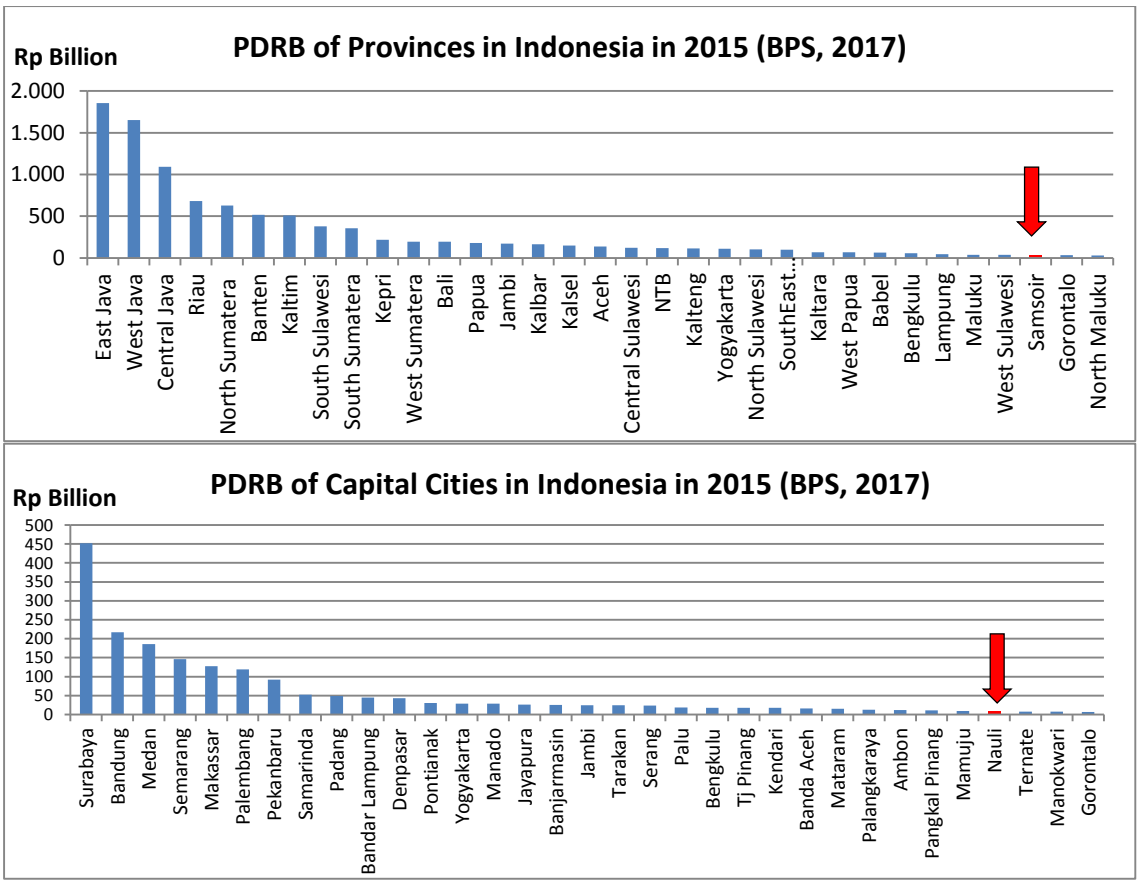


Figure 4 PDRB of Provinces and Capital Cities in Indonesia in 2015 (BPS, 2015)

1.1.4 The Governments and Water Governance

The District of Nauli was established on the 9th of August 1958, under Law No. 69/1958 and with the sub-district (*kecamatan*) of Nauli as the capital city. In 1978 with Government Regulation No. 22/1978, the sub district of Nauli was upgraded to become an administrative municipality[10] of Nauli. In 1996, Nauli was upgraded from an administrative city to become Nauli City, which had all the structures of an autonomous city.

Water management in Nauli region has become more organised since the Ministry of Public Works established a Drinking Water Management Body/BPAM (*Badan Pengelola Air Minum*) as a vertical unit[11] in Nauli, which was called BPAM Kabupaten Nauli (BPAM of Nauli District). The Ministry of Public Works transferred the management of BPAM to the local government of Nauli District in 1986, and soon after that the status of BPAM was upgraded to that of a local water company or PDAM.[12] After almost 30 years of operation, PDAM Kabupaten Nauli became one of the biggest

[10] During the New Order Era under President Suharto's administration, an administrative city was prepared as a candidate for a new city. It had its own structure, led by a mayor, but was still under the parent district's jurisdiction (Firman 2013, p. 186).
[11] A vertical unit is the related ministry's office in a region.
[12] PDAM of Nauli District was formally founded on 15 May 1986.

PDAM in Indonesia with more than 30,000 connections, supplied by 25 water sources, with a total capacity of 575 litre/second. Moreover, the PDAM had just recovered from an acute financial crisis to become the best performing PDAM in Samosir.

In September 2005, the government of Nauli City established PDAM Kota Nauli (PDAM of Nauli City), which emerged from the Clean Water Service Unit under the Local Public Works Department (*Dinas PU*). However, the PDAM management only commenced officially in April 2009 when its board of directors was appointed (PDAM Kota Nauli website, 2015). In 2014, its number of customers reached 6,573 connections served by 16 water sources with a production capacity of 108. However, PDAM Kabupaten Nauli still operates their business in Nauli City's administrative territory. In 2012, 85.8% (22,629 out of 26015 connections) of PDAM Kabupaten Nauli customers were located in Nauli City, which comprised 56.01% of Nauli City's population (Source: PDAM Kabupaten Nauli Company Profile 2013). Until recently, PDAM Kabupaten Nauli's head office was still located in Nauli City, and 19 out of 25 of its water sources are located in Nauli City.

This has been a major cause of dispute between the two PDAMs and, more widely, between the Mayor and Head of District. According to national regulations,[13] the delivery of water provision is the responsibility of local governments, with the local government as regulator and the PDAM as the operator, and water tariffs must be authorised by the head of local government (mayor or head of District). The regulations mean that the policy of delivering water in a particular region is determined by the local government. In 2015, the government of Nauli City asked Nauli District government to transfer the water service network from the PDAM of Nauli District to the PDAM of Nauli City, but the district refused (Pos Nauli 2013). There had been efforts from the Governor of Nusa Tenggara Timur and also some national parliament members to reconcile these two local governments, but they still did not arrive at an agreement (Pos Nauli 2014a, 2014b).

This situation triggered poor performance in drinking water provision in Nauli region. In Nauli City, only 38.17% of households had access to PDAM water (piped water), while others fulfilled their need through other sources like water merchants (32.84%), bore wells (24.16%), and other unprotected water sources (4.83%) like water spring, rivers (which only have water during rainy season), and *embung* (traditional dam). Sadly, 0.48% of the population had no water resource at all based on 2013 data (BPS Nauli City 2014). The population of Nauli City reached 390,877 people in 2015, and the 0,48% means there were 1,876 people who struggled to find water. Meanwhile, in the Nauli District the condition was much worse, with only 1.63% of households served by piped water, while 5.43% of the population had to buy water from water merchants, and 92.94% drew

[13] Government Regulation No. 16/2005 and Ministry of Home Affairs Decree No. 23/2006.

water from protected water wells, springs, rivers (there are three rivers that flow during rainy season: Liliba River, Dendeng River, and Merdeka River), or even rain water (BPS Nauli District 2013).

Figure 5: A well that is 70m deep and still has no water in dry season (source: researcher)

Figure 6: People carry water buckets from a spring sometimes for hundreds of metres (source: researcher)

Figure 7: Unprotected water source, a small creek used for domestic needs (source: researcher)

Figure 8: Rainwater harvested from roof gutters (source: researcher)

In order to support both PDAMs in accessing untreated water for irrigation and other needs, the central government built the Tilong Dam measuring 19.07 million m^3, which was located in Nauli District, 25km from the city of Nauli. Samosir provincial government[14] was assigned to operate the dam. In 2011, the provincial government then established a new department with a semi private financial management system (*Pola Pengelolaan Keuangan Badan Layanan Umum Daerah*/PPK BLUD), which was called BLUD SPAM (*Sistem Penyediaan Air Minum*/Drinking Water Provision System). In terms of drinking water, the main objective of this unit is to provide bulk water to the PDAM of Nauli City and PDAM of Nauli District. However, BLUD SPAM was not only selling bulk water to the PDAM of Nauli City (because the PDAM of Nauli District did not want to buy), but started to sell bulk water to end users (residents in Nauli City and Nauli District, University of Nusa and the airport). The water management system in Nauli region is detailed in the figure below.

[14] According to Law 23/2014 article 4: provincial government is representative of central government.

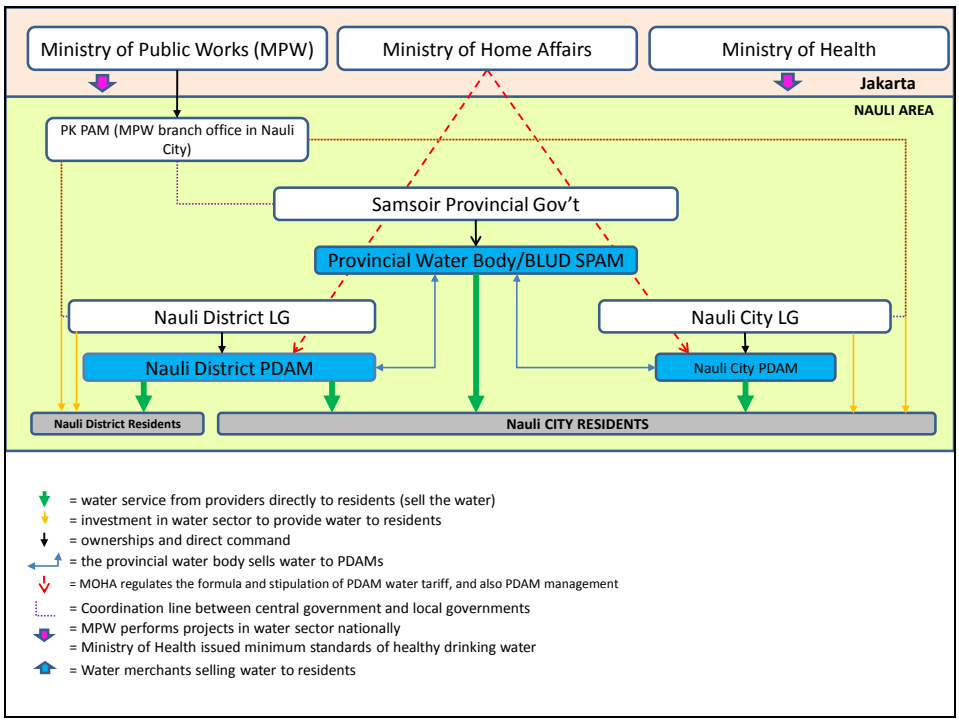


Figure 9: Water Management system in Nauli region (source: researcher)

Both PDAMs and the BLUD SPAM only concentrate on expanding their business in the Nauli City region, as this area covers most of the profitable customers in Nauli area. Despite the fact that the PDAM of Nauli District should focus on serving residents in Nauli District area, this company is still reluctant to discharge their coverage in Nauli City and transfer them to the city PDAM, since it needs the revenue collected from the city to finance their operation in district area. Meanwhile, the quality and quantity of the piped water was also problematic. Supply of water from the PDAM is unreliable. Many people in Nauli City area have experienced that buying water from the water retailers is sometimes better than paying for PDAM water, since the water does not flow regularly from the taps and, furthermore, turning on the taps tends to release a stench and not water (Institute of Research Governance and Social Change n.d.). These two PDAMs also are in conflict in acquiring water sources. Most of the high debit water sources in Nauli city area are controlled by PDAM of Nauli District,[15] and it has caused the PDAM of Nauli City to employ a relatively small debit[16] of 21 water sources, with 18 of them using bore wells which are high in electricity running costs (Simanjuntak et al. 2015, pp. 44-5). The District PDAM head office is still located in Nauli City, and 19 out of 25 of the PDAM water sources are located in Nauli City territory.

[15] PDAM of Nauli District utilize 25 water sources, 19 of which are located in Nauli City area.
[16] A hydrology term for water discharge rate per second.

Table 2: Water sources in Nauli City
(Source: 2014 Performance Report of PDAM of Nauli District)

No	Water Source	Installed Capacity	Subdistricts	Region
1	Oepura spring	40 l/s	Kecamatan Maulafa	Nauli City
2	Alak bore well	15 l/s	Kecamatan Alak	Nauli City
3	Baumata spring	75 l/s	Kecamatan Taibenu	Nauli District
4	Haukolo spring	20 l/s	Kecamatan Maulafa	Nauli City
5	Namosain bore well	10 l/s	Kecamatan Alak	Nauli City
6	Oeleu spring	15 l/s	Kecamatan Maulafa	Nauli City
7	Sagu I spring	70 l/s	Kecamatan Alak	Nauli City
8	Sagu II spring	70 l/s	Kecamatan Alak	Nauli City
9	Amnesi spring	15 l/s	Kecamatan Kota Raja	Nauli City
10	Dendeng spring	10 l/s	Kecamatan Kota Lama	Nauli City
11	Kolhua spring	15 l/s	Kecamatan Maulafa	Nauli City
12	SMKK bore well	4 l/s	Kecamatan Kelapa Lima	Nauli City
13	Bonen spring	25 l/s	Kecamatan Taibenu	Nauli District
14	Tarus spring	19 l/s	Kecamatan Nauli Timur	Nauli District
15	Sagu I spring	70 l/s	Kecamatan Alak	Nauli City
16	Sikumana bore well	6 l/s	Kecamatan Maulafa	Nauli City
17	Oetona I spring	15 l/s	Kecamatan Kota Raja	Nauli City
18	Oetona II spring	15 l/s	Kecamatan Alak	Nauli City
19	Kelapa Lima bore well	10 l/s	Kecamatan Kelapa Lima	Nauli City
20	RSS Liliba bore well	5 l/s	Kecamatan Kelapa Lima	Nauli City
21	Pramuka bore well	3 l/s	Kecamatan Kelapa Lima	Nauli City
22	Oenesu bore well	11 l/s	Kecamatan Nauli Barat	Nauli District
23	Polla I and Polla II bore wells	15 l/s and 7.5 l/s	Kecamatan Maulafa	Nauli City
24	Oanaek bore well	4.5 l/s	Kecamatan Taibenu	Nauli District
25	Benaeu spring	10 l/s	Kecamatan Takari	Nauli District

Both PDAMs struggle to find reliable water sources in Nauli city since this area is very arid with uncertain rainfall. In the dry season between May and November each year, Nauli city experiences

a water crisis. There are three rivers in Nauli city, which flow only during the rainy season (BPS Nauli City 2014), which makes ground water sources a very important alternative for PDAM. The building of reservoirs is not optimal since there had been miscalculations in yields of surface water, and ground water does not supply enough water (ADB 2015).[17] If this worsening water crisis is not addressed immediately, it could impact on the sustainable delivery of services to business and tourism in Nauli City, since most of them rely on ground and surface water withdrawal rather than from PDAM piped water.[18]

In short, there are three water operators owned by three subnational governments: District PDAM, City PDAM, and Provincial BLUD SPAM, and, interestingly, they operate in the same service area: the City of Nauli. They are competing to get customers and currently experiencing conflict by offering overlapping services.

This thesis will explore over a targeted time period how they managed to coordinate in terms of providing public services and how they provided healthy water to all citizens from different economic levels. Another area of the research is to address how the government uses the the water agencies as a political commodity, and how their operations impact the environment.

1.1.5 Other water management conflicts in some new proliferated cities in Indonesia

To date, cases similar to the Nauli City water management case has occurred in other parts of Indonesia due to the proliferation in the number of new urban subdistricts that have become autonomous governments. This includes the City of Bekasi versus the District of Bekasi, Depok City versus Bogor District, and City of South Tangerang versus District of Tangerang, which are neighbouring areas in the built-up Greater Jakarta region.

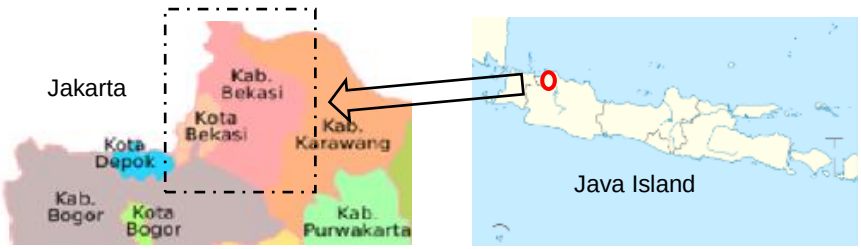


Figure 10: Bekasi region map (source: researcher)

Bekasi District, located in West Java Province, was founded in 1950 with Bekasi Subdistrict as its capital city. The District of Bekasi established its PDAM in 1979. Due to rapid development of

[17] ADB 2015 Annual Evaluation Review, http://www.adb.org/sites/default/files/linked-documents/F-Lessons-on-WSS-Projects.pdf, retrieved 1 September 2015.

[18] Agriculture only occupies 4.15% of land in Nauli City, and it is shrinking due to swift development and growing service sectors (BPS Nauli City 2014).

Jakarta and Bekasi, particularly in terms of residential settlements, in 1982 Bekasi Subdistrict was upgraded to become the Administrative City of Bekasi and, in 1996, it was proliferated to become an autonomous local government, the City of Bekasi. In 2002, both governments declared co-ownership of the district PDAM, and it went well until 2006 when the municipality established its new PDAM, and the conflict started between the two local governments and two PDAMs. At the beginning, the city PDAM only operated to supply bulk water to the district PDAM. However, due to some dissatisfaction in several transactions, the city PDAM started to connect pipes directly to customers. In December 2016, the number of customers of district PDAM in the city area reached 105,000 connections, while the city PDAM's had only 21,000 customers. The Mayor urged the district government to hand over the district PDAM's assets to the city PDAM, but the district government rejected the request. The Head of District even increased investment and ownership for the district PDAM, and it continued to establish new connections in the city area.

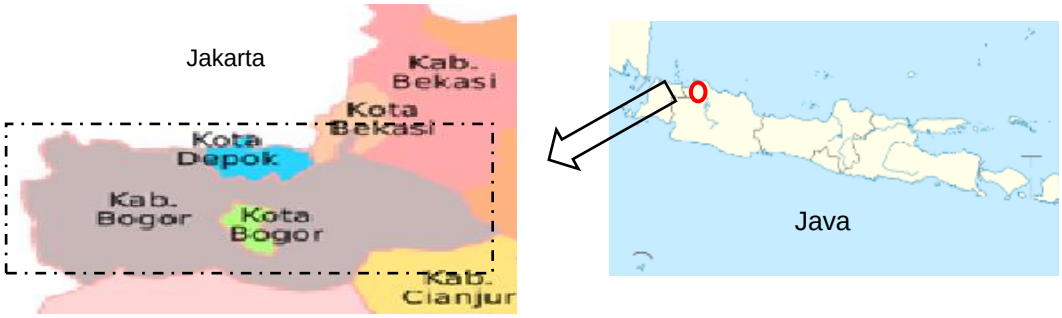


Figure 11: Bogor and Depok map (source: researcher)

In Bogor region, Bogor District was the parent government the new local government for Depok City. The City of Depok was established in 1999 and set up a new PDAM in 2013. During that period (1999-2013), the City of Depok was served by the PDAM of Bogor District and it had approximately 40,000 connections in Depok area. At first, Bogor District Government were reluctant to release their assets in the Depok region. However, through extensive negotiations involving the central government, it took only two years for the district government to decide and finally the transfer took place in 2016 (all assets, customers and staff) while the City of Depok contributed 21 billion IDR as compensation to the District of Bogor.

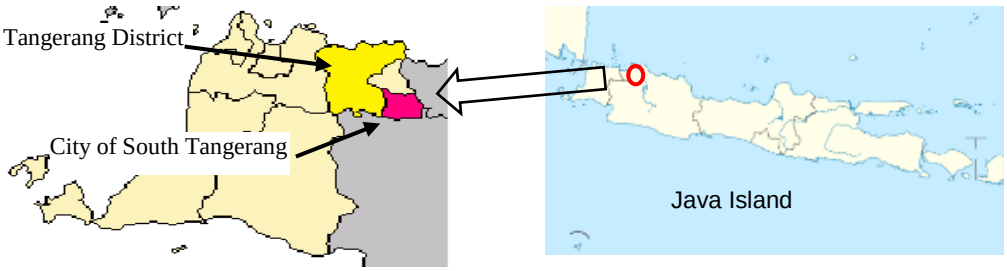


Figure 12: Tangerang region map (source: researcher)

The City of South Tangerang was officially formed on the 29th of October 2008 (proliferated from District of Tangerang), and was effectively functioning from 2009. Until recently, the city government asserted that they did not have any plans to establish a PDAM and allowed the district PDAM conduct business in the city area. However, there should be a mutual partnership between the two governments and this has been negotiated. The City of South Tangerang is a very rapidly growing and profitable area since it has several elite housing settlements and business complexes to support Jakarta. Several government officials (from the Ministry of Finance, Bappenas, and MOHA) predict that in the near future, the city government will think about establishing a new PDAM and, when it happens, conflict between the two governments may arise regarding transfer of assets.

This research addresses the extent to which policies implemented on water provision have adequately addressed the complex needs of both people and the environment, and whether the existence of competition in water provision between three publicly owned water companies and also other private players has improved or worsened the provision of water. The neoliberalist argument is usually that privatisation of water makes it better and more affordable, but the opposite seems to be the case in Nauli. The research thus makes a contribution to understanding the impact of privatisation on the provision of services to meet basic needs. It raises questions about privatisation and commodification, and how it in turn impacts on the life chances of residents.

Moreover, water commodification that has occurred has resulted in poor and marginalised communities experience difficulties in accessing affordable water (Simbolon 2016). The next question is, if the local governments are only focusing on piped water services and and even compete to provide charged water services, is the piped water service better performed than before? Normally, competition between water companies will improve the quality of their services.

1.2 Research Question

This research will answer four research questions: (i) Is the decentralised water management system that is implemented in Indonesia effective for utilising water to the maximum benefit of the people?

(ii) What are the causes that triggered the wicked problems? (iii) Does competition between water companies bring significant improvement to the water provision? (iv) How can water supply in Nauli City be managed in a better way and what ought to be done?

This research will argue that the water management system in Indonesia has to be modified in accordance with local- or regional-specific conditions. What is currently occurring in Indonesia is a result of the government applying a 'one size fits all' model to manage drinking water. In Indonesia's decentralised system of government, the management of water has been transferred to local governments. The different levels of government (local, provincial and central) seem to forget about the ultimate obligation, as stipulated in the constitution: to manage and utilise water for the maximum benefit of the people. Citizens and communities will be treated as participants in this study, rather than customers, because their role and wisdom are vital for healthy democracy and to achieve sustainability in a social and environmental context (McIntyre-Mills 2003, pp. 14, 54).

This research will also carry out analysis of an alternative model of drinking water management in Nauli City to achieve better provision of water, drawing from several models that have been implemented in other countries. Those models of water management include (a) decentralisation system, (b) public-private partnership, (c) public-public partnership, (d) centralisation system, (e) community-based water management, or perhaps a combination of those systems. The phenomenon of municipalities and districts establishing new water companies without first considering the economies of scale, health and the environmental impact has taken place in many areas in Indonesia, due to the proliferation of local governments which continue to rise in numbers.

1.3 Aim

This research will conduct a policy analysis to evaluate the implications of current national and local water management policies to address the effectiveness of water provision in Nauli City as a water-scarce area. Costanza (2015) argues that review of policy instruments should be conducted when current approaches are inadequate to deal with existing and potential problems, and new approaches need to be examined in terms of different options to obtain optimal results.

The aims of this research are: (i) To know the extent of effectiveness and efficiency of the current decentralised water management system in meeting the needs of the people, especially the affected people whose voices are often ignored by the policy makers; (ii) to structure and scrutinize the problems in drinking water management; (iii) to test the hypothesis that competition between water companies does not have a significant impact on improving the quality of water provision; and (iv)

to formulate a better model of water management that can minimise conflicts between water providers.

Unlike existing studies, the research is based on a systemic approach to address drinking water problems from three different perspectives: social, economic, and environmental. The project seeks perspectives from members of the executive (central and local governments), auditors, water companies and residents with regard to drinking water supply management in Nauli City. Several models will be assessed by using Werner Ulrich's twelve heuristic questions, and the objective is to identify the model most suitable to the context of Nauli City.

CHAPTER 2. Water for All: A Literature Review

2.1 We are part of living systems

Laszlo and Krippner (1998, p. 1) define 'system' as "a complex of interacting components together with the relationships among them that permit the identification of a boundary-maintaining entity or process". They describe further the properties of a system: (i) every element has a functioning role; and (ii) every element has an impact on other element(s). Yoland Wadsworth in *Building In Research and Evaluation Human Inquiry for Living Systems* explains the nature of a system and its relationships with wider living systems (Wadsworth 2011). A car, a machine, and an organisation, can be examples of a system. However, those systems need energy to work. A car needs a driver, a machine needs someone to operate it, an organisation needs members, and they are also a part of wider systems. So, we have two major parts of a system: a living sub-system and a non-living sub-system. The living sub-system—or in this case, humans—holds the key that will make the system work. If that human sub-system leaves the system, then the non-living sub-system becomes useless and motionless. But still, the living sub-system will not be able to achieve goals without the non-living sub-system.

The human body is a system with many sub-systems in it, such as the respiratory system, reproductive system and skeletal system, as is the case with other living creatures like trees and animals. However, every living creature is also a sub-system of a bigger system, its environment, and those living creatures depend on each other. Humans need plants for shelter, food and fresh air, and so do animals. Like the driver and their car as a system, the living creatures and their non-living environments (land, water and air) are a system that cannot be separated. Interconnection between the subsystems means that disturbance to any sub-system will affect the other sub-system.

The hydrologic cycle is the process of water movement from the surface to moisture, to precipitation, to the ground, and back to the surface. This is an example of a non-living system. All living creatures should work to maintain this system because it is crucial to support their lives. Wadsworth concludes that all research and evaluation are basically inquiries within the living systems (Wadsworth 2011, p. 19). Robert Costanza in *An Introduction to Ecological Economics* describes the complex interrelation between inorganic and organic (humans, animals and plants) as ecology (Costanza 2015). By that he means, humans cannot survive without all systems surroundings that need to be preserved. And Wadsworth stressed that non-living systems are as important as the living systems.

Wadsworth (2011, p.27) explains that we use ecology to study the natural mega-system, and that ecology is about a system of exchange. Wadsworth then interprets the term *oikos,* the original Greek word for ecology that literally means house or household, stating that: "…it could stand for integrating the currently perceived unsustainable exchange economy as a more ecologically sustainable….a sustainable living 'home' for all at any scale".

Dobson (2007) explains that, as a citizen, every environmental act will have public implications We gain benefit from the environment and also leave environmental waste. As humans, it is in our interest to promote sustainable society to ensure the current and the next generation's future through reducing, recycling, reusing and conserving.

2.2 Sustainability as the main objective

"Sustainability is the capacity to respond to the basic needs of everyone."
Gunter Pauli, 2010

Humans are superior over the other sentient beings, exploiting earth and to some extent forget that other creatures need environment to live in as well. We are now in the age of humans, where humankind has been causing significant changes to the face and the temperature of the earth, causing mass extinction of plants and animals (Stromberg 2013). This era is called the Anthropocene era (from *anthropo* – human, and *cene* – new), which started about 200,000 years ago, a period representing less than 0.01% of the earth's life (4.6 billion years). The anthropocentric attitude towards earth needs to be well governed to build and preserve "stocks for the future", so humans can be stewards rather than destroyers (McIntyre-Mills 2014b, p. 14). Humans need to expand their pragmatism to think about consequences that might or will happen to other people (family, neighbourhood), to the environment, and also to future generations of life (McIntyre-Mills 2014, pp. 29, 54).

Researchers are becoming more aware of the perspective of the importance of preserving earth. The Blue Economy, a term coined by Gunter Pauli in 2010, strives to improve the Green Economy concept in many ways. According to Pauli (2010), in order to address issues of waste and pollution, the Green Economy approach requires huge spending for investment and subsidies which is raised from tax. Producing environmentally friendly products is often costly and usually needs environmentally friendly materials which may still damage the environment. For instance, bio-soaps use palm oil that comes from plantations that destroy rain forests. Pauli acknowledges that the destruction of the habitat of primates alerted him to the issues associated with the misuse of the sustainable living approach. As McIntyre-Mills (2017) stresses in her paper, it is possible to protect the green or blue traditional economies without maintaining the balance of individual and collective

interests for people and the planet which is critical for living sustainably and well. Fishing areas in rivers and oceans can be protected, for example, without protecting the rights of fisherfolk. Land and waters can be labelled blue or green economies but in fact be used to support economics rather than balancing individual and collective needs.

Organic foods are sometimes transported across long distances around the world which can cause pollution. The Blue Economy, as defined by Pauli (2010) which McIntyre-Mills (2017) draws upon, is a 'Planetary Passport' which encourages not only creativity to improve efficiency and effectiveness, but also places emphasis on social and environmental justice in creating jobs in a so-called 'cascade economy' that wastes nothing and no one. She stresses that assemblages of meaning, emotion and connection are created when people are able to own a problem. The more they are able to think about their problem, the more they will be able to reflect on their own emotions and assess the extent to which they shape the way in which they see an area of concern and work through the way in which it affects the many aspects of their lives. The right to own a problem is the starting point for a respectful dialogue about consumption choices.

This means producing, while respectfully reusing, recycling and reconfiguring ways to use waste. For example, from a cup of coffee, only 0.2% of the coffee is used. The remaining 99.8% is waste that can be used to grow mushrooms and feed animals. The animals make manure which bacteria can use to produce biogas for energy, and so on and so forth. With the Blue Economy, the coffee waste can be utilised to produce food, energy and jobs. The Blue Economy concept demonstrates efforts and stimulates creativity to convert scarcity into abundance (Pauli 2010, p. 14). Nauli City is known as a water-scarce area, but still has precipitation that mostly turns into runoff, and creativity is needed to catch the rain water so that it can be utilised during the dry season.

Kenneth Boulding, in his book *The Economics of the Spaceship Earth*, explains that there are two types of human behaviour towards economy (Boulding 1966). First, the open economy which consists of 'cowboys', that believe that this earth has unlimited resources. Boulding uses the idea of a cowboy as a symbolic character to represent open societies where people exhibit wild, romantic, violent and exploitative behaviours. This worldview considers that there are two big reservoirs in this world: the reservoir of input or resources, and the reservoir of output or pollution. People measure the success of an economy by measuring the level of production (the use of factors of production that are raw materials exploited from nature) and the level of output or consumption or profit. In an open economy, the reservoirs which the materials are taken from and the effluent can

be thrown into, are unlimited. The ultimate figure that people care about is the gross national product (GNP),[19] and the more consumption or the more production, the higher the GNP.

The second sphere that is in contrast to the open economy is the 'spaceman economy' that regards this earth as a 'spaceship'. In this worldview of 'spaceship earth', everything is limited and people have to reuse and reproduce everything in terms of input (resources) and output (waste and pollution). With this perspective, the economic performance will be determined by the capabilities to maintain a cyclical system of ecology. Production and consumption should be very efficient and effective in order to minimise refuse. Economic performance will not be the most important indicator to measure performance, but the quality of life of the people and the healthiness of nature will be included in the measurement system. Technology will be directed to maintain stocks or inventories, and both production and consumption (again, as the main indicator for GNP) will be lessened or even seen as a loss.

Boulding was confident that it should be possible and very interesting to separate the GNP into two sources, exhaustible materials and reproducible materials, to show how efficient the economic performance is in the context of the social and environmental approach (Boulding 1966, p. 4). Stiglitz et. al. suggested that the time has come to shift the performance measuring system from measuring economic performance to measuring people's wellbeing (Stiglitz, Sen & Fitoussi 2010, p. 10). By this, Stiglitz et al do not mean that GDP or GNP should be dismissed, but it seems that throughout the world there is a significant gap between economic growth or other information relating to GDP compared with quality of life, especially at the grass-roots level (ibid, p. 11). Moreover, the price of goods and services that is paid by individuals may not reflect the true underlying cost paid by society as a whole, and environmental damage is only a well known example of this.

Manfred Max Neef also introduced the term 'barefoot economics', which came from his lived experience and fundamentally means that economic growth means nothing when you meet the very poor people that have nothing to do with the GNP or GDP. He concludes that growth is just a number. Every living creature grows to a certain limit, and stops growing, including human beings. In spite of this, we keep developing. It means that growth has limits, but development is unlimited (Neef 2010). Robert Chambers emphasises that when wellbeing in terms of experiencing good quality of life is regarded as the objective of development, then sustainable livelihoods are fundamental to support wellbeing (Chambers 1997, pp. 9-10). Development constitutes the quality

[19] Gross National Product is the sum of a nation's economic activity, by valuing the total of finished goods and services produced in a country by its citizens in a year (Atkinson & Stiglitz 2015; Bernanke 2014; Marshall, A 2009; Rittenberg 2009).

of life of the citizens, and it is defined by the World Bank (2012, p.7) as measurable by "access to education and health care, employment opportunities, availability of clean air and safe drinking water, the threat of crime, and so on".

The ultimate goal of development should be to increase the wellbeing of people who rely on a raft of social and environmental aspects for their wellbeing. Seminal thinkers have advocated that governance (the way humans govern their life) should be directed to be more non-anthropocentric. McIntyre-Mills (2014b) argued that wellbeing should be able to build social, economic and environmental stocks for the future generation. Stiglitz et al (2011, p.15, as cited in McIntyre-Mills 2014) proposed that wellbeing can be measured through: (1) Material living standards, including income, consumption and wealth; (2) health; (3) education; (4) personal activities including work; (5) political voice and governance; (6) social connections and relationships; (7) environment in present and future conditions; and (8) Insecurity, of an economy as well as a physical nature. The government which has been entrusted with financial and legal power should be in the front line to be accountable for achieving wellbeing and meeting the wellbeing stocks. McIntyre-Mills stresses that:

> "The root cause of consumption is power without responsibility—so whoever comes to power needs to be held to account through mechanisms to main social, economic and environmental indicators that secure the 'wellbeing stocks' for the future." (2014, p.191).

Martha Nussbaum coined the term 'capability approach' (CA) which argued that the government should promote development that focuses on increasing people's wealth collectively, and, more importantly, the citizen as an individual (Nussbaum, MC 2011). The capability approach emphasises freedom of the individual to make decisions as a basic right and, according to Amartya Sen, development must prioritise the promotion of such freedom (Deneulin 2006; Sen 1999). Sen argues that in constructing development, the freedom of individuals should be treated as the basic building blocks comprising two aspects: freedom to do or to be what one values and the freedom involved in the process (Sen 1999). Martha Nussbaum (2011, pp. 17-44) emphasised that the government should ensure that all citizens possess the 'ten central capabilities'[20] at a threshold

[20] Ten Central Capabilities: (i) Life: to have the ability to enjoy living until normal age or longevity; (ii) Healthiness: to have the ability to have adequate food, clothing, shelter, and healthy living; (iii) Feeling Secure: have the ability to travel freely, free from crime and also free from domestic violence; (iv) creativity: have the ability to expand their knowledge, free to express their mind in terms of political, religious, artistic, and so forth; (v) Emotions: have the ability to express emotions like to love, to grieve, to feel desire, and also anger; (vi) Practical reason: to have the ability to use reason to decide how to act; (vii) Social interaction: to have the ability to affiliate with other human being, or to form a group, without feeling scared of discrimination of race, sexual orientation, religion, caste, ethnicity, and so forth; (viii) the nature: have the ability to pay attention and give concern to animals, plants, and the nature; (ix) Relax: to have the ability to play, laugh, and have fun; and (x) take control on their environment: have the ability to have political stand, free speech, to hold a property, to have equal treatment in social life, and mutual recognition with other people (Nussbaum 2011). Amartya Sen strongly argued that a 'closed' list of capabilities should not be established. Nussbaum's list may be useful in some practical ways, but we can have another list for other purposes. Sen also felt that it is difficult to determine one's capability above or below the others, as different persons or different conditions need different priorities (Sen 2004).

level. Through ten central capabilities, Nussbaum also introduced the non-anthropocene approach of governance by stressing that it is essential to preserve and pay more attention to non-human creatures, nature and the environment (the 8th capability). However, CA was developed in somewhat different directions by Sen and Nussbaum. Nussbaum proposed ten central human capabilities[21] that the government should be responsible to provide and should be included in the constitution, while Sen argued that the people that are affected by the policies should decide what sort of capabilities they will choose rather than developing a list (Robeyns 2003). Nussbaum (2003) stated that this list is the "*minimum account of social justice*" and should be guaranteed at appropriate threshold level.

The government needs to accommodate all interests of all residents. Marginal people usually have the least voice but in most cases suffer the most. To hear what the people really need requires 'putting the last first', which means reversing the conventional order of consultation, or formulating policies starting with listening to the poor, or to the very bottom layer of society (Chambers 1997, p. 201). Government staff members in rural areas often distance themselves from the rural people, which prevents them from learning from the grassroots community. Chambers (1997) stressed that learning must start from the other end, and that marginal people should assert their voice so that the government can make policies based on actual reality, rather than a constructed reality that is often well designed, but flawed.

Amartya Sen discussed the UNDP's annual releases of the Human Development Index (HDI) which ranks human development indicators that can be derived from statistics that GDP and GNP fail to capture (Sen 2004). Statistics are easier to obtain nowadays, and plenty of concepts have been used to explain phenomenas of wellbeing standards. However misinterpretation can affect decisions, and flawed decisions will distort policies. These flawed policies will not only affect the current generation but also future generations in the long term. How well we deliver resources to future generations will determine their wellbeing. These resources are many and varied, and include physical capital like machines and buildings; soft competencies like education, research and technologies; and, more importantly, exhaustible and inexhaustible natural resources as well as a well conserved environment (Stiglitz, Sen & Fitoussi 2010, p. 98).

The Stakeholder Theory by R. Edward Freeman (detailed in his book *Strategic Management: A Stakeholder Approach*, 1984) stresses that all businesses should measure success through creating values for its owners, suppliers, customers, employees, financiers (shareholders and banks) and the communities. All of these stakeholders' interests should not be isolated and have to be seen as

[21] Life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play; control over one's environment.

interconnected with each other. This principle has been developed upon with the Triple Bottom Line (TBL) concept by John Elkington in his publication *Cannibal with Forks* (Elkington 1999). TBL stresses that a business entity's main responsibility is to the stakeholders rather than its shareholders, and its reporting should be cover three dimensions of performance: financial (cost, revenue and financial growth), social (charitable contributions, employee welfare and fair trade), and environmental (environmentally friendly materials and waste management, and land use). TBL asserts that monetary profit means nothing if the government spends more money to clean up the rivers or to pay health care to rectify damage caused by the company's waste or pollution. John Elkington (1999) also introduced the phrase 'People, Planet, Profit' (3P) and connected it with the TBL concept, stating that a business entity should: (i) extend good outcomes towards people's surroundings like the employees and communities (People); (ii) preserve the environment or at least not cause negative environmental impact that eventually will affect the people (Planet); (iii) achieve economic value rather than accounting profit, meaning that all related costs, including social and environmental costs, have been accounted for in the profit and loss statement (Profit).

2.3 Public Good and Common Good

When Adam Smith (1776) wrote *The Wealth of Nations*, he introduced the concept of the 'invisible hand' that operates in the competitive and free market, where producers will maximize their profit, consumers will maximize their utility, and all products have their own prices and that demand will create its own supply in the market's equilibrium.[22] This has resulted in his being regarded as the father of free market economics (Esping-Andersen 1989; Hirshleifer & Sproul 1998, p. 467). However, Smith also stressed that the government should serve its citizens with three types of infrastructure, namely, defence or military force, justice administration and public works (Smith 1776), which contradicts what he described in the equilibrium concept.

The products and services mentioned by Smith above are popularly known as 'public goods'. Economist, Paul A. Samuelson (1954), was considered to be the first to distinguish types of goods (McNutt 1999): (1) Private consumption goods, that are obtained and used separately by individuals, and (2) collective consumption goods, where one's consumption of the goods will not subtract other individual use of the same goods. Theory of public goods was further developed by scholars, and the characteristics of public goods condensed into two distinct domains: non-excludable and non-rivalry (Gravelle & Rees 1992, p. 525; Hirshleifer & Sproul 1998, p. 478; McNutt 1999; Miller 2003; Rapoport 1988). Non-excludable means no one can be excluded from using the goods, and non-rivalry means that there is no competition to get the goods. Some obvious

[22] It is explained in Book I: Of The Causes of Improvement in productive Powers of Labour: Of the Natural and Market Price of Commodities.

examples of public goods are clean air, defense, lighthouses and fireworks. However, the non-excludable characteristic might raise the issue of freeloaders who enjoy the goods but make little or no contribution towards the cost of the goods (Kim & Walker 1984). For instance, public goods are provided to consumer A, but consumer B cannot be excluded to take maximum benefit of the goods, even though consumer B is not willing to pay the cost of production.

Interestingly, Miller (2003, pp. 212-3) states that there can be goods that are non-rivalrous in consumption, but can be excludable in supply, for instance, television or radio programs where people can enjoy the programs freely but have to have access to the media. Another example is a theatrical performance where one can enjoy the show without reducing others' opportunity. These goods are called 'club goods'. There is also a type of public goods that non-excludable but rivalrous in consumption, like mining, fishing and forestry. It very difficult to prevent people from doing the activities but one cannot have both activities in one place. These types of resources are called Common Pool Resources. When it comes to global context, these common pool goods will become global commons: the ocean and space. More broadly, the global commons include the environment (air, soil and water) which we depend on (McIntyre-Mills 2010). Ostrom, Gardner and Walker (1994) presented the types of goods in a matrix, as per the table below.

Table 3: Ostrom, Gardner & Walker's matrix of goods

	Non-Rivalry	**Rivalry**
Non-Excludable	Pure Public Goods	Common Pool Resources
Excludable	Club Goods	Private Goods

Source: Adapted from Ostrom, Gardner & Walker, 1994.

Some public services are considered as public goods, even though they might not be as pure public goods like health services, education, electricity, water and sanitation, etc. According to the concept of the welfare state[23] and welfare economics, the government should provide all public services to the people (Megginson & Netter 2001, p. 8; Moreland 1950; Vogel 2003).

2.4 Welfare State and Welfare Economics to support wellbeing

According to Vogel (2003, p. 374), the welfare state concept can be implemented based on two approaches. First, by law to rule, the market can be regulated to support welfare and minimise inequality within the market. Secondly, by intervention, by shaping the market through redistribution of income (providing several types of benefit and financial supports), tax differentiation, and subsidies. Hirshleifer and Sproul (1998) explain that from a welfare economics

[23](Megginson & Netter 2001) states that the term welfare state was coined by the Archbishop William Temple in his book Christianity and Social Order (1942) to label Britain in contrast to Germany during the Nazi war.

approach, there are two main objectives of public policy:[24] to create efficiency and to create equality. Efficiency can be considered to be attained whenever the economy is Pareto efficient, which means that an increase in benefit for one person will reduce the benefit for other person. While equality means that distribution of utilities is envy free where all parties are satisfied and do not want to change position with other parties. However, it is difficult to value one's utility, so equality can only be measured by the distribution of income. Stone and Norton (1997) contradict efficiency and equality. As mentioned above, in order to create equality, the government can intervene in the market through distribution of income, provide financial supports and issue subsidies. This means the government will take money from the wealthy via tax and transfer it to the poor, and it will not reach an efficient state because one party is worse off to make the other better off. Redwood (1980, p. 1) stated that moving products from private to public sector facilitates the transfer from the wealthier to the poorer in order to reach social equality. He argues that by providing cheaper prices and better service, the industry has taken a significant amount of profit from the shareholders or owners and surrendered it to low income customers.

Debate also occurs when we try to define the target of welfare economics; the citizen. The emergence of New Public Management (NPM)[25] has moved the old paradigm of Public Administration towards a more market-based system with the argument that efficiency and business-style management will improve government management (Christensen & Lægreid 2002; Hood 1991). Osborne and Gaebler (1992), by using the famous expression steering rather than rowing (p. 25), claimed that in implementing NPM, the government should not be involved too much in providing public services, because the government is not too good at it. NPM also argues that government units will provide better and more efficient services if they act like the private sector and enter into competition (Walker, RM et al. 2011). In the NPM model, the citizen is seen as a customer while the government is regarded as a service provider, and customer satisfaction becomes the objective of providing public services (Aberbach, Joel D. & Christensen, Tom 2005; Christensen & Lægreid 2002). When citizens are viewed as customers, then it is possible that the marginalised customers will be left behind and the wealthy customers can get maximum benefit, as the consequence of the risk society (Beck 1992). Denhardt and Denhardt (2000) came up with the concept of New Public Service, and challenged the NPM by saying that the government should be 'serving rather than steering', since the government should not change the direction of the boat, but instead serve and empower the citizens. Moreover, it is the citizens who own the government, and

[24]Stone and Norton (1997) mentions that there are four objectives of public policy: efficiency, equality, security, and liberty. However they also argue that there can be conflicts between them.

[25] NPM was coined by Christopher Hood, 1991 in his article '*A public management for all season?'.* NPM has been implemented in many developed countries, and is strongly supported by the World Bank to be implemented in developing countries (Gadkari 2010; Walker, RM et al. 2011).

administrators should treat citizens as active citizens (King, Stivers & Box 1998), and citizens do have the right to fulfil their basic needs and access welfare as one of their basic rights (Marshall, TH 1950; Ulrich 2003).[26]

2.5 Public utility

There is a clear distinction between public sector and public services. As Spicker (2009, p. 972) mentioned, "the public sector is owned or at least controlled by government; the public services may not be". According to Spicker, the public sector includes government functions, such as courts, policy making and civil service. Even though the government facilitates public services like education, defense and public health, it does not mean that public services stem from the public sector. It is not about the state, but rather the core is the term 'public'. Services can be considered to be public services if they are born to implement public policy. Many organisations, profit or non-profit, might perform services for the public but they are not public services if they are not informed by public policy (Spicker 2009, p. 974).

A public utility is a public service organisation or corporation. Scholars characterized a public utility as having two main characteristics: (1) they provide essential goods or services to the public, and the majority of citizens have to access their products,[27] and (2) they are run as monopoly and are regulated by government (Dugger 1989; Garfield 1964). Public utilities need high initial investment to establish which makes them operate as natural monopolies (L. R. Nash in The Economics of Public Utilities, cited in Nowotny (1989, p. 10). The government surely needs to regulate acceptable tariffs and profit, and the quality of service provided. The most common examples of public utilities are electricity, natural gas, urban mass transportation (like seaports, airports and railways), water and sanitation, and even sometimes television and radio broadcasters. However, running the utilities as a monopoly can limit options and neglects sensitivity in the market to meet the customers' needs and wants (Redwood 1980). By this, Redwood means that if the private sector cannot enter the market because of high investment cost or because they are prohibited, then the people will very depend on the quality, range and price offered by the company, without any natural power as customers (as in the competitive market) to improve the services that they access (1980, pp. 4-5).

Public utilities will focus on public services and public interests, although not all public service and public interest related businesses are public utilities. To differentiate them, Garfield (1964, p. 2)

[26] Marshall, TH (1950) in *Citizenship and Social Class and other essays* described three basic rights of citizens: the right to freedom of speech, the right to participate in politics, and the right to have social security and welfare.
[27] Nowotny (1989) uses an economic term 'inelastic buyer' to describe this kind of customer.

stipulated five conditions: (1) competitors are not allowed to enter the business; (2) they are only allowed to collect revenue based on regulated tariffs; (3) they can make profit at a certain predetermined level; (4) they must be able to supply services to all levels of citizens if required; and (5) they are mostly associated with transportation and distribution.

Providing utilities must also consider another important aspect: fairness (Jones & Mann 2001), which is dependent on the perception of stakeholders. Jones and Mann explained that regulators must be able to balance those perceptions (low and high income users, industries and domestics, profit and non-profit customers, government and suppliers) to ensure that the utilities are delivered to all users with minimal discrimination, and in a way that is economically viable and also considers going concerns (maintaining long term production). According to Bakker (2003, p. 18), public utility systems usually provide subsidy to tariffs and create social equity by providing affordable services.

2.6 Water Crisis and Water Conflicts

"Water is the driving force of all nature".
(Leonardo da Vinci)

Water is widely known as liquid, but water changes its substance constantly from liquid to solid and gas, and back to liquid again which is called the hydrological cycle and makes it difficult to measure the total amount of water present on Earth (Bethea 2011; Chahine 1992; Gleick, Peter H 1993b; Shiklomanov 1993). There are three main reservoirs of water on Earth: ocean, land and atmosphere. The hydrological cycle is described clearly in Figure 13 below.

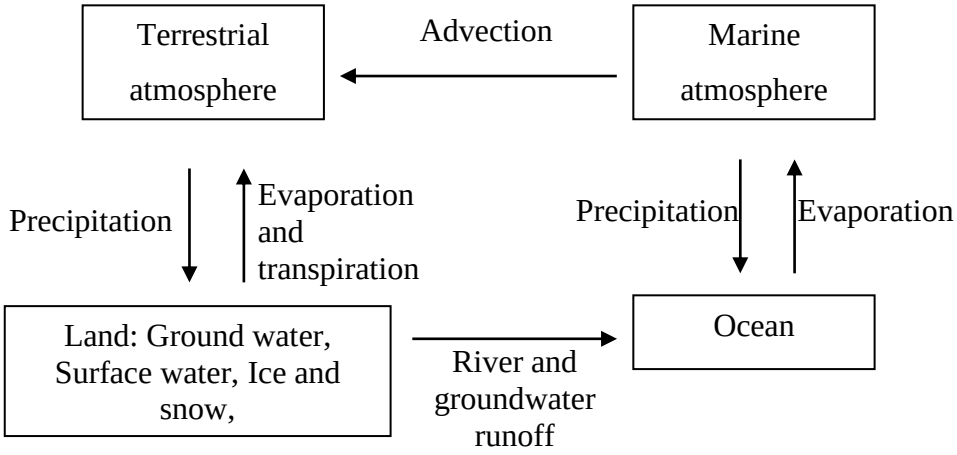


Figure 13 Hydrological Cycle
Adapted from Gleick (1993b).

Shiklomanov (1993) estimates that there are approximately 1,386 cubic kilometres of water on earth. The earth looks blue as water covers almost 80% of its surface. However, only 2.5% of it is

fresh water while the rest of it is saline water. The fresh water itself comprises ice and snow (68.9%), ground water (30%), rivers and lakes (0.3%), as well as moisture and swamp (0.9%), as shown in figure 14 below.

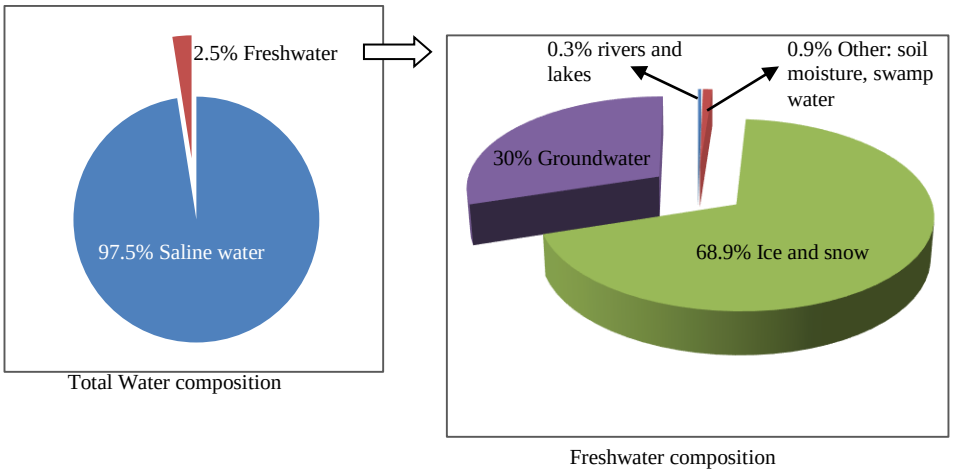


Figure 14: Water composition on Earth (Siklomanov, 1993))

Water experts believe that the world is approaching (or maybe now experiencing) a water crisis, and rapid growth in population has been the major cause (Biswas 1999; Gilles 2006; Gleick, Peter H 1993b; Jain & Singh 2010; Magelgaard 2011; Sears 1936; Shiva 2008). Increasing population means mounting demand for all human needs, agriculture, industry and also duplication of waste disposal, which means higher competition for water use. However, Amartya Sen stressed that a food crisis will never occur if democracy is functioning (Massing 2003), meaning that the role of the government in providing basic needs is the key. Another argument came from Hoekstra and Chapagain (2006) and Wackernagel & Rees (1998), stating that human lifestyle, the rise of industry and climate, rather than population, determines food and water consumption, which is proven by the fact that the ecological footprint and water footprint in developed countries, agricultural countries, and dry countries are much higher.

The UN proclaimed in 2010 that water rights are human rights, then urged its members to ratify the Millennium Development Goals in 2000 which has a specific water goal: “Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation” (See: Millenium Development Goals, Goal 7, Target 7c). To develop on the the MDGs, the UN through the Rio+20 Earth Summit in 2012 established post-2015 goals and set a new target for drinking water, namely, to “achieve universal and equitable access to safe and affordable drinking water for all by 2030”, and this means providing better quality water for all and using it efficiently, as well as preserving water sources and water-related ecosystems (Sustainable Development Goals, Goal 6). In some countries, extreme poverty has a strong connection with food scarcity as a result of not having access to good water (FAO, IFAD & WFP 2013, p. 27). In 2000, approximately 150 million

urbanites suffered annual water shortage and 886 million city dwellers experienced seasonal water shortage (McDonald et al. 2011).[28] As the rapid increase in population continues, in 2050, it is expected that the need for water will rise almost six-fold and the number of people who experience water shortage will increase by almost 50%. This is expected to happen mainly in poor areas of developing countries, where women and children often have to travel for hours to get water (Jain & Singh 2010). People in poverty, especially in the third world countries, are hit hard due to lack of access to sewers and clean water while having to suffer from overwhelming levels of waste generated by burgeoning populations and unregulated industry (Rees 1992). Furthermore, Rees argues that human beings should balance their need of resources and discharge of waste to avoid harming the ecosystem, known as the ecological footprint. By acknowledging the ecological footprint of a population, people will know the carrying capacity or the demand from the nature's ecosystem, or the capacity of land to support a particular size of population sustainably (Rees 1992; Wackernagel & Rees 1998).

From the water footprint perspective,[29] one needs water for direct consumption (for home or individual necessities) and indirect consumption (from products and services) (Avlonas & Nassos 2014). Water footprint is a method used to calculate how much water is consumed by people in a particular region (Hoekstra & Chapagain 2006). It is important for people to be aware of the water footprint, just like the ecological footprint, as the water footprint will indicate the amount of water needed to support a population sustainably (Hoekstra & Chapagain 2006), as human demands on water is growing rapidly (Wackernagel 1994). For instance, on average, there are 135 litres of water needed when we eat only one egg, and we need 35 litres of water to drink a cup of coffee (Antonelli & Greco 2015). However, water consumption differs between regions, and an arid environment will consume more water than a water-rich area. In this context, the integrated water resources management concept[30] is vital so water can be managed across sectors, administrative areas and social systems (Benedito Braga et al. 2014).

Nations and cities around the world have been built strategically alongside rivers, so that people can use water for transporting goods, and to fulfil agricultural, industrial and domestic needs (Baker 2009). These riparian nations are now facing water conflicts, since the usage of water has increased rapidly. Experts have predicted that there will be war over water if interstate river basins are not managed properly (Gleick, Peter H 1993a; Pearse-Smith 2012)

[28] McDonald et al. (2011) define water shortage as a condition where one has less than 100 litres per day.

[29] This concept was introduced by A.Y. Hoekstra in 2002 (Avlonas & Nassos 2014), and the term 'water footprint' is an analogy of the 'ecological footprint' (Hoekstra & Hung 2002).

[30] The integrated water resources management is defined as "a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems" (Agarwal et al. 2000, p. 22).

Vandana Shiva (2002, pp. 68-72) explained that conflicts have occurred between governments and citizens. In Africa, when people in Tonga opposed the building of Kariba Dam, eight people were killed and 30 were injured. In 1985, more than 300 women and children were killed when the Chixoy Dam was built in Guatemala. Shiva also mentioned that conflicts between riparian nations have also happened. Turkey, Iraq, and Syria have frequently been involved in major water conflicts over the Tigris and Euphrates Rivers. Meanwhile, the war between Israel and Palestine is influenced by the fight over water. In 1948, water conflicts began between Israel and West Bank Palestine, Syria, Jordan and Lebanon, when Israel started their National Water Carrier Project from the Jordan River. [31] In Africa, conflict between Egypt and Sudan carried on for a long period of time until the ten countries[32] which shared the use of the Nile River signed an agreement called the Nile River Basin Strategic Action Program.

Water conflict has also occurred between sectors; domestic, agricultural, and even environmental (Boehlert & Jaeger 2010). Schelwald-van der Kley (2009) discussed some local conflicts over water. First, people in cities usually have to compete with surrounding agricultural lands surrounding to get water. Second, conflicts may also arise when water providers fail to consider allocations to different types of customer: industrial and domestic consumers, and between upstream and downstream users. However, Schelwald-van der Kley concluded that water has never been the single cause of conflict; there has to be other related factors such as cultural, economic, or political factors that spur water conflict, or the other way around.

2.7 The social, economic and environmental contextual of drinking water management

Drinking water is water that mainly used for meeting human needs such as for drinking, food, bathing and showering. (ADWG 1996). Scholars agree that managing water should be approached from diverse and multiple perspectives that are interconnected with each other. By interconnected, the researcher means that the problems consist of various aspects that are linked each other, where different stakeholders will have different perceptions, and that addressing one aspect may affect or be affected by other aspects. This kind of problem is regarded as a wicked problem (Churchman 1967; McIntyre-Mills 2008; Rittel & Webber 1973). Drinking water management has to take a more critical systemic approach, addressing at least five aspects, namely, social, economic, environmental, health and political (Elkington 1999; Gleick, Peter H. 2013; Gorre-Dale 1992; Mcdonnell 2008; McIntyre-Mills 2008; Schelwald-van der Kley 2009, p. 8; Zaag & Savenije

[31] Israel only has 3% of Jordan River basin, but 60% of Israel's water needs are supplied by this river.
[32]These countries include Egypt, Ethiopia, Sudan, Uganda, Kenya, Tanzania, Burundi, Rwanda, the Democratic Republic of Congo and Eritrea.

2006).[33,34] Moreover, water governance is a part of bigger local, national, and global systems and it is vulnerable to any changes in other sectors (Biswas & Tortajada 2010). Every solution to one aspect has a connection to other aspects, and sometimes these overlap (Churchman 1979, p. 4). The concept that was applied twenty or thirty years ago may or may not be suitable to current conditions due to rapid changes in society that can have impact on the water sector directly or indirectly, in negative or positive ways. As Peter H. Gleick says, "Just as there is no single water crisis, so there is no single water solution" (2013, p. 14).

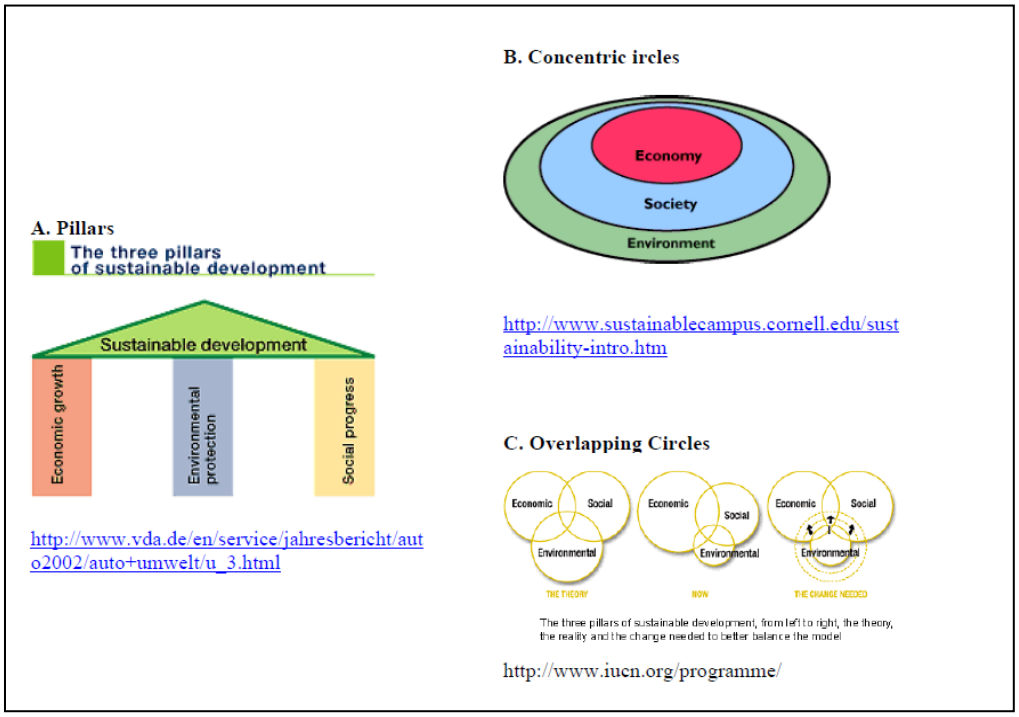


Figure 15: Visual Representations of Sustainable Development (source: www.vda.de, sustainabilecampus, and iucn.org)

2.7.1 Politics

As Dobson and Eckersley stressed in their work *Political Theory and the Ecological Challenge*, "…political theory is not complete without taking account of its ecological counterpart" (2006, p. 2). According to Dobson and Eckersley, political decisions should take several aspects of environmental issues into account: how to deal with non-human species, how to govern anthropocentrism, and how to balance inter-generational justice for building wellbeing stocks.

At first in general, the involvement of government in managing water supply was merely because of market failure, meaning that the market mechanism failed to meet the Pareto optimum (that is, one can be better off without making the other worse off). Market failure in water management is

[33] The first three aspects, social, economic and environment, known as the Triple Bottom Line coined by John Elkington (1999) in his book Cannibals with Forks: The Triple Bottom Line of 21st Century Business.
[34] McIntyre-Mills (2008, p. 10) describes these aspects as 'The Dimensions of Wellbeing'.

mainly because of externalities,[35] when some parties overused water without considering its sustainability and conserving the environment. "The emergence of water extraction technologies has increased the role of the state in water management" wrote Shiva (2002, p. 20). However, Kenneth Boulding with his concept of spaceship earth argued that there is no such thing as externalities (Boulding 1966). McIntyre-Mills (2014, 2016) stressed that negative externalities are fiction, because the impact affects the poor and marginalised people, the environment and even the future generations. These externalities will return to all people, not only the affected people, in the form of rising temperatures, rising sea levels, animal extinction, pollution and eventually conflicts between nation states (McIntyre Mills 2014, p.30).

The increasing role of government in managing water has made water management vulnerable to political intervention (Mollinga 2008, p. 8). According to Mollinga (2008), politics is when all aspects of social life, individuals or groups, are being compromised or contested. So any interactions, conflicts, and coordination between individuals and/or institutions with respect to resource utilisation can be considered as politics (Kerkvliet 1993). Based on this definition, Mollinga (2008) observed the political aspect of water management from three different perspectives: local, national, and global politics of water management.[36]

Within the local context, people engage in politics to manage their water. People use water for farming, housing needs and commercial purposes, which means that they have to conserve the water resources such as ground water or river basin, and they probably try to manipulate or control the water flow to meet everybody's needs which might include building dams. In a small context, these activities are called everyday politics (Kerkvliet 1993).[37] In the context of a nation, water supply management will be very dependent on political situations and governmental systems in the country. Water sources and water provision are usually controlled by the government and then delegated to be performed by one particular government department, or lower level government, a water authority, or even a company (Stephenson 1998, p. 295). In the process of making water policies, there are negotiations between all levels of government, government apparatus, and even groups that will be affected by the policies (Mollinga 2008, p. 12). The government uses its power to stipulate law and regulation to intervene in water service delivery and water business. Negotiations may occur during formulating and implementing the policy. Mollinga uses the term

[35] Externality occurs when someone activity has an (usually social) impact, negative or positive, to others who unintended to incur the impact (Buchanan & Stubblebine 1962). The most common examples for negative externalities are air or water pollution from factories or agriculture. While an example of positive externality is a beautiful man-made landscape from farming.

[36]Mollinga mentions four levels of water politics: local politics, within sovereign-state politics, inter-state politics, and global politics on water. However in this research, inter-state politics is considered not relevant hence will not be discussed.

[37] 'Everyday politics' is a term coined by Kerkvliet (1993).

'politics of policy' to describe the national policy processes. Local leaders tend to use the public service provision as a political vehicle to gain votes from constituents, to consolidate their selected small-scale alliances, or, even worse, to feed predatory business interests who support them during election process (Sulistiyanto, Rosser & Wilson 2011). Findings about how the local governments use water as a means to achieve political objectives will be delivered in Chapter IV and V.
Hall and Lobina (2006) argued that political commitment is indispensable to assuring that water service is conducted properly. In Manila, water privatisation was also spurred by the pro-privatisation environment policies that were implemented by the President Fidel Ramos' ruling regime and the government selected the winning water operators through a transparent bidding process (Grace et al. 2007). Water privatisation is considered successful with several technical and financial indicators improving for water and sanitation service performance in Manila (Grace et al. 2007; Schiffler 2015, pp. 135-40). The role of the private sector and water market in Indonesia are controlled and influenced by the government (Hadipuro 2010). Moreover, PDAMs as publicly owned utilities have to obtain legal permission to raise their tariff. As a result, water tariffs have been used as political commodity. Harsono (2003) in *Water and Politics in the Fall of Suharto,* reported that, in Jakarta, water had been an attractive object for business, and it started when the World Bank stepped in into Jakarta's water infrastructure improvements, but then encouraged the government to privatise its utilities. Thames Water and Suez Lyonnaise des Eaux, two water companies from Europe that were allegedly behind this, exploited this opportunity by forging an alliance with Suharto's cronies to get political protection. Finally, these two companies divided Jakarta's water services into two, a situation that remains to this day.

From a global perspective, there have been continuous efforts to conserve water resources more seriously, and also efforts to increase accessibility, availability and affordability of water. Mollinga (2008) explained that global politics on water began with the 1992 Dublin International Conference on Water, and then followed by the establishment of several global water institutions like the Global Water Partnership (GWP) and the World Water Councils (WWC). GWP advocates for the Integrated Water Resources Management (IWRM) concept, while WWC encourages more investment in water infrastructure globally. The United Nations also plays important role in global water politics, especially through its Sustainable Development program. The UN proclaimed in 2010 that the right to water is a human right and urged its members to ratify the Millennium Development Goals 2000 which has specific water stipulations, namely to: By 2015 to reduce the proportion of people without sustainable access to safe drinking water and basic sanitation by half (Millenium Development Goals, Goal number 7, Target number 7c.). WHO reported in Progress on Drinking Water and Sanitation 2012 that the target had been exceeded by 1% in 2012 (the target

was 88% of population have access to safe drinking water, while the figure achieved was 89%) (WHO & UNICEF 2012. These goals have been amended by the UN Sustainability Development Goals (SDGs) which have seventeen agendas (goals) of which the sixth goal is "Clean Water and Sanitation: ensure availability and sustainable management of water and sanitation for all". This goal stresses that in 2030, all people (one hundred percent coverage) will have access to safe and affordable drinking water.

2.7.2 Environment

Lukeman et al. (2014) defines environment as all physical, biological, social and cultural factors that can influence human beings and can even influence genes. Water plays a very important role in sustaining the environment. It is the lifeblood not only for all living creatures in the ecosystem (human, animal and plant), but also for aesthetic and leisure purposes (Baker 2009), and it is a very important part of an ecosystem (Aylward et al. 2005; Daily 1997; Sandhu, Kikkawa & Steve 1997). Consequently, managing water must also consider preserving the environment which means creating balance between human needs and water requirements for ecosystems (Aylward et al. 2005). Furthermore, we cannot have a good economic system without having a good social system, and we cannot have a good social system without having a good natural system (Friend 2016).

As Shiva (2002) wrote, modern people with more sophisticated technologies abuse nature by taking large quantities of water for agricultural, domestic and industrial use. When groundwater needs to be replenished, rain cannot infiltrate into soil and runoff to the ocean because forests have been changed into roads, parking lots, houses and even monoculture agriculture (Baker 2009). From an ethical perspective, utilitarianism indeed suggested that people are allowed to exploit the environment for the sake of human life. Since the environment also provides resources for human needs, the next problem is that people have to maintain the environment in order to maintain its benefit (Armstrong 2006, p. 10). According to Ulrich Beck's Risk Society, this modern society that is characterised by new technologies bears its own risks, and these risks will contribute to a more global risk society (Beck 1992). Beck also argues that modernisation will bring wealth to the rich and risk to the poor since the top class of people strive to push the risk away from the rich towards the poor.

Water management has been a major cause of damage to the ecosystem through disappearing or decreasing wetlands (Kingsford 2000, p. 109). Diverting the flow of rivers will impact the ecosystems of floodplain wetlands, transforming them from aquatic to terrestrial. Aquatic plants and animals, such as vegetation, fish, and birds, will lose their home and then die, and the impact to the ecosystem as a whole may be severe. In coastal regions, boring too deep may cause saltwater

intrusion, and even only 1% intrusion will reduce the outflow of groundwater by 90% (Ochiewo 2001, p. 269). Once the seawater infiltrates the soil, the impact is irreversible and will surely worsen the condition of ground freshwater.

Building dams (water barracks or levees) to retain water and then redistributing the flow to other areas or at other times, has been in practice for a long time. This method is used for irrigating farms, producing electricity, recreation and fisheries. Between 1950 and 1982, more than 30,000 dams were constructed in the world, causing many serious ecological problems (Van der Leeden, Troise & Todd 1990), including the Iron Gates Dam of the Danube River which has changed the nature of the ecology of the Black Sea despite being around 1,000 kilometres away. Even though the Aswan Dam that catches water from the Nile River successfully relieved Egypt from drought in the 1980s, it also resulted in serious environmental problems to the lower river bank stability and to Egypt's Mediterranean coast (Milliman 1997). Milliman (1997) concludes that damming rivers will cause many environmental implications not only to local conditions surrounding the dams, but also to the rivers and eventually the seas.

Regulatory approaches have been employed to prevent environmental damage, especially to water sources, from the irresponsible economic activities. However, Costanza (2015) explains that this system does not work successfully in an open market economy, like in the US, and has failed in centrally directed market economies like those of Eastern Europe and Russia. A regulatory approach needs political consensus, certainty or clear explanation about what should and should not be done, along with consequences and effective enforcement (Costanza 2015).

2.7.3 Economic

The Dublin Statement on Water and Sustainable Development established four principles (ICWE 1992):

1) Water is a finite, vulnerable and essential resource which should be managed in an integrated manner.
2) Water resources development and management should be based on a participatory approach, involving all relevant stakeholders.
3) Women play a central role in the provision, management and safe guarding of water.
4) Water has an economic value and should be recognized as an economic good, taking into account affordability and equity criteria.

Principle 4 stressed that people should have access to clean water at an affordable price to avoid uneconomical uses of water and overuse leading to environmental destruction. For Zaag and Savenije (2006), this principle can have two different meanings. Firstly, water should be traded and

priced through the market where buyers and sellers meet at the equilibrium point. In other words, water is just like any other marketable goods which need a price. This idea, which Karen Bakker mentioned as controversial, has caused some stakeholders to fear that water will be used purely as a commodity without considering the interests of the poor in terms of the affordability and equity aspects (Bakker 2007, p. 441; Savenije & Van Der Zaag 2002). Secondly, water is an essential resource with importance beyond financial aspects which requires integrated decision making. From this perspective, water management should be treated as a holistic concept via Integrated Water Resource Management (IWRM), and the economics of water becomes more focused on how to meet human needs.

For both views described above, the price will be the biggest pitfall. In many countries, water pricing has been applied to control or influence water use. There are three types of water pricing: uniform, decreasing and increasing block rates. In developed as well as developing countries, increasing block (progressive) tariffs are more common, which means the more water used, the higher the tariff (Hajispyrou, Koundouri & Pashardes 2002, p. 660). However, applying a tariff system should always consider the principle of affordability for all people that is adopted by the UN Sustainability Development Goals. Cross subsidy must be taken into consideration, which means the rich people who use much more water (for their domestic need like gardening, washing cars, and cleaning their big house) and can afford the price, to a certain extent must provide a subsidy to ease the lower level water usage price.

Evidence shows that water pricing policy has affected the social and economic system in several countries. In China, protests arose in 2002 when the government increased the water price around 25% to 50% spurred by high inflation (The Economist 2010). Protests also happened in the City of Cochabamba, Bolivia, due to increases in water price of between 100 to 200 percent in 1999, triggering mass protests that culminated in 175 people injured and one killed (Olivera & Lewis 2004). This riot is known as the ‘Water War’ in Bolivia. Other incidents caused by water pricing policy have also happened in other parts of the world like in Nelspruit (South Africa), Atlanta (USA) and Jakarta (Indonesia) (Public Citizen 2003).

Reed (1973) explained that pricing policy is very dependent upon the main objectives of water enterprises set by the government. Reed (1973, pp. 2-13) detailed some arguments about how public utilities are directed to maximise profit. Supporting arguments assert that if utilities operate at a deficit, then it will be covered by the taxpayer eventually. Furthermore, surplus in running public utilities could generate funds for expanding businesses and providing better service, and the residual can be used to cover social and environmental costs imposed by the industry. However, welfare

economists argue that with the extent of monopolistic power granted by regulations, maximising profit would encourage exploitation of customers and the neglect public obligation and social equity functions that are assigned to public utilities.

Water is fundamental for business as a source of energy, raw material for production, drinking, landscaping and disposal. Some businesses even sell water as a main product (bottled/canned water or fresh water), water as their main facilities (swimming pools and spas) or water related agricultural products (Kurland & Zell 2010, p. 317). Therefore, there will always be attempts to move water towards a market mechanism, meaning that water is a tradable good. Efficiency is the key issue for water allocation to the market, and efficiency is defined as the benefit that can be gained when one wants to shift resource allocation. Efficiency of water use is achieved when the total benefit can be maximised (Rolfe 2005, p. 121). Rolfe stressed that it is important to balance the needs of various sectors in the water trading mechanism, including household, industry and agriculture.[38]

Rolfe (2005, p. 125) argued that not only do stakeholders get profit and sufficient funds to maintain the sustainability of infrastructure maintenance, but also can force efficiency in water use by all sectors. However, environmentalists are reluctant to accept the water trading concept as most water trading mechanisms neglect conservation of ecology in favour of profit under the guise of the term efficiency. For that reason, the water trading concept has to be designed with a systemic approach to accommodate and address broader aspects, and challenge boundaries between theory, policy, practice and bureaucratic management (McIntyre-Mills 2003). It cannot solely be about gaining profit. We must consider the sustainability of water supply for future generations to assure that their wellbeing (Stiglitz, Sen & Fitoussi 2010, p. 98).[39]

2.7.4 Social/cultural

> *Water management is an area where everything depends on everything else: as a system, its efficiency depends not only on the efficiency of each participant, but also on the links binding them together (Frérot 2011).*

According to UNESCO on World Water Day 2006, water and human culture are connected to each other and cannot be separated. The culture of a society can be seen in how they value water (Groenfeldt 2003). In many countries throughout history and even until now, water has been associated with religion, such as the River Nile for ancient Egypt, the Ganges River in India for

[38] To implement water trading, Rolfe explained that the government needs to build water storage to supply for different sectors on a volumetric basis.

[39] ‘‘Sustainability is the principle of ensuring that our actions today do not limit the range of economic, social and environment options open to future generations’’ (Elkington 1999, p. 20).

Hinduism, Zamzam Well in Saudi Arabia for Muslims, and the Jordan River in Israel (as a symbol) for Christianity. Indigenous participants in the 3rd World Water Forum in Kyoto, Japan, March 2003, released a declaration known as the Indigenous Peoples' Water Declaration, stressing that indigenous peoples value water as a sacred gift that connects all life and they will respect, honor, care for, and conserve freshwater and oceans now and into the future (**Indigenous Peoples Kyoto Water Declaration**, Third World Water Forum, Kyoto, Japan, March 2003).

There have been many efforts to pay more respect to water. In Mexico, the state Guanajuato has declared the year 1998 as the Year of Water, and the state water commission intensified their efforts to build awareness in the community, through media, community activities, and even school curriculum, that water is a key element to humans and environmental development (Reynoso 2000, pp. 577-8). This is a good example of how an intensive campaign started in small scale can make a difference. In Europe, campaigns to conserve water started about ten years ago and have become part of the culture (Frérot 2011, p. 179). However, there is still not sufficient attention globally to raise awareness of the fact that we will have a serious problem with water access in the near future, and these efforts must start right away (Frérot 2011, p. 14).

McIntyre-Mills stresses that public education should be encouraged to protect the global commons (which mean the goods that are used globally regardless of national boundaries like air, space and water), by introducing subjects and adjusting curricula in formal and informal contexts (McIntyre-Mills 2016). McIntyre-Mills also states that:

> "Consumption and happiness is now a focus of attention, because the consumption of more resources has not resulted in greater happiness. Instead people with more time and more social capital are found to lead healthier happier lives" (2016, p.6).

Establishing cultural norms around preserving the environment, and water in particular, is important and should be included in the constitution and law enforcement must be conducted. This should be followed by a posteriori approach through introducing indicators and measurement systems to address issues in water security, especially the responsibility of development towards marginal people.

2.7.5 Health

Water related diseases take the lives of more than 400 children every hour (Gadgil 1998, p. 254). According to the International Federation of Red Cross and Red Crescent Societies, around 600,000 people died every year because of water related disease, and most of them are children under age five (2001).

Drinking water has to be "safe and aesthetically good, clear, colourless, and well aerated, with no unpalatable taste or odour, and it should contain no suspended matter, harmful chemical substances or pathogenic micro-organisms" (ADWG 1996, p.1). Most countries and regions have their own definitions and standards for drinking water quality. In Europe, the European Commission applied the Drinking Water Directive in 1998 (European Comission 2015), while the United States ratified the Safe Drinking Water Act (Environmental Protection Agency 2014). Drinking water quality standards are usually based on the Guidelines for Drinking Water Quality issued by the World Health Organization (WHO). To meet the standard, then water provider needs to have certain technology and also treat the water, which can be very costly. The second challenge is to ensure that all people get access to safe drinking water. The WHO guideline points out that safe drinking water should be available for all, and the most vulnerable victims of unsafe drinking water are young people, pregnant women and the elderly (WHO 2011), and, particularly, the marginalised low-income population in rural and slum areas (Mintz et al. 2001).

2.8 Drinking Water Supply Management System

Gadgil (1998, pp. 281-4) explained that in developing countries, there two different views on drinking water management systems. First, the so called 'old view' suggests that to provide 100% coverage of drinking water supply (urban, rural, rich and poor), extensive investment should be undertaken through public sector management, and the government should provide tariff subsidy (particularly to the poor) if necessary. However this view in most cases does not really work well. Extreme inefficiency happens within the system, and only a few people[40] can get well managed piped water service, while the majority of the population still struggles to meet their needs from expensive water vendors (Briscoe & Garn 1995, p. 59). The performance of water systems is also very poor according to some indicators which include: technical performance marked with high water loss (up to 58% in Manila and more than 40% in Latin American cities), management performance where the employee ratio reached 10 to 20 employees per 1000 customers (in Latin America and Asia, even 33 in Mumbai), and financial performance where billions of dollars were spent to subsidise water tariffs that were mostly enjoyed by the rich.

The second view mentioned by Gadgil (1998), which is the 'new view', proposes four centres of attention: (1) Ensuring economic and environment sustainability; (2) providing full recovery services to those who have the willingness to pay; (3) employing public funds to deliver services to community services; and (4) establish a strong and sustainable institution to manage water services that can accommodate all needs.

[40] Gadgil mentions this group usually live within the profitable area, or people who are financially or politically powerful.

The fourth objective, which refers to the institutional arrangement, must consider local issues and conditions (Biswas 2007). It can be performed with several systems: centralisation, devolution, de-concentration, privatisation, public private partnership, public-public partnership, or community based water management.

2.8.1 Decentralisation or Devolution

Decentralisation has been defined differently by experts (see, for example, Bahl & Martinez-Vazquez 2006; Devas 1997; Rondinelli, D 1999; Rondinelli, DA, Nellis & Cheema 1983; Shah 1998; Shah, Thomson & Zou 2004; UNDP 1999). For this thesis, the researcher adopted a simple definition of decentralisation by Rondinelli (1999, p.2) as the "transfer of authority and responsibility for conducting public functions from the central government to subordinate or quasi-independent government." There are four types of decentralisation according to Rondinelli (1999) and Work (2002), namely, political decentralisation (self-election for representatives), administrative decentralisation (transfer of authority and responsibility), fiscal decentralisation (transfer of source of funding), and market decentralisation (privatisation or deregulation from public to private sector). Devolution is one form of administrative decentralisation[41] that transfer authority to municipalities to elect leaders, raise revenue and make investment decisions along with the responsibility to provide public services. Since devolution is a system where local governments have clear geographical boundaries of jurisdiction, practitioners often use the term decentralisation to explain devolution. In this thesis, the terms can be mixed up between devolution and decentralisation.

Biswas (2001, pp. 493-4) explains that, in the past, most developing countries water decisions were made at a central level by a water ministry. However, this approach has changed drastically in recent years since centralised systems were often regarded as inefficient and decentralised systems have been viewed as the most appropriate method for water provision (Naddeo, Scannapieco & Belgiorno 2013).

Bahl and Martinez-Vazquez (2006, p. 6) stressed that the implementation of decentralisation is mainly because people are disappointed in the existing centralised system. There several underlying factors behind this, including bigger population with the central government failing to serve one or a number of particular areas; worsening public services, poor performance and poor accountability of government officials; and cultural and ethnic ego which makes people want to have more autonomy to rule their region.

[41] There are three types of administrative decentralisation: Devolution, Delegation, and De-concentration (Rondinelli, D 1999). Two of them, devolution and de-concentration, will be discussed in this thesis as options for drinking water management.

> "Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.
>
> The participatory approach involves raising awareness of the importance of water among policy makers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects." (Dublin Statement on Water and Sustainable Development in Principle 2)

This view was then supported by Mcdonnell (2008, p. 132), who stated that water management should be more decentralised to accommodate local ideas and management of demand.

2.8.2 Centralization or deconcentration system

As explained above, deconcentration is one of the forms of administrative decentralisation which involves intra-governmental transfer of functions from central government to its local or field offices (Hutchcroft 2001). In the context of a newly decentralising government, deconcentration is a good first step for improving service delivery while the central government still holds control and accountability (Work 2002). Deconcentration is considered as the weakest form of decentralisation and is commonly implemented in unitary states. In practice, the delegation of authority can be from offices in the capital city to those in regions or districts and municipalities, or, as it applied in Indonesia for instance, the central government creates an administrative unit that will work under the supervision, direction and financing from the central government ministry (Rondinelli, D 1999; McLean & King 1999).

Arretche (1992) described that this model had been successfully adopted in Brazil to replace the decentralised approach. During the 1960s and 1970s, municipalities failed to provide water to meet the population growth and urbanisation due to poor practice of planning and management, and lack of financing. The federal government then introduced the National Water and Sanitation Plan (Planasa), and encouraged the setup of state water companies to take over the district water companies. In ten years of implementation, water coverage increased dramatically from 12% to 42%. However, there were still municipalities that remained effectively autonomous (not joining the Planasa), and efficiently ran water provision with their administrative department or an autonomous body.

McLean (1999) explained that the deconcentrated approach is usually used to deliver water services in a centralised government system. In Indonesia, the deconcentrated water management unit was staffed by administrators and engineers appointed by central government (mostly civil servants and local government's staffs). Since all programs came from the ministry, they did not base their work on demand from users, but on central government instructions. Poedjastanto (2009) argued that to solve the problems of drinking water supply, full support from the central government is critically

needed. Simbolon (2007b, pp. 131-3) suggested that the central government can temporarily take over the poor local water companies to restructure their management, financial and operational performance. This can be considered as a national Public-Public Partnership, since basically this will be an agreement between central government, local government and local water company.

2.8.3 Privatisation

> *"…it can also be argued that once a monopoly is established there are no competitive controls upon the costs incurred by the monopoly, or upon the type of service which the monopoly offers to its consuming public" (Redwood 1980, p. 5).*

The Oxford English Dictionary defines privatisation as "the policy or process of making private as opposed to public". Kosar (2006, p. 3) indicated that, in privatisation, the private sector holds a significant role in providing goods and services from production, distribution, quality control and also funding and pricing, while Savas (2000) specifically stressed that privatisation reduces the role of government in conducting public provision.

Many scholars claimed that privatisation can be a good answer to providing better public services. Savas and Schubert (1987) argued that privatisation can be a two-sided coin for creating better or restricted government; restricted in scope compared to other private or non-profit institutions, and better because it can encourage the fulfilment of the people's needs more professionally. Privatisation can be used as both a tool or a final destination. (Savas & Schubert 1987, p. 288). The World Bank, IMF and several regional development banks have also claimed that water privatisation will enhance the effort of providing access to water and sanitation to more (even billions of) people worldwide, since the private sector is more efficient, cost effective, competitive and able to contribute more financing (Public Citizen 2003, p. 1).

In contrast, there are also some arguments saying that privatisation of water services is not appropriate to solve the problems in water management. Bianchi (2005) argued that, in many countries, water privatisation cannot do much to perform better water provision, as privatisation is always followed by significant increases in water tariffs and leaves the poor with no option but dirty water. Meanwhile, Santiago (2002, p. 1), stressed that privatisation of water services conflicts with the United Nations covenants, which state that it is the state's obligations to ensure that all citizens have access to water. Research conducted by Public Citizen (2003) found that water privatisation resulted in major losses in Buenos Aires (Argentina), Manila (Philippines), Atlanta (United States) and Cochahamba (Bolivia). Anthony Giddens mentioned this as the consequence of modernity, of which the main characteristic for building systems and institutional arrangement is capitalism (Giddens 2013, p. 11). In the era of modernity, governments tend to reify water.

2.8.4 Public Private Partnership (PPP) in water supply management

Heilman (1992), defined PPPs as "the combination of a public need with private capability and resources to create a market opportunity through which the public need is met and a profit is made" (p. 197).

PPP was introduced by the New Public Management (NPM) approach, which has a view that efficiency in public sector or services can be attained by implementing private mechanisms or acquiring private organisations to undertake public services (Silvestre 2012). The South African Institute of International Affairs stated that PPPs are able to provide desired outcomes when several conditions are met, such as involving comprehensive planning, engaging active interaction, dedication and integration from related parties, monitoring and supported by a conducive law environment and enforcement by the government (United Nations Economic and Social Council 2005, p. 6).

PPPs were successfully adopted in implementing water sector reform in African countries like Senegal, Ghana, and Lesotho (United Nations Economic and Social Council 2005). However, Aït Ouyahia (2006, p. 2) concluded that research needs to be conducted to study whether involving private sector in providing water is effective to reduce costs like water price, efficient governance, and regulating and enforcement costs. Hence, one should carefully consider the terms and conditions for PPPs in designing the agreement, which means that PPPs cannot be generalised to address all water management problems.

2.8.5 Public-Public Partnerships (PUPs) or Joined-Up Government (JUG)

Vandana Shiva has been a leading voice in the efforts to defend local water rights and promote new forms of public-public partnerships to protect fresh water supplies (Shiva 2008).

Hall et al. (2009), explained a Public-Public Partnership (PUP) as a collaboration between two or more public authorities or organisations, based on solidarity, to improve the capacity and effectiveness of one partner in providing public water or sanitation services. They have been described as "a peer relationship forged around common values and objectives, which exclude profit seeking" (Hall et al 2009, p.2). Neither partner expects a commercial profit, directly or indirectly. PUPs have already been implemented in 70 countries, including Indonesia (Hall et al. 2009). However, the wide implementation of PUPs is only around financial and technical assistance between big organisations or companies

The implementation of the New Public Management (NPM) approach in Indonesia has somewhat shifted the way the government serves its citizens by viewing them as customers, while the

government units are seen as the supplier of the products (Aberbach, Joel D & Christensen, Tom 2005). This approach is ill-suited to addressing a wicked problem with cross-organisational boundaries (Mulgan 2002). Silos between governments (central, provincial and locals), and also between departments within the governments, become bigger as they only focus on their own targets and achievements. In the Nauli City case, the NPM's Enterprising Government (Hood 1991) has been defined as government acting like an enterprise to create new sources of revenue, and water provision has been one of them. Local governments are competing to sell water and they forget that their ultimate objective is to provide water for the maximum benefit of the people.

Joined-up Governments (JUG) became very prominent in 1997 when the British Government under Tony Blair realised that dividing up government by functions or territory without strong sense of coordination was no longer effective. Departments or local governments became selfish, only pursuing their own targets without considering that their actions might bring side effects to other organizations (Christensen & Lægreid 2007; Mulgan 2002). Joined-up Governments (JUG)–central-provincial-local or provincial-local governments–can be seen as a way out to a more holistic, user-friendly, and efficient solution to address the wicked problems cutting across sectors, policy areas, and hierarchical levels (Fimreite & Laegreid 2009). Pollitt 2003 defined JUG as an attempt to co-ordinate thinking and action, both vertically and horizontally. Pollitt (2003) mentioned that JUG basically has four goals: first, to create better policies and minimise conflicts between policies; secondly, to achieve optimum use of resources by eliminating duplication and conflicts between institutions and programmes; third, to enhance synergy of ideas between stakeholders and improve co-ordination and create better ways working and networking; and, last but not least, to integrate services in order to provide greater ease from the residents' perspectives as service users.

The Australian Management Advisory Committee in its report in 2004, *Connecting Government: Whole of Government Responses to Australia's Priority Challenges*, states:

> "Whole of government denotes public service agencies working across portfolio boundaries to achieve a shared goal and an integrated government response to particular issues. Approaches can be formal and informal. They can focus on policy development, program management and service delivery…. This approach is the most suitable approach for a complex and longstanding issues that referred to as 'wicked problem'".

2.9 The Community of Practice (COP)

Based on the fact that water is, or perhaps was, a public good, and conserving water is a must and it needs considerable funding, we have to agree that water should have a price, and it means that water has a market. The water market is very tempting for private players to engage in. Hence, the

state or the government that is given power by the people to serve the people have to be able to balance the people's need of water and the interests of the market (Monk, 2009), and to satisfy all stakeholders (owners, suppliers, customers, employees, financiers and the communities) to achieve sustainable water provision (Freeman, 1984).

Engaging a community of practice is a great way to build good communication across stakeholders. The notion of Community of Practice (CoP) was coined by Etienne Wenger and Jean Lave (1991) as the basis of social theory of learning to represent regular interactions between people or stakeholders who have a similar interest and passion for something, as a medium to learn and, at the same time, share their knowledge and experiences (Wenger 2009). CoP is a collaborative way of learning outside classrooms and training sessions through informal networks (Hara 2008). The CoP concept has been applied from time to time, or is age-old, in almost all sectors like business, government, science, arts, development projects and civic life. Wenger explains that, essentially, a CoP has three main characteristics: (1) the domain - a CoP is not simply a network connection between people, but a collection of people who share a domain, a competence they value, that distinguish the group from other groups. They learn and share the competence and experience of the domain from each other; (2) the community - the members commit to meet on a regular basis to pursue their interest in the domain, engage in discussions and activities, share information, and learn from each other. Not all communities can be regarded as a CoP. An online community, church Sunday service, a student gathering, and even an experts meeting, if they do not interact and learn from each other, are not a CoP; (3) the practice - a collection of people who have similar interests, for instance, music, is not a community of practice. A CoP consists of practitioners or doers. The members are the ones who repetitively perform their particular skill or engage in a particular issue, and they gather to exchange a shared repertoire of resources, experiences, new ways to manage a particular issue, and discuss the kind of problems that may occur and how to address them (Wenger 2009).

Communities of Practices can be incorporated into all stages of water management during planning or designing, executing and monitoring. This is important to build a sense of belief, proactivity and belonging to the community and the domain (Plaskoff 2003 in Hara 2008). Technical experts, central and local government officials, NGOs, foreign funders, water companies and some representatives of the people can gather together and develop a CoP to share their passion in developing better water provision. Wenger in *Communities of Practice: Learning, meaning and identity* explained that the identity of the CoP can be developed from the members' backgrounds (their expertise and experiences); connected and expanded through relationships and interactions between them; and the meaning of the CoP itself can be mutually negotiated through participation

in practice and reifications of meaning (Paul 2002; Wenger 1998). Wenger (1998) described that a CoP is a good place for natural negotiation as well through a process of participation and reification, as members have established mutual engagement, are bound by a sense of joint enterprise and produce a shared repertoire of resources (Roberts 2006).

Developing a CoP to build wellbeing stocks for the future through the Triple Bottom Line enables planners and policy makers to work with service users so as to set better indicators of perceived need. This is core to better governance which relies on a priori norms and a posteriori measures that are made with the service users. The continuous planning cycles can be performed in four steps, as outlined in the figure 16 below.

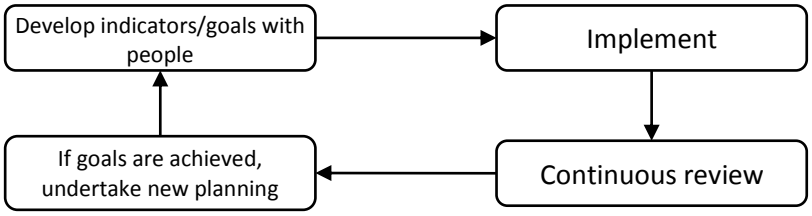


Figure 16: Continuous Planning cycle (diagram is developed by author)

2.10 Gaps in the current literature and contribution to knowledge

As presented above, there has been similar research regarding how to address problems in water management in developing countries (see Faguet 2004; Gadgil 1998; Grace et al. 2007; Kingdom, Liemberger & Marin 2006; Milliman 1997; Public Citizen 2003; Reynoso 2000), developed countries (see Briscoe & Garn 1995; Cassuto & Sampaio 2011; da Cruz, Berg & Marques 2013; Lieberherr 2011; McNallen 2005), and, especially, in Indonesia (see Ageng 2005; Argo & Firman 2001; Crane 1994; Manurung 2005; Poedjastanto 2009; Wijaya 2005).

However, this research will be a fresh contribution to knowledge since most of the literature discussed one water provider in a particular local area or region, whether it is conducted by the local government, a deconcentrated central unit, a locally owned water enterprise, a privatised water enterprise, or a community body for smaller scale. In contrast, in the case of Nauli City there are three local government-owned water companies that are conducting water business and compete with each other without any regulation to manage this competition, and this complex situation has been worsened by the disorganised governments' (central, provincial and local) planning in water programs and water projects. Even though there have been many players in water provision in this small area, they have failed to meet the people's need for water so the private sector has assumed significant market share in providing water to houses.

The way this thesis perceives the water management problem in Nauli City as a wicked problem has led the discussion and considers not only the economic aspect, but also environment and social aspects. Furthermore, mixed methodologies of qualitative and quantitative approaches are employed to unravel the real problems that can enrich the assessment of the problem.

> "…what may have been a viable solution a decade ago may not be so a decade from now. And what applicable in other regions might not suit to be implemented in a particular region, since water problem is case specific. This means that water policies need to be updated periodically so that they reflect the changing requirements" (Biswas 2001, 2007).

CHAPTER 3. Research Methodology

"Not everything that can be counted counts, and not everything that counts can be counted".

(Albert Einstein)

3.1 Introduction

This chapter comprises the research framework that was implemented to collect and analyse primary data directly from the field, as well as secondary data from various first-hand and second-hand sources in order to answer the research questions. It commences with bringing back the research questions and aims introduced in Chapter 1, and how the problem is regarded as a 'wicked problem'. Subsequently, this chapter will explain the research methodology and research design including sampling strategies, data collection methods, list of questions for interviews and group discussions, and conceptual tools that are used to analyse the data.

3.2 The Wicked Problem

A complex issue comprises many interrelated variables that can be perceived differently by different stakeholders. This kind of problem is regarded as a wicked problem (Churchman 1967; McIntyre-Mills 2008; Rittel & Webber 1973). The concept of the wicked problem was first introduced by Charles W. Churchman in 1967, and he characterised it as ill-formulated. Churchman described that a wicked problem has confusing information and conflicting values, involves many decision makers and clients, and any proposed solutions can be worse than the symptoms (Churchman 1967). A wicked problem is often highly resistant to resolution (Australian Public Service Commission 2007). Some may see an issue as a problem and others may see it as a solution, or vice versa where one's solution can be a problem to another. Though water scarcity in Nauli is a problem for many, the water management systems ensure that some private and government sectors profit at the expense of the problem while ignoring the Constitution that stipulates that managing water should ensure that the rights of the people are protected.

Rittel and Webber (1973) in *Dilemmas in a General Theory of Planning*, explained that social problems have never been tame or benign ones. They categorise social problems as wicked because of their complexity and tendency to become a vicious circle, so they are tricky like a leprechaun and aggressive like a lion (p. 160). Russell Ackoff (1974) used another term to explain this kind of situation: a mess. According to Ackoff, messes are different from difficulties because messes have many interlocking aspects and cannot be solved, while a difficulty is a simple problem and is only a small part of a mess. We know the answer for a difficulty but for a mess, or wicked problem, the

answer is ambiguous, hard to pin down, hard to know what the actual source of problem is, there are multiple trajectories, and usually it does not make sense to find an answer (Reynolds & Holwell 2010). If we can scrutinise the wicked problem into small parts of difficulties, then a wicked problem is bigger than the sum of those difficulties (adapted from Aristotle's "*a whole is bigger than the sum of its parts*"). In terms of public policy area, what decision makers deal with is a wicked problem or a mess, not a difficulty. Rittel and Weber (1973) describe the characteristics of wicked problem as follows:

1. There is no definitive formulation of a wicked problem. The biggest challenge to wicked problems is how to treat them. The way we root the problems must be followed by any suggested treatments needed.
2. Wicked problems have no 'stopping rule'. Every policy maker can do better than the other, and any additional effort can bring better output for the solution. One will stop because he thinks that 'it is good enough'.
3. Solutions to wicked problems are not true or false, but good or bad. There is no exact 'one fits all' solution; it really depends on the stakeholders' viewpoint, or whether they feel satisfied or not.
4. There is no immediate and no ultimate test of a solution to a wicked problem. We cannot test a proposed solution, but instead after being implemented in a very flexible period of time, that particular solution can cause a new problem.
5. Every (attempted) solution to a wicked problem is a 'one shot operation'. There is no place for trial and error and it cannot be undone, so it has to be planned very accurately.
6. We cannot identify whether the solutions to a wicked problem are complete. Normally we can identify a set of solutions, but at the same time another set of solutions have never been conceived.
7. Every wicked problem is essentially unique. There will probably be some similarities between a series of wicked problems, but there will always be an important and unique part that will distinguish them, and there will definitely be no rules of solution that fit to one but can be implemented to other problems. In all cases, significant modifications should be considered before transferring one solution to another problem.
8. Every wicked problem can be considered to be a symptom of another problem. As problems are interconnected, a wicked problem can be considered to be the symptom of higher level problem. Thus, the solution should be formulized at as high a level as possible.
9. The causal explanation of a wicked problem can vary in many different ways.

10. The planner has no ‘right to be wrong’ in an experimental sense, i.e., there is no public tolerance of initiatives or experiments that fail.

According to Head (2010), some complex technical problems are not necessarily regarded as complex wicked problems. Some major project challenges, such as the uncertainties and complexities in an infrastructure project, sometimes need only to be solved by technical experts (engineers, finance managers and other planners) and funders. However, when the issues in the projects escalate into other important dimensions (social, economic and environmental) involving value disagreement and affecting various levels of stakeholders, then it can be regarded as a wicked problem.

3.3 Research questions and the aims of the thesis

Based on the aforementioned explanations, the water management problem in Nauli City as a social problem can be regarded as a wicked problem as it involves high tension conflict between local governments, it should consider multiple aspects of human life whilst having to try to balance the ecosystem, and, moreover, it affects many stakeholders especially marginalised people. As explained in Chapter 1, this research will answer four research questions:

(i) Has the water management system in Nauli City been effective in utilising water for the maximum benefit of the people?

The first aim of this thesis is to analyse the effectiveness of the current system in order to provide water service to the people. Facts and findings that are gathered from fieldwork will be presented to show the conditions in Nauli City. Chapter 4 will answer this question by describing how the water management system has curved far from the mandate of the Constitution, and the governments (national and local) have exploited and treated water as a commodity while neglecting their main responsibility to serve the people.

(ii) What are the causes that triggered the wicked problems in water management?

The second aim of the thesis is to inspect the problems to get better understanding of the entangled conflicts that caused wicked problems in Nauli City’s water management. This question will be addressed in Chapter 5 which is part of a policy analysis stage 1: scrutinizing the problem. The chapter will analyse the wicked problems by using the Carol Bacchi’s ‘What’s the problem represented to be?’ (WPR) approach. It will continue with drawing a problem map to outline interconnections and interdependence between causes.

(iii) Does competition between water companies bring significant improvement to water provision?

Normally, competition will make the customers better off through lower prices and/or better quality of product. This assumption will be the hypothesis and this question will test the

hypothesis since Nauli City has a water market in which three government-owned water companies and private water merchants compete to sell water. The hypothesis test will be conducted using a quantitative method in Chapter V through a mixed methods approach.

(iv) How can water supply in Nauli City be managed in a better way, and what ought to be done? Radaelli (1995) emphasized that one of the purposes of scholarly research, other than as a contribution to knowledge and methodology, is as a contribution to the policy making process. Therefore, this research aims to provide a policy analysis by assessing current policy, whether or not it works properly to respond to people's needs, and how it can be improved. Having been introduced in Chapter 5, Chapter 6 will continue the next stages of the policy analysis which will describe policy alternatives to address the wicked problem.

In order to analyse the research questions and to effectively achieve the aims of the research, a proper research methodology has to be developed very carefully.

3.4 Research paradigm

The next step is to establish the research paradigm that will determine the way the researcher analyses the problems. Guba and Lincoln (1994, p. 108) stated that a paradigm is "a set of basic beliefs that deals with ultimates or first principles". A paradigm represents how the researcher perceives this problem, or the worldview, and, as a product of the human mind, it is subject to controversy. Hence, the arguments that are presented in this thesis are also based on the researcher's construction. The researcher, however, tries to persuade readers with arguments and evidence and hopes that it can be useful for policy making considerations.

According to Guba and Lincoln (1994, 2005) and Killam (2013), determining a paradigm will come to a more philosophical process with four sets of assumptions: ontology, epistemology, methodology and axiology.

3.4.1 Ontology

Ontology refers to questions about the nature of reality or 'what is real', in terms of real existence or real action. It uses scientific methods to examine the reality and, as a result, things like aesthetic and moral significance are outside of the ontological context. From ontological assumption there can be two different (opposite) approaches of worldview (Killam 2013): a realist approach where one sees reality is from nature and waiting to be found through objective measurements, and one truth exists and it is unchangeable; and a relativist approach where realities can be found through interpretation, multiple realities exist, and truths really depend on the meaning attached to them.

3.4.2 Epistemology

Epistemology is the belief that questions about the relationships between the would-be knower and the object that would be known. It is the theory of knowledge. How do we get the knowledge and uncover new things? Ontology will dictate epistemology. Realists say that the researcher must stay as far away from the research object as they can in order to get objective measurement, or take an outsider's view from a particular situation. On the other hand, relativists believe that in order to get in depth understanding about a particular situation, one should jump into it, interactions are needed, and sometimes he or she will be accepted, rejected or embraced.

3.4.3 Methodology

Methodology is about the processes and techniques used to get the knowledge in a systematic way. Realists will look for one truth, so they use the relationships of prove and caused, and will experiment to prove the hypothesis. They apply a deductive approach that starts with a theory, building a hypothesis and collecting quantitative data to test to prove or disprove the hypothesis. In contrast, relativists study a phenomenon through an inductive process by observing live experiences and interviewing the subjects. They then look for patterns, common findings and build a theory.

3.4.4 Axiology

Axiology is the belief that questions the ethics and aesthetics, and the values in society related to observations of the would-be-known. It refers to how we assess or judge the truth of the knowledge, how we respect the values integrated in the culture of subjects that are observed, how we can respect the voices of all participants, and that all researchers should attempt to gain the trust of community members (Mertens 2012). Both worldviews (realist and relativist) should comply with ethical constraints and ethical principles.

A paradigm is a lens through which we see the world. Generally speaking, there are two groups of paradigms: positivist and non-positivist. Mertens (2014) described positivism as a scientific research paradigm, and that all natural and social phenomena can be studied or explored 'value free'. Positivists use deductive processes from a theory and test a hypothesis through objective observations and measurements (with quantitative methodology), and generalise their findings to the population beyond a sample (O'Leary 2004). This paradigm is often used by realist researchers. Post-positivism came into practice after World War II (Mackenzie & Knipe 2006). After this period of time, there have been many post-modern paradigms developed, and O'Leary (2004, p. 6) grouped all paradigms, scientists, philosophers, and researchers that debated positivist assumptions as post-positivists, but I would rather call them anti-positivists. In a nutshell, anti-positivists argue that the world is ambiguous (very complex so sometimes we can be wrong when trying to understand it),

variable (truth is not fixed, and is influenced our way of thinking), and multiple in realities (what may be truth for one may not be truth for another). O'Leary (2004, p. 7) produced a table which shows the shifting way of thinking from positivist to anti-positivist.

Table 4: Shifting paradigm from positivist to anti-positivist (Source: O'Leary 2004, p. 7.)

Positivist		Anti-positivist
	The world	
Knowable	----------	Ambiguous
Predictable	----------	Variable
Single truth	----------	Multiple reality
	The nature of research	
Empirical	----------	Intuitive
Reductionist	----------	Holistic
	The researcher	
Objective	----------	Subjective
No biases	----------	Participatory & collaborative
	Methodology	
Deductive	----------	Inductive
Hypothesis-driven	----------	Exploratory
Reliable	----------	Dependable
Reproducible	----------	Auditable
	Findings	
Quantitative	----------	Qualitative
Statistically significant	----------	Valuable
Generalizable	----------	Idiographic or transferable

Some anti-positivist paradigms include post-positivism, constructivism (Guba 1990; Guba & Lincoln 1994, 2005) and two paradigms that developed qualitative and quantitative approaches: transformative and pragmatic paradigm (Mertens 2012, 2014). Post-positivism believes that a reality exists but it cannot be known perfectly. Theories and values that are held by the researcher will influence the understanding and the result of the research (Mackenzie & Knipe 2006), and "we cannot be *positive* about our claims of knowledge when studying the behaviour and actions of humans" (Creswell, JW 2003, p. 7). When positivism is dualist (meaning that the researcher and the research object are assumed to be independent entities) and strongly holds objectivity, post-positivism also believes that objectivity is crucial but it is very difficult to maintain dualism. Constructivism, on the other hand, is an implementation of relativist assumption, and uses qualitative analyses as its methodology with the researcher as the main research instrument. The researcher's background, points of view, historical experiences and values will determine the interpretation of the research results. Multiple realities in people's minds are valued and, as a result, multiple methods for searching and gathering data, such as observations, interviews and recordings, are required in this approach (Golafshani 2003). Crotty (1998) put forward some assumptions to characterise constructivism: (i) Meanings are interpretable and qualitative methodology should be put in place so participants are allowed to express their views; (ii) Interpretation will be strongly influenced by the researcher's historical and social perspectives; (iii) The qualitative research process is largely inductive, and meanings are generated from data collected in the field.

Pragmatic and transformative paradigms arose in order to respond to disappointment from researchers and psychologists with the existing paradigms, especially constructivism (Mackenzie & Knipe 2006) from where they were developed. Pragmatists focus on the questions and aims of research, and use both approaches, subjective or qualitative and objective or quantitative, to find the best result (Creswell et al. 2011). The transformative paradigm believes that constructivism did not do enough to advocate a strong vision to help marginalised individuals or groups of people. They believe that research should be interconnected to a particular policy or political agenda in order to reform or transform, or bring about positive impact for the participants, the environment and the researchers themselves (Creswell 2003, pp. 9-10). According to (Mertens 2017), transformative paradigm will take into account the diversity that occur in the society. Cultural, race, gender, wealthiness, and power should be regarded to have influence on the data generated from the study. We are not researching on or about the people or the communities, but "with" the communities (Mertens, 2017). Furthermore, employing qualitative and quantitative approaches can encourage partnerships between researcher and the community, while addressing the need for trust and mutual engage with the community to get reliable information (Mertens 2012). Hence, this paper employs

mixed methodology (quantitative and qualitative methodologies) with the intention of capturing more complete data and eventually reach a better understanding of the problem through multiple lenses and perspectives. Moreover from several arguments presented previously in this paragraph, this research will be more focus on transformative paradigm instead of pragmatic paradigm.

Researchers have now moved beyond disputing the way in which to work across quantitative and qualitative research paradigms. Guba (1990) and Guba and Lincoln (1994, 2005) explain that quantitative purists (also known as positivists) are realists who believe ontologically in an absolute reality which requires observers to be independent, objective and uninvolved in the subject of their research. They also believe that conclusions can be generalised. In contrast, qualitative researchers are relativists who believe that reality can be constructed, that the context should always be bounded by values and subjectivity, researchers should blend into the situation being observed and should not be separated, and conclusion is case specific. They are called anti-positivist by some, but a deeper study reveals that the divide is not so great and that in fact some qualitative and quantitative researchers understand that testing out ideas enables one to move closer to the truth (Christakis, 2006, Romm, 2001). McIntyre-Mills (2000, 2017) argues that the closest we can get to the truth is through dialogue and testing out ideas.

The four types of paradigms (positivism, post-positivism, constructivism, and transformative paradigm) are characterised by the ontological, epistemological, methodological and axiological assumptions as follows.

Table 5: Research paradigms (ontology, epistemology, methodology, and axiology)
Adapted from Guba and Lincoln (1994, 2005) for positivism, post positivism, and constructivism, and from Creswell, JW (2003); Creswell, JW et al. (2011); Mertens (2012) for Transformative Paradigm

Issue	Positivism	Post-positivism	Constructivism	Transformative
Ontology	Realism	Critical Realism	Relativist	Critical Relativist
Epistemology	Dualist/ objectivist	Modified dualist/objectivist	Subjectivist	Subjective, objective, and Participatory
Methodology	Quantitative	Quasi Quantitative	Qualitative	Mixed of Quantitative and Qualitative
Axiology	Excluded	May give influence	Included - formative	

3.5 Research Methodology

Some people believe that single truth does exist, while some others think that truth can be constructed. McIntyre-Mills (2003) stressed that:

> The way we think shapes the way we see social issues or the way we construct them. This in tum impacts on the way we address them in our management of issues and the way we develop policy. (McIntyre-Mills 2003, p.31).

To address the wicked problem, one should compare and contrast, consider not only numerical data but also values and emotions, and explore different or even competing ideas that come from different points of view or stakeholders (individuals, groups, domestics, businesses and governments) which can mean considering different facts and conditions. The critical standpoint is when one should understand conflicting interests but eventually have to accommodate them into a policy. This is very important when one is developing a social policy of what works, how, when, why and to what effect (McIntyre-Mills 2003). This thesis will address the area of concern in terms of Churchman's (1979) approach adapted by McIntyre Mills (2000, 2002, 2006) based on the idea that we get closer to truth through testing out ideas with other people and through considering that truth and striving for justice really depends on working with many people to address their experience and perceptions of the social, economic and environmental context.

Camillus (2008 as cited in Mertens 2015) claimed that in order to understand and attempt to address a wicked problem, traditional methods of research can be used in combination to address areas of concern using methods such as appropriately designed statistical analyses. Mertens (2015) described how mixed methods have been employed to address wicked problems such as social issues, climate change and other environmental problems. Hesse-Biber (2010) summed up some of the argument below as follows, but stresses that re-presentation is the goal of the qualitative approach, rather than representation or mirroring reality. Hesse-Biber (2010) drew upon the philosophical perspective on knowledge building as shown in the below table:

Table 6: Philosophy of Knowledge Building (Adapted from Hesse-Biber 2010)

	Qualitative	Quantitative
Perspective	Subjective ⟷	Objective
Ontological	Social reality is multiple	There is a concrete social world
Epistemological	Goal is to understand multiple subjectivities. Individuals are experts. No definitive subject–object split.	Goal is to find truth to predict/uncover laws of human behaviour through objective social enquiry. Scientists are the experts.

.

From the explanation above, this thesis will apply transformative paradigm and use mixed methods to collect and analyse the data and to interpret the results. Creswell (2003) claimed that researchers today, particularly in addressing social problems, are debating less about quantitative versus

qualitative methodology, and more about how the research is situated between the two, and how to mix them. Pragmatic paradigm and mixed methods, or multi-method, were introduced when scholars admitted that both traditional methods have advantages as well as limitations and biases, and applying a combination method is an attempt to neutralise their drawbacks (Creswell 2003; Johnson, RB & Onwuegbuzie 2004; Mertens 2015). Greene, Caracelli and Graham (1989) argued that using two methods together will strengthen the result as one method can support or develop the other method. On the contrary, missing one approach will potentially answer the research question partially (Hashemi 2013).

By using transformative paradigm, this thesis will ontologically view that numbers and perceptions are equally important. Cultural complexities, voices and realities, as well political dynamics significantly influenced the situation (Mertens, 2007) and they will be significantly considered in the discussions. Epistemologically, this thesis needs closed relationships between researcher and participants to comprehending their perceptions.

Creswell (2003) and Hesse-Biber (2010) explained that there are two common procedures to perform mixed methods research:

1. Sequential procedure: starts with one method and is followed by the other method;
2. Concurrent procedure: starts both methods together along the way and eventually integrates the results.

Creswell et al. (2008) explained further that sequential and concurrent procedures can be divided into several sub-designs:

a. Sequential Explanatory Design (Quan data → analysed → Qual data → analysed → overall interpretation)
b. Sequential Exploratory Design (Qual data → analysed → Quan data → analysed → overall interpretation)
c. Sequential Embedded Design (Qual data before, and after experiments)
d. Concurrent Triangulation Design (Qual and Quan data are collected and interpreted in parallel)
e. Concurrent Embedded Design (Qual data are collected within the experiment).

This paper will use sequential exploratory design as shown in figure 17:

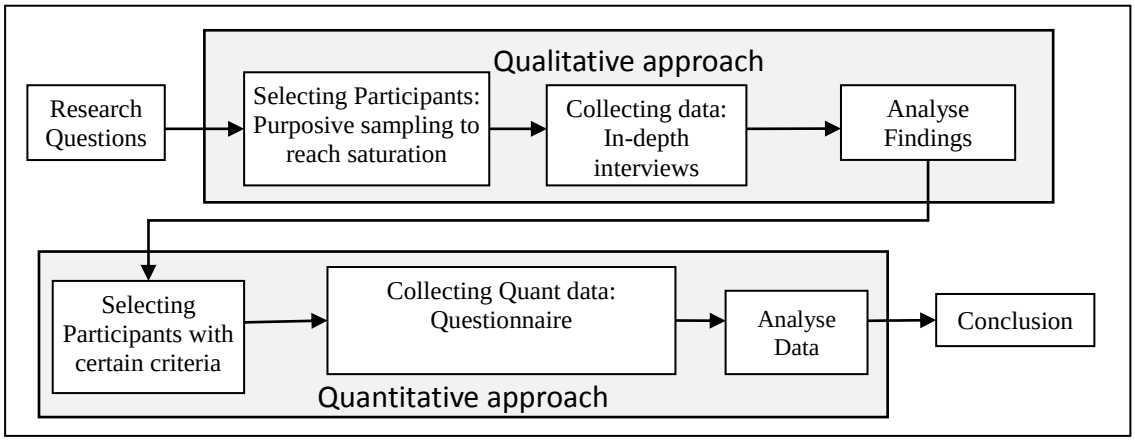


Figure 17: Research design (adapted from Hesse-Biber, 2010)

The first step is applying qualitative approach to understand and analyse how a social system perceive a particular issue (Bricki and Green 2007), in this context, water management in Nauli City. The main advantage of qualitative analysis is the ability of this method to examine problems or research questions in depth (Cleary, Horsfall & Hayter 2014). To be more specific, Bricki and Green (2007, p. 7) suggest that qualitative methodology is better to (1) absorb the human perspective; (2) observe their reaction to the context, and (3) get deep understanding of a process.

The process of conducting this research is outlined in the points below.

a. The causes of PDAMs in Nauli region experienced poor performance are still unclear to the researcher and need to be scrutinized. Arid conditions have been used as the main reason for water providers for to justify their failure to meet targets in water provision, and they seem to ignore complaints from stakeholders which protracted the problems.
b. The researcher will try to understand more about the situation of the research subject, to find a model, hypothesis, and theory (Sugiyono 2012, p. 292). With qualitative methods, we can "enjoy the rewards of both numbers and words" (Golafshani 2003).
c. Data generated from this research will be words (experiences, policies, expectations, feelings and behaviours) and numbers (service and financial data of water performance, economic and demographic statistics and government figures). A systematic approach to measure performance needs to not only score data, but as many relevant aspects as we can (Churchman 1979, pp. 31-4);
d. The researcher will compare and contrast best practices to underpin alternative policy suggestions;
e. It involves feeling and behaviour. From preliminary data based on performance audit conducted by government's internal auditor, poor management in water supply is mainly because of lack of goodwill from parties, that triggers unprofessionalism in PDAMs.

Quantitative approach is mainly utilised to formulate a hypothesis to test that there is no significant difference in water management despite the fact that competition between water companies exists. The purpose of the quantitative approach in this thesis is to find out whether preliminary conclusions drawn from in-depth interviews (qualitative approach) will be confirmed by quantitative approach findings. This paper will use quantitative methods by distributing questionnaires to a sample of participants to find out whether there has been significant improvement in piped-water service in Nauli City with three water companies compared to the condition ten years ago when there was only one water company. This approach will test the hypothesis generated from the third research question: "Does competition between water companies bring significant improvement to the water provision?", hence the *H_0 : The competition brings no significant improvement to the water provision*. A conclusion will be derived from the test which will then be used to suggest what ought to be done in order to address the wicked problem.

Participants are PDAM's customers that have been registered for more than 10 years. There are limitations in in this quantitative research that should be acknowledged. Firstly, participants will be asked to answer questions based on their memory of what took place ten years ago. A longitudinal study, which follows and observe respondents continuously or asked questions in two different point of times, now and ten years ago, would produce more accurate findings (Encyclopedia of Public Health 2008). Date may be subject to bias since it is based on memories. However, it is difficult to do longitudinal studies as the timeframe of interest is ten years and the length of study is only four years.

Secondly, based on the Krejcie and Morgan table, the number or participants for the population of 24,381 customers that have had water connections for at least ten years, with 95% confidence, should be 377 to 380 participants (Krejcie & Morgan 1970). However, this research applies mixed methods by which a quantitative method is applied to test a hypothesis generated from the findings from the preceding qualitative method. It was only possible for 75 respondents to be recruited and willing to participate due to constraints like time, access and distance. The participants were selected conveniently through snowballing, and questionnaires were distributed to participants by email and they were guided to answer the questions through video calls.

3.6 Case study research

Case is the unit of analysis and a bounded context (Baxter & Jack 2008; Miles & Huberman 1994, p. 25; Stake 1983). Case study is my choice of research strategy, which will be focusing on the dynamics of one or several conditions observed by using multiple investigators, and by using various data types such as interviews, discussions, archives and also numbers (Eisenhardt 1989, p.

534). This research is more exploratory[42] than confirmatory (Gerring 2004; Yin 2013), meaning that it is more about analysing, scrutinising and identifying a phenomenon rather than testing a hypothesis or proving relationships (Hancock, DR & Algozzine 2006). Although the number of cases might be very small, this case study will contribute to understanding the bigger phenomenon in the area of concern, and the researcher will observe the condition before, during and maybe after the conditions occurred (Gerring 2004, pp. 342-3).

Gerring (2004) defined case study as an intensive study of a single unit for the purpose of understanding a larger class of (similar) units. Case study is one of several major research strategies in social science research,[43] and how to use each them is contingent on three factors: (i) the research question, (ii) to what extent researcher has control over the context, and (iii) is it a current or historical phenomenon (Yin 2013).

Firstly, for the type of research question, case study is appropriate to answer 'how', 'why' and 'what' questions (Baxter & Jack 2008; Eisenhardt 1989; Gerring 2004; Seawright & Gerring 2008; Yin 1981). There are two of these types of questions in this research: (i) 'why' the performance is poor and what are the causes? (ii) 'how' can it be better managed and with 'what' model? The answer to these questions will be explanatory and will lead to the use of case study because it needs deep understanding and investigation, and needs to be traced over time and examine a series of data rather than mere frequencies and incidents (Yin 2013).

For the second and third criteria, 'the extent of control' and 'current phenomenon', to compare between case study and history approaches, case study will be best method because the events are contemporary and the perpetrators are still alive,[44] but there can be no control on the behaviour and it cannot be manipulated. Experiment will be best if researcher can intervene behaviour directly and systematically. Case study approach also offers flexibility to deal with the full variety of evidence, documents and interviews.

3.7 Research Design

This research was conducted in four steps:

[42] Three types of case study research: (1) Exploratory: tries to explore the research questions; (2) Explanatory: tries to explain why something happens, then find the causal relationships; (3) Descriptive: describe a phenomenon ('what' question), and not tries to investigate ('why' question) (Hancock, DR & Algozzine 2006, p. 37; Yin 2003)
[43] The other four research methods are experiments, surveys, archival analysis, and histories (Yin 2013, p. 9).
[44] History method is better if we are dealing with the past, meaning no relevant persons are alive to be investigated, and the researcher can only rely on documents and other physical evidence.

3.7.1 Step 1: Applying systemic approach to make interconnection between aspects

'Systemic thinking helps to explore conceptual and spatial boundaries that address social, cultural, political, economic, and environmental considerations..' (McIntyre-Mills 2006, p. 31).

Churchman (1979) described that, in systems thinking, a problem is part of a system that has several interconnected subsystems, and these subsystems work together to attain the total system objective. A very famous quote from Churchman put it very clearly: "A systems approach begins when first you see the world through the eyes of another" (Churchman 1968, p.231). According to Midgley (2000, pp. 2-4), systems thinking was introduced in the latter half of the 20th century to combat the traditional mechanism approach – an approach that viewed everything or every problem as if it is a machine, and tended to simplify the solution. Systems thinking will not break down parts of the system separately, but will treat them and their environment holistically, use models rather than experiments, unfolding values and sweeping in the aspects (Jackson 2000; McIntyre-Mills 2006). The related aspects that are surrounding the problem (social, economic, environmental) will also be examined.

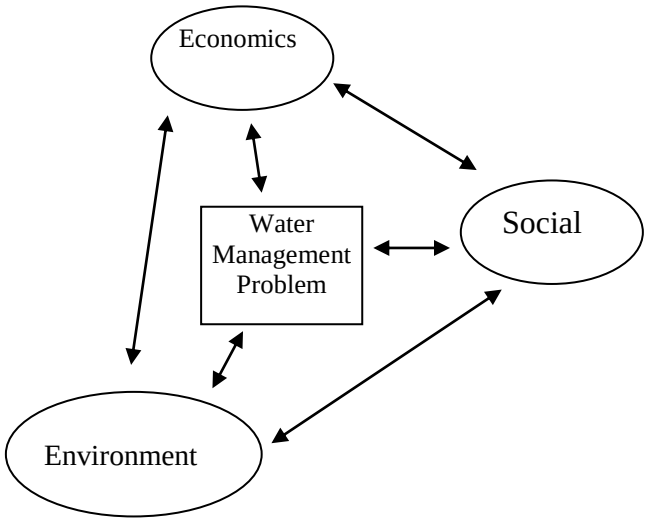


Figure 18: Aspects to be addressed in Drinking Water Management (diagram developed by author)

All aspects in Figure 18 above have been discussed in the literature review in Chapter 2.

3.7.2 Step 2: Determine the case

According to Miles and Huberman (1994, p. 34), there are three types of cases: (i) typical cases (normal or average in the phenomenon); (ii) negative cases (cases that show disagreement with

general trend); and (iii) exceptional cases (cases that show unusual conduct with common circumstances).[45]

This research is considered as exceptional cases, since it never happens in Indonesia that one particular region is served by three public-owned water companies. In this research, the researcher will examine the performance of water supply by PDAM in Samsoir, and the researcher were focusing on three neighboring water institutions in Nauli City: PDAM Kabupaten (district of) Nauli, PDAM Kota (city of) Nauli and the provincial water institution. This conflict happened as a result of local government proliferation in Indonesia.

During the sixteen years of the implementation of decentralisation in Indonesia (from 1999 to 2015), there have been 215 new district and city governments established (Data from Directorate General of Fiscal Balance, Ministry of Finance, 2015). These new local governments then began to create their own PDAM to perform water services in their region with the aim of accelerating water provision to the people. During those 25 years, there were 117 PDAMs established by those new local governments. However, in many cases,[46] problems arose and in Nauli area, for example, conflicts between old and new PDAMs regarding transfer of assets, lack of resources (technology, fund, and human resources) of new PDAMs, and intervention from local governments to new PDAM management led to neglected services and people suffering from lack of water. In Samsoir Province alone, there are currently 22 local governments and only 14 PDAMs. As a result, the number of PDAM could potentially increase in the near future.

3.7.3 Step 3: Data collection

3.7.3.1 Sampling

In all fields of study and research, sampling is needed because researcher will not be able to study, examine, and record every single event, individual, or case on a specific context in the population (Fossey et al. 2002; Hibberts, Johnson & Hudson 2012, p. 53; Miles & Huberman 1994; Ritchie et al. 2013; Seawright & Gerring 2008). Different to quantitative research, qualitative research usually applies a small sample number, but will undertake deeper study to understand the context of the problem from the sample or, as is the case in this research, human participants (Miles & Huberman 1994, p. 27). Miles and Huberman (1994) also stressed that it will be difficult to pre-specify the

[45] See also Devers and Frankel (2000).

[46] From preliminary research, this conflict also occurred at least in 15 cases: Kab Kerinci and Kab Sungai penuh, Kab Ketapang and Kab Kayong Utara, Kab Bengkalis and Kab Meranti, Kab Bekasi and Kota Bekasi, Kab Tangerang and Kota Tangerang Selatan, Kab Minahasa and Kab Minahasa Utara, Kab Bogor and Kota Depok, Kab Sambas to Kab Bengkayang and Kota Singkawang, Kab Buru to Kab Buru Selatan, Kab Minahasa and Kota Tomohon, Kab Bandung and Kota Cimahi, Kab Asahan and Kab Batubara, Kabupaten Kotabaru and Kab Tanah Bumbu, Kabupaten Maluku Tenggara to Kota Tual and Kab. Kepulauan Aru.

sample, however, the number and criteria of the sample will evolve once the researcher starts data collection or field study.

In discussing the sampling method, researchers usually make clear distinctions between probability and non-probability sampling methods. In a probability sampling, samples are chosen from a designated population randomly[47] with each unit in the population having equal characteristics and equal chance to be selected (Sugiyono 2010). Probability sampling is useful to find statistical evidence or relationships between variables, and when the aim of the research is to test hypotheses empirically (Ritchie et al. 2013, p. 78). On the other hand, nonprobability sampling is usually employed in qualitative research by selecting the elements of the sample based on particular features (Ritchie et al. 2013).

To select participants in this research, the researcher used purposive sampling method, also called judgement sampling (Tongco 2007), since the researcher wanted to find relevant persons quickly, and proportionality is not important in this case (Arsovska 2012; Gideon 2012, p. 400). Purposive sampling is often used in qualitative research[48] to understand, consider and locate the unique characteristics of each research subject, and to find the 'information rich' participants that provide the greatest contribution to the research (Devers & Frankel 2000). Participants selected in qualitative research should be well defined and meet certain purposes, that makes sampling in qualitative research is usually called purposive sampling (Collingridge & Gantt 2008).

Participants were selected from two major groups: water providers (government officials and water companies) and water beneficiaries (residents). For the first group, participants were from several related institutions, including central authorities, local authorities, local auditors and water companies, as described in the table below.

Table 7: List of targeted participants

Participant Type	Basis for Recruitment
I. Central Authorities	Three departments: MPW, MoF, MoHA, together with Bappenas conducting programs in accelerating water service performance in Indonesia.
Ministry of Public Works (MPW)	MPW is the department which makes policy, manages and supervises the water sector, as well as undertaking water investment.
Ministry of Finance (MoF)	MoF provides budget for water investment, including water related grants and loans to local governments and PDAM.

[47] There are also several methods in random sampling, some of them are systematic random sampling, stratified random sampling, and simple random sampling.
[48] See also Miles and Huberman (1994, p. 27) and Devers and Frankel (2000, p. 264).

Participant Type	Basis for Recruitment
Ministry of Home Affairs (MOHA)	MoHA supervises all local governments and issues regulations on PDAM management.
National Planning Agency (Bappenas)	Bappenas establishes blue prints for water development in Indonesia.
II. Local Authorities	
Local Planning Agency (Bappeda)	Bappeda designs and monitors infrastructure development in its jurisdiction.
Local Financial Body (DPPKAD)	DPPKAD deals with all financial aspects of local government, including collecting charges and dividends from water companies.
Local Public Works Department (Dinas PU)	Dinas PU designs, executes and monitors all water related infrastructure projects.
III. Water Sellers	
PDAM of Nauli City	Performs water provision on behalf of Nauli Municipality in the City of Nauli.
PDAM of Nauli District	Performs water provision on behalf of Nauli District Government in the City of Nauli and the District of Nauli.
BLUD SPAM	Perform waters provision on behalf of Samsoir Provincial Government in the City of Nauli and the District of Nauli.
DAMIU stalls owners	Sells drinkable water to residents.
Water merchants	Sells water to residents.
IV. Local auditors (BPKP and/or BPK)	BPKP and BPK conduct financial and performance audits of local governments and water companies
V. Residents	To know their problems and expectations with regard to drinking water provision.

From each unit in central and local authorities, two people were recruited as participants, with the criteria: (i) head of the institution (echelon II or III or higher) in charge of decision making; (ii) related officer who was in charge to daily activities.

From water companies, three people were selected initially: the technical director who deals with development and expansion of business, general director who deals with general affairs of PDAM including handling relationships with related institutions, and the financial director who deals with the financial aspects of PDAM and financial sources needed to maintain the business. However, the number of participants from water companies were increased until the information gathered was considered sufficient.

From local auditors, participants were the members of the audit team who performed the most recent audits of PDAMs to clarify information provided in financial and performance audit reports. There are two official auditor offices in Nauli: the Supreme Audit Board (referred to as BPK/*Badan Pemeriksa Keuangan* in this thesis) and the Finance and Development Supervisory Agency

(referred to as BPKP/*Badan Pengawasan Keuangan dan Pembangunan* in this thesis). BPK is the audit body external to the government and responsible to the people. BPK performs audits on the government financial and operational performance and submits their report to the parliament. BPKP acts as an internal control system of the government, responsible to the President in fostering good governance in public service and public management. BPK perform an audit of PDAMs when necessary, and BPKP perform an audit of PDAMs upon request, but both are entitled to perform financial and operational audits of PDAMs.

For local residents, a purposive sampling method was used and, as a start, two groups of people were recruited: religious leaders (a pastor and an ustadz as Protestantism and Catholicism are the most prominent religions in Nauli while Islam comes second), and community leaders (*Ketua Rukun Tetangga*) as the leader of the smallest official community group. Participants were selected from six subdistricts (*kecamatan*) in Nauli City.

The criterion implemented to select the districts from the City of Nauli is population density because the researcher wants to examine the performance of PDAM in delivering its services to the people within the area. Nauli City, with an area 180.27 km^2, currently consists of six subdistricts. The researcher used all subdistricts of Nauli City as samples since Nauli City only has six subdistricts and they are relatively highly populated, and the researcher wanted to study the way people fulfil their needs for water (whether it is from PDAM or other sources). Based on the data from Nauli City in Figures 2014 (BPS Nauli City 2014), the population of the six subdistricts are outlined in the following table.

Table 8: Population and number of suburbs in Subdistricts (BPS 2014)

Subdistricts	Area (km^2)	Population (people/km^2)	No. of Suburbs (Kelurahan)
Kota Lama	3.22	10,246	10
Kota Raja	6.1	8,530	8
Oebobo	14.22	6,447	7
Kelapa Lima	15.02	4739	5
Maulafa	54.8	1,323	9
Alak	86.91	668	12[49]

The first round of participants (pastor and the community leader) were selected from the capital of the subdistricts, and they were then asked to refer the researcher to the next participants based on the following criteria: low and high income, length of stay in the area, and number of people in the family. The number of participants, as mentioned above, is not fixed, but evolved throughout the research especially during fieldwork. As Patton, MQ (1990) stated, flexibility in choosing participants will be dependent on the emerging issue, objective or research, conditions in the field, and also the participants' credibility and honesty. Snowball sampling technique was used to recruit participants, one to another, over and over again until no new information was gathered. In qualitative research, the snowball technique is an effective method to get into an unknown population or to reveal and elaborate hidden issues that are sometimes out of the box (Noy 2008). It this research, employing the snowball sampling method unravelled hidden issues that were previously missed in the researcher's predictions.

3.7.3.2 Data Gathering for qualitative approach

The main instrument and measurement device in this qualitative research is the researcher (Patton, 2001 in Golafshani 2003, p. 600). Other instruments, particularly for gathering data, were dependent on the data gathering technique (Sugiyono 2012).

Data gathering techniques used in this research are semi structured (in depth) interview, focus group discussion (FGD) and document review.

a. Semi structured interview (in depth interview)
   The instrument is a list of questions. The questions are open ended based on the research topic, which provides opportunities for both researcher and interviewee to discuss the topics in more detail (Hancock, B, Ockleford & Windridge 1998). The researcher conducted interviews with PDAM management, local government officials, central governments unit officials, local state auditors and residents. Individual in depth interviews were conducted before conducting FGDs to get preliminary opinions and conclusions to be discussed in the FGD.

b. Focus Group Discussion (FGD)
   To obtain qualitative information from a group of people, FGD will be better than interviews. Due to time and budget constraints, interviews might not be suitable for some cases (Hancock, B, Ockleford & Windridge 1998). In this research, FGD was carried out to gather information simultaneously from several related stakeholders in Nauli and Jakarta. In Nauli, Samsoir's capital city, the research involved local institutions who are dealing with drinking water provision such as Planning Agency (BAPPEDA), Finance Bureau (DPPKAD), Public Works Department (Dinas Pekerjaan Umum), auditors (BPK and BPKP), water companies (PDAMs),

and, of course, residents. In Jakarta, FGD involved central government officials (Ministry of Finance, Ministry of Public Work, Ministry of Home Affairs, National Development Agency), and Water Companies' Association (Perpamsi). After FGD, there was further consultation with persons in charge if necessary.

c. Document Review

Reviewing documents can be a cyclic process: out to the field to gather information, analyse the data, back to the field to gather more information, analyse the data, and so forth (Thomas, DR 2000). The main documents reviewed were regulations (national and local) particularly in the areas of regional autonomy and water supply management, financial reports, other government reports and PDAMs' management reports.

3.7.4 Step 4: Analysis – the twelve critical systems heuristics questions

Fossey et al. (2002) stated that "qualitative analysis is a process of reviewing, synthesizing and interpreting data to describe and explain the phenomena or social worlds being studied" (p. 728. While quantitative method uses a deductive approach to analyse data, qualitative method employs an inductive approach to find hypothesis and/or theory. Therefore, data analysis should be carried out before, during and after the field study (Sugiyono 2012).

The analysis focuses on Werner Ulrich's twelve boundary critical heuristic questions (Midgley 2000, p. 141; Ulrich 1989, p. 244; 1996, pp. 24-31; Ulrich & Reynolds 2010), because we need to consider what Ulrich said as the 'context of application', which means wider circumstances and consequences (Ulrich 1996, p. 18). Critical heuristics will not give theoretical justification as to 'why' and 'how' the solutions are determined, but rather gives stakeholders (decision makers, planners and affected citizens) an understanding about defining problems, designing a system and its implications, and evaluating the programs (Ulrich 1989, p. 277). These questions are essential to explore and justify boundaries in understanding improvements that have been, or are to be, undertaken (Midgley 2000, p. 138), because how we value an improvement will be very dependent on the boundaries of the context or the system of concern (Ulrich 2003, p. 5). In examining an improvement, people have to have a similar lens and perspective, or so-called 'reference system', so we can make sense of the situation and unfold multiple perspectives by circumscribing our understanding in order to encourage a more holistic awareness (Ulrich & Reynolds 2010).

These questions set boundaries in further analysis, because by applying boundaries we can sweep in as much relevant information as possible and, in a social context, setting up boundaries allows us to include relevant stakeholders and, most importantly, decision makers (Churchman 1970). As Cabrera (2006, p. 10) stated, boundaries will distinguish what to include or not to include for a

particular paradigm. This approach is called a boundary critique, a term coined by Werner Ulrich (Ulrich, 1996, Critical systems thinking for citizens: A research proposal. Centre for Systems Studies Research Memorandum #10. Centre for Systems Studies, University of Hull) which described that people's perspectives and judgements have interconnections, that different values will yield to different judgements and possible conflicts, and how people can manage their perception and understanding of a particular context and address the problem (Midgley & Pinzón 2011; Ulrich 1983).[50] Ulrich applied a 'dimensional analysis'[51] to determine the meaning of improvement, and to describe the role of people in that particular improvement. Mainly there are two groups of people: 'the involved' who act as planners and decision makers, and who get the benefit; and 'the affected' (witnesses), who suffer the costs or the expenses from the improvement. This is detailed in the figure below (Adapted from 'Dimensional analysis of the sources of intentionality that determine the meaning of improvement').

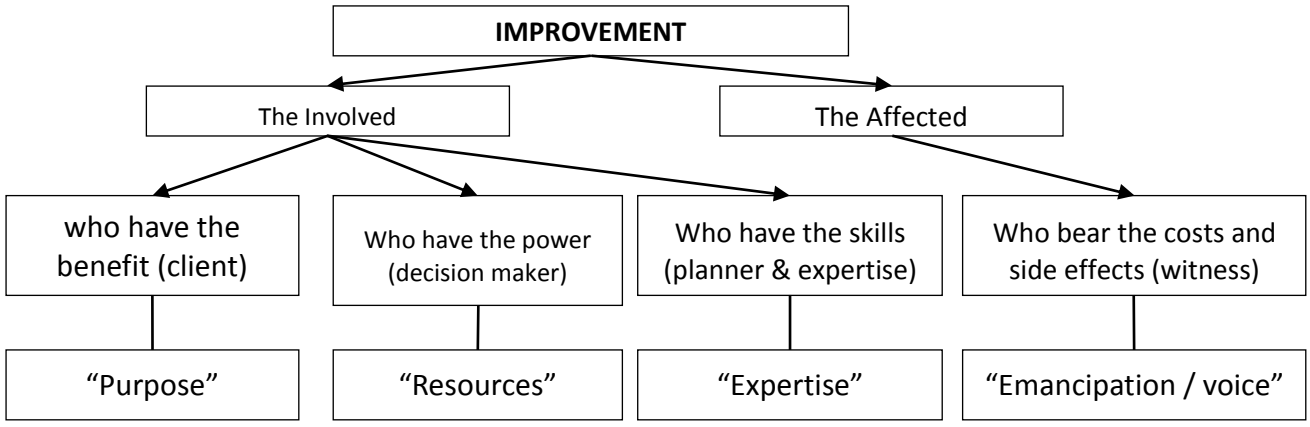


Figure 19 Dimensional analysis to determine the meaning of Improvement Ulrich (1996)

Ulrich distinguished the twelve questions into 'is' mode and 'ought' mode, and grouped them into four groups (McIntyre-Mills 2006; Midgley 2000; Ulrich 1983, 1989; Ulrich & Reynolds 2010):

a. **The sources of motivation** or as the value basis of the design. This is important to know or determine the program's value assumptions, orientation and measurement, and how it influences practical life. There are three questions:
   1. Beneficiary → who 'is' or 'ought to be' the actual client of the system? Meaning those whose interests ought to be or are actually served.
   2. Purpose → what 'is' or 'ought to be' the purpose of the system? Meaning that which are the positive and negative (or even potential) impacts.

[50] Ulrich (1983; 1996, p. 15) uses the terms *boundary judgements* to define boundaries of planning effort, i.e. facts and values that have to be included and to be left out, or *justification break-offs* because "they define the point at which justification ends".
[51] Also called the system of concern or the context of application.

3. Measure → what 'is' or 'ought to be' the actual (built in) performance measurement of the system? Meaning how can we measure that the program's consequences create improvement?

b. **The sources of control**, or sources of power that are needed or available in order to attain the objectives of the programs. This is to examine who will be involved in making decisions and also the environment needed to support the decision. If we can understand the sources of control then it will be easier to identify the span of the program, what should be included and what should be left out, what conditions support the programs, and what is beyond control.
   4. Decision maker → who 'is' or 'ought to be' the actual decision maker in the system? Meaning, who ought to be/is the person or people that has/have power to determine the direction of the program?
   5. Resources → what resources or conditions 'ought to be' or 'are' controlled by the decision maker? Meaning, on what conditions of successful planning should/does the program rely?
   6. Environment → what 'are' or 'ought to be' the conditions that the decision maker cannot control? Meaning that there are/should be conditions surrounding the program that the decision maker does not have power to control, and this is usually from the affected people's viewpoint. These conditions can be national economy, fiscal aspects, demographic and birth rate, community attitudes and expectations, and people movement.

c. **The source of expertise** to know the information, experiences and skills that are relevant. Understanding the sources of knowledge is important to determine the program's boundary assumptions of relevant facts, so we can ignore the irrelevant ones. However, it is still difficult for a program to identify all relevant knowledge, and that makes no guarantee for success. It is also essential to understand what should be guaranteed and how it can lead to the sources of failure.
   7. Expert → who 'is' or 'ought to be' the planner? Meaning, who should be/is involved as the competent planner in the construction of the system?
   8. Expertise → what kind of skills and knowledge 'is/are' or 'ought to be' needed/relevant? Meaning, who should be/are considered as the experts, on what basis, and what should/do they do?
   9. Guarantor → where 'do' or 'should' the people involved seek the guarantee that their planning will be successful? Or, in another way, who will guarantee that the system will be implemented and will prove successful judged by the measurement of improvement?

d. **The sources of legitimation** - justification from the people vis a vis, the involved and the affected. This is important, especially in order to identify the ethical assumptions and possible deficiencies. It is impossible for a program to embrace all people's interest, and, if ignored, there

will be undesired direct or indirect consequences. We have to figure out in what sense that the program bears the responsibility to those affected, and treats them properly so they do not feel completely ignored.

10. Witness → who 'is' or 'ought to be' the (negatively) affected people but are not involved in the system? Meaning, we have to listen to opinions from competent people who speak for the poor and handicapped, and also the nature or environment.
11. Emancipation → 'are' or 'should' the affected people be given the opportunity to emancipate themselves into the system? Meaning, how should/does the program involve the people who may be affected but cannot raise their voice?
12. Worldview → On what worldviews 'is' the system or 'ought' the system be based? Meaning, how should/does the system deal with the different points of view from both the involved and the affected people?

3.7.5 Policy Analysis

Etymologically, the word policy was derived from Greek word *polis* (city/state), evolved into the Latin *politia* (state) and was absorbed by late Middle English to become *policie* which means the work of government to perform public provision (Dunn 1981). A policy is essentially intended to deliver benefit only to targeted people. In general, there are two types of policy: (i) private policy which is made by an individual or private institution and implemented privately, and (ii) public policy which is generated by government and is publicly put into operation (Ozor 2004).

Every policy has three components (Mackay 2011): (i) problems or issues to address. It has to be very clear and unambiguous to prevent misinterpretation or pros and cons; (ii) goals to be achieved. This is important to measure the failure or success of the implementation of the policies; and (iii) policy instruments that will be used to address the problems and achieve goals. These instruments can be any resources that the policy maker can use, for example, financial resources, human resources, technologies, partnerships, subsidies and authorities.

According to Jans (2007) and Dye (1972), public policy is about the public and its problems, and what the government should do or should not do in order to address the problem. There are a wide range of definitions of public policy in the literature expressed by seminal scholars, but most of them emphasized that it is a course of action or activities over a medium or long period of time, undertaken by the legitimised by public power (i.e. the government) involving policy actors (different players that are engaged in the policy making process) to address public problems (Dye 1972; Kraft and Furlong 2012; Lemieux 1995; Meny and Thoenig 1989; Walker 2000). Knoepfel et

al. (2011, pp. 26-8) described that a public policy should resolve a social problem that has been acknowledged and should rebuild communications between stakeholders that may be under threat.

Policy analysis is conducted to formulate a new policy or to examine the effectiveness of the existing policies to meet the people's needs (MacRae & Wilde 1979; Patton, C, Sawicki & Clark 2015; Stokey & Zeckhauser 1978). It is an applied science that can be used to generate information in order to overcome a policy problem (Dunn 1981, p. 35). A policy analysis should be done independently, and a policy analyst will bear moral and professional responsibility for their work, as his or her output will have direct or indirect impact on a large number of citizens (Bardach & Patashnik 2015). Quade (1975) described that policy analysis is broader than operations research, systems analysis, cost benefit analysis and cost effectiveness analysis, but often incorporates these components.

There are two main purposes of policy analysis (Jans 2007): (i) analysis OF policy, which means analysing existing policies and is mostly presented theoretically with determination and attempts to evaluate and develop policies; (ii) analysis FOR policy, which means to formulate new policies and proposals in a prescriptive and technical way. This research will perform an analysis of policy, since the researcher will examine how current regulations are implemented and whether they can address problems in society, especially in Nauli City in relation to water service management.

The policy analysis considers six dimensions in a framework developed by Morestin (2012) and Salamon (2002):

Table 9: Six dimensions of policy analysis (Morestin 2012 and Salamon 2002)

EFFECTS	Effectiveness
	Unintended Effects
	Equity
IMPLEMENTATION	Cost
	Feasibility
	Acceptability

(i) Effectiveness: how effective a policy is to reach or affect the intended targets, and it can have positive or negative impacts; (ii) Unintended effects: outcomes that are not predicted or anticipated from the actions. It can be unexpected benefit, unexpected drawback or perverse result (Merton, 1936); (iii) Equity: the effects of the policy on different groups of targeted people. The policy is intended to minimise the gaps or increase equality; (iv) Cost: which includes financial efficiency by implementing improvement of the policies, and it is important to consider potential costs that might be incurred or can be avoided; (v) Feasibility: the relevance of the policy improvement with current

condition, and its applicability considering relevant regulations, administrative mechanism, related people (quantity and quality) or institutions involved; (vi) Acceptability: how relevant stakeholders accept the policy improvement: targeted communities, government institutions, professionals, financiers, industry, etc.

To conduct a policy analysis, there are different approaches that have been introduced by scholars, and some of them are shown below:

Table 10: Policy analysis stages (diagram developed by author)

(MacRae & Wilde 1979)	(Stokey & Zeckhauser 1978)	(Patton, C, Sawicki & Clark 2015)	(Knoepfel et al. 2011)	(Quade 1975)
a. Define problem b. Determine criteria c. Generate alternatives d. Choose course of action e. Evaluate policy after implementation	a. Formulize problem b. Determine objectives c. Make alternative policies d. Anticipate consequences of alternatives e. Determine criteria for measuring achievements f. Choose course of action	a. Verify and define the problem b. Set up evaluation criteria c. Identify and evaluate alternative policies d. Select alternative policy e. Monitor Policy Outcome	a. problem definition b. administrative programme c. administrative arrangements d. action plans e. implementation acts f. Monitoring and evaluation on impacts and the results	a. Problem Formulation b. Search alternatives c. Forecasting d. Modelling e. Evaluation alternatives

From those alternative methods of policy analysis, the researcher employed a combination of them to meet the needs of the case study chosen (water management problem in Nauli city) as follows:

Stage 1: Identifying, verifying and structuring the public problem.

Public policy is designed to address public problems. Gusfield (1982), in Knoepfel et al. (2011), distinguished clearly between social problems and public problems. A social problem is not necessarily a public problem. On the other hand, a public problem is derived from a social problem that has come into political consideration. Knoepfel et al (2011, p. 136) identified three characteristics of a public problem: (i) particular social groups express their demand; (ii) it raises controversy at a broader level and spurs public debate; (iii) conflicts happen between the social groups and political authorities.

This thesis is based on an analysis of policy and an evaluation of existing water management policy. It proposes new policies to achieve better outcomes. But first, we have to know about the problem. As Russel Ackoff states, people "… fail more often because they solve the wrong problem than because they get wrong solution to the right problem" (Ackoff 1974, p.8).

To a great extent, even though this stage is very crucial in policy analysis, policy makers tend to neglect or do not pay much attention to structuring policy problems (Dunn 1981, p. 98). Dunn distinguished a policy problem based on its structure into three categories: Well structured, moderately structured, and ill-structured problems (ibid, p. 103-4). The first two categories have one or few decision makers involved, limited alternatives of solutions to choose from, tend to be easier to reach consensus between stakeholders and decision makers, and the outcomes will be mostly certain with some risks or uncertainty. The ill-structured problem will involve many decision makers, unlimited options to be examined, will potentially raise conflicts between related parties and the outcome will be incalculable and unknown. Mitroff and Sagasti (1973, pp. 121-3) explained that social and public problems seem to be ill-structured or wicked problems that will need multidisciplinary expertise to formulate action and to optimise return, utility or outcome. Moreover, Mitroff and Sagasti stated that the biggest challenge for an ill-structured problem is "to define the nature of the problem" (Mitroff and Sagasti, 1973, p. 121) as it is interconnected with multiple aspects, and can be perceived differently by stakeholders. One way to understand the wicked problem is to identify the facts that emerged in society that have become public problems, verifying them with evidence and structuring the problems. Meanwhile, Patton, C, Sawicki and Clark (2015) characterised wicked problems as: (i) they are not well defined; (ii) their solutions cannot usually be proven to be correct before application; (iii) no problem's solution is ever guaranteed to achieve the intended result; (iv) problem solutions are seldom both best and cheapest; (v) the adequacy of the solution is often difficult to measure against notions of the public good; and (vi) the fairness of solutions is impossible to measure objectively.

One way to formulise the problem is with Carol Bacchi's 'What's the problem represented to be?' (WPR) approach (Bacchi 2009). The WPR approach consists of six interrelated questions as follows:

Q1: What is the 'problem' represented to be?

> According to Bacchi, policies are not made to solve problems and the problems are beyond the policies and wait to be solved. A problem is part of the policy. Furthermore, the policy represents the problem and how the problem is represented will determine how the issue is thought about, how the government perceive and react to the problem, and how the affected

people are treated. For example, if deploying police and troops is the chosen policy action for lowering theft, then the problem representation is that robberies have happened because of low law enforcement (Bacchi, 2009, pp. 1-3).

Q2: What presuppositions or assumptions underlie this representation of the problem?

This question proposes that a problem representation should be underpinned by assumptions or presuppositions that are taken for granted or are unquestionable. It is not about why something happens, but why it is possible for something to happen (ibid, p. 5). Bacchi then recommends to use binaries or dichotomies to simplify complex relationships and to understand the issue. For example, nature vs culture, public vs private, male vs female, economic vs social, legal vs illegal, national vs local and centralised vs decentralised. We often see the public vs private binary in education policies, or the economic vs social binary in infrastructure policies. Key concepts are important and concepts with different meanings and interpretations are used by political perpetrators to influence policies as concepts are abstract and relatively open-ended (ibid, p. 8-9). For example, the concept of health which people can perceive as a binary between public vs private commodities, or a concept of wellbeing rather than the treatment of illness.

Q3: How does this representation of the problem come about?

The purpose of Question 3 is to highlight why a problem representation can gain a popularity or dominance. It examines the origins or the history of the represented problem. Bacchi takes for an example the case of abortion in Britain as a legal problem which is subject to criminal law. Prior to the enactment of *Offences Against the Person Act* in 1861, abortion was a common way to control the population and it was only regarded as a health problem. This act was driven by medical practitioners who encouraged the government to apply restrictions on illegal practitioners (ibid, pp. 10-2).

Q4: What is left problematic in this problem representation? Where are the silences? Can the 'problem' be thought about differently?

With this question, there should be a careful analysis of possible gaps and limitations of the problem. The objective is to bring forward issues and perspective that are silenced when formulating the problem. As the nature of social problems that can be regarded as wicked problems, a specific problem has surrounding issues which must be identified because they often may be forgotten or ignored by policy makers. This question can also be used to reveal some restrictions in problem representation.

Q5: What effects are produced by this representation of the 'problem'?

> Question 5 is about analysing the implications and impacts of the problem representation. It is assumed that a problem representation will affect one group of people more than another group of people. By identifying the possible or potential implications of the problem in advance, policy makers can assess and prepare policy action to anticipate them.

Q6: How/where has this representation of the 'problem' been produced, disseminated and defended? How has it been (or could it be) questioned, disrupted and replaced?

> This question tries to question and challenge the problem representation. A problem representation cannot accommodate all of the various ideas, issues and interests of different stakeholders.

To structure the problem, collecting documents and evidence is crucial to find the bottle neck in the policies that regulate the national water management system in general, and in Nauli City in particular. Furthermore, this stage will verify how well or how badly the system works to meet the needs of the people compared to the standards that have to be achieved, especially in a water-scarce area like Nauli City. Collating evidence will be conducted during the data collection stage through reading documents, compiling statistics, interviews, focus groups, and so on.

Stage 2: Clarify Goals and determine measurement system

A goal is a general statement of the aim of the whole activities (Walker, WE 2000). Walker (2000) exemplified a goal like 'reduce air pollution' or 'ensure traffic safety' as non-quantified, while the Sustainability Goals use quantification like 'whole' or 'all' to means one hundred percent. Every policy has a specific goal that will be achieved by implementing policy actions. Analysis of policy will mean that clarifying goals and objectives is very important since trade-offs often occur between sectors nationally (environmental versus social versus economic). Economic goals normally are represented by numbers like GDP and economic growth, while these numbers do not always correspond to the overall wellbeing of the population or the quality of natural condition (Cracolici, Cuffaro & Nijkamp 2010; Stiglitz, Sen & Fitoussi 2010).

Quantification of goals in a particular policy is essential in order to determine how effectiveness in achieving goals. As Neely et. al. emphasised, measuring performance can be performed by quantifying the efficiency and effectiveness of a particular action, hence, it needs a performance measurement system (Andy, Mike & Ken 2005). The performance measurement should be able to measure quality, time, cost, and adapt to flexibility.

Every policy action will end up with an output to deliver to the people which may be goods or services. There should be a measurement system to determine whether the goods or services as output of the policy have met a certain criteria of quality. In relation to time, the policy goal has to have a certain timeframe within which the output should be one hundred percent functional to meet the people's needs, and the timeframe can be a long-term (more than 5 years), medium-term (1 to 5 years), or short-term (within 12 months). Policy implementation is very dependent on the availability of financing or budgets, and planners should strive for balance between quality, time, and cost that can be incurred. The higher the quality means the higher the cost, as with timeframe, where the faster it wants to be achieved, the higher the cost will be. Flexibility is a necessary component of a measurement system, as a certain target needs to adapt to change that can happen at any time, for example, change in political conditions in local, regional, or national scopes.

Stage 3: Determine the 'What Next" strategies

Chapter 2 explained some types of institutional arrangements in water management systems: decentralised, centralised, privatised, public-private partnership, public-public partnership, and community based.

Warren Walker mentioned two important principles in proposing a model of policy to address problem (Walker 2000): (i) *Fit the model to the problem, not the problem to the model.* There are many tools to use and options to take from to apply to a particular problem. However it is very often that political or other vested interests lead distortion in determining the best alternative, and decision makers tend to persuade policy analysts to make deceit assumptions only to apply their preferred model. (ii) *Use the simplest model to fit the job.*. Quade (1975) indicated that the best analysis is the one that anyone can easily understand and be convinced of. An analyst has to present and explain his or her chosen model to the stakeholders, particularly decision makers, who may or may not be familiar with the scientific tools applied to generate the results. Moreover, a simpler model is mostly straightforward and unproblematic to implement, hence, it will be easier to prepare policy instruments to support the chosen policy.

Every option must have advantages and drawbacks, so the analysts have to consider the cost and benefit to all stakeholders, not only financially, but also socially and environmentally. Performance measurement systems will provide quantitative and qualitative arguments to support the chosen option and compare and contrast it against other alternatives. One step further, Question 6 of the WPR approach, as explained above, emphasised that the chosen strategy needs to be disseminated or socialized to all stakeholders in order to gain insight, argument, critique, and to anticipate possible negative impacts, especially on the affected people.

Once a decision is made, adopted as a new policy and executed, the government or the executive power will bear the responsibility for whether or not it can resolve the problem. In determining the 'What Next' strategies, the water management problem that has been seen as a wicked problem will be addressed from three main points of view: governance (political and economic points of view), demand management (social point of view), and environment. These three aspects will be elaborated further in Chapter 4.

Stage 4: Policy arrangement

Policy arrangement is an important stage after enacting a policy strategy. Jones (1984) defined policy arrangement as the efforts to put a policy into effect. It translates a policy into actions through institutionalisation, programs, projects and administration as policy outputs, and desired effects upon society as policy outcomes (Kraft & Furlong 2012). In this thesis, once strategies are determined, a set of policy implementation stages will be elaborated in Chapter 7 but will be explained in brief in the following section.

1. Legalisation

The regulations regarding drinking water provision that have been implemented at national, regional and local level must be examined. These regulations may or may not cover the selected model, from the principles to the implementation procedures. By using the doctrine of law *lex superior derogate legi inferior* (which means that when two regulations with different hierarchy govern the same thing, then the higher regulation will override lower regulation), national regulations will be scrutinised first to gain a precise representation of how they accommodate the selected option. However, based on the doctrine *lex specialis derogate legi generalis*, it is important to find out whether higher level regulation gives permission to lower level regulations to govern more specific issues.

2. Institutionalisation

The selected model, supported by regulations, needs to be implemented in the field. In this particular case, the institutionalisation step becomes essential since there are currently several institutions that claim to be in charge of drinking water provision in Nauli City. Forming a new model of institutionalisation will determine how drinking water management will be conducted further, and it will involve different stakeholders with different perspectives and interests.

3. Monitoring and evaluation

Programs have to be monitored to assess whether or not they can meet the goals in drinking water provision. The objective of this monitoring of improving service delivery is to eventually contribute to improving public health, economy and the wellbeing of the people. Kayser et al. (2013) asserted the importance of non-discrimination and equality as fundamental principles of the human right to domestic water. As presented by The United Nations Committee on Economic, Social and Cultural Rights (UNCESCR, 2003), there are four indicators in monitoring these principles: (i) Availability: every person should get sufficient water for personal use like drinking, bathing, washing, food preparation, and other household hygiene. The World Health Organization (WHO) highlighted that the average water need for a person is between 50 to 100 L per day. (ii) Quality: that the water must be safe for domestic consumption, and should only contain micro-organisms and chemical substances according to the standards applied by the WHO or a nationally developed standard. (iii) Accessibility: according to Kayser et al. (2013), water accessibility has three dimensions: physical, economic and information. Physical accessibility means the distance of the water source from the home, and according to the WHO, it should be no more than 1 kilometre or 30 minutes of travel. Economic accessibility means affordability. The Pacific Institute (2013) revealed that, based on the UNDP, the percentage of water cost compared to household income should not exceed three percent. Information accessibility includes every person's right to access and report any issues regarding water. (iv) Non-discrimination and equality: every person, rich and poor, men and women, adults and children, have to have equal right to water and the state has to guarantee that there will be no discrimination.

CHAPTER 4. BRINGING BACK WATER PROVISION TO THE CONSTITUTION

4.1 Introduction

This chapter will discuss how water has been commodified as a result of past policy failure, and attempts to answer the first research question: Is the decentralised water management system that is implemented in Indonesia effective for utilising water to the maximum benefit of the people? Maximum benefit means providing good quality and sufficient quantity of water to the people. In order to do that, the government should consider all relevant aspects, not just economic but also social and environmental. As explained in Chapter II, Wadsworth (2011) mentioned that all beings are part of the living systems and the non-living systems are supporting them. Costanza (2015) stresses that the systems are engaged in complex interrelation.

Water tariffs are determined without first conducting prudent analysis about the efficiency and effectiveness of the water company. Meanwhile, increasing the water tariff does not necessarily mean that the quality and quantity of water provided is improved. Furthermore, providing water to the poor and people in remote areas has not yet been considered a high priority for the government, as indicated by very low funding that was allocated in local, provincial and national budgets compared to water needs and compared to other public works expenditures like roads and buildings. This chapter will also try to reveal what is currently happening with regards to how the poor struggle to find water for their daily needs, based on interviews with residents. Finally, there will be analysis regarding what is the case and what ought to be the case, by answering Werner Ulrich's twelve heuristic questions.

> *"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"* (Article 33, Indonesian Constitution 1945).

The above quote appears in the Indonesian Constitution. It is very clear, that the state, which means all levels of government, should utilise the power given to them by the people to manage all natural resources and give them back to the people. In that particular section of the Constitution, it is clearly stated that water should be managed appropriately to meet people's needs. It does not specifically mention other kinds of infrastructure such as the provision of roads or electricity, and it does not explicitly mention other natural resources that should be managed. It means that water, as the most important substance for human life, should be managed properly by the state.

The Indonesian Government has started to move away from honouring water as a public or common good towards valuing water as a form of economic good. Water supply provision is operated by PDAM and various tariffs, such as connection and usage tariffs, are applied. People in regions that have no distribution network, or poor people in urban and rural areas, seem to be ignored and have to struggle to fulfil their needs for water.

4.2 The commodification of water in Indonesia

The United Nations resolution of 28 July 2010 "recognizes the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights".[52] In 1945, the Indonesian founding fathers included water as a basic function of the government in the Constitution, the highest regulation in the Indonesian legal system.

Water is limited and the most normative issue about water is regarding how to justly allocate water to the people. That is why water appears in the Constitution and maybe the founding fathers realised that there would be a water crisis or commodification of water in Indonesia in the near future. Clearly speaking, water should be managed by the government.

A commodity is defined by Arjun Appadurai as "anything intended for exchange" (Appadurai 1994). By this, Appadurai means that if one wants to acquire a commodity, there should be a transaction involved. When water has turned into commodity, then it has a price. Commodifying something means to transform an object into a market good that has value so it can be traded for something else with same value, or can be bought and sold (Walsh 2011). As Aristotle (1916) explained, an object can have two means: primary or natural purpose, and secondary or exchange purpose. The natural purpose of an object is its main function, for example, shoes are for wear. For shoes to have a secondary purpose, that is to be exchangeable, we have to assign value to it, so it can be bartered with other things of similar value or, in short, is marketable.

Based on the explanation above, water is not a commodity as it is not made for exchange. However, it is still difficult to treat water as a public good that is not traded, since water is also used for commercial purposes. Adam Smith tried to compare water with diamonds, and he said that water–unlike diamonds–has no value in exchange, but people cannot live without water. On the other hand, diamonds have a great value in exchange but, in fact, people do not need diamonds for everyday consumption.

[52] United Nations Resolution Number 64/292: The Human Right to Water and Sanitation. Moreover, there is also a statement from the United Nations Committee on Economic, Cultural and Social Rights (2002): "Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity".

White, MV (2003) responded to Smith that water, like other goods, has no value because of its abundance and it can be easily accessed by users, at least during Adam Smith's time. The scarcer the water is, the more value it has, and, as Adam Smith proposed, demand and supply over water will occur and it will establish a price in the equilibrium. Food and beverage businesses are very profitable nowadays and water is their main raw material before it becomes an end product. According to the Ministry of Industry in Indonesia, total revenue from bottled water sold in Indonesia reached IDR 1.02 trillion in 2015, while food and beverage businesses reached sales of IDR 130 trillion in the same year (The Ministry of Industry of Indonesia 2015). This shows how water has become a very profitable kind of good to sell and there could be problems or conflict between sectors as well as residents in obtaining water.

Based on the characteristics of goods discussed in Chapter 2, we cannot include water as a public good, especially piped water, since consumption by users can reduce the pressure to other users (rivalry) and water producers can distinctly exclude someone from using the distributed water (excludable). In short, water that is distributed by water companies can be considered as a private good and it is a commodity.[53]

The Economist magazine has been advocating the urgency of water pricing by saying that water should have price, it has been under-priced, and that water should be priced more sensibly (The Economist, 2003). This magazine tried to convince its readers by putting forward success stories from several countries that had implemented water pricing, namely, Chile, South Africa and Australia. The pricing of water has to be accompanied by water subsidies to ensure that water for all is enshrined as a human right. Chile charges everyone according to a full price but gives privileges to the poor to reduce their payments. During the apartheid system in South Africa, the provision of basic human services to meet human rights was not implemented equally and was biased to serve white people. In post-apartheid South Africa, a two-tier tariff is used to compensate the poor. Australia, which is known as the driest inhabited continent, has successfully balanced the need for water for human consumption and the need to conserve the environment.

The next question is, why did the government of Indonesia commodify drinking water? Water investment holds a very strategic position in national planning, and is usually exploited as a

[53] Yet Castro (2013) argued that water is not yet a commodity. He put forward sufficient literature reviews to support his argument, for instance, that a primitive vending machine had been used in ancient Middle Eastern and North Africa history to protect holy water in temples from profiteers, and to ensure fairness to the people. Castro said that the notion of water commodification is more a political approach rather than empirical fact. Even though it a real fact that capitalists have treated water as a commodity in a strictest sense, like bottle water, however not all sold or exchanged water can be said to be a commodity like private property in a capitalist market. Castro concluded that freshwater businesses, especially those of public provision, are still beyond the capitalist rationality, so water remains uncommodified.

political issue at local, national and international levels. In Indonesia, investment in water provision started during the colonial period when the Netherlands occupied Indonesia for about 350 years. The Dutch East Indies Government built water treatment plants, reservoirs and distribution networks to support water provision in several big cities, for instance, Jakarta (formerly Batavia as the East Indies capital city) in 1843, Medan in 1905, Makassar in 1924 and Solo in 1929. All of these water investments were managed by the East Indies Government itself (not by water companies), and were intended to support the centre of Dutch interests, trading and housings.

After Indonesia proclaimed independence in 1945, all of these assets were acquired by the Government of Indonesia and were operated by local government departments (Jakarta water system was run by the Municipality of Jakarta Public Works Department, Medan water system was transferred to the Provincial Government of North Sumatera, water system in Makassar was handed over to Water Department of the Municipality of Ujung Pandang, and Solo water system was assigned to be handled by an echelon IV in the Revenue Department of Solo Municipality) (Cited from the official websites of PDAM Tirtanadi Medan, PDAM Makassar, PAM Jaya and PDAM Kota Surakarta). During 1945 to 1966, the Old Order regime under Sukarno's presidency were still busy establishing government systems and fending of separatists and rebels. In 1962, the government introduced *Law No. 5/1962* concerning Local Government Owned Companies (*Undang undang tentang Perusahaan Daerah*).[54] Under this law, local governments which comprise provinces, districts and municipalities are allowed to establish local companies for three main objectives: to provide services, to conduct public provision and to earn revenue.

Because water had become more important for society and bigger investment was needed, the central government through the Ministry of Home Affairs issued a ministerial decree (*Instruksi Menteri Dalam Negeri*) No. 26/1975 on 3rd of November 1975 about Adjusting/Converting the Water Company from Local Government Unit into Local Government Company. This decree stipulated that every local and provincial government unit that dealt with water provision should be upgraded to become a local water company, namely, *Perusahaan Daerah Air Minum* (PDAM). PDAM is a water company that is solely owned by the local government and operates within its jurisdiction. After the issuance of the abovementioned ministerial decree in 1975, all local governments that already had a water management unit (*Dinas/Bagian/Seksi Air Minum*), converted into a local water company.[55]

[54] At the time of writing, this law has not been replaced even though all stakeholders admitted that most of the regulations cannot meet current needs and conditions.

[55] At the time of writing, there were 397 PDAMs and 17 Local government water units in Indonesia. The number of local governments as of December 2013 reached 539 and consisted of 34 provinces, 412 districts, and 93 municipalities (source: Directorate General of Regional Autonomy, Ministry of Home Affairs, 2015). Considering the fact that the

This was the turning point when water started to have a price tag. From an interview with a government official of the Ministry of Public Works in Jakarta (interviewed on 3rd December 2015), one of the main reasons of establishing companies to perform water provision was to increase access to funding, since water investment involves huge amount of capital expenditure. By shifting it to a company, getting access to borrowing will also be easier. Easier to make business plan, easier to monitor the repayment, and it will be more professional since we can perform financial and performance audit. Moreover assigning tariffs for connection and water usage would be possible and we can then revolve the funding for loan repayment and further investment.

Indeed, water supply has enjoyed significant central government support and spending has increased ever since. Foreign loans in the form of bilateral and multilateral borrowings by the water sector were sporadically signed and channelled to PDAMs through the Ministry of Finance (Pokja AMPL 2006). When Suharto stepped up into presidency to replace Sukarno, it was believed that western countries fully supported the surrogation of power (Scott 1985; Sulistiyanto & Erb 2005; Vatikiotis 1998).[56] Western countries and multilateral agencies were pouring aid into Indonesia in the form of loans and grants. According to the Directorate General of Treasury of the Ministry of Finance of Indonesia, since the early 1970s there have been about 20 countries and not less than ten multilateral agencies provide loans and grants to Indonesia. Japan, Germany, the United States, Austria, France and the Netherlands are amongst the bilateral lenders, with Japan as the biggest lender. Together, they formed the Inter-Governmental Group on Indonesia (IGGI),[57] later known as the Consultative Group on Indonesia (CGI).[58] From multilateral organisations, the World Bank, and the Asian Development Bank (ADB) are two main creditors.

However, from several interviews conducted in November 2015 with several officials in the Ministry of Finance,[59] the water loans were regarded as a big mistake. Prior to the implementation of the regional autonomy system, PDAMs were owned by local governments (cities and districts governments). Under the centralised governmental system, central government retained very strong

number of local government is still bigger than the number of PDAMs, there is a high probability that the number of PDAMs will increase.

[56] Sukarno was known as anti-American and he made the famous statement "America, go to hell with your aid". This statement was yelled by Sukarno to the US Ambassador during a public rally in January 1964.

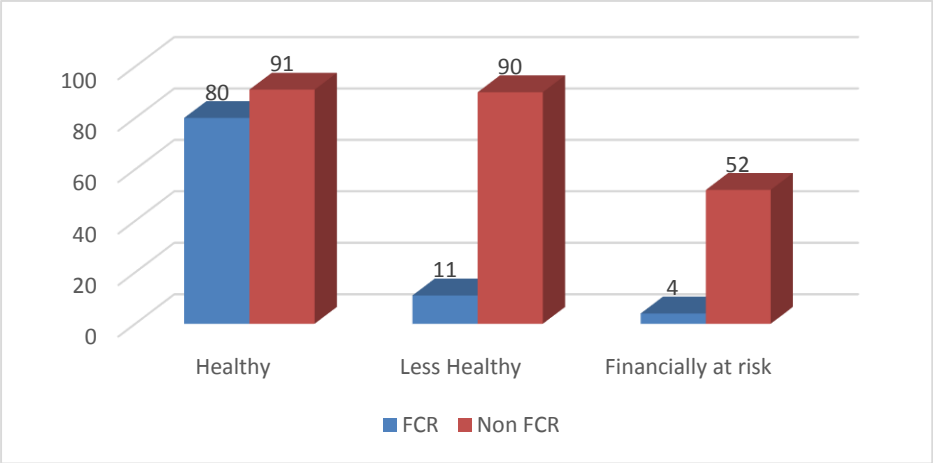
[57] IGGI was in place from 1967 to 1991 and was initiated by the United States. The formation of IGGI had been indicated to have a strong correlation with the collapse of anti-West Sukarno presidency in Indonesia and the rise of Suharto as the new president (Posthumus 1972; Tanter & Kapuscinski 1990)

[58] Again, the establishment of CGI had a strong relationship with the high friction between President Suharto against Johannes Pieter Pronk (representing the Netherlands as the chief of IGGI). In 1991, Suharto dismissed IGGI, established CGI in 1992 and excluded the Netherlands in this new creditor group (Kompas printed edition 26 Juni 2015 page 66, *Selamat Tinggal IGGI, Selamat Datang CGI*).

[59] Amongst them are the Secretary of Directorate General of Fiscal Balance (interviewed on 5rd November 2015), the Director for Financing and Regional Capacity (interviewed on 5rd November 2015), the Head of Subdirectorate of Regional Borrowing (interviewed on 6rd November 2015, and the Head of Subdirectorate of Regional Grant (interviewed on 6rd November 2015).

power since the heads of local governments were appointed by the central government and all fundamental regulations at the local level were determined by Jakarta. This means that PDAMs belonged to the central government and were instructed to borrow. These loans had been used as a political vehicle to absorb foreign loans that had been allocated by lenders. This was top down borrowing instead of being demand driven. Moreover, the very high intervention from central government could not foster the rise in local needs and sense of belonging from local staff and other local actors.[60] Deception and fraud often happened during the investment and operational periods and meant that a huge amount of funding for water projects was wasted (Pokja AMPL 2006). As a result, as of June 30th 2008 (source: Directorate General Treasury of the Ministry of Finance), from a total of 205 PDAMs that had borrowed from central government, 175 of those were in arrears of a total of IDR 4.6 trillion with IDR 1.5 trillion of principal arrears and IDR 3.1 of non-principal arrears (interests and penalties), and they suffered loss. PDAMs were run inefficiently in terms financial and operational aspects.

For the poor condition of PDAMs, most policy makers and planners blamed low tariffs as one of the most responsible causes. Full cost recovery (FCR) tariff must be implemented to address the poor financial condition of PDAMs. FCR tariff means the average tariff can cover the average cost of PDAM. BPPSPAM stressed that to reach good financial condition, FCR tariff is compulsory (BPPSPAM 2014b). BPPSPAM then highlighted that, in 2012, only 29% of PDAMs had implemented FCR tariff. BPPSPAM also shows that low tariff has a strong relationship with poor results in PDAM performance, as audited by BPKP (Source: BPPSPAM report: Performance of PDAMs year 2014).



[60] This claim is based on my 10 years involvement dealing with PDAM borrowing and loan restructuring from 1999 to 2009 when I was working at the Sub Directorate of Local Borrowing, Directorate General Treasury of the Ministry of Finance of Indonesia. I was also highly involved in the PDAM Restructuring Program Phase I and Phase II from 2001 to 2004. In that period of time, I was the loan restructuring analyst for PDAM Kabupaten Bangli, PDAM Kabupaten Klungkung, PDAM Kabupaten Gianyar (Phase I) and PDAM Kota Surakarta, PDAM Kota Palembang, and PDAM Kota Denpasar (Phase II).

Figure 20: Performance of PDAMs with FCR tariff and Not FCR tariff (diagram developed by author)

This picture shows that the less healthy and sick PDAMs had mostly not yet implemented the FCR tariff. According to BPPSPAM and most decision makers, increasing tariffs to reach FCR is the one of the best cures for improving PDAMs' financial instability.[61]

With the heavy burden of loan repayments, the need to maintain their service and, at the same time, expand service coverage, PDAMs as companies could only rely on water revenue. Local governments as the owners do not regard water investment as a high priority compared to other public works infrastructure. The over momentous objectives of PDAM should be undeniably supported by strong financial and operational capacity.

After completing the investment period and when it came to loan repayment, PDAMs felt overburdened and, at the same time, they were expected to contribute to local government budgets from their profits. PDAMs and local governments started to shift their vision, viewing residents not as users but as customers. When people start to talk about improving PDAMs, the first indicator to check is tariff. The government has never blamed the failure of service on mismanagement of PDAMs, lack of performance control or lack of support from government budgets.

Putut Hary Satyaka (The Secretary of Directorate General of Fiscal Balance) stated that:

> To be honest, this nation, this republic, has no comprehensive plan or strategy in managing water. As a top priority, water sector is still left behind in terms of allocation of budget and other policy incentives strategy compared to other infrastructures plans. (Satyaka 2015, interview, 4th November).

Indeed, the central government has started to write off PDAMs' interest and penalty arrears from their borrowings, but one of the compulsory conditions is to increase tariff to FCR, and this has to be signed by the Mayor or *Bupati*, and approved by local parliament (Minister of Finance Decree No. 120/2008).[62] There were no requirements that could induce local governments to increase allocations for drinking water provision, not only to support PDAM but to extend their services to all residents. It means that by implementing FCR tariff, the people will bear all burden and water provision is treated purely as a business and no longer as a government obligation.

[61] Very recently, Rizal Ramli, the Coordinating Ministry for Maritime, stressed that increasing tariff to full cost recovery is urgently needed (Rizal Ramli in a press conference in BPPT Building, Jakarta, 22/12/2015). Moreover, he compared the price of PDAM water with bottled water that is far more expensive.

[62] This is the regulation basis for PDAM loan restructuring. In chapter 8 it was clearly and firmly stated 3 conditions that has to be met in order to get a loan restructuring approval: (1) average tariff should be higher than average cost; (2) Appointment of Directors should be based on a merit process; (3) PDAM should have a 5-year business plan.

4.3 The commodification of water in Nauli City

As explained in Chapter 1, until 2013 there were only 38.17% of households in Nauli City area that had access to piped water, while the others fulfilled their needs through other sources like water merchants (32.84%), bore wells (24.16%) and other unprotected water sources (4.83%) (BPS Nauli City 2014). Meanwhile, in Nauli District the condition was much worse, with only 1.63% of households served by piped water while 5.43% of the population had to buy water from water merchants, 92.94% got water from protected water wells, springs, rivers, or even rain water (BPS Nauli District 2013). The scarcity of water in Nauli during the eight months of dry season, aggravated by the failure of the government(s) to provide reliable water provision, has been exploited as an arena for profit by the private sector. There are at least two local private players that have been taking advantage of this situation: the water tank merchants and DAMIU (Depot Air Minum Isi Ulang/Water Refill Depot). These two local private players have entered the market to fill the huge gap in the water supply as a consequence of poor water management by the three public water operators: city PDAM, district PDAM, and BLUD SPAM. The total revenue from the water market in Nauli City area from these five actors could reach up to IDR 90 billion per year, and water truck merchants contributed more than 30% of that amount. The researcher will compare and contrast how these five actors play their role in selling water to the residents.

4.3.1 Water tank truck

The trucked water is the most favourable option for residents. Merchants deliver the water by using a 5000-litre tank truck for the price of IDR 80,000-100,000. In terms of profit, the total cost to fill up the tank and deliver it is only IDR 40,000 depending on the distance. For a tank of water, they could get at least IDR 75,000 of net profit. They just bored the ground, withdrew water with a high capacity machine, filled up the tank and sent it away with no further treatment to the water. According to interviews[63] with two merchants, there are currently at least 5 water tank truck merchants in Nauli city with two merchants enjoying approximately 90% of the market share. During the dry season (usually between May to August), each dock can sell at least 200 tanks per day on average and, in terms of profit, they can generate almost IDR 18 million every day. During rainy season, each dock can only sell 30 tanks of water per day. Over the course of a year, this model could generate up to IDR 4.8 billion of revenue with IDR 2.9 billion net profit.

Based on Law No. 28/2009 concerning Local Tax and Levy, Chapter 14 concerning Ground Water Tax, it is stressed that ground water taken for commercial use should be taxed by the local government where the water is taken. To implement the law at the local level, the government of

[63] Interviews were conducted separately at their stations in Oepura and Koinoni on 6th November 2015.

Nauli municipality issued Local Regulation (*Peraturan Daerah/Perda*) No. 6/2012 concerning Ground Water Tax. However, the Mining and Energy Department (*Dinas Pertambangan dan Energi)* of Nauli Municipality has never collected any tax from ground water exploitation by the water tank business. The head of the department explained:

> "we have limited funding to buy water meter to be planted in their water sources. We have proposed budget allocation for buying the water meters, but it was removed by the parliament members. The reason is it did not meet the priority. However we have put water meters in district PDAM water sources, and we have taxed them. There are about 20 water meters for PDAM water sources. Indeed, when we proposed to install water meters for those merchants, the parliament members resisted. Indeed we can control the massive water discharge through periodic certification. However it is still difficult since we do not have water meters." (G Kahan 2015, interview, 17th November).

Figure 22 A water tank dock (photo by author)

Figure 21 A water tank is dispensing water to a resident (photo by author)

However, on a separate occasion of discussion, someone from a non-government organisation in Nauli (he does not want his organisation and his name to be revealed in any report. Interview was conducted during lunch in a canteen, 7th November 2015) revealed that:

> "…some of the parliament members were sponsored by the vendors during their campaign, and even still receive bribe until now. Moreover, two merchants belong to DPRD members. Nobody knows how much money the vendors can get every year, but it is big enough to secure their business from tax and other environment issues. They feed officers, military, and policemen in town. And even the mayor himself. And if you visit one of their bases where they pump out the water and filled up the tanks, military and police water tanks were also taking water together with them. They share the spring."

4.3.2 DAMIU (Depot Air Minum Isi Ulang/Drinking Water Refill Depot)

DAMIU is a type of business that offers cheap drinkable water, stored in a 19 litre gallon. It purifies raw water with a reverse osmosis system, as shown in figure 23 below:

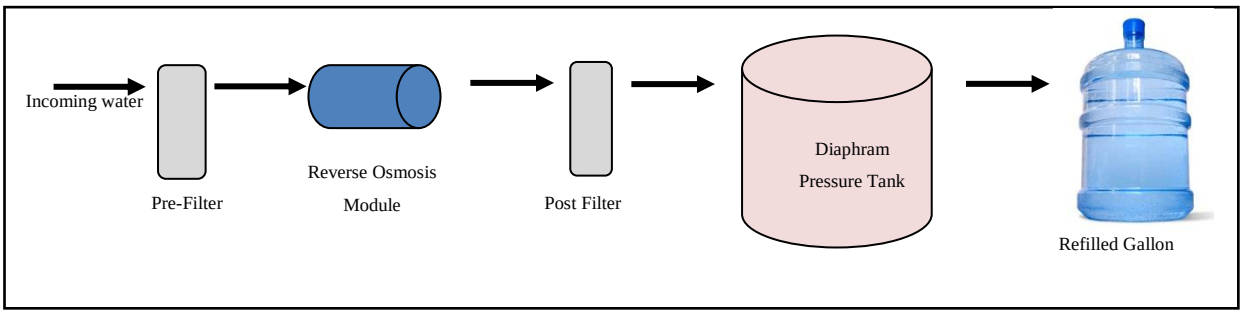


Figure 23 DAMIU water treatment system (diagram developed by author)

Figure 24 A DAMIU stall in a resident house (photo by author).

DAMIU, as a business model, has been become very popular in Nauli due to the increasing scarcity of water. DAMIU can be an instant solution for drinking water, instead of buying packaged water like AQUA–the most famous packaged water brand in Indonesia. A 19-litre bottle of DAMIU only costs IDR 4,000, while the same size of AQUA can cost IDR 12,000. According to the Department of Health of Nauli Municipality's records, there were 376 DAMIU stalls in Nauli as of the 21st of November 2015. Based on my interview with five DAMIU stall owners in Nauli (Interviews were conducted on 19th November 2015 with 5 DAMIU owners that are located in Kelurahan Kuanino, Kelurahan Oebobo (3 DAMIU booths), and Kelurahan Oepura), each DAMIU booth can sell up to 30 bottles per day. In total, that will add up to more than IDR 16.5 billion in revenue from DAMIU throughout Nauli every year. The standard minimum cost for a 19-litre bottle is IDR 1,200, so the net profit per year can reach IDR 11.1 billion in total. This can be a very promising business for companies which supply DAMIU equipment and installation services, and again, to tanked water merchants that supply raw water to DAMIU.

4.3.3 PDAM of Nauli City

The city PDAM that was established in 2005 has had 7,512 connections per Semester I 2015 with a service coverage of 10.22% (interview with the Head of Human Resources and General Affairs Division of city PDAM, 13th November 2015). He stated that they cannot present unaudited data for outside users. The PDAM sells water with a progressive tariff, the lowest being IDR 3,200 per cubic metre for social customers and the highest at IDR 40,000 per cubic metre for big industries. From the audited Financial Report (conducted by a Public Accountant) and Performance Report (conducted by BPKP) year ending 31 December 2014, total revenue for 2014 was IDR 7.6 billion, and the average tariff was IDR 7,475 per cubic metre. The total volume of water distributed and sold (billed) during 2014 was 1.2 million cubic metres and 796,997 cubic metres respectively, which meant a loss of 32% or, if we take into account the minimum tolerance in Indonesia of 20% for unaccounted for water, then it is a 12% loss of water representing a loss of approximately IDR 9 billion in revenue. Moreover, this percentage of non-revenue water (NRW) had increased by 4.25% compared to 27.69% in 2013.

He then stated that the high water loss is due to two reasons: pipe leakage and water meters being broken (technical loss) or fraudulently read by billing staff during meter reads (administrative loss). It only means that there was no significant effort to maintain the technical aspect of PDAM. Furthermore, the increasing rate of non-revenue water showed that the PDAM did not pay much attention to improve this situation.

4.3.4 PDAM of Nauli District

According to the Executive Director of the PDAM in an interview on 16th November 2015, PDAM of Nauli District currently had 33,272 connections as of 30th September 2015. Only 3.72% or 1,238 connections were in the district area while 96.28% or 32,034 connections cover approximately 38% of residents in the city area. In 2013, the district PDAM received slightly less than IDR 30 billion in revenue and had implemented FCR average tariff of IDR 4,124 per cubic metre. In terms of water losses, this district PDAM had been doing well proven by its NRW percentage of only 22%, which was 2% above the tolerable NRW of 20% (BPPSPAM 2014b). However, in interviews with several residents, they said that PDAM service performance had been decreasing over time. The researcher asked them to rate PDAM performance with 0 as the worst and 10 as the best score; 52.6% of them gave a score of 5, 22.12% gave 6, and 25.28% gave 7 or above. Even though water supply was interrupted for two weeks or so (62 out of 80 residents reported this), they got billed for almost IDR 500,000 to 1 million, and the customers had to pay regardless of whether or not the customers wanted to raise this issue in court, and there was no further action from the company to investigate the problem.

4.3.5 Provincial BLUD SPAM

BLUD SPAM was originally instituted to operate big dams that were built by central government and intended to supply the needs of bulk water to PDAMs surrounding the dams, but has started to sell water directly to users. This situation provoked more conflict around water provision. Based on BLUD SPAM 2013 Financial Report, besides selling bulk water to the city PDAM (district PDAM does not want to buy it), BLUD SPAM has connected its pipes directly to end users like the Nauli airport, Undana University, Polytechnic of Nauli, and two master meters to several groups of residents. Their tariff was very low compared to PDAMs' tariffs, at only IDR 2,500 per cubic metre. From the tariff calculation that appeared in its business plan, the FCR tariff of BLUD should be IDR 7,275 per cubic metre. However, BLUD implemented Lowest Cost Recovery tariff (LCR) which did not include investment cost, depreciation expenses and profit in the structure, which comes to IDR 3,842 per cubic metre. Furthermore, BLUD SPAM only charges bulk water to its customers (PDAM and end users) with 40% of per cubic metre cost, so it comes to an average of IDR 2,500 per cubic metre.

According to the 2013 Financial Report mentioned above, BLUD SPAM sold 226,725 cubic metres of water comprising 110,025 cubic metres to city PDAM and 116,700 cubic metres to end users in the city of Nauli. This means that the volume of water sold was approximately 15% compared to the city PDAM. From end users only, BLUD earned IDR 283.4 million of revenue in 2013, which is not much compared to the two PDAMs because its tariff is very low.

The head of BLUD SPAM clearly stated that:

> BLUD SPAM is allowed to fill the gap of water provision that cannot be covered by city and district PDAMs. Additionally, our transmission pipes are going to reach PDAM reservoirs across residential complexes that are not in PDAMs coverage. So we provide service to them, with very low rate even lower than the PDAMs' and the people are very happy with that. However BLUD SPAM does not provide free water to serve the poor because BLUD SPAM needs to run its operation with lowest cost recovery. Every year we have got subsidised by the provincial budget. We do not insist to get profit, but we do not want to suffer losses. Besides, providing water to the people is the responsibility of local government or in this case, Nauli Municipality with its PDAM (Head of BLUD SPAM 2015, interview, 20th November).

4.4 The Water Market in Nauli City

From the explanation above, it cannot be refuted that a very competitive water market has been created in Nauli. Table 11 below compares and contrasts tariffs, market share and profit earned from the water market in Nauli.

Table 11: Market share, revenue and profit between five water sellers in Nauli

Actor	Avg tarif (IDR/m^3)	Vol sold (m^3)/year	Market share	Revenue (IDR)	Profit (IDR)
City PDAM	7,500	794,397	10.8%	5,967,979,372	513,928
District PDAM	5,000	6,072,140	82.7%	29,753,486,000	1,758,292
BLUD SPAM	2,500	129,600	1.8%	283.400,000	0
DAMIU	200,000*	82,334	1.5%	16,468,800,000	11,116,440,000
Water tank	20,000	240,000	3.3%	4,800,000,000	2,880,000,000
Total value of water sold in Nauli				89,193,865,372	
**: DAMIU tariff is Rp4,000 per 20 litre.*					

It is undoubted that the public operators' tariffs are much lower than that of the private sectors. In terms of profit, the private sector with a very small market share can gain a huge amount of net income compared to those of the water utilities, and it can be because their tariffs are very expensive or much higher than their cost of production. So why is this happening when the constitution mandates responsibility for water service to the government? The simple answer is economics.

Rittenberg (2009) clearly identifies three ideas that prompt this attitude: scarcity, choice and cost. One has to choose among the alternatives by considering their ability to acquire a product because of its scarcity. It is scarce because to consume it we have to sacrifice something to get it by sacrificing other alternative uses of it, or at the expense of other users. Practically, everything is limited. Even the air is scarce, because if we want fresh air, then we should stop polluting, and it means we penalise people that create pollution. Water is limited and to consume water, a price must be paid. Water can be used for many purposes other than domestic uses, namely for crops, industry, and other commercial uses, that makes using it for one purpose might relinquish the others. Water is a product, as it needs labour (human effort) and capital (tools) to obtain and distribute it to end users. In conclusion, there are producers and consumers of water, so there is a water market, and in this market, water is not a public good since it is excludable and rivalrous.

With many players involved in the Nauli City water market, there should be competition between them that will derive competitive prices as well. The degree of the competition can be tested by using the Herfindahl-Hircshman Index (HHI) (Besanko & Braeutigam 2005; Rittenberg 2009). HHI is calculated by summing the squares of firms' market shares, and the formula is:

$$HHI = \sum_{i=1}^{N} t_i^2$$

where N is the number of firms, t_i is market share of firm i.

In a monopoly market with only one supplier, its market share is 100% and the HHI is 100^2 = 10,000. In a market with 100 suppliers, then market share for each firm is 1% and the HHI is 1^2 x 100 = 100. In a market that has three suppliers with equally distributed market share, for example firm A: 33.3%, firm B: 33.3% and firm C: 33.3%, the HHI will be: $33{,}3^2 + 33{,}3^2 + 33{,}3^2$ = 3,333.33. But if one firm dominates the market and has 90% market share, while the other two only have 5% each, then the HHI will be: $90^2 + 5^2 + 5^2 = 8150$. So, the higher the value of HHI, the more concentrated the market. The market concentration ratio, according to Calkins (1983), is shown below:

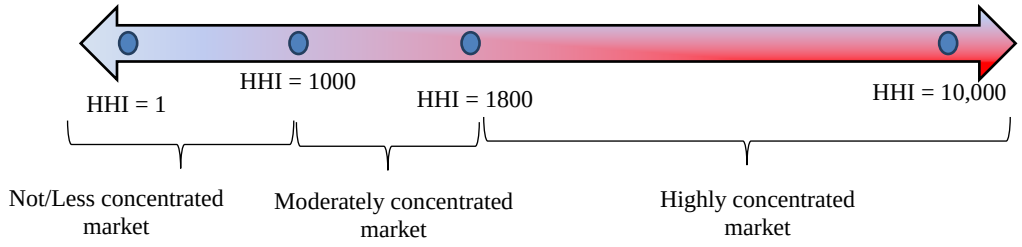


Figure 25: Range of HHI for market concentration (Calkins 1983)

Rittenberg (2009) explain that a market with HHI above 1800 is an oligopoly market (where there are only a few suppliers), a duopoly market (two suppliers), or a monopoly (one supplier). Oligopoly and duopoly markets are inefficient because suppliers have the power to influence market price, and they will worry about their competitors' strategy. Furthermore, suppliers can enter a situation known as the collusion model of oligopoly where suppliers agree to form a cartel where they set a price and production limit so they can obtain maximum profit in on a particular level of output and secure the market. Varian and Repcheck (2010) also describe that a silent or tacit collusion may also occur in an oligopoly when suppliers agree to reduce competition by following the market leader. For instance, if the largest supplier adjusts its price, then the followers will change their price as well. Firms know that profit does not depend merely on their actions, but also on their competitors' decisions, so they have a mutual interdependence in the market. There will be parallel behaviour such as parallel price movements, and it is a need to deter secret deviations in the competition. It is already well known that "…monopoly conduct can arise spontaneously in a highly concentrated market…" (Green, Marshall & Marx 2014).

We can distinguish three water markets in Nauli City: first, piped water market that has three contenders from three governments (city, district and province); second, trucked water market with

five merchants as players where two of them cover up to 90% of market share; third, a water retail market with 376 (DAMIU) stalls competing. To determine which types of market they are, we can observe the HHI, as shown in the table below.

Table 12: HHI value for 3 water markets in Nauli City

Market	No. of firms	Market share	HHI
Piped water	3	District: 86.79% City: 11.35% BLUD: 1.85%	7665
Trucked Water	5	Two merchants: 90% Three merchants: 10%	2058
DAMIU market	376	Considered Equal	27

The table shows the HHI for piped and trucked water and DAMIU are 7665,2058, and 27 respectively. If we put them in the HHI range, then it would look like this:

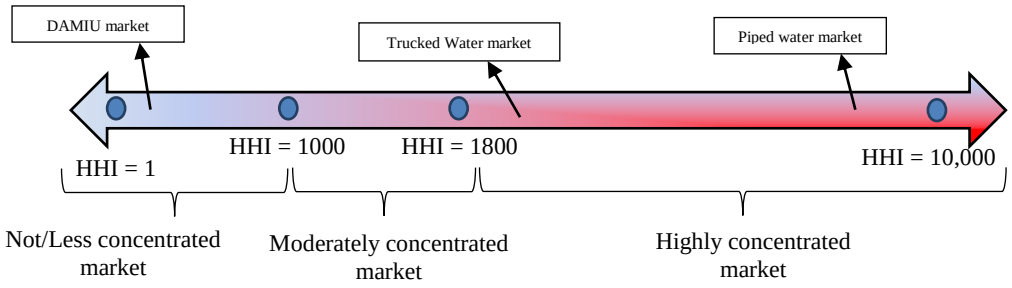


Figure 26: HHI for three water markets in Nauli City

4.4.1 DAMIU market: a perfectly competitive market

The DAMIU market is the least concentrated and it has the characteristics of a perfectly competitive market, where (i) there is a large number of suppliers and buyers and none of them can influence market price, (ii) they can easily enter and exit the market, and (iii) complete information can be easily accessed by sellers (for instance, about technologies of DAMIU, sources of raw water, etc.) and buyers (about market price). In this market, price is efficient. However non-price competition does exist in this market. Sellers often promote special offers (e.g., buy ten and get one free) or issue coupons so that buyers will keep buying at their stalls. However, every stall applies this strategy, and "…in the end, the quality of the water and quality of our service matter most," said a DAMIU stall owner in Nauli City (2015, interview, 15th December).

4.4.2 Trucked water market: a cartel?

The trucked water market is highly concentrated. It can be labelled as an oligopoly market, or probably a duopoly because there were two sellers that acquired 90% market share. In the United States, the Antitrust Division of Department of Justice is very keen to monitor the HHI to measure the degree of market concentration.[64] Any merger that results in an increase in the HHI of more than 200 can be considered as an attempt to increase market power significantly. There can be agreement between the two major market share merchants, written or most likely unwritten, to control the market. However, in most cases, there is no written agreement to prove that collusion between sellers has taken place. In other countries that have legislated fair competition and consumer protection there are debates whether the anti-monopoly commissions or trade watchdogs should use only direct evidence or can include indirect evidence to prosecute cartel behaviour. In Indonesia, even though Anti-Monopoly Law No. 5/1999 stipulated that business perpetrators are prohibited to come into an agreement, written or unwritten, that intends to control price, quality or other marketing processes that can result in monopoly conduct. However, the Competition Agency (*Komisi Pengawas Persaingan Usaha*) still finds it very hard to police unwritten agreements (Indirect Evidence S*ebagai Alat Bukti Dipersoalkan* (Indirect Evidence as an evidence is doubted), Hukum Online, 2nd August 2010). Policy Round Tables of OECD in 2006, which were ratified by 19 countries plus the European Commission, agreed that cartels can be prosecuted by using direct and indirect evidence. Circumstantial evidence can be (i) communication evidence and (ii) economic evidence (OECD 2006). Communication evidence can be meetings, telephone conversations, or travel to an event in which two or more parties participated, and have to be recorded. OECD admitted that economic evidence can be ambiguous and, therefore, should be very carefully analysed. Economic evidence can include conduct (for example simultaneous price increases), structural evidence (high market concentration), or from the firms' financial performance, for example, a large increase in profit without making any significant improvement to delivery. This economic market data should be further analysed and can be used as a basis for investigation.

In the case of Nauli City trucked water market, the local government or the competition agency should examine why the price is extremely high considering the fact that water discharged is not taxed and there is no cost for water treatment, hence, production cost is only for the electricity to pump out the water.

[64] The Antitrust Division consider HHI between 1500 to 2500 as moderately concentrated and above 2500 as highly concentrated market (Horizontal Merger Guideline Section 5.2, https://www.justice.gov/atr/herfindahl-hirschman-index, accessed 24 May 2016).

4.4.3 Piped water market: a competition between governments

This market is the most concentrated water market in Nauli City, with too much of a political aroma to it. Friction between provincial, district and city governments is very intense, which has made leaders forget the greatest meaning of the government: to bring prosperity to the people. In reality, competition between governments has occurred because there is no clarity in regulations at national and local level regarding boundaries of functions between governments, especially when it comes to water management. More about this conflict will be discussed in Chapter 5.

Competition between public water operators in Nauli City can be categorised as an oligopoly, and huge amount of initial investment makes it difficult for new players to enter the market. However, what happens in Nauli City is still better than other cities in Indonesia, and maybe most cities around the world where there is only one (public) firm as a monopoly supplier of water to resident. In other cases, water has been privatised and private companies with legal endorsement from the government have formed a monopoly market with no competition. It is very obvious that competition in the market will lead to lower prices, better quality, better service, more innovation, more efficiency and induce economic growth (Stucke 2013). As explained in part 4.4 above, there has been price competition between these three firms:

Table 13: Piped water prices

Firm	Water Price per litre
BLUD SPAM	IDR 2,500
PDAM of Nauli City	IDR 7,475
PDAM of Nauli District	IDR 4,124

The City PDAM spokesperson admitted that without the Mayor's intervention that prohibits District PDAM from expanding its business, the City PDAM would not be able to survive the competition as utilising ground water as their main water source is very costly due to high electricity and water treatment expenses. The City PDAM has come to an agreement with BLUD SPAM to buy bulk water to fulfil around 15% of their total volume sold. However, the BLUD SPAM, whose main objective is to operate dams to support PDAMs in its surrounding area and also provide water to farms and other environmental concerns, stepped into the water market and started to connect its pipes directly to residents. The Head of BLUD SPAM argued that in terms of 3K (*Kuantitas, Kualitas dan Kontinuitas* - Quality, Quantity and Continuity), the PDAMs are still underperforming and, according to Government Regulation No. 16/2005, the Provincial Government should step in to meet the needs for water provision.

These firms are totally supported by their governments, and the competition is not only about business but also power. The city government (which owns the City PDAM) has prohibited the

District PDAM from expanding their business into its area, and this resulted in the City PDAM becoming a monopoly. People choose to buy water from the private sector because of its reliability and good service. Water from PDAMs is not flowing regularly, and the private sector can supply water anytime and to anywhere; it is only a matter of price. The further the distance of the customers, the higher the price. Even though the private merchants' price is much higher than PDAM and BLUD's water tariff, people keep calling the merchants. All of the interviewed residents that have ever used the water truck said that PDAM water is not flowing every day and, when they need water immediately, they only have to call the merchants and in about 1 or 2 hours the truck comes and fills up the receptacle. When people were asked which water provider is better, public or private, they did not care which water utilities will cover their area as long as they can get water easily. An interviewed resident put it very cynically:

> …water utilities spent huge amount of investments, built offices and big infrastructures, buried pipes, employ workers with complicated management structure, regulated by the government, involved central, provincial, city and district governments, their parliaments and their budgets, but still cannot provide good service to the people. While the merchants, whenever we call them, they come straight away. No need for difficult planning, workers, managements, so on and so forth. Moreover, sometimes we never use the (PDAM) water but we have to pay because the meter keeps spinning. While DAMIU, just bring your gallon and fill it up next door and it is ready to drink.

4.4.4 Opportunity loss from water market

The failure of the governments to manage water in Nauli City has resulted in a huge opportunity loss to the economy and, especially, to the people. If we recall the information provided in Table 12 above (Comparison of market share, revenue and profit between five water sellers in Nauli City), people bought water from water merchants at 320,000 cubic metres per year for IDR 21.2 billion. If we convert it to buying water from the public water companies with a water tariff of IDR 7,500 per cubic metre, then the total payment would be only IDR 2.4 billion. This means there was a loss of IDR 19 billion that could have been received by the public companies and utilised to develop more sophisticated water provision services or subsidies for the poor. For an easy comparison, that amount of money is more than three times the City PDAM's total revenue. The connection fee that is charged to connect a new customer to the PDAM pipe network is IDR 1.5 to 2 million, which means that the money lost could have connected more than 10,000 new customers for free. If one person needs 100 litres of water per day and 36,500 litres per year, then that money could have been used to provide free water to 8,500 people per year, and if one household consists of five people, then 1,700 poor households could have been getting free water. If we compare it with the 2015 Municipality budget, the opportunity loss was nearly as much as total retribution revenue of IDR 21.6 billion, or five times the annual total subsidy expenditure of IDR 4.5 billion, and much bigger

than other areas of the budget, for example, transportation (IDR 8.3 billion), social security (IDR 9.5 billion), and 26 other functions as shown in the figure below.

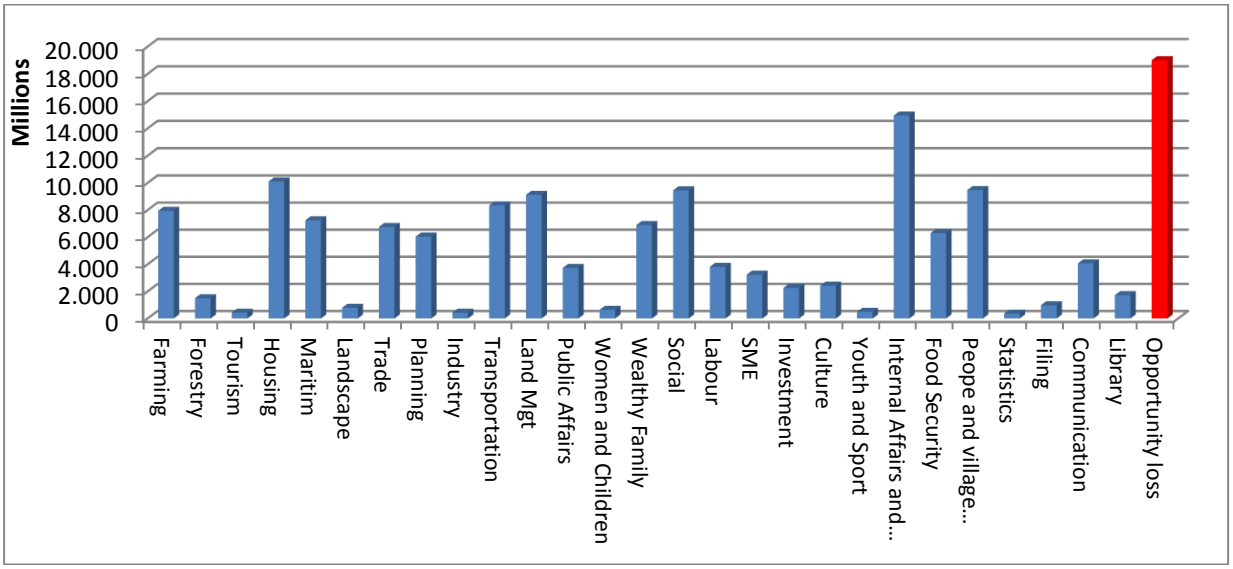


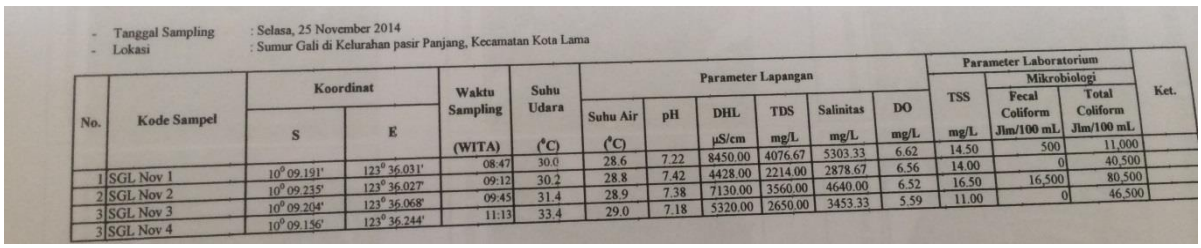
Figure 27: Comparison between the Opportunity Loss against 27 budget areas in Nauli City Government's 2015 budget allocation (diagram developed by author)

4.5 Health problems

"All people, whatever their state of development and their social economic and conditions, have the right to have access to an adequate supply of safe drinking water."

(United Nations Water Conference, water as a right, 1977)

The Environment Control Body of Nauli Municipality during June to November 2014 conducted laboratory testing of sampled water from 100 households from water that was used by the residents for their domestic needs (sourced from rivers, springs, wells, trucked water, PDAMs and BLUD SPAM). One page of its report is shown below.



- Tanggal Sampling : Selasa, 25 November 2014
- Lokasi : Sumur Gali di Kelurahan pasir Panjang, Kecamatan Kota Lama

No.	Kode Sampel	Koordinat		Waktu Sampling	Suhu Udara	Parameter Lapangan						Parameter Laboratorium			Ket.
													Mikrobiologi		
		S	E	(WITA)	(°C)	Suhu Air (°C)	pH	DHL µS/cm	TDS mg/L	Salinitas mg/L	DO mg/L	TSS mg/L	Fecal Coliform Jlm/100 mL	Total Coliform Jlm/100 mL	
1	SGL Nov 1	10° 09.191'	123° 36.031'	08:47	30.0	28.6	7.22	8450.00	4076.67	5303.33	6.62	14.50	500	11,000	
2	SGL Nov 2	10° 09.235'	123° 36.027'	09:12	30.2	28.8	7.42	4428.00	2214.00	2878.67	6.56	14.00	0	40,500	
3	SGL Nov 3	10° 09.204'	123° 36.068'	09:45	31.4	28.9	7.38	7130.00	3560.00	4640.00	6.52	16.50	16,500	80,500	
3	SGL Nov 4	10° 09.156'	123° 36.244'	11:13	33.4	29.0	7.18	5320.00	2650.00	3453.33	5.59	11.00	0	46,500	

Figure 28: A page of 120 pages report from 2015 Water Inspection Report released by Environment Control Body of Nauli Municipality

The report revealed that all of the water sources in Nauli City were highly contaminated by coliform bacteria and that the contamination reached levels of between 5,000 to 80,000 Mg/L. More

specifically, the faecal coliform index spanned from 100 to 20,500 Mg/L[65] for 83 of 100 tested locations. According to the Ministry of Health of Indonesia Decree No. 492/2010 and 739/2010, the coliform index in drinking water should be zero. Based on a study conducted by the WHO in 2008, Indonesia had 39,000 incidents of child mortality due to diarrhoea (Boschi-Pinto, Velebit & Shibuya 2008), and the International Vaccine Access Centre reported that there were 30,000 cases in Indonesia in 2014 and Indonesia was ranked number 9 for Global Mortality in Children under five years old caused by diarrhoea. Based on Nauli City Health Profile 2014 (released by the Department of Health of Nauli City) the number of diarrhoea incidences was 17,526 and was the fifth most frequent disease in Nauli City.

Not less than 20% of the sampled water had a high TDS level. TDS stands for Total Dissolved Solids, and is used to measure the level of minerals (calcium, magnesium, sodium, potassium cations and carbonate, hydrogen carbonate, chloride, sulphate and nitrate anions) present in a litre of water. High TDS in water may affect its taste, and WHO rated the level of TDS in terms of affecting taste: TDS < 300 mg/l as excellent; 300 < TDS < 600 mg/l as good; 600 < TDS < 900 as fair; 900 < TDS < 1200 as poor; and TDS > 1200 as unacceptable. Meanwhile, the above mentioned Ministry of Health Decree states that the acceptable maximum level of TDS for drinking water is 500. The report shows that 22 out of 100 water samples contained TDS of up to 4500 mg/litre, and the people still used the water for their basic needs. The researcher visited one of the households that consumed water with TDS of 3547 mg/l, and the water had a very strong taste and, due to the large number of suspended particles, could be described as turbid.

Figure 29 Water with high TDS (photos by author)

[65] Total Coliform bacteria is common in the environment like soil, water, and vegetables, and is harmless. However, a high level of contamination indicates that the source of water should be examined and need to solve the problems. On the other hand, *Fecal* coliform contamination indicates that there is high risk of illness for water consumers (Washington State Department of Health 2016).

High TDS in water can increase the risk of arthritis or inflexibility in the joints which is caused by high calcium and minerals deposits, and also kidney stones as kidneys filter about 180 litres of water everyday (Rozelle & Wathen 1993).

A Health Department of Nauli City official stated in an interview that the department had never conducted regular inspection or treatment of commercial, communal or private water sources, due to budgetary limitations. They checked water sources only when they were asked by users to do so. The water merchants and PDAMs confirmed that their water sources had never been tested by the government, so they do not have an incentive to treat the water since they the water looks clean and clear.

4.6 Environmental problems

Nauli's geographical condition (arid with very little rain) means that water is scarce. Groundwater exploitation has occurred from time to time for commercial purposes by manufacturing and service industries, seaports, water companies and water merchants. The victims will always be the residents that use water for daily basic needs. A resident said: "Ten years ago we can get water from a shallow bore well only 15 meters deep. However today we have dug until 70 meters, and still in dry season it has no water".

The table and graph below show the comparison between the trend of population against rainfall in Nauli City in 2005 and from 2010 to 2015:

Table 14: Population and Rainfall trend from 2005 and 2010-2015

	2005	2010	2011	2012	2013	2014	2015
Population	251,170	291,794	336,239	365,348	378,425	380,136	390,877
Rainfall (mm)	2215.9	1720.7	1925.6	1561.2	1621.15	1579.1	1290.2

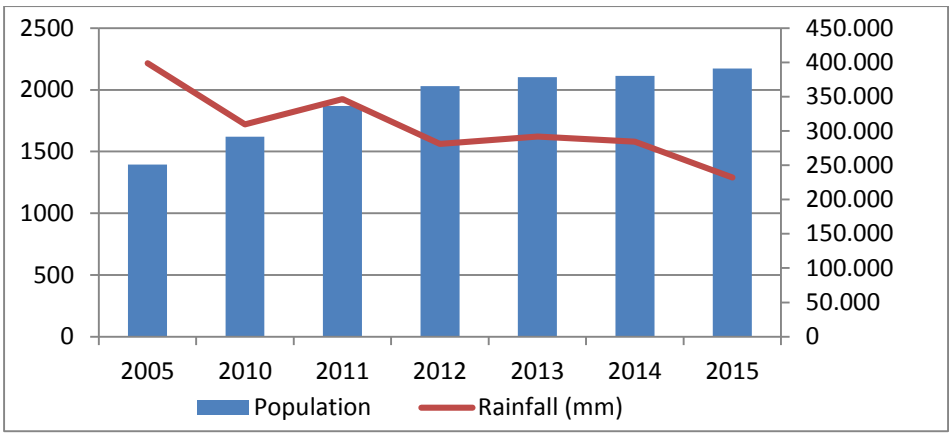


Figure 30: Population and Rainfall trend 2005 and 2010-2015

The table and graph indicate that Nauli City has experienced rapid growth in population of about 60% in 10 years from 2005 to 2015, however, the volume of precipitation decreased by approximately 40%, which means the availability of water in Nauli City is much less than ten years ago. Like other growing areas in Indonesia, ten years ago people in Nauli City did not have any difficulties in finding water with a shallow bore well or water pump. According to a plumber interviewed in Nauli City (14 November 2015), the maximum depth of a well where water can be extracted by hand pump is 11 to 15 metres depending on the type of the pump. Below are pictures of wells that are abandoned because they can no longer reach ground water.

Figure 31: Abandoned wells (photos by author)

Meanwhile, the residents also have problems with their bore wells, since they have to drill deeper to find water. A resident explained that, currently, the bore well at the back of his house is 70 metres deep, but during the peak of the dry season, sometimes it runs out of water. Most houses in Nauli City have their own wells, and not every resident could afford to build a well since it costs IDR 35–40 million to dig a 70 metre well nowadays. The poor residents get their water from other residents by putting long hoses, carrying small jerry cans or building communal wells and then sharing the water. Below are pictures of four wells from four subdistricts, and how people share the water:

Figure 32: Wells in Nauli City (photos by author)

Figure 33: Getting water by using jerry cans and long hoses (photos by author)

Data gathered from the Department of Mining of Nauli City stated that, as of 2014 (Final Report of Research on Ground Water Zoning and Development 2015), there were not less than 6,000 shallow and deep bore wells all over the city, with various depths from 4m to 70m and each well is commonly shared amongst three to four households. As of December 2014, only 3,100 bore wells were well documented, most of them belonging to residents, with 123 high capacity bore wells that were used by commercial or government institutions like the District PDAM (nine wells), the City PDAM (twelve wells), the city harbour (two wells), the airport (four wells), PT Semen

Kupang/Kupang Cement Co. (three wells), water merchants (25 wells) and others like banks, universities, churches, government offices and military barracks.

The Head of Nauli City Environment Control Body stated, "If the government, particularly the Department of Mining do not take immediate action regarding this water discharge phenomenon, we will not be able to preserve the environment and in the next 25 years Nauli City will run out of ground water" (2015, interview, 20th December). The head of the Mining Department explained that controlling water extraction has not been a priority in the local budget, and no funding has been allocated for that purpose. He admitted that the time has come for the government to look after the environment in terms of controlling water discharge, but the department has to make it a priority since its budget was very limited and they need to control other mineral and mining issues (2015, interview, 12th December).

Seawater is denser than the freshwater because it is much saltier than freshwater (Johnson, T 2007). If the sea level is higher than the ground water level, then the seawater will flow into the fresh water space because of the pressure differences, causing seawater intrusion, as shown in the below picture.

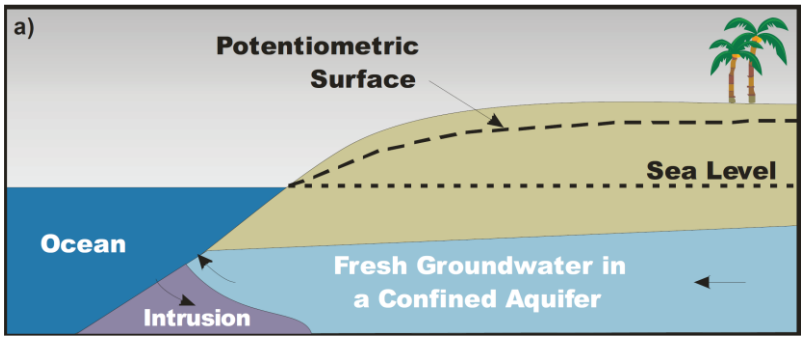


Figure 34: Seawater intrusion process
Source: Annenberg Digital News 2013

Continuous and massive freshwater discharging over a long period of time will decrease the freshwater table and it will lose its ability to balance the pressure and the flow of the seawater (Johnston 2007). Bear et al. (1999) described that seawater intrusion around the world has caused not only saline pumping wells to be abandoned, but the intruded area is also changed as the environment (the ground, the plants, and the animals) has to adjust to the conditions.

Even though there has never been any research conducted to examine the level of reduction in the water table in Nauli City, along with the scarcity of water in the bore wells, the people and the City PDAM have experienced higher salinity of water. The City PDAM confirmed that water sources in subdistrict Alak has high salinity that caused the PDAM to stop production in September 2015,

waiting until rainy season comes so the water quality can be normal again. The residents were complaining about the policy:

> The PDAM water is stopped (no longer available from this provider) . They said it is because the water is salty so it is not good to drink it. But we also need water for washing, bathing, and other everyday needs. The PDAM and the government don't give us alternatives, so we have to buy from the merchants which is very expensive. Thank God it is November and we are approaching the rainy season.

Nauli City government (the Planning Agency and the Public Works Department) were not providing any solution to address the problem; similar to the PDAM and the residents, they were only suggesting that the people have patience to wait for the rainy season.

4.7 Applying the Critical Systems Heuristics (CSH)

Applying the CSH questions in analysing the problem of water management in Nauli City is appropriate since this is a complex or 'wicked' problem. It means that the water management problem of Nauli City should be perceived from several aspects that surround and affect the problem.

Ulrich distinguished the twelve questions into 'is' mode and 'ought' mode. The two modes are closely related, as the 'is' mode represents current conditions in Nauli City water management, and the 'ought' mode offers suggestions as to what should happen and how it can be managed properly (Ulrich 1996). The twelve questions are then grouped into four: the sources of motivation (as the value basis of the design); the sources of control (or sources of power that are needed or available in order to attain the objectives of the programs); the sources of expertise (to know the information, experiences and skills that are relevant); and the sources of legitimation (to identify the ethical assumptions and possible deficiencies, and justification from the people vis a vis, the involved and the affected) (McIntyre-Mills 2006; Midgley 2000; Ulrich 1983, 1989; Ulrich & Reynolds 2010).

The assessment of water service performance in Nauli is summarised in table 14 below.

Table 15 Assessment of the water performance in Nauli using the CSH (diagram developed by author)

Question	"is" condition	Problems	"ought to" be done
The source of motivation			
1 **Beneficiary**: 'who' is the actual client of the system?	Customers: people who can pay connection fees and water charge.	Connection charge and water tariff are prohibitive for the poor to get piped water.	All residents in terms of individual including marginal and poor people, in urban and remote areas.
2 **Purpose**: 'what' is the purpose of the system?	Providing water in good quantity and quality to all residents	• interruptions to water flow • Cost prohibitive for the poor • No chemical treatment of water (water contains very high *e-coli* and TDS*).* • No prevention of water exploitation	• Production and distribution capacity should be expanded to reach all residents. • Water should be chemically treated before distributed to residents. • Need regulation and real action to balance needs for water and environmental preservation
3 **Measure**: 'what' is the actual (built in) performance measurement of the system?	• coverage ratio: MDGs target: 68.87% in 2015. National target: 100% in 2019. • Water price becomes affordable for the poor	• Nauli City coverage: 38.17%. • Poor people still do not have access to clean water	• Need to accelerate expansion of coverage. • Cross subsidy should be formulised and optimal efficiency is urgent to get water to the poor
The source of power			
4 **Decision maker**: 'who' is the decision maker?	• National regulation by central government • Local design and regulation by local government • Water operation by PDAMs.	• There are many overlapping regulations at national level. • In local level, water is used as political issue and compelled to contribute to local revenue. • PDAMs difficult to grow business and expand services.	Water should be managed more regionally; local governments and provincial governments through their water company should not compete against each other to sell water.
5 **Resources**: 'what' recourses and conditions are really controlled by the decision maker?	Financial resources, inter border power, legal power.	The governments never really coordinated deliberate blueprint for water provision in Nauli, so there are often conflicts of overlapping programs.	Since water is the responsibility of the state, then all levels of governments should coordinate and use their legal power to ensure water is well provided.
6 **Environment**: 'what' are conditions that cannot be controlled?	Water sources, population and geographic.	• Geographic condition creates water scarcity • Ground water discharge has lowered the water table	• The three water companies and governments need to coordinate to organise the use of water sources

Question	"is" condition	Problems	"ought to" be done
		• Population dispersed over a remote area making coverage difficult.	to save water and reduce production costs. • The local governments need to provide financial assistance to PDAM for expansion.
The source of knowledge			
7 **Expert**: 'who' are the planners?	PDAM of Nauli City	Local governments only rely on PDAM planning.	Planners should be interdisciplinary people including users that are appointed by and responsible to the government.
8 **Expertise**: what skills and knowledge are relevant or needed?	Need to acquire skills in managing issues of water, corporate, financial, environment and social issues.	Planners and key persons lack of experience, multidisciplinary understanding and attention in water provision related aspects.	Planners and key persons need to be aware of and consider relevant aspects, so involving relevant people like academics and end users is needed. Service users should be involved to obtain insights in setting priorities.
9 **Guarantor**: where do the designers seek guarantee that their planning will be successful?	Central government, local governments, and local parliaments.	• Uncoordinated programs between governments made the implementation and maintenance not optimal. • Executives and legislatives often cannot reach political agreement in managing water.	• Municipality and higher tier governments should actively synchronise programs and support the planning
The source of legitimation			
10 **Witness**: 'who' will be the affected people?	Poor people; Children and those who unable to raise their voice.	Water management design only involves top level decision makers.	The system needs to accommodate the interest of marginal people. (All water users; those who are excluded)
11 **Emancipation**: are the affected people allowed to involve in the system?	No	Water companies only serve customers, not all residents. Local governments only rely on water companies.	The system has to provide equal opportunities to all people.
12 **Worldview**: on what worldview the system should be based?	Water development planning is included in the local governments' medium term planning.	Designing the system is based on technical and financial aspect, and not considering social aspect. Water development is still not in high priority in the medium-term planning.	As stipulated by the constitution, the system should be able to provide water for the maximum benefit of the people.

4.7.1 Problems on the Source of Motivation

Governments need to remember their ultimate objective: to serve the people; this is the main problem now. To 'serve' means providing public service adequately. 'The people' means all people or all residents without exception, whether they are wealthy or poor, children or adults, men or women, locals or migrants, or from different ethnicities and religions. These are the real beneficiaries. The governments have moved water from being a public good to an economic good, and it has many restrictions so that only customers can access it. PDAM, as the government owned water company, is the only institution that is mandated to fulfil this provision. Other than PDAM, residents get their water supply from water merchants and retail outlets with very expensive prices. There is no water subsidy in the local budget, and water regulations are still not clear as to which level of government (local, provincial or national) should be held to account for any failure. Moreover, water projects from these three levels of government costing a huge amount of money are still overlapping.

The quality, quantity, and continuity of the provision were also very questionable since the water did not meet health standards set by the government and local government has never conducted inspections, water did not flow swiftly, and water only flows two or three days a week. The national government has put in medium-term planning for 100% water coverage (supplied by PDAM or other government institution) by 2019. This target has not been included in local planning, since Nauli Planning Agency stated that the government does not have any water development planning, and delegated water provision solely to PDAM. The officer then said that that target will not be able to be accomplished in Nauli City on time.

4.7.2 Problems on the Source of Power

There are plenty of regulations as the basis of managing water in Indonesia. Water has been transferred to be the second tier local government's function with Government Regulation (GR) 38/2007, which has caused confusion and raises several unanswered questions: 1) Should water provision be by related local government or could other local government suppliers of water be encouraged to support a particular administrative area? 2) If a new area is declared as new autonomous local government, should the parent local government release all public services that are conducted by local companies? 3) Can the provincial or state government establish an institution to operate water supply in local area? These questions have been asked to all participants from local and central governments, and they cannot give clear answer.

The City Government of Nauli has never treated the water issue as high priority. There is no clear regulation regarding water management, and all concerns are handed over to PDAM. There is no master plan formulised by Nauli City Government, and it has spurred overlapping water projects that are coming from higher levels of government without coordination. A newspaper stated that the water itself was confused about where to go because there were so many pipes buried under the ground (Fajar Timor 2nd October 2015, Unik, Air di Kota Nauli Bingung Dalam Pipa).

4.7.3 Problems on the Source of Knowledge

As mentioned above, Nauli City Planning Agency does not have a master plan for water management in this area. The Head of Infrastructure Planning Division of the Nauli City Planning Agency revealed that neither the unit nor the PDAM has any expertise in water planning. The Head of BLUD SPAM, who was a former expert in national water management and had experience as a technical director in several PDAMs, confirmed that PDAM Nauli City lacks of experts and there is no pure 'plumber' in that PDAM. The local government could not cover the deficiency so water management planning had no direction. Every institution could exploit water in this area without any restriction.

4.7.4 Problems on the Source of Legitimation

Poor management of drinking water in Nauli City, especially when they commodified water, means that almost 70% of the people do not have access to piped water, 5% of them got water from unprotected water resources, and more than 1,500 people did not have access to water at all and they had to rely on their neighbours to share water. The governments at all levels, especially the local level, did not take this seriously and they never heard the voice of the poor. According to Nussbaum, M and Sen (1993), poor people like these cannot function even at a very basic level to be well nourished and healthy. The people have no choice about their need for water, or the available choices are suboptimal in terms of water price, quality, quantity and method of access. This should be taken into vital consideration by the government, since this will support the poor residents to achieve greater potential in their lives.

The steps to design the new system can be explained in the diagram of soft system below:

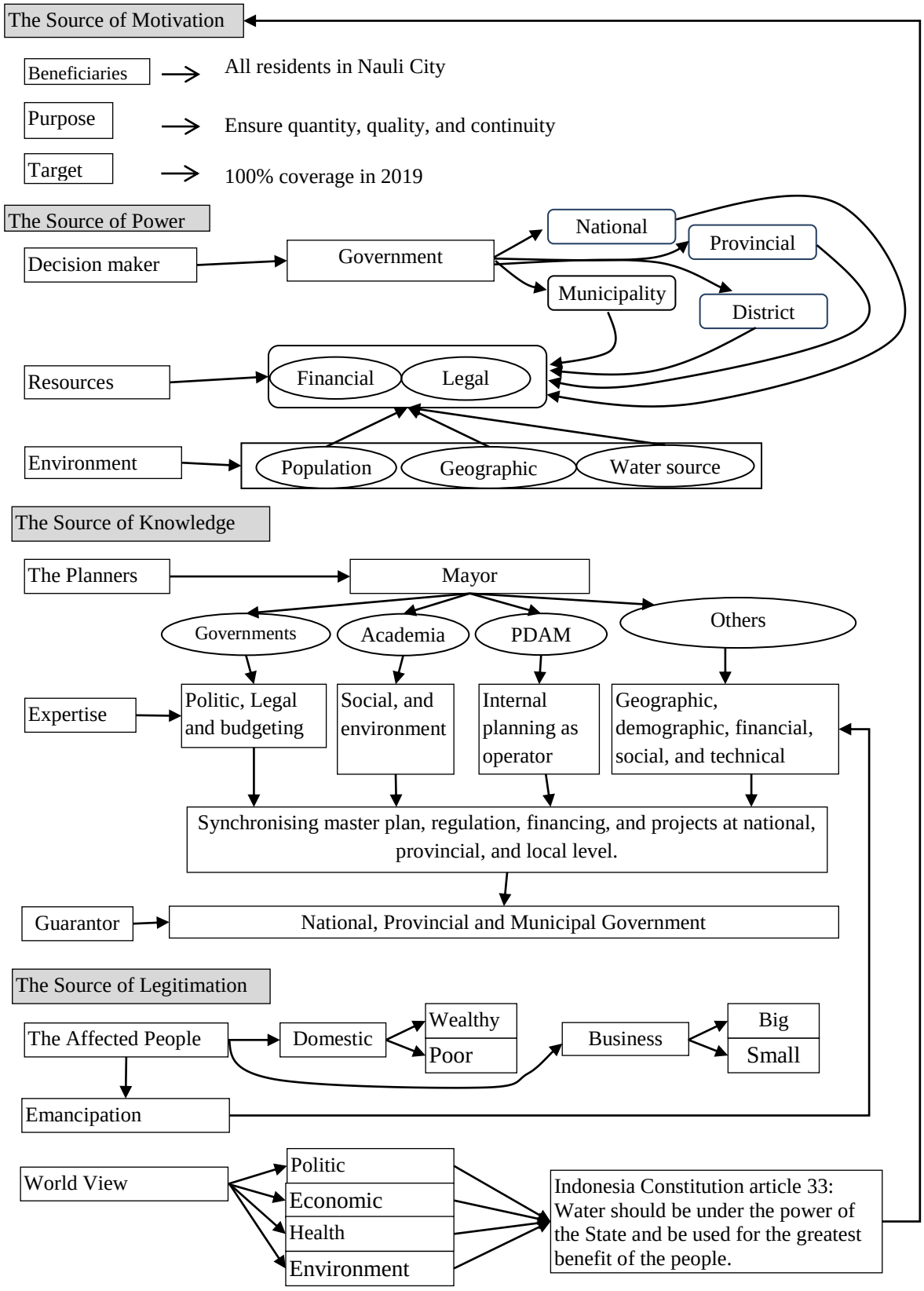


Figure 35: Designing water management system in Nauli City (diagram developed by author)

4.8 Shifting Paradigms

The twelve CSH questions are applied to determine relevant boundaries critically, in order to understand what is/ought to be the case, and who are the involved and the affected people of the problem. Addressing the problem based on the presentation of the previous two methods, we can draw how the twelve CSH questions shift paradigms from "is" conditions to "ought to be" conditions as follows:

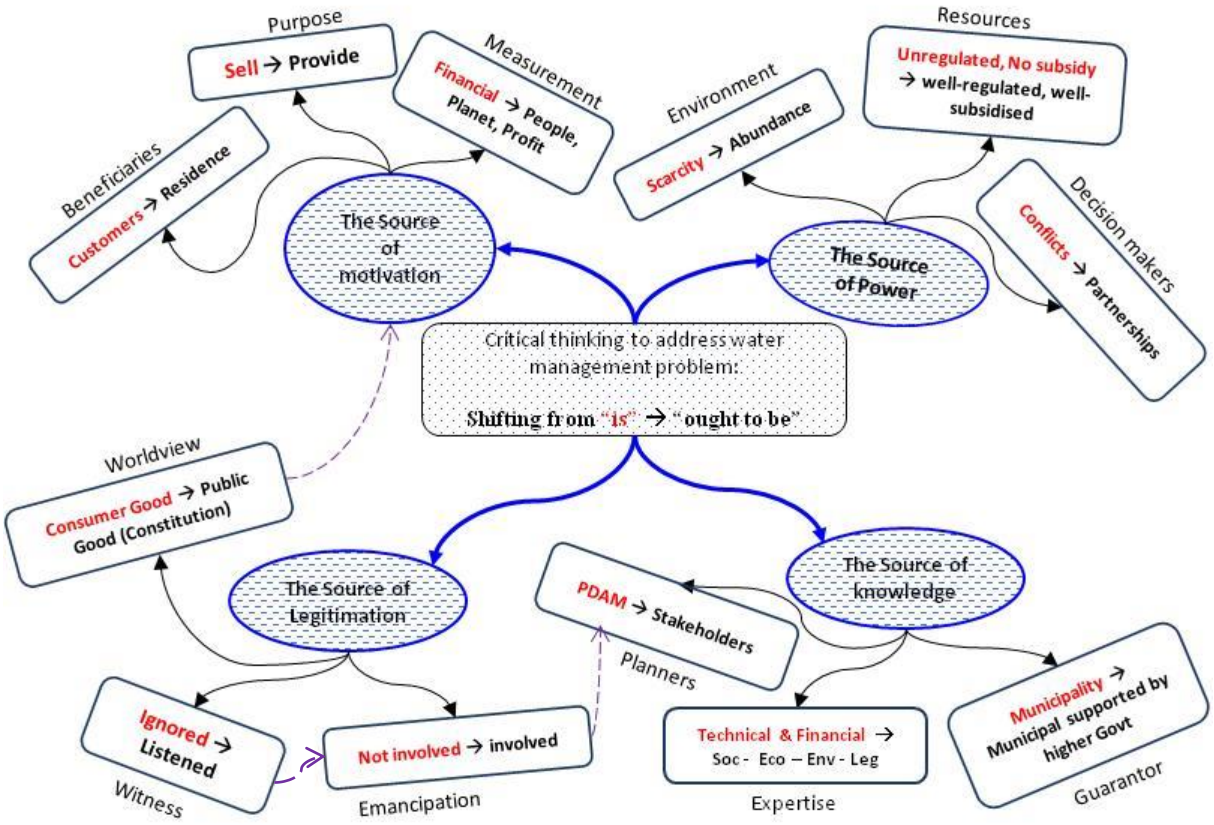


Figure 36: Addressing the wicked problem with CSH (diagram developed by author)

CSH provides a way to address the wicked problem as the twelve questions will set boundaries for further analysis so we can incorporate as much relevant information as possible (Cabrera 2006). In a social context, setting boundaries will allow us to include relevant stakeholders and, most importantly, decision makers (Churchman 1970). Moreover, this approach will allow the affected people (the poor and marginal) to be involved in decision making by applying 'putting the last first' (Chambers 1997). By involving the affected people that usually have the least voice in the society, their needs could be accommodate as they are also the beneficiaries of the policies.

The Source of motivation

1. Beneficiaries: The government as water provider should realise that the actual beneficiaries of the system are not ‘customers’, but instead residents or the people.
2. Purpose: Public service includes water provision as the responsibility of the government, so the main function is to provide rather than to sell water.
3. Measurement: Water provision is performed by water companies and financial indicators are used to measure their performance. This measurement system has to be replaced by balancing the effort to get profit with addressing social issues and conserving the environment. The Triple Bottom Line (TBL) can be a good alternative.

The Source of Power

4. Decision Makers: The governments (central, provincial, district and city) should not be caught in conflicts, but instead have to establish partnerships to build sophisticated water provision systems to benefit the people.
5. Resources: Making regulations and allocating budgets are the resources that the government should utilise. Strong regulations in water management are needed to overcome social, economic and environment problems, poor coordination and also law enforcement issues. Furthermore, allocating more funding and applying a cross-subsidy system can help the poor to have access to reliable water.
6. Environment: Conditions that cannot be controlled can also be resources if managed properly. The local government can develop the Blue Economy concept that promotes creativity of the people in order to turn water scarcity to water sufficiency by assisting and encouraging the people to build home water catchments, and replanting idle land with water-saving plants. Indeed, research is needed and this should be handled by the government.

The Source of Knowledge

7. Planners: The City Government, that currently relies on PDAM’s planning, has to establish a comprehensive plan by involving people not only with various expertise but also experience. They can be from NGOs, universities, consultants, international organisations and include the affected people. Further, a Community of Practice should also be developed to maintain good communication between the planners.
8. Expertise: Planners consist of people who are experts in climatology, law, finance, environmental conservation, sociology, and also have experience in local water service.
9. Guarantor: Applying the principle of subsidiarity, the implementation of the decentralisation system should empower the City Government to make sure that the program can be executed properly, and it needs full support from the provincial and central governments.

The Source of Legitimation

10. Witness: The affected (poor and marginal) people should not be ignored, but instead they need to be given the opportunity to raise their voice, especially regarding their needs for water.
11. Emancipation: The affected people should be involved and their representation needs to be invited in the planning process, as they are one of the stakeholders of the system.
12. Worldview: Who owns the water? The constitution has mandated that the state has full control over water, and it should be utilised for the maximum benefit of the people. As such, the mindset saying 'water is a consumer good', should be replaced with 'water is for all'. Returning to the first question, the beneficiaries are all people, not a group of people.

4.9 Recommendations

Based on the abovementioned assessments, this research offers some suggestions to address the problems in water service provision in Nauli City. First, both local governments in Nauli region and the provincial government need to find a better model to manage drinking water in order to attain better cooperation and coordination in water provision. Nauli City and District leaders admitted that they have failed to provide adequate water service to the people (Indonesian Supreme Audit 2014), and it means that current practice need to be revisited. The decentralised system, where PDAM can only cover residents in a local government's particular area, can be adjusted and a more regional mindset needs to be developed. Drinking water related regulations at the national level need to be re-examined so there will not just be a 'one size fits all' regulation, but instead should accommodate local wisdom and aspirations. Second, governments should not just sell the water to the residents, but instead have to provide water for all, especially the poor ones who cannot afford to pay. The tariff structure has accommodated cross-subsidy from the rich to the poor, but real subsidy from the local budget is still needed by the poor.

Third, improving financial and technical performance of PDAMs is crucially needed. PDAMs audit report described how PDAMs operated inefficiently, proven by the high water losses (technical and administrative losses, low water bill collection rate of 62% and inefficient operational expenses). Fourth, water development planning need to be supported and included in the local governments' medium-term planning (five year plan), to avoid further debate and disagreement in political processes between executives and legislatives when enacting annual programs. Fifth, water development planning need to be pictured as a grand design rather than being atomistic, comprising all relevant planners from central, provincial and local governments. Planning processes need to involve people from universities and communities not only to obtain wider social, cultural and environmental perspectives, but also to determine prioritisation in water development. Building

communication through engagement (doing things together with other relevant people and engaging with the world), imagination (constructing an image of what we will do and how we will do it), and alignment (to assure that related programs and activities are aligned) (Wenger 2000) can be implemented for a better result. More frequent meetings with the communities are needed to hear their voice, complaints and demands regarding water service performance. A Community of Practice could be implemented to give the members a sense of bonding, mutuality and shared repertoire (Wenger 1999). The members need to represent different stakeholders and their diverse values, and strive to find a way to address their shared goals, namely, a safe, accessible water supply.

Finally, any planning that is made for water expansion should be based on the Triple Bottom Line (TBL) analysis, incorporating economic, social, and environmental aspects (Elkington 1999), to ensure that all current water development programs are preserving balance for future generations.

4.10 Conclusion

Water provision is a big issue that needs to be addressed by the government. Indonesia is still trying to pursue the global target in water provision, and it has been adapted as the government medium term target: to reach 100% coverage by 2019. However, national data shows significant growth in water service and some areas, like Nauli region for instance, are still struggling to find the best way to manage drinking water, especially with the trend for local autonomous systems and where local ego sometimes disregards the main objective of the development: the people. Developing the people should be the main goal of every kind of development, physical and non-physical, as it is the people who will enjoy and continue the development (UNDP 1994).

By using the CSH approach to assess drinking water management in Nauli, it can be seen that there are still huge developments that have to be undertaken to improve the current conditions. Firstly, as the source of motivation, there must be a change in mindset to see that all people, with no exceptions, are the real beneficiaries of water service. Secondly, as the source of power, water providers and all levels of government have to integrate water programs and policies, and coordination in planning and institutional arrangement needs to be improved. Thirdly, as the source of knowledge, water management planning should be viewed from a broader aspect to consider social and environment perspectives so people from different backgrounds with different and complementary forms of expertise could be involved. Finally, as the source of legitimation, planning in water systems should give equal opportunities to all, since the basic standpoint for starting any kind of public service is the constitution: to employ all services for the maximum benefit of the people.

CHAPTER 5. EXAMINING THE WICKED PROBLEM OF ACHIEVING WATER PROVISION IN LINE WITH THE A PRIORI NORMS OF THE INDONESIAN CONSTITUTION AND THE UN DEVELOPMENT GOALS

5.1 Introduction

This chapter will attempt to structure the problems in Nauli City's water management, and also to answer the second research question: *What are the causes that triggered the wicked problems?* As has been explained in Chapter 3 part 3.7.5 Policy Analysis, stage one of the policy analysis is *Identifying, verifying and structuring the public problem*. The decentralised system that is currently implemented in Indonesia has provoked the local ego that was entrenched during the colonialisation era. This culture has not only been the main cause of the proliferation of decentralisation and the creation of local governments, in addition it has also become deep-rooted in the sectoral institutions that has made coordination difficult. This chapter will start with a brief history about the transformation from centralised to decentralised government in Indonesia with the aim of describing how local ego was constructed, and how central government relinquished powers but, at the same time, tried to retain it. The discussion will continue with a problem map of the wicked problem in water management in Nauli City to provide a brief picture of what happened and how the situations are interconnected. The discussion will continue with some policy recommendations to address the problems within the wicked problem.

This chapter provides contextual background for addressing service delivery and the challenges associated with meeting the needs of service users. It addresses the question to what extent water delivery in Nauli complied with a priori norms; the Constitution (1945) as the national objective and the UN SDG as the global target. This thesis will make the case that the service delivery has not complied with these norms and that an analysis of the primary and secondary data reveals a range of challenges associated with complying with the norms and structures, as well as a lack of attention to social justice in the process

Public utilities regulation is dependent on the political structure and the ruling regime (Gormley Jr 1983). Wilson made a strong argument that the politics of regulation does exist, especially for intervening in the market and providing utilities (Wilson 1980, p. 357). By and large, one way that government can regulate or control its political power in public service provision is through governmental systems: centralised and decentralised.

The UNDP defines decentralisation as the restructuring of the power of central government and expanding the responsibilities and capacities at the subnational government levels to achieve effectiveness and better quality in the system of governance (UNDP 1997). As Cohen and Peterson (1999) explained, decentralisation can be defined as distributing or delegating functions based on historical origins or geographical context (like central to local government), problem/value centre or service delivery foci. Bahl and Martinez-Vazquez (2006, p. 6) stressed that the implementation of decentralisation is mainly triggered by people's disappointment with the existing centralised system. There are several underlying factors that may be behind decentralisation, including the central government failing to serve particular areas, declining quality of public services and poor performance or accountability of government officials. However, the UNDP (1999) emphasised that decentralisation is definitely not regarded as an alternative to centralisation since centralisation of policy is still needed in the national regulating context, and successful decentralisation will depend on coordination and relationships between all actors: the government, private sector and civil society.

5.2 The Historical context of Centralisation

Understanding the decentralisation policy in Indonesia would be clearer if we take a look at the governmental systems that had been applied in Indonesia throughout history.

The *divide et impera* strategy, which means divide and conquer, was the most successful political strategy used by the Dutch in many of its colonies, including Indonesia, in order to control the bureaucracy and to defeat any opposition. During more than 300 years of Dutch colonial rule of Indonesia, the colonial government adopted limited decentralisation which means that there were government structures at regional and local levels but the Governor General in Batavia was still able to fully control the systems in terms of administration, politics and policies (Legge 1961). The Japanese era of occupation in Indonesia began in 1942 and the Japanese felt happy to continue the centralised system that had been applied by their predecessor. In fact, they even strengthened the structure in order to exploit all resources to support their troops in the World War II (Sulistiyanto & Erb 2005). On the 19th of August 1945, two days after proclaiming independence, Indonesia formally established its system of government. There were eight provinces: West Java, Central Java, East Java, Sumatera, Kalimantan, Sunda Kecil, Sulawesi and Maluku. In 1949, as a result of the Netherlands' effort to regain power, Indonesia formed a federal nation called The Republic of the United States of Indonesia (RUSI) with 16 constituent states, in which the Republic of Indonesia (that only consisted of some small parts of Java and Sumatera) was one of its states. This structure lasted less than one year and on 17th of August 1950, the Republic of Indonesia declared

itself as a unitary state, and all constituent states were part of it because they did not want to be colonial puppets (Devas 1997). Following this period, Sukarno tried to find the government model that would be most appropriate to Indonesia, and several systems were tested. Indonesia, under President Sukarno's administration, adopted a regionalised government system with the introduction of Law No. 1/1945 about Regional National Committee. This law was developed and replaced by a number of subsequent laws during the parliamentary democracy period in 1950s: Law No. 22 / 1948, Law no. 1 / 1957. With these laws, regions were given the opportunity to manage their own affairs including elections and controlling their social and financial matters. However, due to ideological and political conflicts between elites and a boisterous local rebellion led by military commanders, Sukarno ended the parliamentary democracy system and all regulations produced during the period were no longer valid, including Law No. 1/1957 (Bourchier & Legge 1994; Legge 1961). It was clear that Jakarta no longer had the willingness to support decentralisation (Sulistiyanto & Erb 2005, pp. 4-5). The Sukarno administration re-implemented an even stronger centralised governmental system with full support from the military as he thought that this would be best for unity (Legge 1961).

During the political crisis of 1965, which is known as the revolution era, the economic and development conditions were very miserable. The inflation rate reached more than 500% per year, public service provision was very poor, and national, as well as local, political conditions were chaotic. The New Order under President Suharto stepped up to gain power and to stabilise the situation, and during 1966 to 1970, the government started to take control over every aspect of life and began to implement a centralised approach. As a result, the inflation rate significantly dropped down to 9% in 1970 and economic growth reached almost 7%. This regime maintained a strong centralised decision making system to enforce strict loyalty to control the society, as maintaining calm and stable political conditions was the main objective. In the early years of this regime, there was a strong intention to ensure central domination (Turner 2001).

After receiving plenty of suggestions from experts, politicians, and foreign institutions, and considering the fact that Indonesia is too big to be centralised and that local people have had their own ego since the colonialization era, the government felt that the time has come to introduce a decentralised system with Law no. 5/1974 about Government in Regions. This law introduced three levels of government: central government, provincial government and local governments (district and city governments). Moreover, this law also established three principles in implementing the system: decentralisation (*desentralisasi*), deconcentration (*dekonsentrasi*) and co-administration (*tugas pembantuan*). The distinction between these three concepts was ambiguous at the implementation level (Devas 1997) as explained later on.

Decentralisation means dispersing or separating functions from central or upper level subnational governments to local governments within their administration. Deconcentration and co-administration are the systems that involve local governments in conducting the central government's functions through projects, and they have to account to the central government. Even though this law has introduced the terms 'decentralisation' and 'local autonomy', experts believed that the spirit of decentralisation introduced by this regime was only on paper and never happened at the level of implementation (Butt 2010; Pokja AMPL 2006; Rohdewohld 1995; Sulistiyanto & Erb 2005; Sulistiyanto, Rosser & Wilson 2011; Turner 2001). The President and the Minister of Home Affairs (*Departemen Dalam Negeri* or MoHA), which is described by Morfit (1986) as "a local ministry with a local agenda", had the power to decide about formation and elimination of a local government, and appoint the *kepala daerah* and the heads of local governments (governor, mayor and *bupati*). The local parliament (DPRD) suggested three names and the President would decide and, hence, the *kepala daerah* was responsible to the President. Sulistiyanto and Erb regarded the law as "initiating limited decentralisation while preserving the unitary system" (2005, p. 6). Rohdewohld (1995) clearly explained that decentralisation in Law 5/1974 has been translated by elites as the delegation of functions in which political power and authority was still in the hands of Jakarta. Unlike the globally implemented concepts of decentralisation, Turner (2001) claimed that it was a type of restricted decentralisation in which the regional governments should follow national direction, had a high financial dependency on central government and experienced weak human resource capacity. In a nutshell, the implementation of decentralisation under the New Order regime from 1974 to 1999 was very elusive and, with military behind the regime, it was also very intimidating (Sulistiyanto & Erb 2005).

Public service provision was also conducted in a very complicated and centralistic system. Each level of government had their own office to perform functions in local areas. For instance, in drinking water provision, a local government (district or city government) had a department called *Dinas Pekerjaan Umum (Dinas PU)* (Local Department of Public Works) that took the responsibility in their administrative area, while the provincial government had its own *Dinas PU* to conduct water management across local governments within the province. Meanwhile, the governments (local and provincial) also had Bappeda (*Badan Perencanaan Pembangunan Daerah*) – the Local Planning Agencies – who made master plans for all developments conducted by the government, both physical and non-physical, and the design made by *Dinas PU* must be aligned with the one made by Bappeda. At the national level, the Ministry of Public Works had strong control through its regional offices at provincial level called *kantor wilayah* or *kanwil PU*, and local offices at district or city level called *kantor departemen* or *kandep PU*, which theoretically dealt

with national issues that emerged at the local level, and which decided on the areas of development as well as proposing funding to Jakarta. As has been explained in Chapter 1, the Ministry of Public Works (MPW) was the key player in shifting water management system from a local government unit into a PDAM through a Ministerial Decree in 1968. Nevertheless, in the decentralisation era in which local government had been given the authority to manage themselves, MPW still directed water development policies from national, provincial and local levels. Moreover, it was not only about technical aspects, but MPW also intervened in the procurement process, management system, and in appointing directors and middle level managers. In short, in order to establish a design on water management in a particular local government, the related local *Dinas PU* should coordinate their planning with local Bappeda, Provincial Bappeda, Provincial *Dinas PU, Kandep PU,* and *Kanwil PU.* If there was other issues like health and environment matters involved in the planning, the local *Dinas PU* should also coordinate with related line department at local, provincial, *kanwil* and *kandep* levels. If the water investment activities were conducted by PDAM, then the water company should be included in the loop as well, and it happened very frequently that the PDAM design had to be adjusted to accommodate many interests from local government, provincial government, central government, and sometimes even interventions from the parliaments.

At the national level, *kandep PU* and *kanwil PU* would collect data and undertake planning for their administrative region and propose them to the Ministry of Public works. The compilation of data, planning and designs would be discussed with other related units to determine priorities, terms and conditions, as well as the financial arrangement, and it would become a national program. Pokja AMPL (2006) explained that before 1999, making a national program on local water provision should involve at least eight ministries and 19 central government units.

Activities	Menko	National Planning Agency				Ministry of Finance			Ministry of Public Works				MH	Men		Ministry of Home Affairs			Min
		DHS	DWR	DE	DH	DB1	DBL	DGFI	DWS	DWW	DPP	BPP-SPAM	DEH	DSE	DC	DSP	DCD	DLF	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Policy Development and Planning	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
Infrastructure Development and Rehabilitation									✓	✓			✓	✓					
Technical Assistance for Program Implementation		✓			✓				✓	✓	✓	✓	✓	✓			✓	✓	
Administration and Enforcement of Regulations									✓	✓		✓	✓	✓	✓		✓	✓	✓
Capacity Building and Training		✓			✓			✓	✓	✓	✓	✓			✓			✓	
Promotion and Socialization			✓					✓	✓	✓	✓	✓	✓	✓	✓	✓			
Financing on Water Program	✓					✓	✓	✓			✓	✓			✓			✓	

Table 16 Role of central government units in Water Activities (diagram developed by author)

Abbreviations:

Menko	Coordinating Minister for Economic and Finance	DPP	Directorate for Planning and Program	DH	Directorate for Health	DSE	Directorate for Small Enterprise
DB1	Directorate of Budget 1	DC	Directorate for Conservation	DHS	Directorate for Human Settlements	BPP-SPAM	Water Supply System Development Support Body
DBL	Directorate of Budget for Local Gov't	DSP	Directorate for Spatial Planning	DWR	Directorate for Water Resources	DEH	Directorate for Environmental Health
DE	Directorate for Environment	Men	Ministry of Environment	DWS	Directorate for Water Supply	DLF	Directorate for Local Finance
DGFI	Directorate General of Financial Institution	DCD	Directorate for Community Department	DWW	Directorate for Waste Water	Min	Ministry of Mining

The steps would involve a series of meetings and discussions. First there has to be a meeting between Echelon I officials or directorate generals and deputies (first level manager below the minister) from each ministry as a kick-off meeting. This must be followed with meetings between Echelon II officials or directors (second level manager below the minister) to discuss technical aspects. Finally, the agreements resulting from the meetings will be presented in a concluding Echelon I officials meeting to get final endorsement. To some extent, this process would be useful to accommodate various interests that might emerge from each line ministry and need to be considered in the planning. This would be aligned with the concept of systemic thinking as it can incorporate many related aspects that surround water management issues and unfold the complexity from different worldviews (Ulrich & Reynolds 2010). Unfortunately, sometimes a meeting was not effective because sometimes the topics of discussion had to be repeated again in the following meeting as they had not reached an agreement in the previous meeting, or the person who attended the meeting to represent a particular unit was different to the one who came in before.

Turner (2001) revealed that significant dysfunctions in Indonesia were apparent in this complex system of water management between local, provincial and central governments, and between units within the governments. In terms of water management, the real evidence for this was the testimonies from the residents who experienced great inconvenience when the road was dug up several times in a year for PDAM water projects, municipal water development projects, provincial water projects, and sometimes for electricity or telecommunication projects (interviews with residents in Nauli, Jakarta, Bekasi and Medan, in December 2014 – January 2015). During the era of Law No. 5/1974 (before 1999), there were no high level regulations (laws or presidential regulations) that clearly mandated division of functions between central, provincial and local governments. Division and distribution of functions were only regulated by ministerial decree, and it was theoretically allowed by regulation since local governments were responsible to the President and, as a result, ministers have power over local government (Butt 2010). However, these ministerial decrees were not well socialised and ambiguous which then produced confusion at the level of implementation, and were very centralistic in order to accommodate the ministries' local offices, *kanwil(s)* and *kandep(s).*

5.3 The Decentralisation Era

About twenty years before Suharto's political demise, the strong centralistic system became unpopular and the people started to openly raise criticism. Dozens of publications (see for example Honna (2013) and Anwar (2005)) reported events which happened as a result of military

suppression, particularly over Suharto's political opponents. It started with the Petition of Fifty in 1980 that included 50 well known people including former army chief, General A. H. Nasution, former Jakarta governor, Ali Sadikin, and former prime ministers during Sukarno's presidency, Burhanuddin Harahap (9th Prime Minister) and Mohammad Natsir (5th Prime Minister). Suharto quelled the conflict, asserted his domination throughout the government structure and no one would dare to disagree with him or the central government's policies and directions.

It was 1999 when the local aspiration was unleashed. After the fall of Suharto in 1998, Indonesia finally had to end its 'disguised' centralised government system that had been in place for almost 53 years since independence. In 1999, the government under BJ Habibie's presidency stipulated a package of autonomy laws: Law Number 22/1999 about Regional Government (*Pemerintahan* Daerah) and Law Number 25/1999 about Fiscal Balance Between Central and Regional Government (*Perimbangan Keuangan antara Pemerintah Pusat dan Daerah*). Law 22/1999 (signed by President Habibie one year after he gained the power from Suharto), in particular, gave all regional governments (provincial, districts, and municipalities) the broadest autonomy (*otonomi seluas-luasnya).* President Gus Dur, who stepped up in 1999, established a State Minister for Regional Autonomy to prepare for decentralisation, because the country had a tight deadline within which to implement Law 22/1999. Article 132 stated that the law should be implemented within two years at the latest, and regulations should be in place within one year after the law was ratified. According to the characterisation by Rondinelli, D (1999), Indonesia decentralised the four cores of government: (i) political (giving local citizens and political leaders the opportunity formulate and implement local policy), (ii) administrative (distributing authority and financial resources for planning, managing and financing certain public functions), (iii) fiscal (where locals are allowed to collect their own revenue, borrow or organise self-financing or cost recovery projects), and (iv) economic (allowing local government to perform privatisation and deregulation, or enter the commercial market through their local enterprises) (World Bank, 2001).

To exercise this broad authority, the regional governments were allowed to issue Regional or Local Regulations (P*eraturan Daerah/Perda),* to prepare the local budgets (were allowed to collect local taxes, spend budgets, find additional sources of financing from loans or selling local assets), and to implement their policies without intervention from central government. Local governments were given the authority to conduct all functions except for seven strategic functions, namely, foreign affairs, police and defence, justice, fiscal and monetary functions and religious affairs. All other functions, including education, public works, health, tourism and mining, were decentralised to regional governments. The transfer of functions was followed by transfer of resources. All line ministries' local offices (*kanwil* and *kandep*) were dismissed, while assets and employees were

transferred to local government's *dinas.* It was known as *bedol desa* or lock, stock and barrel transfer. Hofman and Kaiser (2004) revealed some statistics during what they termed as 'the big bang period of Indonesian decentralisation'. In terms of apparatus, 75% or almost 2 million *PNS Pusat* (central government officials) were transferred to the regions based on their original administrative areas (*kanwil* to provinces and *kandep* to districts and municipalities). At the same time, 239 *kanwil* and 3,933 *kandep* (offices and all other assets) were also transferred, and a further 16,000 local facilities, including schools and hospitals, were handed over to the regional governments. In the national budget, allocation of regional funding also jumped significantly from 15% to 30%.

The transfer was considered mostly smooth with some hiccups at the local level since the local governments struggled to accommodate the former central government staff, particularly those who were high ranking. Many of them were placed in local government owned companies, such as PDAMs, which made those particular local companies have a more centralistic than local focus, and those officials made strong connections with central government officials. To some extent, it brought advantages when they could lobby the Jakarta officials during the national budget preparation process and successfully obtain funding for their projects. However, this meant that the allocation of funding for local projects was not fairly distributed to all local governments. In addition, bribery was prolific in the process since to get more money from the national budget, they had to give more money to the officials as well.

Proliferation of local government became a colossal phenomenon. In 1998, prior to the decentralisation laws, there were only 319 regional governments outside Jakarta, comprising 26 provinces, 234 districts and 59 municipalities (Source: Directorate General of Regional Autonomy, Ministry of Home Affairs). Between 1999 and 2013, 190 new regional governments were established (8 provinces, 178 districts and 4 cities), as shown in the table below:

Table 17: New local governments established after decentralization (diagram developed by author)

Year	Provinces	Districts	Cities
Before 1999	26	234	59
1999	1	34	9
2000	3	-	-
2001	-	-	12
2002	1	33	4
2003	1	47	2
2004	1	-	-
2005	-	-	-
2006	-	-	-
2007	-	21	4
2008	-	27	3
2009	-	2	-
2012	1	4	-
2013	-	10	-
Total new governments	8	178	34
Grand Total	34	412	93

In 2004, the government enacted two new laws as the new legal basis for managing deecntralisation. Law 22/1999 was revised by Law 32 / 2004 about Regional Government, and Law 25 / 1999 was replaced by Law 33 / 2004 about Fiscal Balance between Central and Regional Governments.

5.4 Structuring the wicked problem

5.4.1 The 'What's the problem represented to be' approach

As explained in Chapter 3, part 3.7.5 Policy Analysis, Carol Bacchi's 'What's the problem represented to be' (WPR) approach can be applied by service providers, in order to structure a problem. The table below will try to answer the six guiding questions of WPR analyse the problem.

Table 18: WPR analysis of water provision in Nauli (diagram developed by author)

Q1	What is the problem represented to be?	There is no coordination between governments and water companies in providing drinking water. The central, provincial and local governments are competing to sell water, rather than provide water, to the people.
Q2	What presuppositions or assumptions underlie this representation of the problem?	Water provision is a government obligation as mandated by the Constitution. Currently, the regulations allow overlapping functions between governments in conducting water provision, and national versus local water policies are not aligned.
Q3	How does this representation of the problem come about?	The problem emerged because the implementation of decentralisation was not followed by clear division of functions between the three levels of government. The subdistrict of Nauli became an autonomous city government which made the authority of water provision in Nauli City unclear.
Q4	What is left problematic in this problem representation? Where are the silences? Can the problem be thought about differently?	Water provision in Nauli City has been seen from governmental function (programs and projects) and economic (profit making and cost recovery) points of view. Other aspects such as social justice, health and the environment have been ignored and left problematic.
Q5	What effects are produced by this representation of the problem?	A policy will not be able to satisfy all groups of people, but it is best if the policy can cover more interests of most people. Replacing or making adjustment to current policy will give advantages and also disadvantages depending on which points of view, but it is desired that it can relieve the burdens of marginal people that have been the affected people for so long.
Q6	How/where has this representation of the problem been produced, disseminated and defended? How has it been (or could it be) questioned, disrupted and replaced?	We will answer this question after we find the result of this policy analysis. The new model will be questioned from different points of view from various stakeholders.

5.4.2 Mapping the Problem

The answers to the six WPR approach questions are very useful as guidance to better observe the problem. In the previous chapters, the researcher has mentioned that water management in Nauli City can be regarded as a wicked problem. Russell Ackoff used another term to explain this kind of situation: a mess (Ackoff 1974). According to Ackoff, messes are different from difficulties

because messes have many interlocking aspects and cannot be solved, while a difficulty is a simple problem and is only a small part of a mess. Solution for a difficulty is easier to find, however it is almost impossible to scrutinise an answer for a mess as it is very and involving multiple crossing lines (Reynolds & Holwell 2010). If we can scrutinise the mess into small parts of difficulty, then a mess is bigger than the sum of those difficulties (adapted from Aristotle's 'a whole is bigger than the sum of its parts'). In terms of public policy area, what decision makers deal with is a mess, not a difficulty.

In order to understand the mess or the wicked problem, mapping is essential. Horn (2001) explains that a problem map is important to describe the cross-boundary casualty map that will show how the situations, events and phenomena are interrelated with one another, as an executive summary of the mess. The wicked problem map can:

1. "Structure the flow of complex discussions
2. Enable decision makers to see causal connections, and find interconnections between sectors and situations;
3. Incorporate perspectives from different stakeholders
4. Maintain the big picture when discussions enter the details
5. Give quick information for newly involved person to catch up.
6. Help members to explain the wicked problem to their colleagues" (Horn & Weber 2007, p. 13).

Furthermore, Horn and Weber described steps to formulise the problem map: First, conduct data collection from documents, interviews and group discussions, and analyse the data. Second, identify problems, situations, and perceptions. From the data collection processes, the conditions that are occurring in the field or in society, and the perceptions of different stakeholders from different points of views can be pictured and put in different boxes. Third, make causal links or connections between boxes. This can be done over and over again, until we find the best arrangement and interconnections between problems.

In this thesis, the wicked problem will be presented and structured in several levels based on their cause and effect. Based on the discussion in Chapter 4, the researcher would like to formulise the wicked problem map of water management in Nauli City as follows:

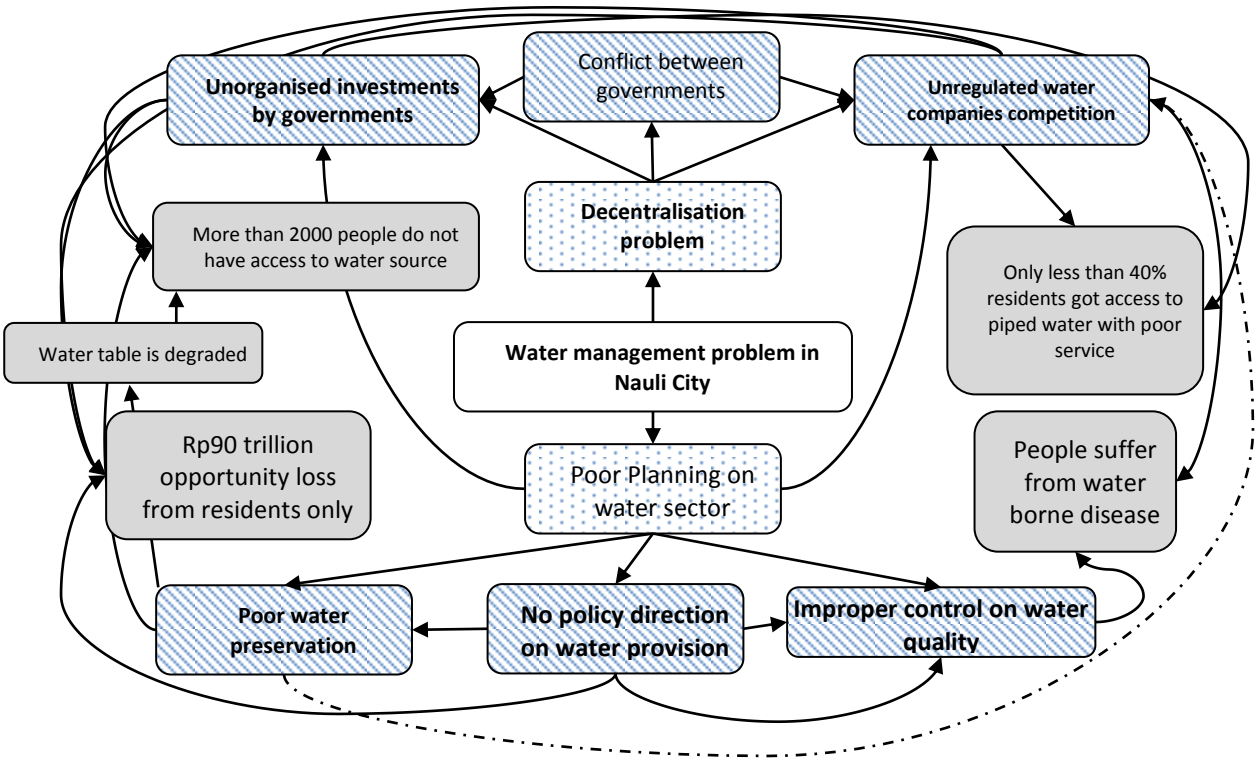


Figure 37: Problem Map (diagram developed by author)

In the map, there are 3 different types of boxes: (i) the shaded boxes which are the effects; (ii) the dot-patterned boxes which are the primary causes; and (iii) the line-patterned boxes which are the secondary causes.

5.4.2.1 Effects: shaded boxes

The shaded boxes are the conditions that occurred as a result of the governments' water provision performance. There are five shaded boxes. First, *more than 2000 people do not have access to safe water*. Poor people in rural areas have to struggle to find sources of water. Some of them have to travel long distances and carry heavy buckets of water home, some source water from small, unprotected rivers where other residents dump domestic waste and bathe, and some people even extract water from a cut banana stem and wait all night to get a small bucket of water. Second, *more than 90 trillion rupiah of opportunity loss from the residents' pockets*. Because of poor service from public water companies or PDAMs in providing sufficient quantity and continuity of water, and lack of coordination in governments' water investment implementation, the residents have to buy water from water merchants and retailers which are very expensive. The people incurred an opportunity loss of about IDR 19 billion per year. This does not include the opportunity loss from overinvestment in underperforming water provision conducted by the governments. Third, *less than 40% of residents had access to piped water with poor service*. Even though there are three public water companies serving the City of Nauli, the coverage is still very low and all three providers

stated that it is nearly impossible to reach the Sustainable Development Goals of 100% coverage by 2019. What makes it worse is the fact that some the residents have two piped water connections (City PDAM and District PDAM or City PDAM and BLUD SPAM) that remain ineffective. Fourth, *people suffer from water borne diseases*. As explained in Chapter 4, eighty three out of a hundred water samples had high coliform index which has caused diarrhoea to be one of the five most common diseases in Nauli City. Furthermore, the TDS (Total Dissolved Solids) index was also very high in more than 20% of the samples, which can increase the risk of arthritis and kidney stones. And fifth, *water table is degraded*. Even though there has not been comprehensive research to find out how much water has been discharged and what is the current level of water table, people have provided anecdotal evidence that the ground water level has decreased significantly compared to what they experienced ten years ago.

5.4.2.2 Primary Causes: dot-patterned boxes

The Primary Causes are the root of the wicked problem from the governments' perspective as one of the stakeholders. Of course there are other stakeholders that need to be taken into account, like the residents and the private sector, however Kaufmann, Kraay and Mastruzzi (2009) defined governance as the institution(s) that exercise the authority or power, and then described six dimensions of governance: (i) voice and accountability, that represent the freedom of citizens to express their minds and participate in selecting the government; (ii) political stability and absence of violence, that represent the unlikeliness of violence to happen in order to destabilise the political condition; (iii) government effectiveness, which represents how effective the government is in providing public services and the quality of making, implementing and committing to policies for public service provision; (iv) regulatory quality, which represents the effectiveness of the government to make and implement policies to encourage the development of the private sector; (v) rule of law, which represents the effectiveness of law enforcement conducted by government officers as well as the members of parliament; (vi) control of corruption, which represents to what extent power has been effectively utilised to prevent officials from making private gain by any means of corruption.

Points (iii) to (v) above represent the work of a government in providing public services with adequate regulations supported by law enforcement. These functions have not worked well and have been the primary cause of the water management problem in Nauli City. The map shows that there are two primary causes that significantly triggered secondary causes, the first of which was the problem of decentralisation. One of the origins of the wicked problem in water management in Nauli City was the proliferation of Nauli subdistrict to Nauli City government. The regulations regarding this matter were not ready to accommodate issues and conflicts, and central and

provincial governments were not capable to mediate the conflicts. Poor planning in the water sector was the second primary cause. As acknowledged by the Nauli City Government Planning Agency, there was no master plan for drinking water management and there are huge gaps in regulation regarding water issues.

5.4.2.3 Secondary Causes: line-patterned boxes

The secondary causes are triggered by the primary causes, and are the causes for the effects. From the first primary cause, which is *insufficient regulation on proliferation*, we can derive secondary causes, which are: (1a) *conflict between governments*, that is conflicts of interest in providing public services between the City Government of Nauli City and the District Government of Nauli City; (1b) *unregulated competition between public water companies*; and (1c) *poorly planned water investment by governments*. The central government has spent a huge amount of money to encourage the development of community-based water management, however, it has not been well organised and well maintained, and the community-based water management has been mistreated and neglected. From the second primary cause which is *the lack of master plan in the water sector*, we can draw three secondary causes: (2a) *no regulation on water merchants*; (2b) *distribution of untreated water*; (2c) *lack of action on water preservation*.

5.4.3 The Primary Causes

5.4.3.1 Decentralisation

Nauli City was established as a new autonomous local government in 1996, three years prior to the implementation of the decentralisation system in 1999. From that time until recently, there were insufficient regulations that dealt with proliferation, especially regarding (i) the period of transition in connection with transfer of assets from the parent to the new local government, and (ii) the division of functions with no clear line to separate decentralised versus deconcentrated functions.

5.4.3.1.1 Transfer of assets

When decentralisation was implemented in 1999, the regional autonomy laws (Law No. 22/2009 and Law No. 25/2009) and its derivative regulations did not explain clearly how parent and new local governments should divide their assets. Government Regulation (GR) No. 129/2000 about Proliferation and Amalgamation of Regional Governments only explained about the procedure of forming or amalgamating a local government, and did not explain further about the process of transition following it. The subsequent transfer of assets, and lending and borrowing from parent to new regional government is regulated by further derivative regulations of the GR, the Ministry of Home Affairs (MoHA) Decree No. 42/2001. However, according to the Indonesian hierarchy of regulations as shown below, a ministerial decree is a technical explanation and should be mandated

by its higher level regulation, the GR. GR No. 129/2000 did not mention anything about transfer of assets and did not mandate a ministerial decree to stipulate further regulation. In this case, MoHA Decree No. 42/2001 explained procedures that had not been mandated by any particular GR and, as such, it did not have a strong legal standing (interview with Head of Sub-directorate of Special Grant [*Dana Alokasi Khusus*], MoF, 5 November 2015).

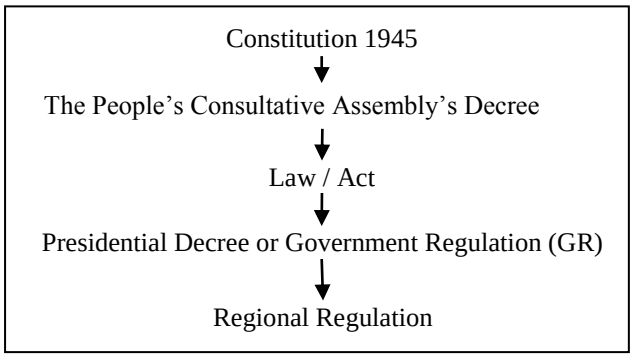


Figure 38: Hierarchy of regulations in Indonesia based on The People's Consultative Assembly Decree No. III/2000, Law No. 10/2004, and Law No. 12/2011

To address this problem, GR No. 78/2007 was implemented to replace GR No. 129/2000. In the new GR, transfer of assets, lending and borrowing are explained in more detail. It stipulates in Article 33 that all assets belonging to the parent government and are located in the new government administrative area should be transferred within one year of the territorial split in line with regulations. It does not mention specifically which regulations that should be referred to, so it may refer to MoHA Decree No. 42/2001. The Decree uses the term *'barang'* (thing/item) rather than *'aset'* (asset) which is used in GR No. 78/2007.

Barang is defined in the MoHA Decree as: (i) immoveable things like land and buildings, and (ii) moveable things like vehicles, heavy equipment and office inventories. The term *barang* has been consistently used in Indonesia's administrative system to represent the government's assets, as then specifically regulated by GR No. 27/2014 about *Pengelolaan Barang Milik Negara/Daerah* (Management of Government Property). In the GR, *barang* is classified based on how, or from where, they were obtained and how to manage them, rather than what they are, and includes the codification of all tangible things belonging to the government.

The term *aset* was introduced in 2005 when Indonesia reformed its financial system and implemented financial reporting through establishing GR No. 24/2005 (about Government System of Accounting, then replaced by GR No. 71/2010). *Aset* is defined in the GR as "all economic resources that belong or occupied by government that are used to get economic and/or social benefit in the future". Included in the classification of assets are current assets, fixed assets, investments,

construction in progress, intangible assets and other assets. The description of *barang* is similar to what is classified as fixed assets and inventories. Investment comprises investment in obligation and ownership in state-owned enterprises, local government-owned enterprises and other private companies. Local government's ownership in PDAM (solely or partly) is reported on its balance sheet as Investment – Ownership in PDAM.

This ownership is not regarded as *'barang'* or 'things' by GR No. 27/2014, but as Separated Resources of Local Government (*Kekayaan Daerah yang Dipisahkan*). This type of asset is excluded by this GR in terms of management, as it is not considered as tangible government property. Consequently, according to this GR, even though PDAM assets from the parent region (like installations, reservoirs and piping systems) may be in the new local government's area, they belong to PDAM as a company instead of the parent government as the ownership, just like its characteristics, has been separated. The Ministry of Finance Decree No. 55/2001 (about the Procedure of Asset Transfer from Central Government to Regional Governments Related to Regional Autonomy) clearly defined government assets as *all barang (assets) that belong to the government and were obtained from national budget financing, excluding the separated assets that are controlled by State Owned Enterprise*.

GR No. 78/2007 does not mention clearly whether this kind of asset should be transferred to the new local government. This lacuna of law has caused confusion at the implementation level, and some former local governments were reluctant to release their ownership of local government companies.

5.4.3.1.2 Decentralisation of authority versus division of functions

Determining the most effective system to achieve optimum structure for establishing vertical units with more local authority is a big issue around the world. As explained by Illner (1999), deconcentration and decentralisation are two different types of methods that have been used to implement this multi-tiered government system (as was briefly explained in Chapter 2). With deconcentration, central authority deconcentrates some of their functions (mainly based on geographical concern) to a local unit without weakening the hierarchical system, and central authority is still the ultimate decision maker. The particular local unit is called a vertical unit (or a branch, in private sector terms). With decentralisation, central government transfers or decentralises its authority to local units, namely local governments. These local authorities can execute their discretion and decision making power without any recourse from higher authorities.

The division of functions between central, provincial and local governments after decentralisation was ambiguous. Law 22/1999 transferred most public service authorities to local government, except for foreign affairs, security and defence, fiscal and monetary, religion, and justice (Article 7). The position of local governments was very strong, while provincial government held three kinds of authority: (i) public service provision across local government jurisdictions or within their jurisdictions only when the local governments did not have the capability to provide those public services; (ii) coordination of the local governments within its administrative area to synchronise all programs and to mediate conflict that may occur between them; (iii) representing central governments (Article 9). The first and second authorities were for provincial government as an autonomous region, and the third authority was given as an administrative region. When Law No. 22/1999 came into practice, transfer of authority from central to provincial and local governments was implemented, and division of functions between central and provincial government as the administrative government was regulated in GR No. 25/2000. There was no further legal product to regulate or synchronise authorities from central to regional (provincial and local) governments as autonomous regions.

In one way or another, the objectives of decentralisation that are to create a sense of place and community, to be more efficient and effective in public service provision, and to be a counterweight to the strong centralistic system (Goldsmith, 1992; Baldersheim et al 1996) that had occurred for more than thirty years, seemed to be attained. As mentioned in the Decentralization Law No 22/1999, other goals of decentralisation, which were to accelerate local democratic growth, economic growth and capacity improvement, were properly implemented by the local governments. On the other hand, it also brought several negative impacts. The Secretary of Directorate General of Fiscal Balance stated that the local leaders looked very surprised to have such big authorities that they never had before, and started to act like small kings (Satyaka 2015, interviewed in Jakarta, 4th November 2015). Decentralisation transferred not only power, but also corrupt behaviour from central to local government officials. Based on research conducted by the World Bank, 2007, from 1999 to 2004 there were 265 corruption cases against local parliaments (DPRD), with 967 members of parliament found guilty. Moreover, dynasty politics, which is entrenched in local government has disturbed local planning and development because staff recruitment was mostly based on nepotism rather than merit. Central and provincial governments had somewhat lost control of local governments, and even the provincial government found it difficult to manage them (World Bank, 2007).

With the intention to stabilise the problems resulting from decentralisation, the central government took extreme action and, in October 2004, Law No. 32/2004 was passed to replace Law No.

22/1999. According to Iwan Butar-butar, a senior analyst of central and regional financing at the Directorate General of Fiscal Balance, Law 32/2004 has recentralised the system (I Butar-butar 2015, interview, 20 December). First, the term 'transfer of authority' (that was used in Law 22/1999) was replaced by 'division of functions'. It meant that the local governments now only held limited authority in managing themselves, in performing government functions and in the law making process. Local governments had to synchronise their public provision planning with the province's planning through a Provincial Planning and Development Annual Meeting (*Musrenbang Provinsi*) before executing them. Before the local governments establish a new law or an annual budget law, they have to be submitted to the provincial government to get endorsement and the governor has the authority to cancel the law.

In order to structure the detailed functions at each level of government, the central government issued GR No. 38/2007 concerning the Division of Functions Across Central, Provincial and Local Government, which distributed 31 functions and sub-functions to three levels of government according to their capacity. In the drinking water sub function (as a part of public works function), the division of functions between the three levels of government are shown as follows:

Table 19: Division of functions between central – provincial and local governments in drinking water sector based on GR 38/2007 (Source: Law 32/2014)

Authority	Central	Provincial	Local
1. Regulating	1.Issuing and stipulating national strategy and policy in drinking water development.	1. Issuing and stipulating provincial regulation in drinking water development across districts and municipalities within the province	1. Issuing and stipulating national strategy and policy in drinking water development in related district or municipality.
	2. Establishing BPP-SPAM (national drinking water system regulatory body).	2. —	2. —
	3. Setting up a central government owned company to conduct drinking water service across provinces.	3. Setting up a provincial government owned company to conduct drinking water service across districts and municipalities.	3. Setting up a local government owned company to conduct drinking water service in related district or municipality.
	4. Establishing norms, standards, procedures and criteria for national drinking water service, including establishing Minimum Service Standards (SPM).	4. Establishing provincial regulation on norms, standards, procedures and criteria for provincial drinking water service, based on national SPM.	4. Establishing provincial regulation on norms, standards, procedures and criteria for local drinking water service, based on provincial and national SPM.
	5. Issuing permits for conducting drinking water service across provinces.	5. Issuing permits for conducting drinking water service across districts and municipalities.	5. Issuing permits for conducting drinking water service in its region.
	6. Establishing the allocation of raw water for the development of drinking water systems.	6. —	6. —
2. Supporting	1. Facilitating negotiation to solve	1. Solving problems across districts	1. Solving problems in its region.

	problems across provinces.	and municipalities in its region.	
	2. Facilitating improvement in managerial and technical capacity in drinking water service nationally.	2. Improving managerial and technical capacity in drinking water service within its region.	2. Improving local managerial and technical capacity in drinking water service, including PDAM.
3. Construction and implementation	1. Facilitating fulfillment of raw water for national drinking water system development.	1. Establishing the need of raw water for drinking water system development in its region.	1. Fulfill the need of raw water for drinking water system development in its region.
	2. —	2. —	2. Developing drinking water systems in its region to meet the minimum standards.
	3. Facilitating technical assistance for national drinking water development system.	3. Facilitating technical assistance of drinking water development system in its region	3. Facilitating technical assistance of drinking water development system to subdistricts, townships administrators, and communities.
	4. Establishing master plan for drinking water development system across provinces.	4. Establishing master plan for drinking water development system across districts and municipalities after coordinating with districts and municipalities.	4. Establishing master plan for drinking water development system in its region.
	5. Provision of drinking water infrastructure for national strategic needs.	5. Providing drinking water for disaster prone and water-scarce regions across districts and municipalities.	5. Providing drinking water for disaster prone and water-scarce areas.

GR No. 38/2007 was the first regulation that clearly divided authorities into three levels of government: central, provincial and local. As shown in the above table, the role of central government was only to establish national standards, policies, strategies, and, to some extent, providing facilitation and support for addressing problems, technical matters and capacity building across provinces. These roles were more or less the same as the provinces' roles, while the main role of conducting the development of drinking water systems to meet minimum standards was assigned to local governments only, with no responsibility for this assigned to central nor provincial governments.

However, in reality, the central government has hundreds of programs within the drinking water sector with an enormous amount of funding, and they are implemented mostly by the Minister of Public Works. A smaller number of programs are managed by other ministries like the Ministry of Energy and Mining, the Ministry of Agriculture and the Ministry of Health.

Deconcentration (*dekonsentrasi*) and co-administration (*tugas pembantuan*) has been used to cover these water projects. By definition, based on Law No. 22/1999, deconcentration is delegation of functions from central government to Governors (heads of provincial government) as representatives of central government in the provinces. However, Law 32/2004 extended the units

that were delegated to execute deconcentration activities into provincial government and central government vertical units, which means the ministries could re-establish their vertical units that had been dismantled by Law 22/1999. Co-administration was not explained clearly in either law. The central government later issued GR No. 7/2008 about Deconcentration and Co-administration. This GR states that co-administration is a form of delegation of functions from central government to provincial and local governments. The what, who and how of deconcentration and co-administration are explained in the below table, based on GR No. 7/2008:

Table 20: Deconcentration and Co-administration based on GR 7/2008

	De-concentration	**Co-administration**
From	Central Government	Central Government
To	Central's vertical unit or Governor as a representative of central government	Provincial and Local governments as autonomous region
What to delegate	Functions that are assigned by regulations as central government's function	Functions that are assigned by regulations as central government's function outside the 6 main central government's functions
Financing	National budget	National budget

Regarding the arrangement of deconcentration and co-administration activities, Iwan Butar-butar said:

> "Since the funding of deconcentration and co-administration is from the national budget, and the preparation of the national budget commences two years in advance, while the activities must comply to a master plan that has been endorsed by the minister of planning within a medium or long term, it is very difficult to synchronise the programs and projects with those of local governments, that makes conflicts or overlaps are inevitable" (I Butar-butar 2015, interview, 20 December).

Meanwhile the head of Nauli District (Bupati[66] of Nauli) complained about these conflicts especially in water sector:

> "We are OK if central or provincial governments establish a national master plan for drinking water development, however it should be communicated with the local governments as we have our own priorities and designs too. Moreover in implementing the plan, central should delegate it to local government because we know how to do it best" (Bupati of Nauli 2015, interview, 10 November).

5.4.3.2 The Second Primary Cause: Poor Planning on water Sector

The United Nations, through the Sustainable Development Goals, mentioned that by 2030 all people must have equitable access to safe and affordable drinking water. The government of

[66] Bupati is the head of district government.

Indonesia translated this goal into its Medium-Term Planning (*Rencana Pembangunan Jangka Menengah*/RPJMN) 2015-2019 as a national priority, known as the '100-0-100' target: to reach 100% access to drinking water provision, to eradicate to 0% of shanty towns, and to reach 100% coverage of sanitation. Particularly for the drinking water target, the Directorate General of Cipta Karya (the Ministry of Public Works) had a grand design and the funds needed to reach the target is IDR 274.8 trillion which will be raised from several sources: national budget, local budget, PDAM, partnerships with private sector, and corporate social responsibility (CSR) (Cipta Karya, 2015). The planning also outlined institutional arrangements and parties to be involved (like PPP, CSR, and community based) and time frames for achieving the target. In short, the central government formulated a plan and are currently at the implementation stage. However, as it needs real involvement from local government and PDAM as the proprietors of water provision in local context, the researcher brought up this issue in interviews with officials in charge, the Bappeda (Planning Agency) of Nauli City. A planning agency is a unit that is responsible to make grand designs for its administrative region, and Bappeda of Nauli City put in its fourth mission: *to give direction to all elements of development in defining their programs* (Bappeda of Nauli City, 2015, interview, 18th November). The researcher wanted to find out from the perspective of the Bappeda, how the conflict can happen and how they will handle it.

> *Question: How does the city of government respond to the central government target 100% in drinking water?*
>
> We have to consent and put it as our target as well. However, there are plenty of water players in this City. We have city PDAM, district PDAM, BLUD SPAM, NGOs, private sectors like water merchants and water stalls, and even the central government do projects in this region. For the city government, the only planning we have is of PDAM. Currently they have about 10% coverage and they are expanding.
>
> *Question: There are plenty of confusions and overlaps occurred in the implementation. Do the other players that you mentioned previously follow your planning in doing their projects?*
>
> No. They just do everything they want without asking us, especially the provincial government and the central government. They do many projects in Nauli City as they said, this is their jurisdiction too.
>
> *Question: You are the planner. Do you have a grand design on water sector? I mean, how can you make sure that all of the players comply or in line with your planning?*
>
> The ideal condition is, we make a grand design and ask the players to follow it. That is what the National Planning Agency do. But I admit that my office has no planning at all. We only rely on the PDAM planning. What we do is, we compile all programs from the other Nauli City departments like Public Works, Health, PDAM, et cetera, and we put them together in a book. So they have their plans for themselves, and we do not know whether or not their plans are overlapping. To be honest, we do not have the capacity to make our own planning even for our internal interest, as our human resources are very limited. The other departments also admitted that their programs frequently intersected one another. For instances, very recently the local Environment Control Department (BPLHD) released the water test of results showing that our water sources were highly contaminated, and it upset the Health Department (Dinkes) as they thought it was their duty. We cannot blame the BPLHD since the Dinkes have never done the tests and did not have any program to protect water sources.

Question: There are conflicts between the district PDAM, the city PDAM, and BLUD SPAM in the piped water industry. What is your opinion as an official planner?

As I said previously, every perpetrator executed their programs and projects. We know that they were overlapping and we saw that road damage had never stopped due to installations and pipes laying along the road by the three companies. However, whenever they hid behind public service reason, we could not do anything to stop them and had to release permit. Again, this is very political and to be honest, we have no plan about it so far.

Question: What do you think is the way out for this situation?

First we should be entrusted by the government to do our job, just like the Bappenas in the National level. Then we should strengthen our organisation in order to rein this 'out of control' situation. And I do not think it can be realised in the next 5 years.

Other departments that are responsible for water management also expressed pessimistic response regarding water sector planning. Nauli City Health Department revealed that they have the laboratory and facilities needed to perform water testing. In the department, water quality monitoring is conducted under the Environment Health Section, an echelon IV unit,[67] The section only consisted of two people: one head of section and one staff member. The head of section was responsible to organise all duties and particularly handled regular DAMIU[68] water assessment, and the staff member dealt with monitoring of other water facilities. They stated that the inspections for all water sources are conducted by PUSKESMAS (*Pusat Kesehatan Masyarakat*/Community Health Centre), while the department provide budgets and compile data from the health centres. However, the department do not give any particular policy direction or prioritisation to PUSKESMAS activities.

In general, we can divide public water sources into two categories: commercial and non-commercial. Commercial water sources are those that owned and sold by water sellers like water companies, water merchants and DAMIU. Non-commercial water sources are those from nature or built and founded by individuals or communities like springs, rivers, dams and wells. For commercial water sources, the department only conducted regular monitoring on DAMIU (even though monitoring was only performed on some DAMIUs as five stalls that the researcher visited revealed that they have never been visited for inspection), and still did not have plans to perform examination on the water quality of water companies and water merchants. For non-commercial water sources, the department did not have criteria on the minimum standard of healthy water sources or how water sources should be built in order to maintain healthiness and avoid contamination. Furthermore, there is no plan, program or budget allocated to build or improve contaminated or unhealthy non-commercial water sources. When the Environmental Control Body (BPLHD) of Nauli City released the 2015 Water Inspection Report and showed that more than 90%

[67] A section or an echelon IV unit is the smallest unit in the department structure.
[68] DAMIU (Depot Air Minum Isi Ulang): the refilled-water stalls

of public water sources in Nauli City were highly contaminated by *e-coli* bacteria and contained very high TDS, the Health Department refuse to make any comment but nor did they refute the report. They said that the BPLHD should not do the examination without having coordination with the unit in charge. When the researcher asked what the Department would do to respond to the report, they said there was no particular plan to treat water sources even though diarrhoea was the fifth most common disease in Nauli City with more than 17,526 cases in 2014.

Regarding the conservation of water, the researcher also had an opportunity to interview the BPLHD (D E Ndapamerang 2015, interview, 20th November). It is interesting to know that the City Government did not have any plans to conserve water sources or prioritise drinking water security, even though the area is very arid with only 120 to 150 rainy days per year. The rivers and springs almost dry out during the dry season, and the population is rapidly increasing as shown in the table and chart below.

Table 21: Population increase and rainfall in Nauli City (BPS 2010-2015)

Year	2010	2011	2012	2013	2014	2015
Population	291,794	336,239	365,348	378,425	380,136	390,877
Rainfall (mm)	1720.7	1925.6	1561.2	1621.15	1579.1	1290.2

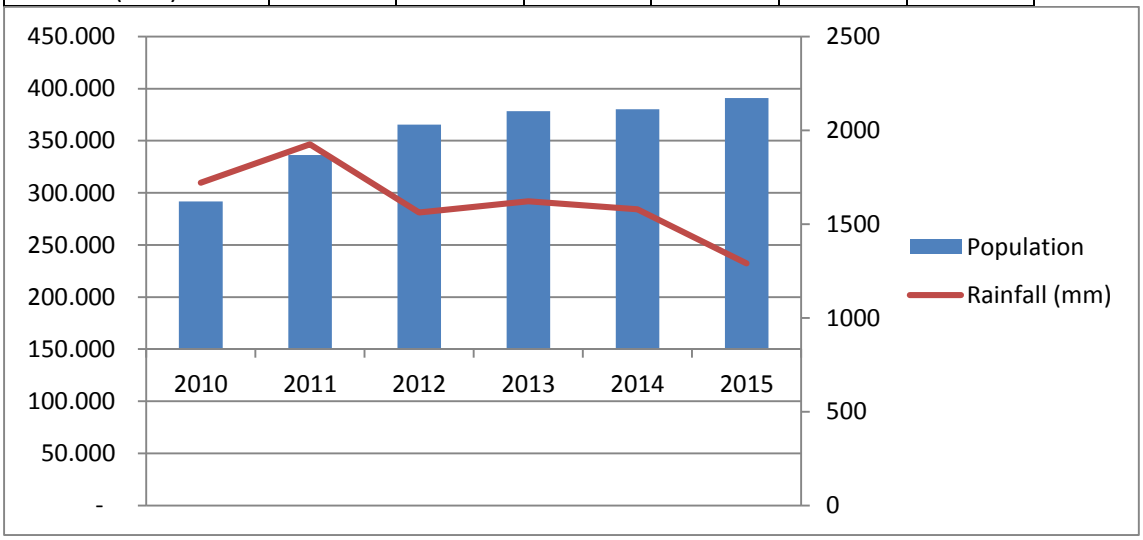


Figure 39: Population increase and rainfall in Nauli City

The BPLHD and the Department of Mining of Nauli City did not have any data on how much water has been discharged by water industries per year and what sort of action must be taken to preserve water for future generations. The Mining Department, which is in charge of ground water withdrawal (as ground water for commercial uses has been considered as a mineral), only dealt with collecting charges from the water industries, and have not yet planned to apply restrictions regarding ground water exploitation.

5.4.4 Secondary Causes

5.4.4.1 Secondary Causes of the First Primary Cause

5.4.4.1.1 Secondary Cause 1.1: Conflict between governments

The Nauli City water conflict is a unique case and does not happen in other parts of Indonesia. Considering the fact that Nauli is not a rich city (per capita income was lowest of all capital cities at IDR 7.3 million in 2013, compared to national rate of IDR 36.5 million), with a population of only 378,425, it is very unusual that there are four levels of government with their own water provision programs. Moreover, there are two PDAMs and one BLUD SPAM operating in this area so it makes seven different entities with their own programs and projects in water provision. However, the result is not very pleasing, as the coverage of piped water connection was only 38.17% in 2013, and 0.04% or about 2000 people did not have access at all to water (BPS 2014). The arid condition of Nauli City with only four months of rainy season has made it worse since Nauli City do not have many water sources like other parts of Indonesia that have water in abundance.

Having seven entities undertaking water activities without proper coordination has made water management in Nauli City become an entangled mess. The researcher interviewed officials from related units of the four governments, two PDAMs, BLUD SPAM, and residents of Nauli City. The result shows that they have different perspectives and interests that are very difficult to correspond. First of all, based on interviews with 80 resident, the researcher highlighted some key points:

a. Question: What are the common methods of getting water in this area? Are they piped water from PDAM, public well/hydrant, ground water, trucked water, or other source? Which one do you prefer to use?

About 53% stated that they connected with both PDAMs as they want to ensure that water flows consistently. The rest of the residents get access to water through public hydrants (12%) and ground water (through private wells) or rivers. These people have tried to connect to PDAM, individually or collectively. Some of them had even paid registration fees but PDAM could not meet their request due to the following reasons: (i) District PDAM is not allowed to add more connections in the city area; (ii) City PDAM customers may have to wait because PDAM does not have a distribution network in that particular area; (iii) for some, it was simply no response from PDAM.

The central government implemented a community-based water management system as an alternative water provision system, however, it did not last long due to poor management system and lack of supervision from the government.

Interestingly, for both residences with or without PDAM water, almost all of the them (more than 90%) bought trucked water from water merchants, especially in the dry season, as PDAM water flowed only for two or three days a week.

b. Question: If you had an opportunity to talk to the Mayor of Bupati, what would you say regarding water provision?

Almost all of the respondents know about the dispute between the City and District governments about the water market in Nauli City. They said, "please stop fighting", "We do not care who or how to provide water, all we need is water", "We are willing to pay and we have the ability to pay, if that is what they want", and "Please make the water accessible and affordable."

Conflict on water provision between district and city governments occurred due to lack of regulation on transfer of assets following the proliferation of Nauli City. Should water provision that has been performed by the district PDAM be transferred to city government? Let us recall the aforementioned regulations about transfer of assets after proliferation of a new local government: GR No. 129/2000 (with its explanatory regulation MoHA Decree No. 42/2001), and its substitute, GR No. 78/2007.

When Nauli City proliferated in 1996, which was prior to decentralisation in 1999, water service was performed by the district PDAM. Following decentralisation, there was no significant change in water provision system in Nauli City. In 2003, the City of Nauli established a technical service unit (*Unit Pelayanan Teknis Daerah/UPTD*) for water service, caused by the need of the city government to have self-dependency in water provision as they could not rely on the district PDAM anymore. By passing Nauli City Law No. 6/2005, the government of Nauli City upgraded the status of the water UPTD to become PDAM of Nauli City, and it was fully operational in 2009. From this point of time, the call for handing over the District PDAM's assets to the City PDAM was emerging. When the new Mayor of Nauli City stepped up, the demand was getting stronger and it turned into conflict between the two governments.

I had opportunities interview some executives involved with the conflict. From the City Government side, I interviewed several people as transcribed below:

a. Head of Department of Public Works (*Kepala Dinas PU*) of Nauli City

> *Question 1: As we know, conflict between governments regarding water provision especially those of PDAM service has been climaxing, and it seems that no way out as meetings and negotiations have been conducted and mediated and they were failed. Can you please explain the reason why it is stuck?*

Well, it is complicated. Most of the reasons are political, power and authority. More than ninety five percent of their customers are located in Nauli City, while only less than 5% are located in the district area. We required them to hand the PDAM over to us but they rejected. Furthermore, the district PDAM does not want to agree or comply with our regulations or terms and conditions that are applied in our administrative area. They said that it is because they belong to the district government. But in fact, they operate in our jurisdictions so they have to obey our rules. For instance, tariff. PDAM tariff is determined by the government as the owner. It applies to all PDAMs in Indonesia. The District Government (*Bupati* and DPRD) determined the water tariff without having consultation or communication with the City Government. We have tried to propose a method of calculating the tariff but they did not consider it at all. They just ignore it. It had happened not only once, but for every Mayor since *Pak*[69] S. K. L, to *Pak* D. A., and today *Pak* J. S.

Question 2: Have you budgeted some funding from the Municipal budget to support the district PDAM? Or perhaps established some regulations that can facilitate the district PDAM operation or lower their cost? As we know, the district PDAM was one of the biggest debtor PDAMs from the central government's lending. Have there been any efforts from the City government to help the district PDAM in fulfilling their obligation?

Actually this is a difficult question. Indeed we have never done that as it belongs to the district government. The loans were as a result of their past failure projects and we do not want to sacrifice our resources for that. Moreover, all of their profit goes to the district government budget and they never pay any sharing to us. That is why we negotiate for a very long time so we can have some profit sharing (as main point) from PDAM so that we can reinvest the profit to support PDAM. We have submitted our proposal of 70:30 profit sharing (70% to city government and 30% to district government) based on its location of business, more than 95% are located in our area. But they rejected. It is a dead lock until now. Lastly, the Mayor has released a decree, prohibiting the district PDAM to add more connections to give the opportunity to the city PDAM to expand its business.

Question 3: What do you think about our constitution that clearly asserts that water should be controlled by the government and should be utilised for the maximum benefit of the people?

Yes, we surely aware of that. However this is the city area and we know the residence's basic needs especially for better access to safe water better than other governments. In conclusion, they should surrender their PDAM's assets to us. Perhaps you should remind them about the constitution as well.

(Head of Department of Public Works (*Kepala Dinas PU*) of Nauli City 2015, interview, 14th December).

b. The Head of Nauli City Local Planning Agency (*Kepala Bappeda*) was interviewed on a separate occasion. He answered the above questions with more or less similar explanations but added another point:

Question 1: …Can you please explain the reason why negotiation is stuck?

The government and the city PDAM have planning in water sector and it is difficult to harmonise our planning with the district's water programs and projects. We have our own prioritization and we have tried to invite them to sit together to discuss about future planning, but they have never accommodated our request. We have so many planning to take into considerations: from the central government, the provincial government, other international donors, NGOs, private companies as part of their Corporate Social Responsibilities (CSR), they all want to do something to fulfil the need of water in the society. We just simply require the district PDAM planning to comply with our planning. That's all. And it is very difficult for them.

[69] *Pak* means mister.

Question 2: …Is there any support given by the City Government towards the district PDAM to help them?

No we did not do that. We are not a rich municipality and even for our programs we still need some help from others. We even invited others to support us to invest their water projects in Nauli City. And why should we spend money to support a company which does not belong to us? Instead, we can use the funding to establish and develop our own company. Perhaps you will ask me 'why don't we buy the district PDAM's assets?' The answer is, 'why should we'? This is government to government, so district government is the parent so they should hand over the assets to us in the first place.

Question 3: …What do you think the relationships of this case and the 1945 Constitution especially article 33?

There are many regulations below the constitution like laws, government regulations, and local government laws. We should comply with all of them. In short, all we need to do is fulfilling the need of the people to safe water, and it will be easier if the City Government take all the responsibility and the authority to manage water provision. Now the provincial government with its BLUD SPAM have been doing water business in Nauli City as well. They said that this is their area so they have the right to do that. They promised us that in the future they will hand over the connections to the city PDAM. But we do not see any indication of it. Everybody is doing business and no one pay attention to the constitution. Yes they invited us to a series of meeting. But coordination is just on the table, not in the implementation.

(The Head of Nauli City Local Planning Agency (*Kepala Bappeda*) 2015, interview, 18th December).

c. The Head of Human Resources and General Affairs Division of Nauli City PDAM did not answer all of the questions one by one, but instead he gave a general opinion:

The PDAM carry out water provision as their main duty as directed by the owner – the City Government - and try to perform their business as a public service company: public service, collecting revenue or profit, and finally support local budget by paying dividend. Well as you know we do not have a specific law to regulate the local-owned companies, so we just act as a normal company. We do not really take significant interest in the conflict between governments, as for a company, competition is natural. We have to survive. But this business is not like other private sector. We do need support from the government as we have to spend huge initial investment and sometimes we have to follow some political interests from the Mayor and the parliament members. As a consequence when they ask us to expand the distribution network to a particular area where the district PDAM has acquired for example, then we need to invest new installations and it needs big money. Otherwise we tell them that it will be easier and much cheaper if we can take over the water networking system, or perhaps make partnerships with the district PDAM. We are aware that water management conflict in Nauli City had affected the relationship between the two governments, however we have good relationships with the district PDAM as we are affiliated in the Perpamsi-NTT (The Association of Water Companies –East Nusa Tenggara Province), and their main director is the chief of the association and our main director is the associate chief.

(The Head of Human Resources and General Affairs Division of Nauli City PDAM 2015, interview, 13th November).

The opinions that are constructed by the city government sides revealed that, without a doubt, they wanted to take over the district PDAM assets, and it can be concluded that they have tried to put

forward negotiations but failed. However, the district government officials' statements show opposing points of view.

a. Bupati Nauli (the Head of Nauli District Government)

Question 1: …Can you please explain the reason why negotiations are stuck?

First of all, we look at the history. When they became an autonomous government, we (the government and the PDAM) were very happy to support water service in the City area. They never asked about us surrendering the PDAM. At that time, the PDAM were nearly bankrupt because it had huge amount of bad debt to the central government. It was about 6 years ago when they started trying to propose to take over the PDAM, when its debt had reached Rp. 30 billion. We said 'take it all, or leave it'. But they refused. They just wanted the business and the assets, not the debt. It is not fair, because it is a company. Time flew, we recovered the PDAM with the help from the central government, overhauled its management, slowly it improved and currently the debt remains less than Rp. 10 billion, last year the PDAM was given an award as the best PDAM in our province in 2013. And I said 'forget about it. As long as I am the Bupati here, it will not happen'. Any company can run its business everywhere. If they want to compete, let us have a fair competition. The governor tried to intervene in the case, but eventually asked us to give it away. If I agree, the parliament and the people will be angry with me. They asked about profit sharing. I said 'OK, we will do 50:50'. They refused, and they want 70% for them and 30% for us. I threw the offer away. There is no point to negotiate with them. Now, the Mayor issued a decree to disallow our PDAM to make more connections in the city area. We are OK but I see it from different angle. He did not care about his people that are in the PDAM coverage but have not got connected yet. The PDAM have to turn down a lot of request because of the selfish decree.

Further question: Is there any coordination between both-sides related departments in order to mix and match your planning and grand design in water service?

Yes, we have series of meeting to discuss about water network, prioritisation, and something like that. But when they told our PDAM to do a plan and if it was not part of the PDAM's planning, they did not provide any funding. Again, the PDAM only do their business and they collect revenue, making profit, and eventually re-invest the profit. They cannot just give orders without giving any support.

Question 2: Do you still put some funding to support PDAM to do its business in Nauli City are?

I told them that they have to be able to survive with their own resources. Their business in Nauli City is already settled so they can use the revenue to cover the cost. And we understand that the company cannot add more customers in the city area. The only option is they have to expand their coverage to the district area or our area, which is not very profitable. For a comparison, the poverty level in our region in 2013 was about 20% while in the city was below 10%. So for example, in the down town the city of Nauli there are 100 or more customers in a township because it is an urban area, while our area is not too populated yet and not all of the people are willing to be PDAM customers. For this purpose especially to set up installation and other fixed cost investments, we inject some funding to the PDAM.

Question 3: Our constitution clearly states that water should be controlled by the government and be utilized for the maximum benefit of the people. What do you think about that?

Exactly. You got the point. Let the company do the business and the government do the social services. The government should more focus on improving infrastructure, public services, and public administration. Rather than setting up a new PDAM and competing with us, I think it is better for them to spend the money to build community based water management, or if they want to withdraw their ego, we can offer them co-ownership on the PDAM.

b. Executive Director of Nauli District PDAM (16th November 2015):

Question: As we know, conflict between the City against the District governments on water management has mounted up and the people are the victim as they cannot have proper water service and have to buy more expensive water from the water merchants. How do you perceive this condition?

It is very political. My duty is to do business in water management. I cannot give opinion about the conflict. However I just want to criticize the policy of the Mayor that prohibit us to add new connection. I do not understand the basis of the decree that allowed the Mayor to restrict our business. Then the provincial government came up with an alternative solution that their BLUD SPAM, who operates big dams in this province that are built by the central government, can take over both PDAMs for a period of time until we can solve the problem. We both rejected the offer, and now the BLUD SPAM connected their pipes to end users. If in a football match, then the referee becomes the third team.
(Executive Director of Nauli District PDAM 2015, interview, 16th November).

5.4.4.1.2 Secondary Cause 1.2: Unregulated competition (conflict) between public water companies

Water provision as a public service in Nauli City is performed by three water companies that are owned by three governments: the City PDAM (owned by the Municipality of Nauli), the District PDAM (owned by the District of Nauli Government), and the BLUD SPAM (owned by the Provincial Government). As indicated by the Problem Map in Figure 37 this situation occurred due to conflict between governments (secondary cause 1.1), insufficient regulation on proliferation and decentralisation of function (the first primary cause), and the lack of master plan in water sector (the second primary cause).

The water market is much different to those of gas, telecommunications and electricity (Klein & Irwin 1996). First of all, the most efficient market for piped water is monopoly, as laying a pipe network needs substantial investment and is the major cost of water provision. Secondly, sellers have to ensure good quality of water since it will directly affect consumers' health. In most poor areas around the world, piped water supply is initiated and performed by government-owned companies or institutions, and initial investment for building water installations and distribution networks are funded by the government budget. However, as the population grows and water business become more profitable, plenty of market mechanisms have been implemented.

Australia has applied different drinking water supply systems across the different states. In Melbourne, for example, water catchment is performed by Melbourne Water, a company owned by the Victorian Government (Melbourne Water, 2017) that is not only responsible for treating water, maintaining ten reservoirs and delivering drinkable water to its customers via three retail water companies, but also must protect the catchments that cover an area of 156,700 hectares including state forests, national parks, rivers, creeks and private land. The three retail companies, City West

Water, Yarra Valley Water and South East Water, are also owned by the Victorian state government and operate in three different areas which do not overlap.

Meanwhile, in South Australia, which is the driest state in the driest inhabited continent on earth, water supply is managed by a state-owned (South Australia State) company, South Australia (SA) Water (SA Water, 2017). This company is responsible for water from catchment until supply to end users. Same as Melbourne Water, SA Water is also responsible for protecting water sources that invlude the River Murray (36%), reservoirs (30%), desalinated sea water (28%) and ground water (6%). The water supply system in South Australia is regulated by the SA Water Industry Act 2012 (Government of South Australia 2012).

The World Bank (2015) explained that water management systems in the Philippines have changed since its independence in 1946, and several regulations (presidential decrees and Republic Acts) have been released to strengthen policies in water management. This country adapted local water management for the first 10 years from independence, and then from 1955 to 1971, water management was controlled nationally by National Waterworks and Sewerage Authority (NAWASA). In 1971, the Philipines Government released Republic Act (RA) 6243 that transformed NAWASA into the Metropolitan Waterworks and Sewerage System (MWSS) that was responsible for water provision in metropolitan Manila, and local governments were given the authority to perform their own water provision. In 1991, through RA 7160, the local governments' roles in water management were strengthened by allowing them finance, operate and maintain their water supply system. RA 8041 about National Water Crisis Act was issued in 1995 and was the legal basis for privatising water provision in metropolitan Manila. In general, every step taken in improving and developing water management systems at national and local levels was supported by national level regulations.

In Indonesia, as explained in part 5.4.3.1., there has been a lack of regulation, especially at Presidential level,[70] that can be used as a legal basis for water management to regulate competition in the piped water industry. The first law of water supply in Indonesia was Law No. 11/1974 which was under a centralistic Suharto administration. In this law, the division of function between different government levels was blurred since local governments were regarded as central government branches, and functions between local governments and central vertical units were overlapping. After decentralisation era 1999, significant adjustments were made to sectoral regulations including the revision of the aforementioned Law 11/1974 to be superseded by Law 7/2004. However, Law 7/2004 was revoked by the Constitutional Court in 2015, as the law was

[70] Chapter 3 explained the hierarchy of law in Indonesia. Only Presidential level decree or regulation will bind local regulations.

regarded to give opportunity to the private sector to commercialise water without any clear restriction. The term 'private sector' refers to companies with majority private ownerships, meaning that PDAM is not categorised as private sector. Indonesia has Law No. 5/1999 about Anti-monopoly and Business Competition, however, this law is meant to regulate the private market and commercial product. In reality, water provision in Indonesia is organised by local governments through their PDAMs and they run as a monopoly.

The Indonesian water management system has not been prepared to face the existence of two or more PDAMs competing for customers in one area like what is happening in Nauli City. Competition between public goods providers is not common in Indonesia, and that is why the government does not regulate this type of competition. Electricity is supplied by a state-owned Power Company, PLN, while national toll roads are managed by the state-owned company, PT Jasa Marga, which monopolises electricity supply and toll road management throughout Indonesia. Oil retail sales was monopolised by PT Pertamina, also state-owned, but since 2004, non-subsidised oil can be marketed by private companies like Shell, Total and Petronas.

The Head of the District of Nauli claimed that a company (including local government-owned or state-owned) can do their business anywhere. For instance, in the financial market, many regional banks (*Bank Daerah*) have been expanding their business nationally and even competing with the private sector. Another example comes from the tourism sector where the Provincial Government of East Borneo opened a hotel in Jakarta and it is operated by their local company.[71] However, none of the examples he mentioned were public services, especially those which have been delegated by regulation regarding the division and distribution of authority and responsibility between central, provincial and local governments.

Based on the experience of delivering public services and managing infrastructure as explained in the previous paragraph, the government wanted to implement the monopoly system on water provision at the local level, where a local government-owned company controlled water delivery as a monopoly. Local public services that are operated by government-owned companies have conventionally operated as a monopoly in fields like water delivery, transportation and traditional markets. However, without comprehensive legal basis, unclear division of jurisdiction on water function to sub national governments (where every level of government has their own discretion over water) has made redundancy at implementation level which has caused the wicked problem.

[71] The Blue Sky Pandurata, Jakarta, is operated by Melati Bhakti Satya Co. which is owned by the Provincial Government of East Borneo.

5.4.4.1.3 Secondary cause 1.3: Unorganised water investment by governments

"Unik, air di Kota Nauli bingung dalam pipa".
Strange, even the water in the pipes in Nauli City is confused. (*Fajar Timor*, 2015)

The above statement explicitly represents the mess around distribution of drinking water investment in Nauli City. There were too many pipe networks laid below the ground without coordination, which is said to make the water confused as to where to flow because some of the networks were disconnected or discontinued. The below pictures show a discontinued network and a disconnected distribution pipe that were found in Nauli City based on information from the residents..

Figure 40: Networks that were discontinued and disconnected (photos by author)

Nauli City Government, which is in charge of water provision as stipulated by regulation, assigned the City PDAM to perform piped water provision in its area. However, the fact that the District PDAM still operates and acquired most areas in the city forced the City PDAM to extend their networks and crisscross below the ground. BLUD SPAM then came into the market and started to lay their own pipes without making interconnections with the other two PDAMs. Most recently, there came the central government with its vertical task unit, PK PAM, that was assigned to perform huge projects which are well beyond the capacity of the organisation.

PK-PAM stands for *Pengembangan Kinerja Pengelolaan Air Minum* (Developing Performance of Drinking Water Management). It is a non-echelon unit, structured as a vertical unit (like a task force), directly responsible to the national Ministry of Public Works. Hence, it acts as, and has the power of, central government. Its duty is to perform the Ministry's projects across the province throughout 20 local government areas with an annual budget of more than IDR 100 billion. A provincial official was appointed to head the unit and is supported by ten staff, two of which have a procurement certificate (a certificate that is released by the government to certify government

officials to conduct a procurement activity). Although its office is small and looks a bit untidy, contractors with luxury cars visited this office everyday, as shown in the picture below.

Figure 41: PK PAM's office (photos by author)

This office executes the central government's drinking water project, including building *broncaptering* (installation to catch water from rivers and springs), reservoirs, transmission pipes, small dams and supporting community-based water projects, with the essential intention to support local governments. The local governments submit proposals to the provincial government to be submitted further to the Ministry of Public Works. The Ministry then prioritises the projects and decides which projects are going to be funded by the national budget. In Kupang City alone, its budget reached IDR 25 million, much higher than the Kupang City water budget of IDR 2 million. The structure is pictured below:

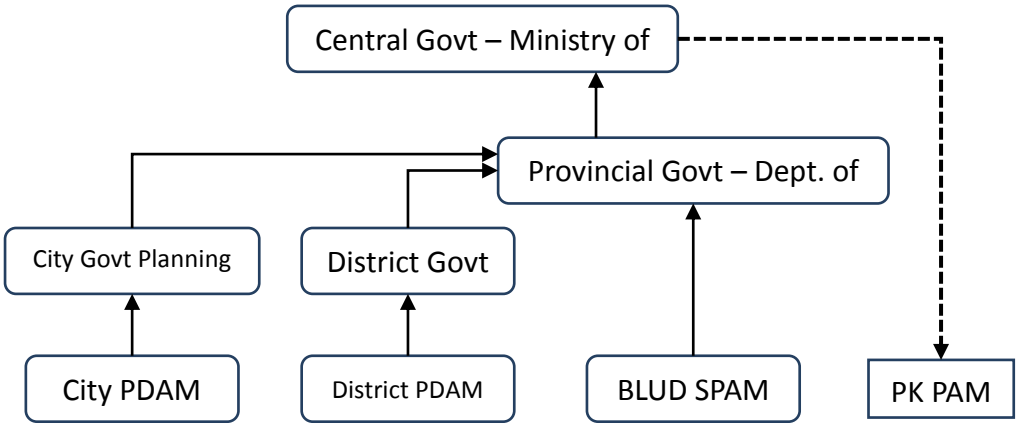


Figure 42: Projects proposal and execution flow (diagram developed by author)

However, the PDAMs felt that the PK-PAM's projects were not well organised. They often objected when the provincial government and PK-PAM supported projects that were not in line with those of the PDAMs and only supported BLUD SPAM's activities which made the conflicts in the piped water competition worse. The District PDAM director revealed that ove the last ten years, PK-PAM and the City Government had spent almost IDR 141 billion to lay pipe networks to

support the City PDAM and BLUD SPAM, which were redundant as they are in the same coverage areas with those of the District PDAM.

Meanwhile, in non-piped water projects, the central government through PK-PAM built water tanks for households and communities, and also supported the establishment of community-based water management, namely PAMSIMAS (Community Based Drinking Water and Sanitation Development Program), which started in 2008 and ended in 2013 as the government began to focus more on rural areas in the province that are not covered by PDAMs. The below table shows the number of PAMSIMAS projects in Nauli City from 2008-2015 and the official PAMSIMAS website stated that all of the projects are fully functional:

Table 22: Number of PAMSIMAS project in Nauli City from 2008-2013 (source: PAMSIMAS)

Year	No. of townships
2008	9
2009	15
2010	11
2011	11
2012	10
2013	10
Total	64

Prior to PAMSIMAS, the central government also implemented P2KP (*Program Penanggulangan Kemiskinan di Perkotaan/* Urban Poverty Eradication Program) which was followed by another similarly focused program, PNPM Mandiri, and community-based water service was part of its agenda. These programs reached hundreds of townships and invested billions of rupiah for building water catchments, local piping networks and pumps.

In the fifteen locations visited by the researcher, the residents revealed that none of the projects were still working due to various reasons. A resident said that only six months after the project was handed over to the community, water stopped flowing and water tanks used to catch rain water were left empty. The below pictures show a non-functional water pump from P2KP, a neglected PNPM community room, a non-functioning PAMSIMAS water system, and an empty and improperly laid pipe that lies in front of a resident's house.

Figure 43: Neglected central government water project infrastructure (photos by author)

Interviews with residents (December 2015) who were assigned to manage the assets revealed that the P2KP, the PNPM and the assets were only functioning for several months after the transfer. Water could not be drawn using the P2KP hand pump, and the community water councils for PNPM and the PAMSIMAS community-based water system were dismissed as the members were in dispute over maintenance costs and also corruption of community money. A resident expressed that:

> We have brought this issue to the local government, and after visiting several offices and tables, the unit in charge said that they were not responsible for the failure. They said that it was the central government's project and they know nothing about it. We have sent letters to the provincial government but still, no response. We have asked the PDAM to take over the infrastructure, but the PDAM refused. (A residence in Nauli City 2015, interview, 13th November).

The City Government and the PDAM said that infrastructure was neglected since there was not proper planning and transfer of assets from central or provincial governments to local authority, and the local budget did not have funding to maintain the projects.

This was explained in an interview with the Head of Public Works Department of Nauli City:

> *Q1. How were the projects planned and implemented?*

The projects started with requests from the central government to propose initiations from the City government, which townships needed the P2KP or PNPM or PAMSIMAS, and Jakarta decided according to the availability of budget. Then Jakarta assigned PK PAM to lead the projects, and we set up a joint team consisted of PK PAM, the Province, the City government, and the communities representatives. The communities performed the projects and they were funded by the government and under the joint team supervision. After completion, the team transfers the assets to the community representatives so they can maintain them.

Q2. I found that none of the assets are functioning. Do the governments (central, provincial or local) ensure that the communities operated and maintained them properly?

As I said, it was led by the central government, and there has been no plan or program to maintain the assets, and we have many other things to do with limited budget. The residents should responsible for ensuring that the water infrastructures were operating properly as it is for their own benefit.

Q3. However the fact is, all of the projects are abandoned and dysfunctional currently. From your point of view as a government official, should the people and the already invested assets be ignored? Shouldn't the government find a new policy to make them work again?

Perhaps this question is better asked to central government, as this is their policy. As I said, it was led by the central government, and there has been no plan or program to maintain the continuity of the activity.

5.4.4.2 Secondary causes

5.4.4.2.1 Secondary Cause 2.1: No planning to control water discharge

Nauli City, as an arid and a water-scarce region, should be aware of the importance of protecting ground water from over-discharging. When it comes to rainy season, rivers in Nauli City are flow abundantly, as shown in pictures below:

Figure 44: Three rivers in Nauli City during rainy season (photos by author)

According to Adoe (2008) plenty of water flows in rivers during the rainy season in Nauli City for two reasons: (i) precipitation up on the hill produces large amounts of water which makes the rivers flow; (ii) runoff from precipitation around the city as there are less permeating areas to absorb water into the ground. Adoe (2008) claims that the second reason is easier to address, since development plans in Nauli City do not aim to preserve the environment by allocating green open spaces to combat runoff.

Both directors of PDAMs admitted that the water discharge rate for all water sources has declined over time. This significant decrease led to suboptimal services from the PDAMs and they have had to suspend water flow to their customers, particularly during dry season. The director of the District PDAM stated:

> For serving our 32.234 connections we rely on 30 water sources, consist of 14 surface waters and 16 ground water pumps. Ideally we need 1200 lt/s water sources capacity, however in realty we only have 550 lt/s. It is because the water sources discharge rate have been decreasing at almost 5% every year, and in total it has been 60% to 80% decrease for the whole time. Rain water is quickly flowing to the rivers and straight to the sea, as we have much less water captivation area due to the massive physical development around the city (Director of Nauli District PDAM 2015, interview, 10th 2015).

The director of the City PDAM revealed that:

> Currently we have slightly less than 10.000 customers and we expect to connect about 2500 new customers for the next 10 years. We have 18 water sources and 16 of them are ground water pumps. They are not efficient because we need to dig at least 40 meters deep and they need expensive daily expenses for electricity. Our water sources capacity reaches 500 lt/s during rainy seasons and fall down to maximum 200 lt/s during dry seasons. With this condition, it means we need hundreds of water pumps for the next 20 years and that will be impossible to do. We need support from central government to build a big dam to meet the need of bulk water (Director of Nauli City PDAM 2015, interview, 13th 2015).

Data gathered from the Department of Mining of Nauli City stated that, as of 2014, there were not less than 6,000 shallow and deep bore wells all over the city, with various depths from 4 m to 70 m, and each well is commonly shared amongst three to four households (Final Report of Research on Ground Water Zoning and Development, 2015). As of December 2014, only 3,100 bore wells had been documented, most of them belonging to residents, and there are 65 larger capacity bore wells that were used by commercial or government institutions like the District PDAM (9 wells), the City PDAM (12 wells), the city harbour (2 wells), the airport (4 wells), Nauli Cement Co. (3 wells), water merchants (12 wells), and others like banks, universities, government offices, and military buildings. Hundreds, or probably thousands, of other wells used by commercial buildings remained undocumented (Dis Amalo 2015, interview, 12th November).

The central government released regulations about discharging ground water for commercial use through several Government Regulations, namely, GR No. 121/2015 and GR No. 43/2008, while the City Government also had Local Act No. 15/2003. Those regulations generally mention that to use the ground water for commercial use, a business entity should fulfil stipulated technical requirements, including (i) type of business, (ii) location, (iii) total amount of water will be discharged, (iv) technique of water discharging, (v) installation design, (vi) report on initial exploration of ground water, (vii) statement of willingness to provide open space for water permeating area. The permit is issued by the relevant government for a three month period but can

be renewed with consideration for the availability of water for the people and the condition of the environment. Furthermore, the business entity should pay ground water tax to the local government at 20% rate of the amount of water discharged.

According to the Head of the Mining Department of Nauli City, law enforcement had not been implemented properly due to limited funding and capacity of human resources. One of the department staff explained that strict inspection only applied to water sources that were utilised by the district PDAM (due to political issue and competition in water distribution with the City PDAM) and big private companies (bottled water companies, cement factories and harbours). Technical reports on ground water discharging had never been produced, providing open space for absorbing water is not followed up, business entities were not compelled to renew their license and illegal commercial bore wells operated without any recourse. As explained in the previous sections, people in power (parliaments, military, police, and executive officials) are behind this illegal water business that makes them ignore the rule of law. As a result, the affected people will suffer the most since access to safe and reliable water becomes more difficult.

5.4.4.2.2 Secondary Cause 2.2: Improper planning to manage the water market

The notion of water being a public good is no longer relevant. Moreover, the constitutional mandate that water should be controlled by the government and be provided for the maximum benefit of the people has been ignored. The unregulated water market is allowing perpetrators to enter into business, commodification of water happens without any hesitation and, in the future, water will be the cause of war between nations (Shiva 2002). On a much smaller scale, war on water has happened in Nauli City in the form of competition between government versus government, public versus private sectors, and public needs versus profit orientation.

As already explained in Chapter 4, the commodification of water has happened widely in Indonesia where the national government encourages local government and water companies to charge full cost recovery water tariff to the people. On the other hand, water subsidy from the local budget was not persuaded that made water price climbing up to match all costs.

Competition should have made customers better off. However, competition between governments and between PDAMs is more likely to be about political conflict rather than business competition as local leaders are quarrelling about their legal authority (who should do what, where and how). Meanwhile, the companies (PDAMs) do not have incentive to improve services since they depend on political decisions and water tariffs are determined by the government.

Intense conflict between PDAMs has spurred water merchants to enter the market and collect huge profit since they are only extracting ground water and delivering it to their customers. Regulations have been issued to manage this business, however, the government has never put significant effort into enforcing the regulations and tax from this market has never been imposed or calculated properly.

The mess in the Nauli City water market happened mainly because the City Government did not have any master plan or policy direction on water provision, and departments of Nauli City Government work individually without good coordination. The below table shows Nauli City departments that are dealing with water provision with their duties and responsibilities:

Table 23: Nauli City departments and their water provision related duties (diagram developed by author)

Department of Public Works	Build water and sanitation infrastructure
Department of Mining	- Control and maintain the condition of surface and ground water - Issue licenses for using surface water and ground water mining
Department of Trade and Industry	Issue licenses for water trading
Department of Health	Protect water sources
Financial Department	- Collect tax from water businesses - Allocate budget for water projects
Environmental Body	Protect the environment including surface and ground water sources

It is very obvious that there are plenty of interconnections between these departments' duties that make good coordination necessary. However, in separate interviews, the researcher found that these departments performed their roles without considering any potential relationships or links between the organisations.

Secondary Cause 2.3: Lack of planning to control water quality

The quality of water distributed to and consumed by the people is questionable (D E Ndapamerang 2015, interview, 20th November). Lack of planning to maintain quality of water followed by tokenistic law enforcement made water sellers reluctant to spend money on water treatment. There are two local institutions that are dealing with ensuring good water quality for domestic consumption: local Health Department and Environmental Control Body. Both institutions are equipped with laboratories and budgets to test water samples, however, only the Health Department has the budget for buying chemicals needed to test the water sources. The Health Department

supervises ten community health centres or PUSKESMAS[72] around the city to collect samples from the community water sources. Based on the 2015 water source inspection report produced by PUSKESMAS (tests conducted from January to December), 84.9% of 1,137 samples met the healthy water standards set by the Ministry of Health regulation. However, this report contradicted that of the local Environmental Body, which stated that from 100 samples, 100% of them were highly contaminated by E.coli bacteria, and that 20% of samples contained very high Total Dissolved Solid (TDS).

Commercial water agents (PDAMs, BLUD SPAM, water merchants and DAMIU) are obliged to ensure that their product meets healthy standards. However, inspections were only performed on PDAM and BLUD SPAM water, while water merchants and DAMIUs were left uninspected. The local Planning Agency official stated that the Planning Agency, who should act as a coordinator for all government functions (including water quality supervision), had never released clear policy design regarding this matter, including how to apply sanctions to water sellers.

5.5 The resident's perception on water provision

The kind of conflict surrounding water provision in Nauli City is unique in Indonesia, and perhaps in the world. Normally, there is only one public water company providing piped water to the population or, whenever there is more than one company, they divide their service zones and are strictly regulated by the government like in Melbourne, Australia, and Manila in The Philippines (World Bank 2005). However, in Nauli City, the water companies operate in the same area, using the same water sources. Unlike what happens in Melbourne and Manila where there is no competition between water companies, in Nauli City the water companies are competing to connect their pipes to the residents' homes, regardless of whether or not the residents already have piped water connection.

Neoliberal theorists argue that competition will make consumers better off, as price will be competitive or the quality of products/services will be improved. This research attempts to find out whether the competition between water companies has indeed brought significant improvement to water provision. The hypotheses are as follows:

H_0 : Current Condition = Condition 10 years ago

H_1 : Current Condition ≠ Condition 10 years ago

[72] Puskesmas (Community Health Centre) is a government health institution at sub-district level, with the main purpose of developing community participation in creating healthy environment, healthy lifestyle, and providing basic medical treatment.

Questionnaires were administered to 75 residents who have been connected with piped water service for at least ten years and are located in four of the six sub-districts in Nauli City. Questions are grouped based on three main categories: technical aspects, administrative aspects and customer satisfaction, as shown in the table below. The full questionnaire is provided in the appendix to this thesis.

Table 24: Number of questions in the questionnaire

	Condition 10 years ago (Before)	Current Condition (After)
Technical aspects (11 questions)	**BTTotal**	**ATTotal**
Administrative aspects (8 questions)	**BATotal**	**AATotal**
Customer Satisfaction (7 questions)	**BSTotal**	**ASTotal**

Technical aspects were addressed through asking the residents about how the company or companies provide their technical services like frequency of water flow, water quality, water pressure and the need for other sources of water. Administrative aspects questions are about how the company/companies treats the customers like complaints procedure, payment method and tariff. Customer satisfaction questions asked how the residents rate the overall performance of the water company/companies based on the two other aspects. Technical and administrative questions used a three-point Likert scale (Yes, Sometimes, No); while Customer satisfaction questions used a four-point Likert scale (Very Satisfied, Satisfied, Disappointed and Very Disappointed). The questionnaire aimed to find out whether there have been significant improvements in the three aspects of water provision in Nauli City.

Before performing the hypothesis test, the normality test was undertaken on the three sets of data through SPSS. The data show that none of them are normally distributed at a confidence level of 95%, shown by the 'Sig.' values of less than 0.05, as follows:

Table 25: Normality test

Tests of Normality

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
BTTOTAL	.147	75	.000	.960	75	.018
BATOTAL	.182	75	.000	.901	75	.000
BSTOTAL	.168	75	.000	.926	75	.000
ATTotal	.157	75	.000	.951	75	.006
AATotal	.161	75	.000	.901	75	.000
ASTotal	.200	75	.000	.889	75	.000

Since the data are not normal, a non-parametric test was performed. The Wilcoxon Signed Ranks will be used (Rey & Neuhäuser 2011) with confidence level 95%. Through SPSS, the results are as follows:

Table 26: Descriptive statistics

	N	Mean	Std. Deviation	Minimum	Maximum
BTTOTAL	75	24.2400	2.87975	19.00	32.00
BATOTAL	75	16.5333	2.32107	13.00	21.00
BSTOTAL	75	18.5467	3.40625	13.00	26.00
ATTotal	75	23.3733	3.15703	18.00	31.00
AATotal	75	15.7467	3.07603	12.00	22.00
ASTotal	75	17.4000	3.54889	13.00	26.00

Table 27: Ranks

		N	Mean Rank	Sum of Ranks
ATTotal - BTTOTAL	Negative Ranks	41[a]	21.00	861.00
	Positive Ranks	4[b]	43.50	174.00
	Ties	30[c]		
	Total	75		
AATotal - BATOTAL	Negative Ranks	41[d]	36.71	1505.00
	Positive Ranks	25[e]	28.24	706.00
	Ties	9[f]		
	Total	75		
ASTotal - BSTOTAL	Negative Ranks	35[g]	22.89	801.00
	Positive Ranks	8[h]	18.13	145.00
	Ties	32[i]		
	Total	75		

a. ATTotal < BTTOTAL	e. AATotal > BATOTAL
b. ATTotal > BTTOTAL	f. AATotal = BATOTAL
c. ATTotal = BTTOTAL	g. ASTotal < BSTOTAL
d. AATotal < BATOTAL	h. ASTotal > BSTOTAL
	i. ASTotal = BSTOTAL

Table 28: Test statistics

	ATTotal - BTTOTAL	AATotal - BATOTAL	ASTotal – BSTOTAL
Z	-3.924[b]	-2.614[b]	-3.994[b]
Asymp. Sig. (2-tailed)	.000	.009	.000

a. Wilcoxon Signed Ranks Test
b. Based on positive ranks.

Table 26 shows the means of each set of data. It appears that all 'after condition' means (AT, AA, and AS) are lower than all 'before condition' means (BT, BA, and BS). It means that the residents, on average, tend to give higher values for all aspects ten years ago compared to the current condition. This fact is confirmed by figures shown in Table 27. Negative ranks mean that 'after

condition' is lower than 'before condition', positive ranks means 'after' is higher than 'before', and ties mean they have similar value. For technical aspects (ATTotal-BTTotal), 41 people are in negative ranks meaning that they feel the condition ten years ago was better than the current condition, 30 people are in ties, while only eight people felt that now is better than before, which means that only 8 out of 75 respondents felt that the current condition is more satisfactory than that of ten years ago.

For administrative aspects (AATotal-BATotal), 41 people are in negative ranks, 5 people in ties, and 25 people positive. If we combine negative and ties, then we can say that only a third of the samples felt that the current condition is better. For overall customer satisfaction (ASTotal-BSTotal), 35 people are in negative ranks, 32 people in ties, and only eight people are in positive ranks.

Table 26 and 27 indicate that current condition is different to the condition of ten years ago. To know whether the difference is significant, we take a look at Table 28 that shows that the significance (Sig) value for technical aspects is 0.000, administrative aspects is 0.009, and satisfaction is 0.000. It means that with a level of confidence of 95%, all aspects of the current condition are significantly different to those of ten years ago. Thus, we reject the null hypothesis and accept the alternative hypothesis.

Combining Tables 26, 27, and 28, it can be interpreted that the conditions are significantly different, however, it is in a negative manner which means that the current condition is significantly worse than that of ten years ago. This can be proven by the fact that total water sold in 2005 was higher than 2015, while the number of customers increased significantly, as shown in the below table:

Table 29: Total water sold compared to population in 2005 and 2015

	2005[a]	2015[b]
City Population (people)	265,050	390,887
Number of customer (unit)	24,381	40,784
Total water sold	7,398,864	7,001,737
[a]: one company (the district PDAM) (BPS, 2006) [b]: three companies (data from interviews with water companies' staff)		

In 2005, assuming that water was distributed evenly to every connection, each connection could enjoy 303.5m^3 per year or 831 litres per day. However, in 2015, each connection could only get 172m^3 per year or 470 litres per day. These figures briefly explain how piped-water could not meet

the needs of the customers in terms of the quantity provided. It is very clear that if the PDAMs need to expand their coverage, then the water will not be enough to be distributed.

CHAPTER 6. WHAT OUGHT TO BE DONE? (POLICY ANALYSIS OF WATER MANAGEMENT)

6.1 Introduction

The previous chapter explored the wicked problem of water management in relation to social justice and ended with structuring the problem through a problem map. This chapter will strive to address the problem with a policy analysis to answer the fourth research question: How can water supply in Nauli City be managed in a better way and what ought to be done? As explained in Chapter 3, policy analysis in this thesis will be performed in five stages:

Stage 1: Identifying and structuring the problem

Stage 2: Clarify Goals and determine measurement system

Stage 3: Determine the 'What Next" strategies

Stage 4: Policy arrangement

Stage 1 has been analysed in Chapter 5 through the WPR approach, the Problem Map, and by capturing the residents' perspectives. This chapter will continue the policy analysis from Stage 2 to 4 and conclude with policy recommendations.

6.2 Stage 2: Setting up goals and measurement system

6.2.1 International Goals

In a global context, the United Nations have placed water accessibility as one of its big concerns and, in September 2000, 189 member countries ratified the Millennium Development Goals which included a target to halve the proportion of people without access to safe drinking water by 2015. The WHO reported that the target for drinking water accessibility was achieved successfully, as evidenced by the following data:

Table 30: Population with an improved drinking water source, 1990 and 2015

Source: WHO Main report - Progress on Drinking Water, Sanitation and Hygiene 2017

Region	1990	2015
Developed	98%	99%
Developing	70%	89%
World	76%	91%
	2.3 billion people	4.2 billion people

If we look further into the MDGs, the whole program strived to improve the financial and social condition of the people while balancing environmental sustainability.

Table 31: Millennium Development Goals
(Source: United Nations Official website, 2014)

Goal 1	Eradicate extreme poverty and hunger
Goal 2	Achieve universal primary education
Goal 3	Promote gender equality and empower women
Goal 4	Reduce child mortality
Goal 5	Improve maternal health
Goal 6	Combat HIV/Aids, malaria and other diseases
Goal 7	Ensure environmental sustainability
Goal 8	Develop a global partnership for development

The United Nations declared the Sustainable Development Goals (SDGs) to continue the spirit of the MDGs. This agenda attempted to renew the global political commitment to encourage sustainable development for all members. The Brundtland Report (1987), known as *Our Common Future*, defined Sustainable development as:

> "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:
>
> - the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
> - the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs" (Bruntland & World Commission on Environment and Development 1987).

In general, the agenda focuses on three pillars of sustainable development: economic growth, social improvement and environmental protection (Rio+20 UN Conference on Sustainable Development). While most of the MDGs stipulate a target to improve (eradicate or minimise) the related issues by half of the proportion within a time range of 1990 to 2015, the SDGs aim for entire elimination or achievement around 17 issues, as shown in the picture below.

Figure 45: The Sustainable Development Goals (Source: UNDP 2015)

The SDGs were ratified on 25 September 2015 by 193 countries at the United Nations headquarters, and include 169 targets to achieve and 304 indicators to observe. The SDGs are universal, and inclusive of all countries and people (UNDP 2015).

As a start for setting goals for drinking water management in Indonesia, especially in Nauli City, it is important to look deeper into the SDG Goal 6: "Ensure availability and sustainable management of water and sanitation for all" (unstats.un.org, 2016) and its targets and indicators as indicated in the table below:

Table 32: The SDGs Goal 6: Targets and indicators
Source: UNDP Turkiye

	Targets		Indicators
6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1	Proportion of population using safely managed drinking water services
6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1 6.3.2	Proportion of wastewater safely treated Proportion of bodies of water with good ambient water quality
6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 6.4.2	Change in water-use efficiency over time Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1 6.5.2	Degree of integrated water resources management implementation (0-100) Proportion of transboundary basin area with an operational arrangement for water cooperation
6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1	Change in the extent of water-related ecosystems over time
6.A	By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.A.1	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan
6.B	Support and strengthen the participation of local communities in improving water and sanitation management	6.B.1	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

These targets correspond to the three sustainability pillars: social (6.1 and 6.2); environment (6.3, 6.5, 6.6), and economic (6.4, 6.A, and 6.B). Countries, including Indonesia, which have agreed on these targets and indicators, have to adopt them in their national planning.

6.2.2 National Goals: 100% coverage by 2019

The Indonesian Constitution (1945) explicitly mandated that government should have full control over water and use it for people's welfare. The central government, under President Joko Widodo (elected in 2014), translated this mandate into its 2015-2019 Medium-Term Planning (RPJMN 2015-2019). In the RPJMN, one of the six main national development targets (target no. 3) is Priority Sector, which consists of three main objectives:

Table 33: Three Agendas of water development in RPJMN

1. Supply side	Optimising current infrastructure and building new infrastructure;
2. Demand side	Increasing efficiency in water usage
3. Enabling environment	Creating conducive environment for water development

From the supply side, the government set indicators and targets in relation to water development that need to be achieved by 2019, as shown in the table below:

Table 34: Water indicators and targets
Source: RPJMN 2019

	Indicators	Baseline 2014	Target 2019
1.	Water Security		
a.	National bulk water capacity	51.44 m^3/s	118.6 m^3/s
b.	Number of Dams	21	49
2.	Basic Infrastructure and connectivity		
…			
f.	Safe drinking water access	70%	100%
g.	Safe sanitation	60.9%	100%
3.	Basic service for low income people		
…			
b.	Drinking water access	55.7%	100%
c.	Safe sanitation	20.24%	100%

From the demand side, the government encouraged a change of attitude towards water use for all citizens, based on four slogans (Pamsimas, 2014):

a. *Protect water (Jaga air)*: to improve the residents' awareness to protect the hygiene and the sustainability of water sources.
b. *Store water (Simpan air)*: encourage people to build storage for rainwater harvesting that can be used for secondary usage (household scale), or to provide water absorption areas (community scale).
c. *Efficient use (hemat air)*: encourage people to value every drop of the water, and also develop a new system to minimise water loss in PDAMs.

Enabling environment as the third objective can be achieved by establishing a master plan on water development across local governments. The Local Policy and Strategy of Drinking Water Provision System (Jakstrada SPAM) and the Master Plan of Drinking Water Provision System (RISPAM) will be translated into annual planning, will improve data systems on water provision to be the basis of planning and allocation of funding, and will provide or improve relevant regulations needed to support the programs.

In terms of finance, the RPJMN also recommended Public Private Partnerships (PPP) as a development approach. PPP can be employed in order to increase the role of private institutions and the community in water development.

6.2.3 Local Goals: 100% of residents have access to good water

RPJMN emphasised that all local governments have to have their own Jakstrada SPAM (*Kebijakan dan Strategi Daerah atas Penyelenggaraan SPAM*/Local Policy and Strategy for Water Provision) and RISPAM (*Rencana Induk Sistem Penyediaan Air Minum*/Master Plan for Water Provision). These two local level documents are regarded as master plans for drinking water provision systems. The government of Nauli City, through its Department of Public Works, revealed that they do not have Jakstrada SPAM, but they have prepared the RISPAM via a private consultant. The head of department mentioned that the RISPAM is used as the foundation for water management planning in Nauli City (Sain 2015, interview, 13th November).

The RISPAM provides some data about existing conditions, especially the city water provision that is conducted by the District PDAM. However, it does not have any information about the City PDAM, the BLUD SPAM and other water providers. The RISPAM also made the projection that in 2019, water coverage will be 70% and in 2030 it will reach 100%, but it did not give any information about how this will be achieved, who the providers will be, what institutional arrangements will be made and what sort of financing will be sought. When I tried to clarify points about the RISPAM with the head of the department, he answered:

> The document was prepared by a consultant that was appointed with an open procurement system. Yes I admit that the RISPAM is far from perfect, and even very lack of information, I have also briefly read it, but nothing we can do as the consultant company was proposed by one of the parliament members who has a closed connection with the Mayor. We have sent the RISPAM to Jakarta because it is a compulsory document and as a pre-requisite for some funding from the Ministry of Public Works. To be honest, perhaps we will never use that document for our planning (Sain 2015, interview, 13th November).

As mentioned in Chapter 5, the Planning Agency (Bappeda) also did not have a master plan or grand design about water management in Nauli City and left it completely to the City PDAM which found it difficult to make a master plan due to the complex water management conflict between the governments. In order to expand its business, the City was trying not to enter the District PDAM coverage area to avoid the construction of overlapping pipe networks.

Government planning can potentially adopt two models: the SDGs (to achieve 100% coverage by 2030), or the RPJMN (reaching 100% in 2019). If we compare the existing condition of Nauli City against national coverage (as at 2015), then 2030 is a more sensible target than 2019.

Table 35: Comparison of national and local targets

	Existing (2015)	Target
National	70%	100% in 2019
Nauli City	48.22%	100% in 2030

The 48.22% coverage of piped water service in Nauli City is organised by three water companies: PDAM of Nauli City (10.22%), PDAM of Nauli District (38%), and BLUD SPAM (unknown as it was starting to connect pipes to end users). To accelerate the achievement of the main target, the government should utilise not only piped water service, but also non-piped access by developing and encouraging community-based water management. As shown in Chapter 5, there were 64 townships that received central government assistance in the form of PAMSIMAS (community based water management), while hundreds of poor communities got P2KP and PNPM Mandiri projects for water infrastructure. The next challenge is how to change the decision makers' mindsets to think critically about the desperate need for improvement in water provision. Moreover, it is important to establish a system that can bring together those aforementioned institutions and programs under a master plan for water management in this particular area.

According to Kusek and Rist (2004), it is important to distinguish between goals, outcomes and targets. A goal is long-term objective, normally over more than ten years; and outcome is for medium-term objectives between five and ten years; and a target is for shorter term objectives between one and three years. In this case, 100% coverage which applies to accessibility, quantity,

quality and continuity of water service, can be set as a goal or outcome. For targets, more technical issues related to governance, demand management and the environment should be addressed properly.

6.3 Stage 3: Determine the 'What Next" strategies

It is urgent that Nauli City government formulates a master plan for drinking water management that will integrate various water provision alternatives and consider all relevant aspects. These strategies should then be included in the main targets which should be formulated and implemented within the three years.

> Social boundaries need to be drawn based on expanding pragmatism from narrow competition to considering the consequences for others and future generations of life. (McIntyre-Mills 2014a).

McIntyre-Mills (2014) stressed that the elected government should realise its obligation to serve the people and to protect the environment on which we depend in the interests of future generations (p. 9).

Recalling the problem mapping in Chapter 5, the impact of the wicked problem can be categorised into effects, primary causes and secondary causes as follows:

The effect	1. more than 2000 people do not have access to safe water 2. More than 90 trillion rupiahs opportunity loss from the residents pocket 3. Poor water provision: only less than 40% of residents got access to piped water with poor service 4. people suffer from water borne diseases 5. water table is degraded
The Primary Causes	1) Decentralization problem. 2) Poor Planning in water sector
Secondary Causes	(1-i) Conflict between governments (1-ii) Unregulated competition between public water companies (1-iii) Unorganised water investment by governments (2-i) No regulation on water merchants (2-ii) Untreated water distribution (2-iii) Ignorance to water preservation

The findings show the wicked problem of Nauli City water management can be basically rooted into three main issues: demand management (social), governance, and environmental, as pictured in the below figure:

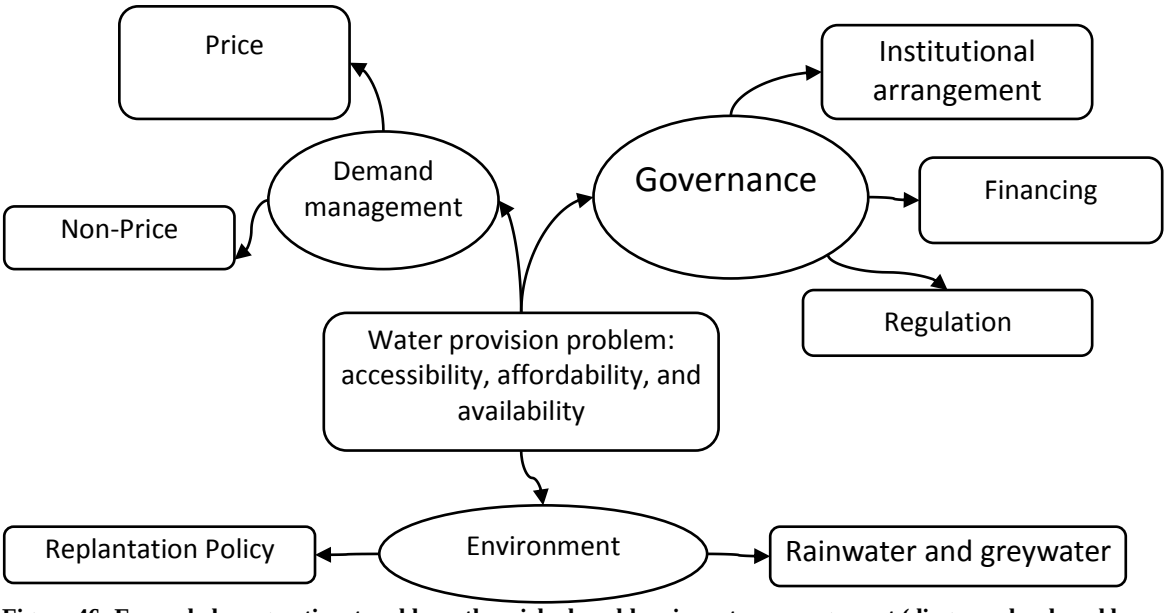


Figure 46: Expanded pragmatism to address the wicked problem in water management (diagram developed by author)

6.3.1 Governance

According to McIntyre-Mills (2017), the term 'governance' means the process of working across public, private and non-government sectors in order to address an area of concern. In this case, an effort to protect water security requires working not only with government but also with civil society and the business sector to ensure that the norms of the Sustainable Development Goals and the Indonesian constitution are achieved. Thus, governance is about working across conceptual and spatial silos as a first step to alleviating poverty. It has to be able to encompass needs from interconnected aspects, systemic and organic, in order to address the wicked problem.

Osborne and Gaebler, by using the now well cited expression "steering rather than rowing" (1992, p. 25), claimed that in implementing the NPM (New Public Management), the government should not be too involved in the provision of public services, because the government is not good at it. Denhardt and Denhardt (2000) came up with New Public Service, and challenged the NPM by saying that the government should be "serving rather than steering" (p.549), since the government should not change the direction of the boat, but instead, "serve and empower the citizens" (p.549). Moreover, it is the citizens who own the government, and administrators should treat citizens as active citizens, meaning "citizens rule and are ruled in turn" (King, Stivers & Box 1998, p.196), and

citizens have the right to fulfil their basic needs, with welfare as a basic right (Marshall, TH 1950; Ulrich 2003).[73]

Regional governments that are currently providing water in Nauli City have to turn their objectives back to the constitution in that water should be utilised for the maximum benefit of the people, not for profit making. The UN World Water Council in the World Commission on Water for the 21st Century Report stressed that governments, national and local, are enablers who establish effective and transparent regulations with good political will, even if the issues are beyond or across borders. Governments should not shirk their responsibilities to ensure all people, including the poor, have adequate access, even when full-cost pricing is applied (Serageldin et al. 2000). The report also stressed that partnerships between governments and stakeholders are vital and must be supported by the governments to create a conducive environment to provide proper water services.

6.3.1.1 Institutional Arrangements

There are several options for water management institutionalisation that have been implemented globally or in the Indonesian context, and have been discussed briefly in Chapter 2, part 2.8. However, in Nauli City's case, public-private partnerships will not be discussed as it seems that Nauli City water market is not attractive to private investors, so this particular subchapter will discuss centralised or provincialised system, decentralised public-public partnerships, and community-based water management.

6.3.1.1.1 Centralised or provincialized water management system

Indonesia implemented a centralised system for electricity provision which is performed by a state-owned enterprise (SOE), namely, State Company for Electricity (PLN). Even though it is clearly mentioned in Law Number 30/2009 about Electricity that the provincial and local governments are allowed to manage their own electricity needs, conflict has occurred when the central government established Law 23/2014 on Regional Government, in which authority for regulating local electricity systems was given only to provincial governments. The centralised system for electricity was applied nationally and the local governments are very dependent on the PLN supply so no local government has attempted to implement their own electricity system. However, PLN can only cover 60% of the electricity needs, two-thirds of which is concentrated in Java, Madura and Bali (IEA 2008). The total capacity of PLN was 46,103 MW (Detiknews, 2014), which was far from enough to reach all of Indonesia. Only very recently, the Jokowi administration established a target to increase capacity by 35,000 MW to achieve coverage of 97% across Indonesia.

[73] Marshall, TH (1950) in *Citizenship and Social Class and other essays* described three basic rights of citizens: the right to freedom of speech, the right to participate in politics, and the right to have social security, economic, and welfare.

Compared to the electricity case, building a centralised water management system is very difficult and it will be easier if the scope of centralising the system is narrowed down to the provincial level. However, implementation of the regional autonomy system has, to a certain degree, created a gap between provincial and local governments, where the districts and municipalities are reluctant to be regarded as subordinate to the province (DGFB Secretary 2017). North Sumatera is the only province that has successfully implemented a provincially organised water management system, with PDAM Tirtanadi as a provincial water company whose operation covers the whole province and cooperates with local government PDAMs. However, whenever the local PDAMs are able to operate independently, PDAM Tirtanadi delegates the business to them (PDAM Tirtanadi, 2017).

6.3.1.1.2 Decentralisation

The drinking water management system in Indonesia is currently decentralised, as explained in part 2.8.1 as a transfer of authority from central government to local government (Rondinelli 1999). This system is also in accordance with the Dublin Principle (1992) which encourages water management to be performed at a more local level. To some extent, it performed well in most areas of Indonesia prior to the enacting of the first regional autonomy law in 1999. After 1999, cities and districts were obliged to increase local revenue and local ego increased significantly. Moreover, Prud'Homme (1995) mentioned that decentralisation can undermine efficiency, particularly public service efficiency, mainly due to the economies of scale. Municipalities' administrative areas became much smaller and, in the water management case, performing tasks in a more regionalised scale is more efficient and may be a good solution as it can bring planners closer to the service users. However, this is not necessarily effective for the piped water system, especially since regional autonomy in Indonesia triggered the proliferation of new local governments.

Many PDAMs in newly proliferated regions were established in response to huge gaps in regulations regarding piped water management. For instance, there are no minimum requirements for establishing a government-owned water company, and also insufficient regulations regarding transfer of assets from parent government to new local government. For the decentralised system to be effectively implemented in piped-water management, regulations about transfer of assets, as previously is explained in Chapter 5 as one of the primary causes of the wicked problem, must be clearly delineated to avoid conflict. However, in Nauli City case, the proliferation of the city government occurred over twenty years ago in 1996, and implementing new regulations will not be effective in addressing the conflict around transfer of assets (Bupati of Nauli District 2017).

6.3.1.1.3 Joined-up Government and Whole of Government Approaches

The biggest challenge for Nauli City water management is lack of coordination across government departments and the lack of responsiveness to the needs of residents. This has resulted in conflict over water provision. Hence, Joined-up Government (JUG) or Whole of Government (WOG) approach might be a better way to encourage collaboration as well as greater responsiveness to the needs of the residents in urban and rural areas. JUG would encourage the city, district and provincial governments to form a mutual partnership, and WOG can increase inter-departmental coordination within the regional governments and help to avoid duplication or conflicts in planning, budgeting and implementation processes.

Regional partnerships have been regulated several times since 1975 (Minister of Home Affairs Decree No. 6), and the latest is regulation is Government Regulation No. 50/2007. Regions have administrative borders as regulated by laws, however, dysfunctional relationships across borders have triggered social and economic issues, and competing interests have emerged (Keban Undated). Partnerships between governments have also been implemented in several regions. For instance, six local governments in Central Java Province, namely, Kendal District, Semarang City, Semarang District, Grobogan District, Salatiga City and Demak District formed a partnership named Kedangsepur (an abbreviation of the six regions' names) (Grobogan, 2017). Other partnerships have been established in East Java (Gerbangkertosusila from Surabaya, Gresik, Bangkalan, Mojokerto, Sidoarjo, and Lamongan), West Java, North Sumatra Province (Medan, Binjai, and Deli Serdang) and South Sulawesi (Makassar, Maros, and Sungguminasa) (DSF, 2011). These partnerships have formed a joint secretariat as a communication forum for establishing coordination and planning between governments, but they implement agreementd separately in their own administrative area.

Nauli City needs a collaboration or partnership not only in the planning stages but, most importantly, a joint operation with combined or shared service networks. There are some options for collaboration for implementing the JUG that will be discussed in the following part.

6.3.1.1.4 Options for a Joined-Up Government

Taylor (2003) mentions that collaboration between local governments may take the form of:

a. Handshake agreement based on political trust between local governments without any formal or written agreement. This model is suitable for regions that have a long history of cooperation, although there is the risk of misunderstandings, especially during the implementation stage.

b. Fee for service contract (service agreements), which basically means one local government will 'sell' public services (e.g., electricity, water, waste management) to another local government for an agreed period of time.
c. Joint agreement. This model requires strong participation and involvement from related local governments to establish an independent organisation with shared ownership, control and responsibilities over programs.
d. Jointly-formed body. This has been implemented widely in Indonesia as Joint Secretariat, which comprises representatives of related local governments, and hired experts and professionals. However, this body tends to be only a think tank that produces concepts on planning and evaluation, and action is difficult in the implementation stage.

Hulst and Van Montfort (2007) explained that there are four types of agreement for intermunicipal collaboration that have happened in Europe:

a. Semi-regional government, which is a standing organisation established by local governments which has the authority to coordinate policies and sometimes is given authority to implement policies in one or more sectors. To be effectively operated, it should be able to balance local and regional perspectives, though this may be problematic due to the large number of people involved.
b. Service delivery organisation is a standing organisation established or mandated by inter-municipalities with the main objective to perform service delivery. There are three types of service delivery organisation. First, municipalities transfer some particular tasks to an existing organisation, for instance, to provincial or state departments. Second, municipalities enter a contract with a new organisation, usually for sellable services like water delivery, public transport or waste disposal. Third, a municipality makes a contract with neighbouring local government to perform a particular service delivery, which is also called a service delivery agreement.
c. Service delivery agreement is, in most cases, an agreement between a bigger and smaller municipality where the first sells services to the second. This collaboration does not need a joint organisation and it can save costs (like start-up costs and other coordination costs to manage the joint organisation). Even though this is always an inter-municipality agreement, more research should be conducted to find out how effective it is for vertical cooperative arrangements.
d. Planning forum, which is not a standing organisation established as a forum to share best practice, knowledge and development of policies or programs. In many ways, it is similar to the jointly formed body that was explained previously.

In the Nauli City water management case, some characteristics should be considered to determine the appropriate model.

Table 36: Comparison of models for Joined-up Government (diagram developed by author)

	Handshake agreement	Fee for service contract/service agreement	Joint agreement/Service delivery organisation	Jointly-formed body/planning forum
Partner	Governments (vertical or horizontal)	Government or private	Government or private	Government and/or individual experts
Binding	Informal	Written agreement or contract	Written agreement or contract	Informal or formal agreement
Types of services	Any services	Sellable services	Any services	Any services
Right and obligation between parties	Flexible	Mandatory	Mandatory	Optional

6.3.1.2 Regulation

Since the institutional arrangement chosen for this particular case study is a Fee for Service Contract or Service Agreement that is a partnership between three governments (City, District, and Provincial) and three companies (City PDAM, District PDAM and BLUD SPAM) with PDAM of Nauli City as the only water operator in the area, the City Government has the sole regulating power including the formulation of a master plan for water provision – something that has never been done before. In doing so, the government of Nauli City should be given the authority – in accordance with the Decentralisation Law, without any intervention from higher tier governments, to manage its water issues.

The critical aspects that need to be addressed and properly regulated by the City Government are social, economic, health, and environment. with regard to the social aspect, there were more than 1,500 households (more than 1.4% of population), mostly poor people in rural areas, that did not have access to water (BPS 2015). Integration between Nauli City's departments that deal with water provision is crucial. Furthermore, the City PDAM has to be encouraged to expand its coverage to reach and serve all people, not only customers.

From economic perspectives and the residents' points of view, this integration will make residents better off since they will get better service (water quantity and quality) and better management. However, it will not guarantee that the price will be lower, since the service agreement requires profit for the water producer and water distributor, and a monopoly system can be easily abused.

Hence, this system should be properly regulated by the local government, supported by subsidies from the local budget, and monitored.

6.3.1.3 Financing and Planning

Currently, there are three governments spending their budgets in the water sector: Central Government, Provincial Government and Nauli City Government. The City Government allocates budget for water sector capital works to the City PDAM (the PDAM is solely owned by the City Government) and through its departments' programs in the water sector. The Provincial Government allocates funds in Nauli City through the BLUD SPAM and its departments, and the Central Government also allocates funding for developing the water sector in Nauli City area through its vertical office, PK PAM.

As explained above, these three types of planning and funding have brought confusion and chaos in the implementation and monitoring stages, as there was no coordination between governments. Moreover, the assets that were being invested in (e.g., water storage, pipe networks, and diesel pump wells), or the programs that were being executed (community-based water management) were not properly maintained and the city government's officials revealed that almost all of them (they did not want to say all) were abandoned or no longer worked. There has to be political willingness from higher level governments to release or transfer their authority in water management planning to the City Government so it can be integrated holistically.

6.3.2 Demand Management

Jorgensen, Graymore and Toole (2009) claim that both population and lifestyle can affect water consumption. The government should ensure that water is delivered properly to all residents, however, demand management is also required to encourage the most efficient and effective way to consume a limited resource (Savenije & Van Der Zaag 2002). Demand management is not about controlling the demand to meet limited supply but, more broadly, is about supplying water to achieve trans-generational equity and environmental integrity (Savenije & Van Der Zaag 2002). This is important as, according to the Nauli City Water Provision Master Plan (RISPAM) (Public Works Department of Nauli City, 2015), total water supply capacity needed for 2020 will be 723 l/s consisting of 629 l/s (87%) for domestic use and 94 l/s (13%) for commercial use.

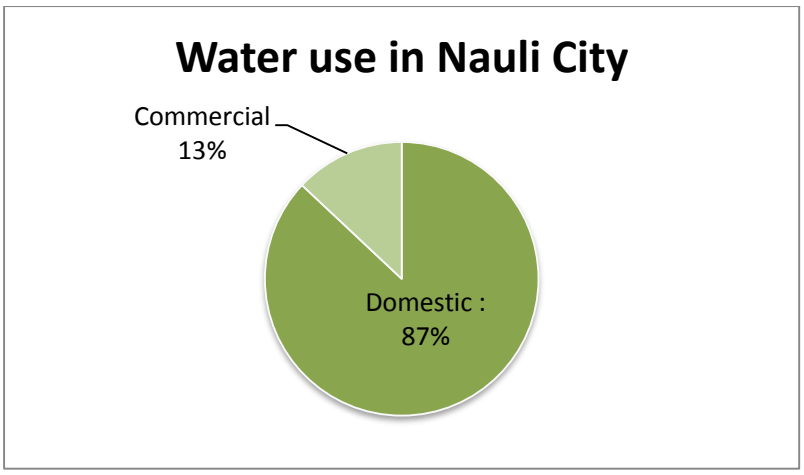


Figure 47 Commercial and domestic water use in Nauli City (diagram developed by author

Jorgensen, Graymore and Toole (2009) explained that demand management strategies have been introduced through pricing and non-pricing policies. they also identified several direct and indirect factors that drive water behaviours as follows:

Table 37: The direct and indirect drivers of water saving behaviours
Jorgensen, Graymore and Toole (2009)

Direct Drivers	Indirect drivers
Climate/seasonal variability	Person characteristics (e.g., subjective norm, behavioural control, attitude toward the behaviour)
Incentives/disincentives (e.g., tariff structure and pricing, rebates on water saving technologies, etc.)	Institutional trust (i.e., trust in the water provider) and Inter-personal trust (i.e., trust in other consumers)
Regulations and ordinances (e.g., water restrictions, local government planning regulations)	Fairness (i.e., in decision-making processes, water restrictions, tariffs, new pipelines)
Property characteristics (e.g., lot size, pool, bore, tank, house size, house age, etc.)	Environmental values & conservation attitudes
Household characteristics (e.g., household composition, household income, water saving technology, water supply technology)	Socio-economic factors (e.g., income, household composition, age, gender, education, etc.)
Person characteristics (e.g., intention to conserve water, knowledge of how to conserve water)	Intergenerational equity

6.3.3 Pricing Policy

Rogers, Bhatia and Huber (1998) explained that the cost of water comprises two elements: supply costs and environmental costs. However, social costs need to be taken into account, and these three elements should be reflected in the cost structure to constitute the full cost of water, and need to be translated properly into the pricing policy:

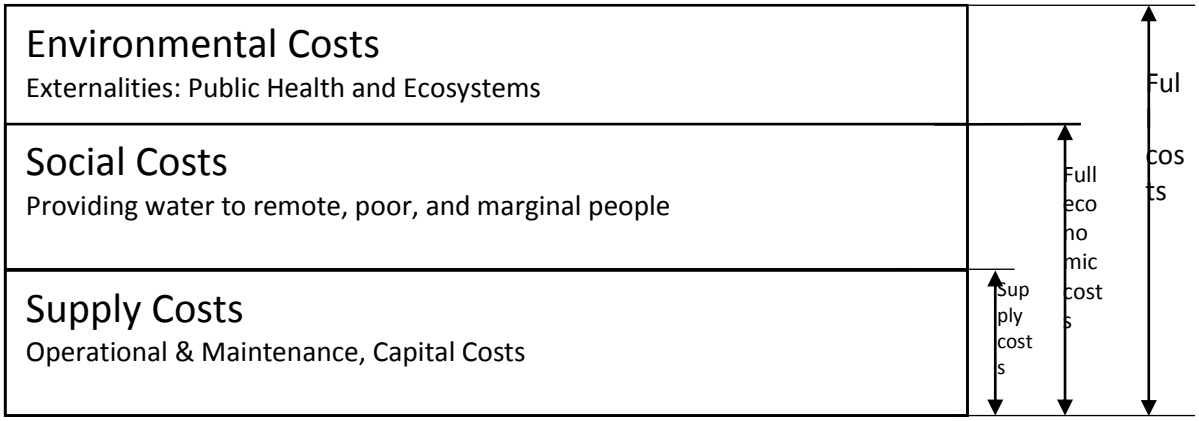


Figure 48: Three elements of costs of water
Adapted from OECD (2010)

Supply Costs include capital costs and costs for production (to obtain and treat water), distribution, maintenance, and other administrative costs including water losses during the processes. Social costs include the cost to provide water to the poor, remote and marginal people that have not been covered by the PDAM's network. These costs should be borne by the governments' budgets through subsidies or other poverty alleviation programs, or through cross-subsidy tariffs. Supply costs and social costs are regarded as full economic costs as they relate to providing the product (supply) to all people (demand).

Environmental costs are related to preserving the environment so that water is sustainable. Many environmental impacts have occurred due to the diversion of water flow, water pollution, and dams which harm public health and the ecosystem.

6.3.3.1 Non-Pricing Policy

Determining water tariff is dependent on law and political climate which sometimes makes it very difficult to do and ineffective to affect the demand. As a result, non-price approaches should be taken into account to conserve water, especially during shortages. A study by Michelsen, McGuckin and Stumpf (1999) in seven cities in California showed that residential areas across these regions tended to be price inelastic (price elasticity -0.23 which indicated that 10% increase in price could only reduce demand by 2%), that made water providers look into non-price programs. Michelsen et al (1999) found that a non-price approach had more pronounced effects and within 10 years it could reduce demand by 12%.

There are three non-price strategies: (i) introducing new technologies; (ii) apply water use restrictions; (iii) early education on conserving water (Corral 1998; Michelsen, McGuckin & Stumpf 1999; Olmstead & Stavins 2007, 2009; Samuelsson & Kaga 2008).

6.3.3.1.1 Introducing new technologies

Australia , the driest continent, has promoted water demand management programs. Some of the programs that introduced new technologies that can be implemented in Nauli City include dual-flush toilets and low-flow showerheads (White, S & Fane 2002). The dual-flush toilet with low-flush, invented by Victor Papanek in 1976 (Papanek & Fuller 1972), is mandatory for new buildings in Australia. In 1980, the capacity of traditional toilet cisterns was more than 10 litres, and it has decreased to around 4-5 litres with the new design, and water used for toilet purposes has reduced by nearly 20 litres per person per day (White 1999, 2002).

Encouraging the use of low-flow showerheads with financial incentives (rebates) has been proven to be underperforming in Australia (White & Fane 2002). However, in Florida, USA, water saving from the use of low-flow showerheads reached 13.6 litres per capita per day (Anderson et al, 1993).[74]

6.3.3.1.2 Mandatory water restrictions

Mandatory water restrictions were applied to almost 75% of Australians in various forms as of March 2008 (Grafton & Ward 2008). Seville (Spain), Hong Kong (China) and several states in the US like Texas and California, also implemented water rationing and restrictions to respond to drought (see Garcia-Valinas (2006) for Spain, Woo (1994) for Hong Kong, and Olmstead and Stavins (2007) for the US cities). California successfully implemented mandatory water restrictions followed by penalties for excessive usage, and it reduced demand by 29% (Olmstead and Stavins 2007).

According to the World Resources Institute's Aqueduct (WRI 2017), some of Indonesia's regions (Java to Nusa Tenggara) are rated as high global water risk and Nauli City is located in this area. Nauli City and other water-scarce areas have to respond immediately by introducing water restrictions. Grafton and Ward (2008) compiled studies of the performance of water restrictions around metropolitan cities in Australia and found that people are willing to pay more for particular uses of water. They suggested that the water restrictions should be applied by imposing extreme volumetric (progressive) tariffs for excessive use, and the additional revenue can be used to cross-subsidise the low-income users to address equity between the rich and poor.

[74] Replacement of old with low-flow showerheads was also followed by rebate program.

6.3.3.1.3 Education and campaign

People's behaviour towards water consumption is determined by their perceptions about water. Harvey and Miceli (1999) stated that externalities occur when one decides to take an action that can harm others and the environment without considering the impact of that action or even trying to compensate the result. Hardin (1968) explained that the 'Tragedy of the Commons' (TOC) happens because of externalities; when one uses or consumes a common good in excess of their pro rata needs. This attitude will indeed affect other people, the environment, and eventually the person themselves. Jorgensen et. al. (2002) claimed that a number of studies found that pricing policies do not always affect water use decision-making in the long run. Instead, education can have significant influence to change people's mindsets towards conservational behaviour (Davis 2015; Samuelsson & Kaga 2008).

Water suppliers and water users have to understand that freshwater is finite and its importance to overall human life is irreplaceable. For water suppliers, training can be provided that enables participants to learn the most recent water efficient technologies and methods of water governance, and how to deal with current and future challenges, especially in water-scarce conditions (Ferdous Hoque 2014). Early education has been statistically significant in influencing demand by delivering water conservation information and materials being included in the curricula and through participatory activities (Ferdous Hoque 2014; Michelsen, McGuckin & Stumpf 1999). This approach can have two significant impacts: it develops awareness and attitudes towards water conservation in the future society; and the children and students can share their knowledge and encourage their families to not waste water.

Water conservation campaigns are also significant to inculcate water conservation behaviour and culture within society. A recent study by Fielding et al. (2012) examined water conservation campaigns as interventions to reduce household water consumption in three cities in Queensland, Australia (Brisbane, Gold Coast, and Sunshine Coast). Three interventions were conducted to three groups of participants, and a control group which did not receive any information was created as a comparison. The first group was 'information only', whereby households were given information about tips to save water in the home. The second group, 'descriptive norm', was given information about what other people have done to save water. The third group, 'water end use feedback', were sent monthly information about their water usage with their water-using appliances.

The average water usage per person during the intervention period (4 months) is shown in the table below. It shows that the interventions resulted in significantly lower water consumption, not only during the intervention period, but almost one year after the intervention. It can be concluded that

the water conservation behaviour had been embedded in the participants, while the control group's water consumption increased.

Table 38: Average daily water usage (litres per person)
Source: Fielding et al. (2012)

Groups	Intervention period (4 months)	Four months post-intervention period	Eleven months post-intervention period
Control group	115	118	130
Information only	95	91	98
Descriptive norm	105	102	118
Use Feedback	99	100	120

6.4 South Africa Water Crisis and the use of water usage map

Cape Town, the capital city of South Africa's Western Cape Province, is the second most populous city in South Africa after Johannesburg. The National Geographic described that by summer 2018, the people in Cape Town, regardless of their wealth, skin colour, religion or position, will probably be queueing in long lines surveilled by police and armed guards only to get water. In 2017, the government predicted that 'Day Zero', the day when the city runs out of water and the government will shut off the taps, will happen in 2018 and water restrictions were applied. On 16 January 2018 via the Cape town official website, the Executive Mayor of Cape Town announced that Day Zero is 21 April 2018. It is because of the capacity of Theewaterskloof Dam, the dam which supplies the city with almost 50% of its water, is at only 10% capacity. The other five major dams are running dry as well. Moreover, 36 ancient springs and four rivers are now covered by buildings and other construction.

Stringent water restrictions (Level 6B) were applied from 1 February 2018 to avoid Day Zero. Residents were only allowed to use 50 litres of water per day per person, much less than US residents' usage of 1,135 litres. Commercials had to reduce their water usage to only 45%, while the agricultural centre reduced usage by 60%. Residents not complying will be fined, and the government named and shamed water abusers. The water map was also made public. A water map is a map that showed residents' water use based on the previous period's meter reading.

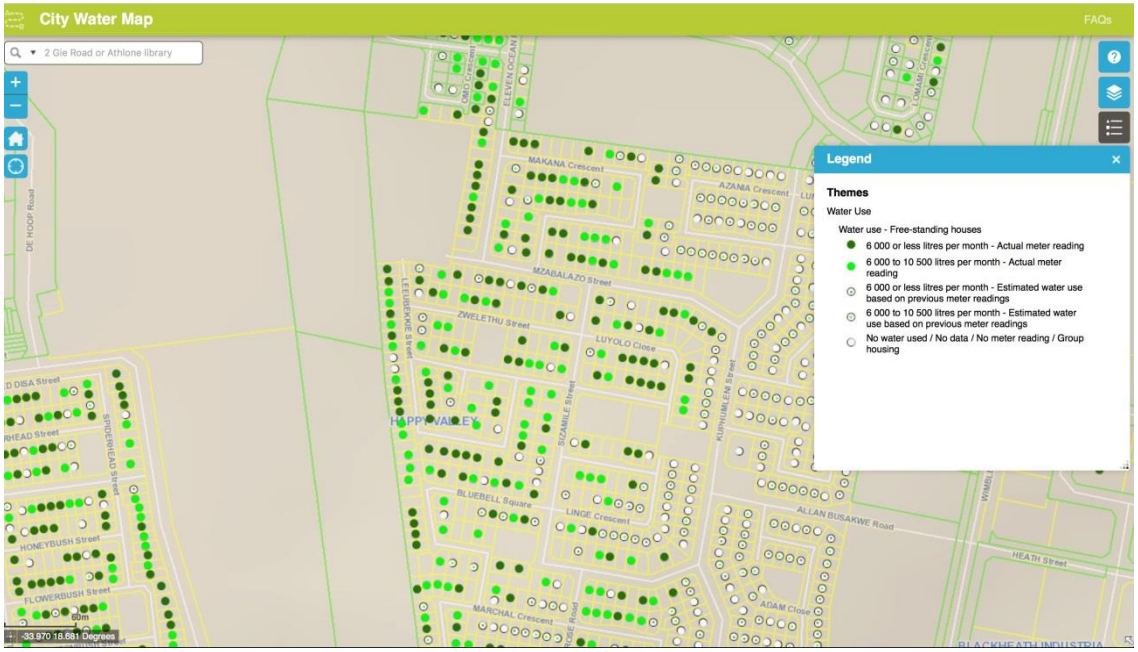


Figure 49: Cape Town water map
Source: citymaps.capetown.gov.za/waterviewer/

Residents were encouraged to use this map to see whether their neighbours complied with the water restrictions imposed. The community had been self-monitored in water usage and the residents watched one another.

These efforts brought good results. In mid-March, the Mayor announced that Day Zero would be pushed back to the end of August, and on 3rd April, the government announced that Day Zero was postponed to 2019. However, restrictions are still applied to maintain current conditions.

The use of the water usage map was proven effective to encourage residents to behave wisely towards water consumption. This example can be adopted in Indonesia, particularly in Nauli City, by introducing a more user-friendly water map or even a water-app (an application to monitor water usage), so the residents can view not only their region's water consumption, but also their household's water usage.

6.4.1 Environment

The central government built large dams to overcome the water scarcity problem in Nauli City and surrounding areas. There are three big dams that have been completed or are in progress: Tilong, Raknamo, and Kolhua. Tilong and Raknamo, which are located in the district area, are operational and they supply water for drinking and electricity mostly to Nauli City area, while Kolhua is planned to be located in the City area. However, Biswas & Tortajada (2001, 2010) revealed that despite a number of positive impacts that can be gained from dams, disadvantages may occur as well. Biswas & Tortajada (2001) claimed that there has been no proper study that has been

conducted to examine the real economic, social and environmental impact on building large dams. What are the costs and who bears them, or what are the benefits and who gains them? There were only anecdotal stories told by proponents that dams have helped to increase GDP and per-capita income, or by the opponents that dams have caused unfinished resettlement problems, environmental degradation and even conflicts between regions (Kingsford 2000; Milliman 1997). Bio-degradation is not sustainability (Pauli 2009).

Residents interviewed in Nauli City revealed that it has become harder to get water from the bore well which means that ground water table has lowered over time. Depletion of groundwater can cause negative impacts such as drying up wells, worsening water quality, seawater intrusion, lowering water in rivers and lakes and even land subsidence (USGS Water Science School 2017). Jakarta land subsidence is just one example (Abidin et al. 2001).

Groundwater can be controlled and replenished (Thangarajan 2007). However, USGS (2017) argued that an aquifer is like a bank account where deposits should be greater than withdrawals. Patel and Shah (2008, p. 27) mentioned that groundwater condition depends on several factors: rainfalls, topography, vegetation cover, evapotranspiration and water bearing properties of rock and soil. In terms of vegetation cover, Patel and Shah (2008) state that replanting and manipulation of vegetation cover can minimise water losses and runoff, increase water yield and prevent evaporation by almost 16.5%. Recharging groundwater can also be done by flooding a relatively flat area so it can be absorbed into the soil (Patel & Shah 2008, p. 78).

The Statistical Body of Nauli City recorded that from 2005 to 2015, open space in Nauli City has shrunk by half, as shown in the below table (total area of Nauli City is 18.03ha) :

Table 39: Total open space in Nauli City 2005 and 2015 (BPS 2005, 2015)

	2005 (Ha)	2015 (Ha)
Wet Land	1.23	0.38
Dry Land (include unused open space)	4.86	2.86
Total	6.09	3.25

6.4.1.1 Replantation Policy

This thesis addresses the ‘what next’ strategies by applying expanded pragmatism that is based on expanding the consideration of the consequences in the short, medium and long term for human beings, animals, plants and the environment, and draws on Nussbaum’s capability approach and the non-anthropocentric approach of McIntyre-Mills (2014). We have to conserve nature because it is invaluable and protecting nature means we are protecting our generation (Monbiot, 2014).

The decreasing water catchment area (wetlands and savannah areas are the most typical open spaces in Nauli City) spurred runoff of rainwater and high evapotranspiration as well. Replanting the land should be included in the main strategy for water conservation in Nauli City. However, the arid condition of the area makes this difficult. The land should be fertilised and, according to the CSIRO, it needs carbon (CSIRO 2017). Carbon should be captured and restored to the soil via carbon sequestration which is best done by replanting trees (Jandl et al. 2007; McCarl, Metting & Rice 2007).

Recovering the land by replanting trees will surely help to accelerate groundwater recharging, avoid evapotranspiration and the release of soil carbon to the atmosphere will improve soil quality. The more fertile the soil, then the easier it is to plant vegetation which eventually will improve the quality of the land. Good aboveground vegetation will improve water purity and can help capture and store water (Ernst, Gullick & Nixon 2004). This is also important considering the fact that 20 out of 22 water sources used by the water companies are groundwater, and the other non-piped water residents depend on the availability of groundwater as well.

Tallamy (2011) stresses that replanting native plants will help to restore the environment, as they naturally evolved in that particular region. These native plants will sustain the food web as insects and other herbivores have adapted themselves for thousands of years to eat local plants. Moreover, replanting native plants offers low maintenance as they are suitable to the climate, and can combat climate change, supporting wildlife and conserving water (Bird friendly communities 2017).

A native tree from the Nauli City area is the lontar tree (*Borassus flabellifer*) which grow very well in the savannah area (BPS, 2015). *Borassus flabellifer* will assist to recharge and control groundwater as its roots grow vertically into the ground, helping water circulation in the aquifers, injecting nutrients into the soil, and can also stabilise soil around lakes, ponds and rivers (Barot, Gignoux & Menaut 1999; Mordelet, Barot & Abbadie 1996).

According to Marlistiyati, Mahayasa and Pelokila (2016), a hectare of lontar tree with an average diameter of 30cm can absorb 72.3 tons of carbon per year. For comparison, a tropical agroforestry system can sequestrate 95 tons per hectare per year (Dombro 2011). According to the Forestry Research Body of Nauli City, the population of lontar trees in Nauli City area has declined dramatically over the last 50 years from more than 60,000 in the 1950s to only 30,000 trees in 2015 due to the rapid development of the city area (Forestry Research Body of Nauli City, 2015).

The government has allocated a special fund called the Reforestation Fund (*Dana Bagi Hasil Kehutanan)* through the central-regional fiscal balance mechanism. This fund is allocated as a

percentage of the revenue that has been produced by the forest area (or in other words the value of trees that have been chopped down). The fund is transferred back to the local budgets of related provinces and all local governments within the provinces. This particular fund can only be used to rehabilitate and protect forest areas (MoF Decree 126/2007). Since Samsoir Province does not produce significant revenue from forestry, the amount of Reforestation Fund allocated to Nauli City was also insignificant.

Table 40: Reforestation Fund allocated to Nauli City
Source: DGFB, MoF

Year	Allocation (IDR)	Equivalent in USD
2018	3,838,000	295.23
2017	3,469,000	266.85
2016	0	0.00
2015	5,761,000	443.15
2014	4,020,151	309.24

It is clear that Nauli City does not have much in their allocation to support the replantation policy but must use its own funding from the local budget, since the central government reforestation funding is miniscule.

6.4.1.2 Rainwater and Greywater

There was no available data about how much groundwater has been extracted over the years in Nauli City. As shown in Table 11, in Part 4.4, the total volume of water sold (not including water losses) in 2015 was 7,318,471 cubic metres, and this figure is only from the three water companies, DAMIU, and water merchants' production of which 90% was from groundwater. It did not include the use of bore wells for households and other commercial uses like bottled water companies. At a rough estimate, the actual figure may be three times this amount at about 21 million cubic metres of groundwater discharged every year. For the last ten years, residents have deepened their bore wells from 15 metres to about 40 to 60 metres, which shows that the groundwater table is reducing.

How people use water really depends on the availability of water. A household that has to carry water over a distance typically consumes only 10 litres per capita per day (lcd), while households with installed piped water can consume up to 100 lcd (Thomas, T 1998). Thus, households with limited access to water should optimise their options for getting water. Thomas (1998) explained that domestic water autonomy can be categorised into two types: rainwater harvesting and water recycling (greywater). According to Rathjen et al. (2003), the percentage of water used for domestic purposes is generally as follows:

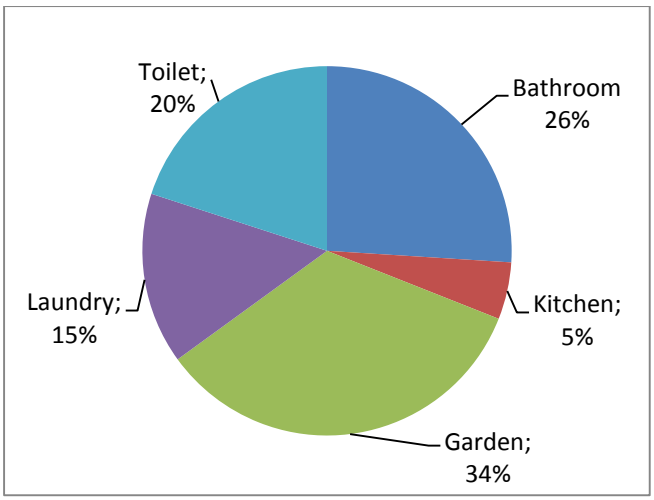


Figure 50 Typical Domestic Water Use (Rathjen et al. 2003)

From the above chart, rainwater can be used for washing, greywater can be used for flushing toilets and gardening, and these comprise almost 95% of total domestic daily water usage.

6.4.1.2.1 Rainwater harvesting (RWH)

Thomas (1998) explained that rainwater harvesting (RWH) is mostly conducted in poor areas as wealthy people normally purchase water and can transport water. RWH has happened globally due to several reasons like low quantity of water due to climate, or low quality of water because of contamination or sea water intrusion. Lo and Gould (2015) documented that RWH has been prevalent in Bangladesh, Bermuda, Brazil, Japan, Cambodia, Kenya, Thailand, China and Taiwan, while Mbilinyi et al. (2005) revealed that half of Tanzania relies heavily on rainwater. In Australia and the USA, governments offer various kinds of rebates to residents who are using rainwater (Thomas 1998).

RWH has also been practiced in poorer areas of Nauli City for many years. The residents store the rainwater in water tanks that were built under central government projects that were originally intended for community-based water management projects which failed.

Figure 51: Rainwater harvesting (photos by author)

Rainwater collection os not optimised as the roof gutters were not designed to catch the rainwater and some residents just used bamboo as connecting pipes. To build a RWH system properly, Thomas (1998) identifies three important elements: a surface for rainwater collection, guttering and a water tank. Surface areas can be a natural surface (rocky slopes), less permeable surfaces like roads and rooftops, and purpose-built catchments (usually for large scale agricultural or industrial needs) (Zhu 2015). Guttering will depend on whether the water tank is above the ground (most common in domestic use) or under the ground (Gould 2015). Constructing these three RWH elements should be planned very carefully and also matched with water demand and cilate condition for the lowest possible cost. RWH has been very effective in improving social and environmental conditions, and it is economically feasible (Zhu et al. 2015).

The government may have to start promoting rainwater harvesting in Nauli City, not only as an alternative to anticipate water scarcity during dry season, but also to control flooding by decreasing runoff and conserving the environment by reducing groundwater extraction (Lo and Gould 2015).

6.4.1.2.2 Water recycling (greywater)

Wastewater can generally be grouped into three types: black water (water containing faecal matter), yellow water (water containing urine), and greywater (matter other than black and yellow water) (Abbassi & Baz 2008). Black water should not be used as it contains pathogens and medicinal waste. Yellow water can be used for irrigation as it contains nitrogen and phosphorous. Greywater is the lightest type and can be used for many purposes like flushing toilets, washing cars, house cleaning and irrigation (Abbassi & Baz 2008).

A large percentage of the population in Nauli City use a ‘hole in the ground’ to discard wastewater from toilets (more than 40% compared to the use of proper septic tank, tiver, pond, or field) (Ministry of Environment of Indonesia presentation in Chiang Mai, 2013), which explains why groundwater contamination was very high and caused water-borne deseases leading to a high rate of child mortality in this area (National Social Economic Survey 2007). The World Health Organisation (WHO) revealed that the use of greywater has been increasingly popular, especially in water-scarce areas, and it has become more accepted by communities and planners (WHO 1989). Imhof and Muhlemann (2005) documented various definitions of greywater from the literature, including:

- Domestic wastewater reuse or recycle
- Water from baths, showers and laundries
- Waste water not from toilets

- Most definitions include kitchen sink and dishwasher wastewater as greywater, but some do not, as it could contain microbial contamination, soil and greases that are harmful to the environment (TOWTRC 2003; Christova Boal et al. 1996; Wilderer 2003).

Countries like Japan, USA and Australia have been leading the development of greywater use, while Canada and some European countries, like the UK, Germany and Sweden, have actively encouraged greywater research (Dixon, Butler & Fewkes 1999). In Asia, Indonesia has the lowest connection of wastewater sanitation which only covers 2.3% of the national population and 5.6 million tons per day of untreated black, yellow and grey water filters into the environment (World Bank 2003). Greywater producing activities in Indonesia reached 80% of total water consumption per day and nearly 90% of greywater was disposed of directly into the environment (SUSENAS 2007).

Greywater treatment can be in three steps (Fowdar et al. 2017; Imhof & Muhlemann 2005; Jefferson et al. 2000). First, primary treatment which involves physical treatment to stabilise sludge. Primary treatment can use sedimentation ponds (requires a big space) or septic tanks (commonly used worldwide). Secondary treatment typically involves biological processes with anaerobic filters and digestion. Lastly, tertiary treatment involves chemical processes and filtration. This system has to be properly planned as an integrated function to optimise the social, economic and environmental benefit (Abbassi & Baz 2008).

The quality of greywater depends on several factors like the quality of water source (tap, ground or rain water), distribution network of water supply and greywater, source of greywater (kitchen, laundry or bathroom), household activities and styles of water usage, geographical location, and demographic and occupancy level (Imhof & Muhlemann 2005). Greywater management systems comprise of processes of collection, treatment and reuse (Abbasi 2000). The picture below shows how clean water, rainwater, and greywater can be integrated for domestic use in order to conserve water.

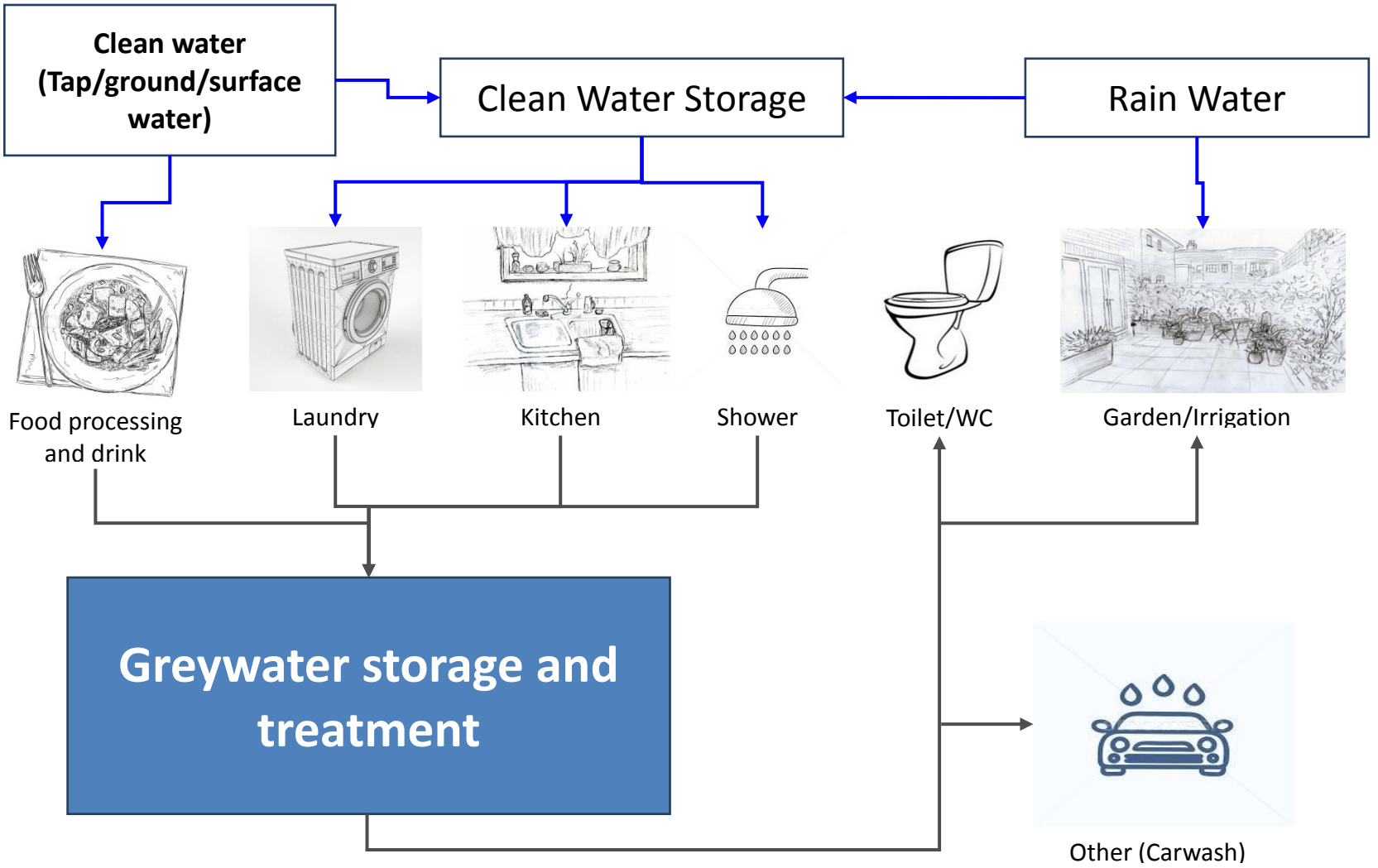


Figure 52: Integrated water management system (clean water, rainwater, and greywater) (diagram developed by author)

CHAPTER 7. RETHINKING POLICY IN TERMS OF LEGISLATION, INSTITUTIONAL DESIGN, MONITORING AND EVALUATION

7.1 Introduction

This chapter will explain stage 4 (as explained in Chapter 3 part 3.7.5) of the policy analysis in terms of policy arrangements that span three aspects, namely, legislation, institutionalisation, and monitoring evaluation.

This stage will propose how the government should take control of drinking water management and use it for the maximum benefit of the people, as mandated by the constitution. The first step is establishing legislation and regulations that will support the strategies. This step will list all related regulations that should be amended in order to accommodate, or at least not hamper, the strategies that will be undertaken.

The second step is institutional arrangement as the cornerstone for implementing strategies. This step will be crucial to unite all parties currently in conflict and support comprehensive and cohesive planning that incorporates various points of view. The last step is monitoring and evaluation. This step will adapt the concept of Monitory Democracy which was coined by John Keane in his book *The Life and Death of Democracy* (2009a). Monitory Democracy is basically a power sharing democracy where the government or the non-government (NGOs, private sectors, and the communities) is subject to public control, and ongoing monitoring and evaluation to find out to what extent the governments are taking appropriate action.

7.2 Legislation

Based on Law Number 12/2011 on Hierarchy of Regulations in Indonesia, as shown in the diagram below, the local government should refer to the Central Government Regulation (GR, issued by the President) and cannot create new norms that are not regulated by a particular GR.

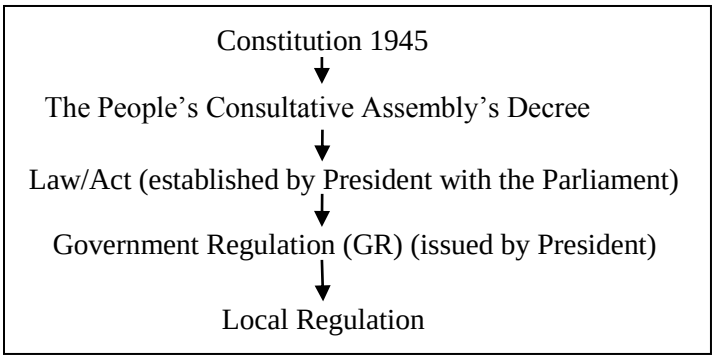


Figure 53: Hierarchy of regulation in Indonesia based on Law No. 12/2011

Drinking water management in Indonesia that is conducted by local water companies (PDAM) has not been properly regulated from a national level. The only national law applicable is Law No. 5/1962 regarding Local Government Owned Enterprise (LGOE), in which PDAM is included. As explained in Chapter 4, this law has been regarded as obsolete by the government, even though the government has not been able to replace or amend it despite several attempts.

Below is a list of four national laws that regulate water provision:

Table 41: National level regulations on water provision (diagram developed by author)

Regulation	Concerning	Content
1. Law No. 5/1962	Local Government Owned Enterprises/LGOE (*Perusahaan Daerah*)	The objectives, establishment, rights and obligations of LGOE and processing for disestablishing a LGOE.
2. Law No. 11/1974	Irrigation (*Pengairan*)	Water sources and water supply management
3. Government Regulation (GR) No. 121/2015	Water Resource Utilisation (*Pengusahaan Sumber Daya Air*)	How to utilise or commercialise water resources based on priority scale.
4. GR No. 122/2015	Drinking-Water Provision System (*Sistem Penyediaan Air Minum/SPAM)*	Government management of drinking water to meet the people's needs.

Based on the hierarchy of regulation illustrated in Figure 53 above, these national level regulations are the basis for local governments and parliaments in making local regulations. The implementation of those regulations is as explained below:

1. Law No. 5/1962 is no longer applicable to either central or local regulations because of changing situations and most of the terms that are used in the law are obsolete.

2. Law 11/1974 about Irrigation was the first law produced concerning water management after Indonesia's independence. This law has been replaced by Law 7/2004 and derivative regulations for the new law were issued as follows:

Table 42: Government Regulations under Law 7/2004 (diagram developed by author)

1. GR 16/2005 about The Development of Drinking Water Management System
2. GR 20/2006 about Irrigation
3. GR 42/2008 about Water Resources Management
4. GR 43/2008 about Ground Water Management
5. GR 38/2011 about Rivers
6. GR 73/2013 about Swamps

However, in 2015, the Indonesian Constitutional Court revoked Law 7/2004 considering that it was not aligned with the Constitution as it treated water as a product, allowed the private sector to enter the water management system without any restrictions, and failed to consider the right to water as a fundamental human right (Indonesian Constitutional Court verdict No. 85/PUU-XI/2013, read on 18 February 2015). The verdict then reinstated Law No. 11/1974.

3. GR No. 121/2015 about Water Resource Utilization (*Pengusahaan Sumber Daya Air*). Following the reinstatement of Law 11/1974 and to adapt it to current conditions, the government acted swiftly to release two government regulations: GR No. 121/2015 and GR 122/2015. The first GR stipulates several responsibilities that should be carried out by local government (most of them have been in place since 1974), and the table below shows how the tasks and obligations were performed by Nauli City government:

Articles	Responsibilities	Implementation in Nauli City
Article 8-9	Issue Water Allocation Priority (there are 11 priorities: first priority is for basic needs, and the last priority is for private sector non-drinking water business)	Never
Article 10	• Perform strict surveillance and monitoring on water provision • Accommodate complaints from residents about water provision	• Occasionally • Never
Article 15	• Issue permit for using water for business • Permit is given based on Water Allocation Priority	• Yes • Never

4. GR No. 122/2015 about Drinking Water Provision Systems (S*istem Penyediaan Air Minum/SPAM*). This GR was released simultaneously with GR 121/2015 on 28 December 2015, in order to immediately address the lacuna of law caused by the cancellation of Law 7/2004. GR 122/2015 was intended to replace GR 16/2005 as this GR had been widely implemented and had triggered the private sector to enter the drinking water provision market or engage partnerships with PDAMs. Article 40 of GR 122/2015 outlines the authority and responsibilities of local government, and the table below indicates to what extent they are implemented in Nauli City:

Table 43: Local government responsibilities defined by GR 122/2015 and their status of implementation

Authorities and Responsibilities	Implementation
a. Establish grand policy, strategy, and master plan on water provision system (SPAM)	Never
b. Perform SPAM	Only by PDAM
c. Establish PDAM	Only PDAM
d. Record residents' complaints	Never
e. Issue permits to corporations to conduct SPAM	Not yet
f. Conduct monitoring and evaluation on SPAM performance	Only on PDAM performance
g. Guarantee the availability of raw water for SPAM	Only to support PDAM
h. Conduct partnerships with other local government	Not yet

GR 122/2015 mentions at least four times that the Drinking Water Provision System should guarantee that all people have access to good quality, quantity and continuity of water but this has never been implemented in Nauli City.

7.2.1 Some recommendations of regulations for Nauli City water management

The existing regulations around Nauli City water provision still cause confusion and can be misinterpreted. Several important points that need to be further regulated are:

a. Transfer of Assets to new local government

As explained in Chapter 5, part 5.4.3 The Primary Causes, there is a lack of clarity about how assets should be transferred from parent to new local government, especially related

to non-fixed assets such as long term long-term investments, as illustrated in the graph below:

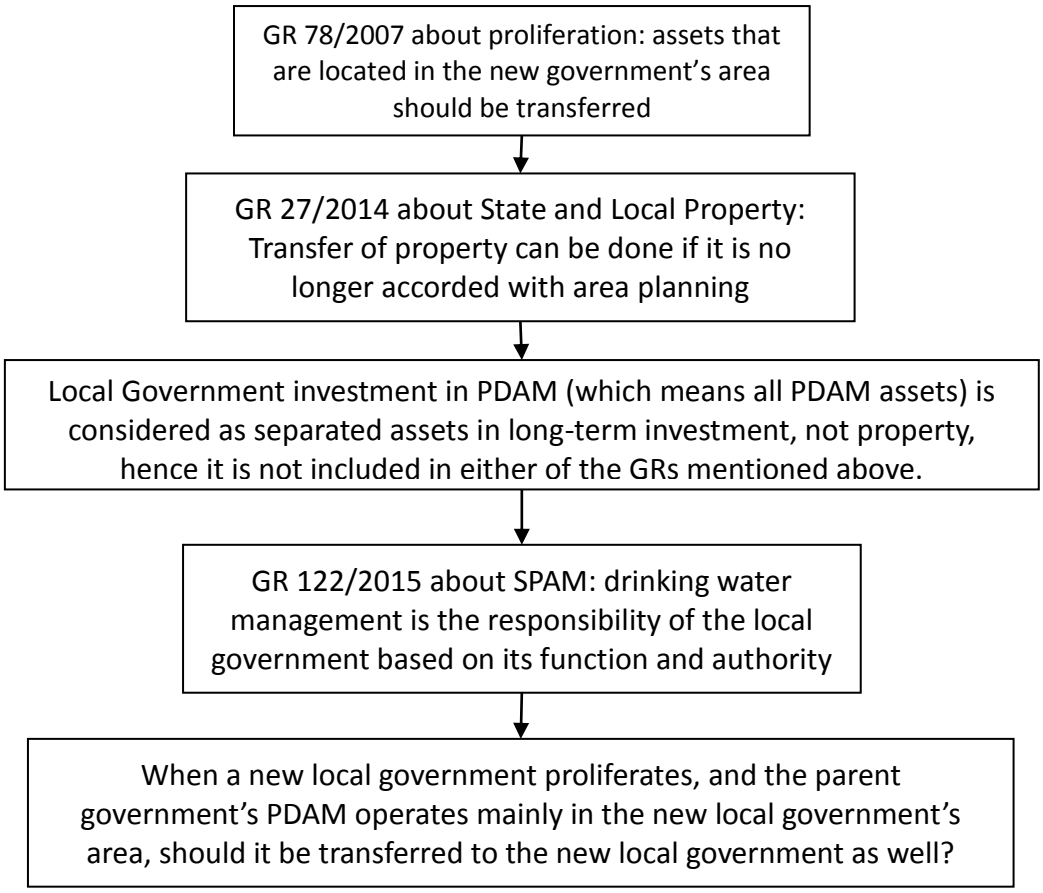


Figure 54: Regulations about transfer of assets (diagram developed by author)

Regulations state that water provision should be one of the main obligations of local governments. As discussed in Chapter 1, part 1.1.4, some proliferation cases have caused confusion regarding how to treat PDAM's assets in the proliferated regions.

This matter has led to inefficiency in the water sector because when there are two water companies in one region that serve the same residents, they have to construct their own water distribution networks and other supporting infrastructure. In Nauli City area, the book value of total fixed assets of the District PDAM was around IDR 13 billion in 2015 (IDR 45 billion of acquisition value less IDR 32 billion depreciation over more than 30 years), while the City PDAM had a book value of fixed assets of IDR 17.8 billion (IDR 23 billion original cost less IDR 5.1 billion depreciation over 10 years) in 2015. Their fixed assets comprise similar items as follows:

Table 44: Comparison of PDAMs' fixed assets in Nauli City area (diagram developed by author)

Items	Book Value (in thousand IDR)	
	City PDAM	District PDAM
Land and Building	615	2,061
Water Source Installation	4,382	4,156
Pumping Installation	3,082	5,144
Treatment Installation		148
Transmission Distribution Installation	14,345	29,233
Water Equipment	46,762	699
Vehicles	243	2,132
Office Furniture and Equipment	314	2,171
Total	**23,029**	**45,749**

This duplication of assets would not occur if the regulation clearly prohibited two or more water companies operating in one region.

b. Criteria for establishing new PDAM

Proliferation of local governments in Indonesia is becoming a phenomenon and the regions become smaller over time due to the ego of ethnicity and other cultural backgrounds that spurred proliferation. Table 17 in Chapter 5 part 5.3 shows that 212 new local governments were established in the 14 years from 1999 to 2013 and, according to Perpamsi (Association of Indonesia Water Companies), 25 new PDAMs had been established and number continues to rise (Perpamsi 2017). Perpamsi released data about PDAMs based on the number of customers in 2015 as follows:

Table 45: PDAM based on number of customers in 2015
Source: Perpamsi website

Number of connections	**Number of PDAMs**
< 10 000	199
10 000 – 30 000	152
30 000 – 50 000	38
50 000 – 100 000	29
> 100 000	18
Total	**436**

The table shows that 199 PDAMs had less than 10,000 customers, representing poor economy of scale. The Directorate General of *Cipta Karya,* The Ministry of Public Works, stated that a PDAM should operate with a minimum 20,000 customers to reach an appropriate economy of scale. Economy of scale means that the margin of increasing output is bigger than the margin of increasing relevant cost. In order to determine efficient conditions for water companies to operate and reach the economies of scale, Tynan and Kingdom (2005) outlined relevant indicators, such as number of customers, population served and length of distribution network. In addition, Tasman (2007) stated that it is important for the water sector to expand the scope economies as well by providing two or more services or engaging in joint services using the same infrastructure. In the case of Nauli City and other new regions in Indonesia, a new water company could focus on sewerage and drainage service instead of entering drinking water supply competition.

7.3 Institutional arrangement

Chapter 6, part 6.3.1.1, explained that joined-up government would be a suitable model for collaboration across governments in providing water service in Nauli City. From the alternatives that were explained previously in Table 37 in Chapter 6, the most suitable model for local government partnership in Nauli City's water management case is the fee for service contract or service agreement. This is due to the characteristics of this model which requires written agreement between parties where one local government sells public services (in this case water service) to another local government, and parties are bound to their rights and obligations during the agreed term. Terms and conditions that are suggested include:

- The District PDAM and the BLUD SPAM will operate under the coordination of the City PDAM and distribute water to the residents on behalf of the City PDAM.
- The District PDAM and BLUD SPAM bill the water to the City PDAM. Water price is the total of water distributed with a considerable profit, and will be determined by an independent appraisal.
- The City PDAM acts as the only water operator in Nauli City and sells water to the residents. Price will be determined by the government of Nauli City, and a subsidy will be paid if there is a gap.
- This can be a long-term contract with an option that the City PDAM will pay an agreed amount of money (determined by an independent appraisal) to take over the whole water network by the end of contract.

– Technically, service area can be divided between the three companies, and eventually they have to be connected to one another as an integrated system.

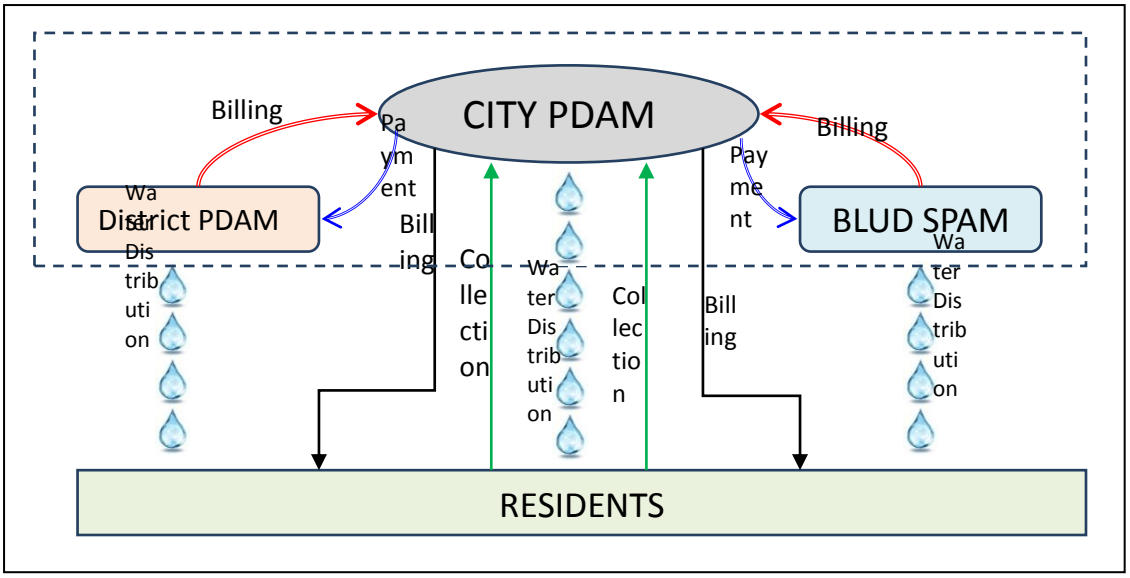


Figure 55: Partnerships arrangement between three water companies (diagram developed by author)

With the proposed partnerships arrangement the City government and the City PDAM could establish a more holistic master plan. In line with this approach, the District PDAM could continue its business and make new, or maintain old, investments without fear of losing its assets. Furthermore, the City PDAM can focus on serving all people and manage cross-subsidy tariff systems to assist poor people. Local government can allocate funding more wisely as it only deals with one water operator. Moreover it will not amend any local or higher level regulations, since the service agreement will accommodate all terms and conditions, and water management can pay more attention on other social and environment matters.

However under this system, it will be difficult to set an agreed terms and conditions particularly regarding assets, price, and term of contract. It is very likely that the District PDAM will be reluctant since it is much bigger than the City PDAM, and the District governments will be reluctant since they will lose not only profit, but also political interest and control over water provision.

7.4 Monitoring and evaluation

As explained previously in Chapter 4 and 5, water management in Nauli City has been very chaotic and it causes conflicts between central government's and local government's projects, between local and provincial governments, between departments within the local governments, and between local water companies. There has never been an integrated planning in doing monitoring and

evaluation regarding water service in Nauli City. All level of governments have invested huge amount of budget in building water facilities, but they never conducted proper planning and monitoring (described in detail in Chapter 5).

Kusek and Rist (2004) described that monitoring can be performed at two levels: implementation and results. Implementation monitoring supervises the strategies and actions (input → process → output) for achieving targets, while results-based monitoring oversees the achievement of outcomes and goals of a program or policy for a medium- or long-term activity.

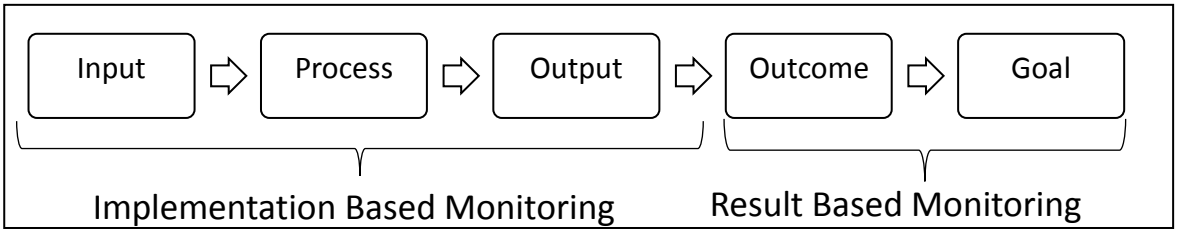


Figure 56: Results-based and implementation-based monitoring (diagram developed by author)

Implementation-based monitoring for the Nauli City water problem can be conducted to examine the implementation of a 'what next' strategy that is explained in part 6.3 above, consisting of three main aspects: governance, demand management and environment. Results-based monitoring can be conducted to measure whether the 100% coverage of water provision has been achieved for 100% accessibility to water of good quantity, quality and continuity.

In a development context, Estrella and Gaventa (1998) emphasised that participation from all stakeholders, particularly the service users, the doers and the affected people, is critical. These parties need to be actively involved as a form of 'monitoring from below' to ensure that the policy has reached its target (McIntyre-Mills 2017). McIntyre-Mills (2017, p. 93) explained that the use of a community of practice is effective to implement monitoring from below, to balance the individual and collective needs, encourage residents to raise their voice, and eventually create user-centred governance of resources. As West Churchman said, we have to see the world through the eyes of another if we want to holistically address a social or wicked problem. The era of traditional democracy where the government acts in the name of the majority without restrictions has gone, replaced by the era of monitory democracy where people, public accountability, the public and citizens have emerged to be the most important, and elites lose their grip on politics (Keane 2009a, 2009b, 2011). According to Keane, "monitory democracy is the age of surveys, focus groups, deliberative polling, online petitions and audience and customer voting" (Keane 2009a, p.10).

Participatory monitoring and evaluation has been effectively implemented not only in developing countries like Brazil and Vietnam where farmers were involved in planning and decision making, but also in the USA and the UK where community leaders and supporting institutions involved the community to improve performance (Estrella & Gaventa 1998). McIntyre-Mills (2017) stated that monitoring from above (by national policy to address global objectives) and from below (allowing people to express their interests and protecting local environment) are important to balance individual and collective needs. Monitoring and evaluation is needed to find out to what extent people are doing the right thing. It is not enough for governments and experts to plan and evaluate their own performance in public service delivery; there must be accountable monitoring to ensure that services are efficient, effective and reach their target demographic.

CHAPTER 8. CONCLUSION

> *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* (Article 33, Indonesian Constitution 1945).

It has to be admitted that water provision poses a problem and is a big issue that needs to be addressed by the government. Indonesia is still trying to pursue the global target for water provision (Sustainable Development Goal 6: "Ensure availability and sustainable management of water and sanitation for all" by 2030), and it has been adapted as a medium-term target: to achieve 100% coverage by 2019. Even though national data has shown significant improvement in water service, some areas, like Nauli region for instance, are still struggling to find the best way to manage drinking water, especially when the trend of local autonomous systems is emerging, and where local ego sometimes disregards the main objective of the development: the people. Development for people should be the main goal of every kind of development, physical and non-physical, as it is the people who will enjoy and continue the development (UNDP 1994).

Nauli City's precipitation rate from May to November is almost zero every year, and this area is water-scarce with dry climate, and a rocky and mountainous landscape. Nauli City Government was part of Nauli District Government that proliferated in 1996. The District PDAM operated in the city area since 1958, and when the city government established its new City PDAM in 2005, this area was served by two water companies. As they were operating in the same area with the same customers, conflict was inevitable. The related local governments were in conflict as well and, even worse, the provincial government stepped into the competition by establishing a new water provider, the BLUD SPAM.

This thesis makes the case that water management in Nauli City is a wicked problem in that the social, economic and environmental aspects of the problem are perceived differently by different stakeholders. The wicked problem has interconnected aspects where stakeholders have different, and sometimes opposite, points of view, a solution for one can be a problem to another, and time is running out as the conditions (social, economic, and environmental) are degrading. Economically, local governments and provincial governments seem to be very busy trying to commodify water; turning water from a common good into a sellable product. Local Governments engage in

competition to get more customers but, still, the quality of service (quality, quantity, and continuity of water distributed) was not improving. The environment has been ignored as groundwater discharging happened ad hoc without any attempt to maintain the ecology, no law enforcement to restrict commercial use of groundwater, and water permeating areas continued to shrink.

The governments regard the people as their customers instead of citizens, which eventually led to ignorance of marginal people. The central government tried to accommodate poor people and people in rural areas by carrying out a community-based water management program. However, it was a more project-oriented program and was neglected after the projects were completed as almost all of the projects are no longer working.

David Bollier (2011) defined the commons as a social system, wealth, knowledge or sector of economy that has long-term stewardship with preserved shared values that must be passed on to the next generation with minimum reliance on the market or state. To a large extent, water is a common as it is a basic need for human life. Hardin (1968) explained the term 'Tragedy of the Commons' and refers to shared resources that are used independently by its users according to their needs. The 'Tragedy of the Commons' happens when one or more users use the resources excessively without considering the negative impact to other users or to the extinction of the resources (Hardin 1968).

This thesis will contribute to the literature as little research has been done on water-scarce regions in Indonesia like the City of Nauli. This thesis shows how water has been mismanaged and politicised for power while ignoring the principles of justice for the people as required in the Constitution. Furthermore, in Nauli City, water has been commodified by the governments. They try to get profit from it by neglecting the poor and marginal people, and failed to conserve natural resources and the environment by allowing unrestricted use of groundwater, which Anthony Giddens mentioned as a consequence of modernity (Giddens 2013). As mentioned in part 2.10, there has been research in developed and developing countries, as well as in Indonesia, that tried to address problems in governing water management. However, the unique condition of the water problem in Nauli City means the analysis offered in this thesis could be a new insight to the literature.

This thesis will also contribute to enrich research methodology, as it applies multiple approaches to analyse, scrutinise and address the problems and the findings. Firstly, the wicked problem was analysed by using the Critical Systems Heuristics (CSH) approach in Chapter 4. This approach was conducted to determine 'what is the case' and 'what ought to be the case', meaning what is happening and it how should be happening. This approach uses twelve questions that can be divided

into four categories: (1) the source of motivation (the main objective of the policy); (2) the source of power (the parties and resources needed to enforce the policy); (3) the source of knowledge (the parties and resources needed to undertake planning); and (4) the source of legitimation (the parties that should not be forgotten in policy implementation). By using the CSH approach to assess drinking water management in Nauli, it can be seen that there remains much to be done to improve the current condition. As the source of motivation, there must be a change in mind set that all people, with no exceptions, are the real beneficiaries of water services. As the source of power, water providers and all levels of government have to integrate all water programs and water policies, and coordination in planning and institutional arrangements needs to be improved. As the source of knowledge, water management planning should be viewed from a broader perspective to consider social and environmental perspectives, and people from different backgrounds of expertise should be involved. As the source of legitimation, planning in water systems should give equal opportunities to all, since the basic standpoint for starting any kind of public service is the Constitution: to employ all services for the maximum benefit of the people.

Secondly, the wicked problem is scrutinised and examined with the 'what's the problem represented to be' (WPR) approach and a structured problem map (Chapter V). These two approaches tried to perceive and disentangle the wicked problem so it can be properly addressed from economic and social perspectives. The WPR approach explores the power dynamics and how well or badly the government uses its approaches. Quantitative data collection and analysis was also conducted (see Chapter 5) to get a more comprehensive analysis from the residents' point of view. By using sequential exploratory design of data collection and analysis (qualitative data followed by quantitative data), hypothesis tests show that the residents perceived that the existence of water market competition in Nauli City has not brought any positive impact to the quality of water service. The data even showed that the condition of the water service was worse compared to the condition ten years ago, even though there are three water companies operated in that area.

There are four stages of policy analysis discussed in this thesis:

a. first stage: Identifying and structuring the problem;
b. second stage: Clarify goals and determine measurement system;
c. third stage: determine 'what next' strategies; and
d. fourth stage: policy arrangement.

The first stage is explained in Chapter 5 and has been summed up in the previous paragraph, the second and third stages are described in Chapter VI, while Chapter VII discusses the fourth stage.

The second stage (part 6.2) starts with explaining that international society has agreed to create better social, economic, and environmental conditions by improving several indicators through the Millennium Development Goals (MDGs), followed by the Sustainable Development Goals (SDGs). While the MDGs tried to improve the most indicators by half by 2015, the SDGs aim to eliminate, or achieve by 100%, the targets by 2030. In the drinking water sector, the SDG aims to achieve 100% access to safe and affordable drinking water. Indonesia, as a country member of the United Nations which launched the MDGs and SDGs, has ratified those targets and has included them in the national and local targets. As national targets, the Indonesian medium-term planning targets 100% coverage of drinking water by 2019. Based on the findings, Nauli City Government tried to adapt the national target in its medium-term planning, but the government officials admitted that they did not know how to achieve the target as the planning document was formulated by a consultant. This thesis suggested that achieving 100% coverage by 2030 would be realistic for Nauli City as, in 2015, it had less than 40% coverage with problems and conflicts due to the wicked problem. After determining a long-term target, the thesis offers the 'what next' strategies to achieve the target that explains the second stage of policy analysis.

In formulating the 'what next' strategies as the third stage of policy analysis (as explained in part 6.3), expanded pragmatism is essential to avoid anthropocentric ways of thinking, and should consider consequences of decisions in short, medium and long terms for self, others, the next generations and the environment (McIntyre-Mills, 2014). The wicked problem should be addressed by properly managing three main aspects. Firstly, governance (part 6.3.1) which must include formulating the most suitable institutional arrangement to accommodate various interests from many different stakeholders to end the conflicts. The thesis suggested joined-up-governments with service contracts between water companies as the new system for Nauli City water management to reach a win-win condition. Financing and regulations can be formulated between the City, Provincial, and Central Governments to facilitate the system.

Secondly, demand management (part 6.3.2) means to encourage the people to have awareness of the most efficient and effective way to consume water to achieve transgenerational equity and environmental integrity (Savenije & Van Der Zaag 2002). There are two ways: (i) pricing policy, which suggests that pricing should include social costs and environmental costs in addition to operational costs; and (ii) non-pricing policy, which concludes the introduction of water efficient technologies such as dual-flush toilets and efficient showerheads, mandatory water restrictions under new water related regulations, and educational campaigns. The success story of Cape Town's extension Day Zero (the day when water delivery ceases due to drought) from April 2018 to 2019 is

also presented in part 6.3.2. One of the strategies was by applying stringent water restrictions and monitoring it with a water map that allows residents to monitor their own area.

Thirdly, the environmental aspect (part 6.3.3) should be taken into account in order to maintain sustainability and build wellbeing stocks for future generation (Stiglitz et al 2011, McIntyre-Mills 2014, Pauli 2009). The thesis suggests two approaches to preserve the environment. The first is a replantation policy, which encourages replanting of native plants, such as Lontar trees or *Borassus flabellifer*, that will help to recharge and control groundwater. In addition, native plants will also help restore habitats for native animals and insects. The second approach is rainwater harvesting and greywater use. According to Rathjen et al (2003) the rainwater and greywater can be used for almost 95% of domestic daily water usage, including applications for bathrooms, toilets, cleaning, garden and laundry.

Chapter 7 of this thesis discusses the third stage of policy analysis: policy arrangement. There are three steps that are proposed:

(i) legislation, to establish, amend, and synchronise all regulations regarding water management to support the strategies. This thesis suggests that transfer of assets from old to new local governments and criteria for establishing a new PDAM for new local government should be clearly regulated.
(ii) institutional arrangement, to establish a strong and conflict-free institution based on the regulations. Collaboration between governments is a suitable model for addressing the wicked problem of water management in Nauli City, and figure 49 describes how the partnerships between water companies can be formulated.
(iii) monitoring and evaluation, to implement a monitoring system that can adopt monitoring from below (McIntyre-Mills 2017, p. 93), monitory democracy (Keane 2009a, 2009b, 2011), or participatory monitoring and evaluation (Estrella & Gaventa 1998) to ensure that the policy has reached the target: the people.

The researcher acknowledges that further research should be conducted, particularly to follow up the ‘what next’ strategies. Firstly, as Indonesia is a very large country with diverse conditions and background, governance for the water sector needs to be reformulated to find the most suitable institutional arrangement for different areas with different characteristics like climate, demography, geography, population density, cultural diversity and political situations. A one-size-fits-all system should not be implemented, and continuous research needs to be conducted across all regions in Indonesia. Secondly, the people need to be encouraged to use water efficiently and a participatory

study needs to be performed to know how to manage demand. Monitoring from below is urgently needed since planning has been determined top down, regardless of what the people actually need. A culture shift in the society can be driven by structural forces from the top or from the society, and by the individual through self-responsibility (Inglehart 1990). This is why demand management is important. Thirdly, more research on how to conserve the vulnerable environment should be conducted, as well as rehabilitating the groundwater level. The water table is lowering due to excessive use of groundwater and the extensive city development which does not consider absorption areas or provision of green spaces in the city which could prevent runoff. Revegetation policies need to be implemented to bring back native plants. This would be a good solution, however, proper regulations and funding should be enacted as well. In addition, the people should be encouraged to be familiar with rainwater use and water recycling, and incentives can be provided as a reward.

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Appendix

Questionnaires

Research Title: ***WATER AS A PUBLIC GOOD: A CRITICAL REVIEW OF WATER GOVERNANCE IN NAULI CITY***
Researcher: Jackwin Simbolon
Institution: Flinders University, Australia

Below is a questionnaire that aim to know the significance of improvement in pipe water service provided by PDAMs in Nauli City. Respondent is asked to answer questions based on current condition compared to that of ten years ago. The main criteria of the respondent is 'has been registered as PDAM customer for more than 10 years'.

1. Respondent details. Please Circle your answer.

1. Name :…….. (you can leave it blank)
2. Gender: (1) Male (2) Female
3. Age: (1) 18-30 (2) 30-50 (4) > 50
4. Family member: (1) 1-3 people (2) 3-5 people (3) > 5 people
5. Duration of being PDAM customer: (1) 8-10 year (2) > 10 year
6. Monthly Income: (1) 0-1 million (2) 1-3 million (3) 3-5 million (4) > 5 million
7. Occupation: (1) Self-employed (2) Govt/army (3) Private (4) Not clear (5) Unoccupied (6) Other……..
8. Currently registered as: (1) PDAM Kota Kupang; (2) PDAM Kab. Kupang (3) BLUD SPAM Prov. NTT

2. Questions

Please put (X) for the most appropriate answer. If you don't know the answer, please give some notes.

Y = Yes; S = Sometimes; N = No;

		Current condition				Condition 10 years ago			
		Y	**S**	**N**	**Note**	**Y**	**S**	**N**	**Note**
I	**Technical aspects**								
1	Water flows all the time (morning, afternoon, night)								
2	Water flows everyday but only at certain time								
3	Water flows well, can fill up a 20-litre bucket in 3 minutes.								
4	The amount water from PDAM is enough for household needs (no need to get water from other sources)								
5	Water tap only flows water (not wind)								
6	Water is clear								
7	water is tasteless								
8	Water is odourless								
9	Home water-tank is not needed to contain reserved water								
10	Bore well is not needed								
11	Trucked water is not needed								
II	**Administrative aspects**								
1	Meter reader comes every month								
2	"Water stop" happens only occasionally (less than once a month)								
3	Customers can submit complains through calls (phone)								

4	Technical Complaints are responded less than 3 days								
5	Administrative complaints are addressed less than 7 days								
6	PDAM always provide important information e.g. “water stop” schedule or change in service or tariff								
7	Water bill can be paid through ATM or online								
8	Water bills are presented to customers less than 15 days prior to due date.								

Questions on Customer Satisfaction

VS: Very Satisfied

S: Satisfied
D: Disappointed
VD: Very Disappointed

		Current Condition					**Condition 10 years ago**				
		VS	S	D	VD	Note	VS	S	D	VD	Note
1	The frequency of water flows from the tap										
2	Water pressure from the tap										
3	The quality of water tap										
4	Water billed properly according to usage										
5	Billing system is properly scheduled and easy method to pay										
6	Complaints are addressed properly										
7	Water tariff is balanced compared to overall										

	service										