CRITICAL SYSTEMS THINKING REVIEW ON DECENTRALISED DRINKING WATER MANAGEMENT IN NAULI CITY[1], INDONESIA

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ABSTRACT

This paper is based on a PhD project[2] that strives to assess the performance of decentralised drinking water management in the city of Nauli, Indonesia. The implementation of decentralised government system followed by decentralizing some functions including drinking water services, is unsatisfactory in providing access to drinking water for all residents in the city of Nauli. Nauli Municipality that has just split up as an autonomous local government under the decentralized government system in Indonesia, is facing conflicts in providing water provision to the society, since there are three public water companies in this region: City PDAM, District PDAM, and Provincial BLUD. Furthermore, these governments and their water companies seem to forget the main objective of government in water provision as stated in the Indonesia Constitution: to fully control the water and manage it for meeting the people's needs. The aim of this research is to apply Ulrich's critical systems heuristics (CSH) to address the following research questions: (i) how effective is the current decentralized water management system?; and (ii) how the current system can be improved and what ought to be done?

Keywords: Systems thinking, drinking water management, decentralisation, sustainability

Introduction

The Indonesia Constitution article 33 states that '*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*.' It goes on to say that in Indonesia, government has the responsibility to provide public utilities to the people. In terms of providing water, Indonesia has implemented the decentralised system in water management, meaning that the responsibility of water provision is one of local governments' functions. However the effectiveness of the system is still unsatisfactory compared to some targets that have been established. This paper as part of a PhD project, tries to unravel the cause of poor water management in Indonesia, with Nauli Region as a case study. I am currently pursuing my PhD in the School of Social and Policy Studies on improving Water Supply Management in Nauli region, to examine the problems and to find a better model of institutional arrangements of water supply management. The empirical research assesses the extent to which the management approaches support the UN Sustainable Development Goals (SDGs). I will consider what works, why and how and what does not work why and how.

This research will try to examine the performance of water providers, - namely water companies- and local governments in the Nauli region in providing drinking water.

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However this is not merely related to political and management per se, but other related aspects that are surrounding it will also be considered, which makes provision of water problematic or so called 'a wicked problem' (Churchman 1967) because the competing interests at the different levels of government. This paper will use a critical systemic approach with four aspects namely: social, economic, environment, health and politics (Elkington 1999; Gleick, Peter H. 2013; Gorre-Dale 1992; Mcdonnell 2008; McIntyre-Mills 2008; Schelwald-van der Kley & Reijerkerk 2009, p. 8; Zaag & Savenije 2006)[3,4]. Moreover, water governance is a part of bigger local, national, and global system, so it will be very vulnerable to any changes in other sectors (Biswas & Tortajada 2010), and every solution of one aspect has a great connection to or implications for other aspects, and sometimes the issues are overlapping (Churchman 1979, p. 4). This research will apply an analysis through applying Werner Ulrich's Critical Systems Heuristics (CSH) to get a more detail picture to answer two research questions: (i) how effective is the current water management system in providing drinking water to the society; and (ii) how can the current system be improved and what ought to be done?

Indeed similar research has been conducted in other countries (developed and developing)[5], however many aspects and conditions have change during the time, so '….what may have been a viable solution a decade ago or in a particular region may not be so now or in other region. This means that water policies need to be updated periodically so that they reflect the changing requirements' (Biswas 2001, 2007). The paper will be divided into eight parts: first part will discuss global efforts to achieve sustainable water; the second part will discuss about decentralisation euphoria in Indonesia and its impact on drinking water management; the third part will discuss about the performance of drinking water provision in Indonesia; the fourth part will discuss about problems in drinking water management in Nauli; the sixth part will describe a little bit about key concept, the approach, and methodology; the seventh part will examine the effectiveness of this system through Werner Ulrich's CSH; and concludes with recommendations for future improvement.

Decentralisation euphoria in Indonesia and its impact on drinking water management

Indonesia under President Sukarno administration had adopted a regional government system since the introduction of Law no. 1/1945 about Regional National-Committee, and then developed by a number of subsequent laws, which later revised former law: Law No. 22/1948, Law no. 1/1957, and Law no. 18/1965. However the term 'decentralisation' was formally introduced in President Suharto era, through Law no. 5/1974 about Government in Regions, which is regarded by Sulistiyanto and Erb (2005, p. 6) as 'limited decentralisation while preserving the unitary system' (Purwanto 2005). With this regulation, President Suharto regime seemed to introduce regional autonomy and implemented decentralisation, but still has the power to appoint the head

[3] 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.

[4] McIntyre-Mills (2008, p. 10) constitutes these aspects as 'The Dimensions of Wellbeing'.

[5] See also (Domènech 2011; Hwang, Forrester & Lansey 2014; Kim 2008; Moglia et al. 2011; Reynoso 2000; Wilder & Lankao 2006)

of regional governments, and to intervene in local administration. In principal, this law did not give power to regional government to manage their affairs (Sulistiyanto & Erb 2005), and with military behind the regime, it was also very intimidating. In terms of water management, Ministry of Public Works had strong control through its regional offices (*kantor wilayah*) in each province, which decided on the areas of development as well as proposing funding to Jakarta. The ministry issued Ministerial Decree no.3/PRT/1968 which has been regarded as the starting point of nationally integrated water management. In the First Medium Term Development (Pelita I[6]), Ministry of Public Works acted as the key player in organizing water related investment all over the country, started with 120 cities funded by foreign loans. In the Second Medium Term Development (Pelita II[7]) the ministry then expanded all local government units in charge to water-management units into local-government-owned water companies called PDAM[8]. However in practice, water management nationally was regulated and controlled by the Ministry of Public Works, and PDAM management must comply with regulations stipulated by the Ministry of Home Affairs.

Since 1999 following the downfall of Suharto, Law no. 22/1999 was introduced and had gradually dismantled centralistic system towards decentralisation (Sulistiyanto & Erb 2005). By this law, local governments head are not appointed but central government but directly elected by the people, and there are clear separation of functions between central government and local governments (municipal and district government) which means that local governments have the authority to perform the functions without any intervention from central government. Drinking water management is one of the transferred functions and the Department of Public Work regional offices are closed down as shown in figure 1 below:

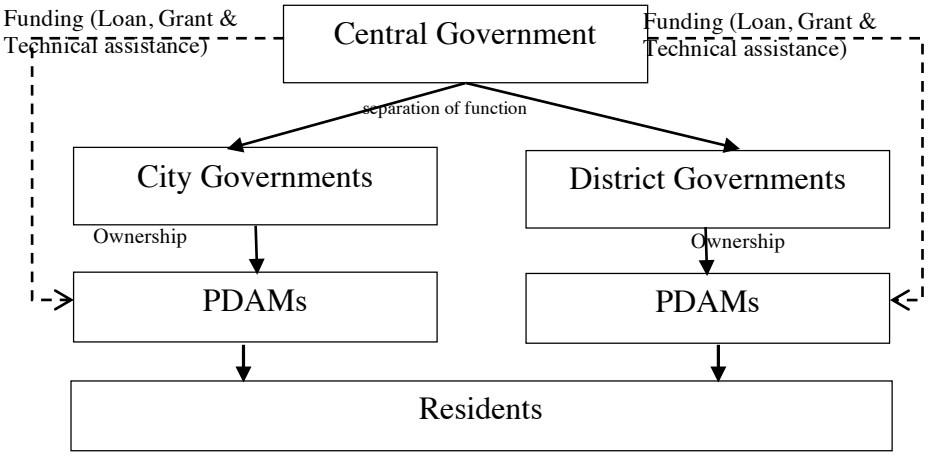

Figure 1 Transfer of water service function from central government to local government

[6] Pelita: Pembangunan Lima Tahun (Medium Term Development). Pelita I was from 1969 to 1973.
[7] Pelita II : 1974 – 1978.
[8] PDAM: Perusahaan Daerah Air Minum.

The government started to assigned water supply provision to PDAM since 1970s, and at the beginning of 1980s there were only 12 PDAMs established in Indonesia[9] with overall service coverage in urban area was only 7 per cent (Simbolon 2007). However regulatory functions and policies are still shared among several government institutions before the function is really landed into the hands of PDAM. Some of the institutions are the National Development Planning Agency (establishing water blue print and coordinate all sectors), Ministry of Public Works (execution of the planning), Ministry of Home Affairs (managing local government issues including PDAM management and water tariff), Ministry of Health (establishing healthy water standard), and local governments (responsible for delivering water to residents).

During sixteen years of the implementation of decentralisation in Indonesia (from 1999 to 2015), there have been 215 new district and city governments were established[10]. These new local governments then began to create their own PDAM to perform water service in their region, with the aim of accelerating water provision to the people[11]. There are 117 new PDAMs established by those new local governments, and water management has moved towards more local based rather than partnerships between local governments (OECD 2010, p. 113). However in many cases[12], problems arise and in Nauli region for example, conflicts between old and new local governments and their 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, and they have neglected services with the result that people suffer from lack of water. This phenomenon of establishing new water company without considering the economies of scale, cultural and environment detriment, has been taken place recently in many regions in Indonesia, due to boisterous proliferation of local governments.

After about 50 years of the existence of PDAMs, PDAMs have been experiencing unsatisfactory performance. Firstly financial performance, the Water Supply System Development Support Body (BPPSPAM[13]) 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.

Secondly, by the end of 2011 PDAMs could only cover 55.04 per cent of population (13.94% in rural area and 41.88% in urban area)[14], while if the target set by

[9] Some of them were not really established by the local government, since they are already existed since the colonial era. Some of the oldest water companies for example: in Medan (1905), in Jakarta (1918), in Makassar (1924), in Semarang (1911).

[10] Data generated from Directorate General of Fiscal Balance, Ministry of Finance, 2015.

[11] Until 2015 there have been 117 new PDAMs and it is still counting. (Perpamsi, 2015).

[12] 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.

[13] BPPSPAM: Badan Pendukung Pengembangan Sistem Penyediaan Air Minum

[14] (Suara Pembaruan 2013)

the Millennium Development Goals (MDGs)[15] on water access is implemented in Indonesia, it should be 68,87 per cent coverage in 2015[16].

In several big cities, residents have increasingly complained about on PDAMs services since PDAMs applied very high water rates but still delivered poor services and unreliable access to water. Moreover, PDAM responded to customers' complaints are very slow, and there were cases where new commercial customers should pay illegal fees for getting new connection (Winters, Karim & Martawardaya 2014).

Overall, poor water management has caused over 100 million people in Indonesia lack access to safe water and more than 70 percent of the country 220 million populations rely on water obtained from potentially contaminated sources. This unsafe drinking water is a major cause of diarrhea, which is the second leading killer of children under five in Indonesia and as the major cause for 20 percent of child deaths each year (Dursin 2006).

Nauli City Profile and Drinking Water Management Problem

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% or 180.27 km2 is City of Nauli jurisdiction and 96.7% or 5,298.13 km^2 as Nauli District administrative area. Most of the area surface is mountainous and rocky landscape with very little precipitation (raining only between December and March, while from May to November precipitation rate almost zero (BPS, 2014).

The District of Nauli was established on 9 August 1958 with Law No. 69/1958[17] and the sub-district (kecamatan) of Nauli as the capital city. In year 1978 with Government Regulation Nr. 22/1978, the subdistrict of Nauli was upgraded into the administrative municipality[18] of Nauli. In year 1996, the status of administrative city of Nauli was then upgraded to Nauli City, which had all the structure of an autonomous city[19].

According to the Statistics Body of Nauli City, Nauli City population in 2013 was 318,425 people, of which 33,800 people or 10,6% lived under poverty line. In terms of level of education, only 13% of the population have graduated high school or above, while 11% of the residents had never finished primary school. As a capital city, the city government itself can be considered as the poorest in Indonesia, as its budget was the second lowest amongst 32 capital cities in Indonesia, and surprisingly this local government has been ranked as the most corrupt city government in 2015 according to the Indonesia Corruption Watch.

Water management in Nauli region has become more organised since 1986 after that the status of District Government local water body was upgraded to local water

[15] 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.
[16] DG Human Settlements (2009),
[17] BPS Nauli District (2013)
[18] During the New Order Era under president Suharto administration, administrative city was prepared as a candidate of new city, it had its own structure, led by a mayor, but was still under the parent District jurisdiction (Firman 2013, p. 186).
[19] BPS Nauli City (2014)

company or PDAM[20]. After almost 30 years of operation, PDAM of Nauli District becomes one of the biggest PDAM in Indonesia with more than 30.000 connections, supplied by 25 water sources with total capacity 575 litre/second, and it is financially healthy.

In September 2005, the government of Nauli City established its own PDAM (PDAM of Nauli City). In 2014, the number of connections reached 6,573 served by 16 water sources with 108 production capacity. However the District PDAM still operates their business in Nauli City administrative territory. In 2012, 85.8% (22.629 out of 26015 connections) of the district PDAM customers were located in Nauli City, which comprised of 56.01% of Nauli City population[21]. Until now its head office 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[22], the function of delivering water provision belongs to the local governments, the local government as regulator and PDAM as the operator, and water tariff must be authorised by the head of local government (Mayor and Head of District). The regulations mean policy of delivering water in a particular region is made by the local government. The government of Nauli City has asked Nauli District government to transfer water service network from the district PDAM to the city PDAM, but the district government refused[23]. There had been efforts from the governor of Samsoir[24] and also some national parliament members[25] to reconcile these two local governments, but still could not arrive into an agreement.

This condition has triggered poor performance in drinking water provision in Nauli region. In Nauli City, on 38.17% of households had access to PDAM water (piped water), while the others should fulfil their need through other sources like water merchants (32.84%), bore well (24.16%), and other unprotected water sources (4.43%), and sadly there are 0.4% or more than 15,000 people do not have access to water sources at all (BPS Nauli City 2014). 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, 92.94% got water from protected water well, spring, river, or even rain water (BPS Nauli District 2013).

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[20] PDAM of Nauli District was formally founded on 15 May 1986.

[21] PDAM Kabupaten Nauli Company Profile 2013.

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

[23] Pos Nauli news: Pemkot akan ambil alih PDAM (City government will take over PDAM), dated 8 September 2013, http://Nauli.tribunnews.com/2013/09/08/pemkot-akan-ambil-alih-pdam

[24] Pos Nauli news: Gubernur Pertemukan Bupati dan Walikota (Governor gathered the Regent and the Mayor), dated 5 February 2014, http://Nauli.tribunnews.com/2014/02/05/gubernur-pertemukan-bupati-dan-walikota-Nauli

[25] Pos Nauli news: Bupati Curhat PDAM ke Komisi V DPR RI (The Regent converse about PDAM to Indonesia Parliament member), dated 14 March 2014, http://Nauli.tribunnews.com/2014/03/14/bupati-curhat-pdam-ke-komisi-v-dpr-ri

Figure 2 A well with 70m deep and still no water in dry season

Figure 3: People carry water bucket on from a spring sometimes for hundreds of meter.

Figure 4 Unprotected water source, a small river used for domestic needs

Figure 5 Rainwater harvested from roof-gutter

On the other hand, to support both PDAMs in getting raw water as well as for irrigation and other needs, central government had built Tilong dam with 19.07 million m^3, a big dam located in Nauli District, 25 km from the city of Nauli. Samsoir provincial government[26] is 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)*, and it is 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 PDAM of Nauli City and PDAM of Nauli District. However in point of fact, BLUD SPAM not only selling bulk water to PDAM of Nauli City (because PDAM of Nauli District does not want to buy), but started to sell bulk water to end user (residents in Nauli City and Nauli District, University of Meranti and the El Loco airport). Water management system in Nauli region is described in the picture below:

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

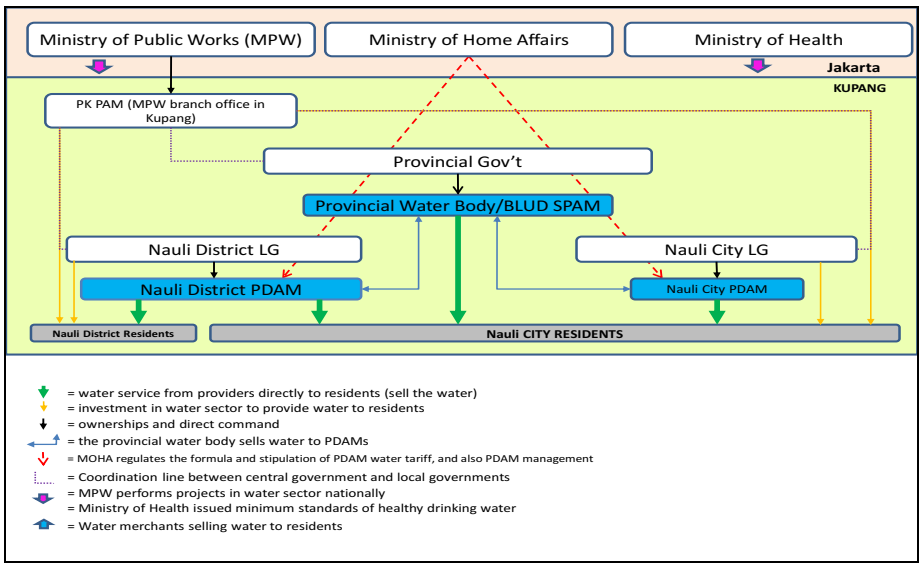

Figure 6 Water Management system in Nauli region

It means, both PDAM only concentrate to expand their business in Nauli City region, as this area covers most of profitable customers in Nauli area. Despite the fact that PDAM of Nauli District should serve residents in Nauli District area, this company is still reluctant to discharge their coverage in Nauli City and hand them over 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 PDAM is not reliable. Many people in Nauli City area witnessed that buying water from the water retailers sometimes is better than paying for PDAM water, since water tap is not flowing regularly, and the tap released stinky air –not water[27]. These two PDAMs are also having conflict in acquiring water sources. Most of high debit water sources in Nauli city area are controlled by PDAM of Nauli District[28], and it has caused PDAM of Nauli City employ 21 relatively small-debit[29] of water sources, where 18 of them are using bore well which require high electricity cost (Simanjuntak et al. 2015, pp. 44-5). In fact both PDAMs have to struggle to find reliable water sources in Nauli city since this area is very arid area with uncertain climate. In dry season between May to November each year, Nauli city experience water crisis. There are 3 rivers in Nauli city which flow only during rainy season (BPS Nauli City 2014), which makes ground water sources as very important alternatives for PDAM. The building of reservoirs is not optimal since there had been miscalculated in yields of surface water, and ground water does not supply enough water[30]. If this deteriorating water crisis is not addressed immediately, it could lead impact on the sustainable delivery

[27] Institute of Resource Governance and Social Change, http://www.irgsc.org/opinion/Stop-Balakai.html, retrieved 2 August 2015.
[28] PDAM of Nauli District utilize 25 water sources, 19 of which are located in Nauli City area.
[29] A hydrology term for water discharge rate per second.
[30] ADB 2015 Annual Evaluation Review, http://www.adb.org/sites/default/files/linked-documents/F-Lessons-on-WSS-Projects.pdf, retrieved 1 September 2015.

of services to business and tourism in Nauli City, and since most of them rely on ground and surface water withdrawal rather than from PDAM piped water[31].

Key concepts and approach

It is generally accepted[32] that public utilities (such as electricity, water, transportation, and waste collection) should be provided or at least controlled by the government, and it is part of the development driven by the government. That is also the case in Indonesia. With the purpose of conducting the above mentioned responsibility, the government established and implemented a great deal of regulations, and often changed repeatedly. Public utilities regulation is very dependent on the political structure and the ruling regime (Gormley Jr 1983). Wilson makes a strong argument that politics of regulation, especially for intervening the market and providing utilities, does exist (Wilson 1980, p. 357). By and large, one way that government can use to regulate or control its political power to public service provision is through governmental system: centralized and decentralized.

The term decentralization was used by Thomas Jefferson as:

> *"….by dividing and subdividing these republics from the great national one down through all its subordinations, until it ends in the administration of every man's farm by himself; by placing under everyone what his own eye may superintend, that all will be done for the best…"*
>
> (Thomas Jefferson, 1999, quoted in Treisman 2002).

The UNDP define decentralisation as a restructuring of the power of central government and expanding the responsibilities and capacities of subnational government level, to achieve effectiveness and better quality in the system of governance (UNDP 1997). As Cohen and Peterson (1999) explain, decentralisation is not only based on historical origins or territorial cluster, but can also be based on problem/valued centre and service delivery focuses. Bahl and Martinez-Vazquez (2006, p. 6) stressed that the implementation of decentralization is mainly because of people's disappointment with the existing centralized system. There several underlying factors behind it: bigger population and central government failed to served one or some particular areas; worsened public services, poor performance and poor accountability of government officials; cultural and ethnicity ego, that makes people want to have more autonomy to rule their region. However the UNDP (1999) emphasis that decentralisation is definitely not regarded as an alternative to centralisation since centralisation of policy is still needed in national regulating context, and successful decentralisation will highly depend on coordination and relationships between all perpetrators: the government, private sectors, and the civil society.

According to UNDP (2014, pp. 5, 85), providing access to adequate clean water is one of the *universal provision of social services*[33], and it is essential in order to strengthen

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

[32] See for example da Cruz, Berg and Marques (2013); Drakakis-Smith (1995); Laffont (2004).

[33] UNDP emphasizes that universal provision of social services are: education, health care, water supply and sanitation, and public safety.

the quality of life of the people especially in early stages of development. Scarce water is now a big problem for some countries, and it has to be addressed to assure health security is achieved. In formulising the 2013 human development index, UNDP (2014, pp. 212-5) included 'children 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[34]. While Indonesia that ranked 16 in gross domestic product but unfortunately ranked 108 in human development index (clustered as Medium Human Development) and has abundant of water in the country, had 130 cases of per 100,000 deaths of children under age 5.

Mahbub ul Haq said that *"people are the real wealth of a nation"* (UNDP 2010). 'Development means good change' (Chambers 1995). Development constitutes the quality of life of the citizens, and it can be to get "access to education and health care, employment opportunities, availability of clean air and safe drinking water, the threat of crime, and so on" (World Bank Group 2012). The goal of the development or improvement is the citizen as an individual, not only citizens collectively as a society or as a group (Nussbaum 2011), and this goals referred to as the Capabilities. Capability Approach emphasises freedom of individual to make decision as a basic right, and according to Amartya Sen, development must pay biggest attention to promote such freedom (Deneulin 2006; Sen 1999). Sen argues that in constructing development, the freedom of individual should be treated as the basic building blocks (Sen 1999). Martha Nussbaum (2011, pp. 17-44) emphasises that the government should secure to all citizens Ten Central Capabilities[35] at a threshold level, and 'healthiness' (the ability to have a healthy living includes access to clean water) is at the second most important. It means that providing water is considered as basic need and it is also important to sustain human living not only for current but also for future generation (Stiglitz, Sen & Fitoussi 2010, p. 98). Robert Chambers emphasises that when well-being in terms of experiencing good quality of life is regarded as the objective of development, then sustainable livelihoods is fundamental to support well-being (Chambers 1997, pp. 9-10)

The UNDP introduced the human security approach in the Human Development Report 1994, with central idea: 'the right to live in freedom and dignity, free from poverty and despair… with an equal opportunity to enjoy all their rights and fully develop their human potential' (Gómez & Gasper 2013; UNDP 1994). Whilst human development approach is talking about freedoms and people's choice, human security

[34] It shows that per 100,000 cases of death of children under age 5: Denmark (1 case), Luxembourg (2 cases), Czech Republic (1 case), Cyprus (13 cases), Qatar (6 cases), United Arab Emirates (10 cases), Chile (1 case), and Cuba (1 case).

[35] 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.

concept is prioritising the choices and assuring the provision and implementation, and water security is one of the human security components (Gómez & Gasper 2013, pp. 3, 14). People, or citizen, should be treated as participants, rather than consumers, because their role and wisdom are vital for democracy and to achieve sustainability in social and environment context (McIntyre-Mills 2003, pp. 14, 54). Formulating water policies should regard the reality that happen to the poor at the periphery level instead of those in elite groups, and is able to reduce poverty by providing broader access for the poor to health service and water provision (Chambers 1995, pp. 175, 82). Therefore, expanding pragmatism in water policy is needed, especially to widen perspectives towards balancing individual versus collective interests and also the environment (McIntyre-Mills 2014, pp. 45-6).

Managing water has moved to be a more political commodity and not merely as public service provision. 'The emergence of water extraction technologies has increased the role of the state in water management' wrote Shiva (2002, p. 20). The increasing role of government in managing water has made 'water management is inherently political' (Mollinga 2008, p. 8). In the context of a nation, water supply management will be very depending on political situation and governmental system 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, or a water authority, or even a company (Stephenson 1998, p. 295). Biswas (2001, pp. 493-4) explains that in the past, most developing countries water decision was held at central level by a water ministry. However this approach has changed drastically in recent years since rather than centralized was often regarded inefficient and decentralised system has been viewed as the most appropriate way to water provision (Naddeo, Scannapieco & Belgiorno 2013).

> Dublin Statement on Water and Sustainable Development in Principle 2:
> ***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.*

This view was then supported by Mcdonnell (2008, p. 132), saying that water management should be more decentralized to accommodate 'local ideas and demand management'. In the process of making water policies, there are negotiations between all levels of government, government apparatus, and even all groups that will be affected by the policies (Mollinga 2008, p. 12). The government use their power to stipulate law and regulation to intervene water service and water business. Negotiations may occur during formulating and implementing of the policy. Mollinga uses a term 'politics of policy' to describe the national policy processes. Local leaders tend to use the public service provision as a political vehicle to gain vote from constituents, to consolidate only with their selected small scale alliances, or even worse to feed the predatory business interests who back them up during election process (Sulistiyanto, Rosser & Wilson 2011).

Sustainable Water

Water experts believe that the world is approaching (or maybe now experiencing) a water crisis. Some believe that rapid growth in population has been the major cause (Biswas 1999; Ehrlich 1970; Gilles 2006; Gleick, Peter H 1993; Jain & Singh 2010; Magelgaard 2011; Sears 1936; Shiva 2008). Increasing population means increasing demand for all human needs, agriculture, industry and also duplication of waste disposal, which means higher competition for water use. However Amartya Sen stresses that food crisis will never happen if democracy is functioning (Massing 2003), meaning that the role of the government in providing basic needs is the key. Another argument comes from Hoekstra and Chapagain (2006) and (Wackernagel & Rees 1998), saying that human lifestyle, industry booming, and climate -instead of population- determines food and water consumption, proven by the fact that 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 right, then urged its members to ratify the Millennium Development Goals in 2000 which has a specific water issues: 'Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation'[36]. To continue the MDGs, the UN through Rio+20 Earth Summit 2012 had established post-2105 goals and set a new target in drinking water sector, namely to 'achieve universal and equitable access to safe and affordable drinking water for all by 2030', and this means providing water for all in better quality and use it efficiently, as well as preserving water sources and water-related ecosystems[37]. 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)[38]. As the rapid increase in population still going on, in 2050, it is expected that the need for water will rise almost sixfold and the number of people who experience water shortage will increase by almost 50%, and it happens mainly in poor area of developing countries, where women and children have to go far away for hours to take water (Jain & Singh 2010). People in poverty, especially in the Third World countries, are hardly hit due to lack of access to sewers and clean water while have to suffer from overwhelming wastes generated by burgeoning populations and unregulated industry (Rees 1992). Furthermore, Rees argues that human beings should balance between their needs 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 number of population sustainably (Rees 1992; Wackernagel & Rees 1998).

From the water footprint perspective[39], 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 to calculate '*water used in*

[36] See http://www.un.org/millenniumgoals/environ.shtml Millenium Development Goals, Goal 7, Target 7c.

[37] Sustainable Development Goals, Goal 6, https://sustainabledevelopment.un.org/focussdgs.html, retrieved 31 August 2015.

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

[39] 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).

relation to consumption of people in a particular region' (Hoekstra & Chapagain 2006). It is important for people to be aware of the water footprint, likewise to know 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, or we need 35 litres of water to drink a cup of coffee (Antonelli & Greco 2015). However water consumption differs between regions, and arid environment will need more water than those of water-rich area. In this context, the integrated water resources management concept[40] is vital so water will be managed across sectors, administrative area, and social systems (Benedito Braga et al. 2014).

Methodology

'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. According to Midgley (2000, pp. 2-4), systems thinking was introduced in the latter half of the 20th century to attack the traditional *mechanism* approach – an approach that viewed everything or every problem as if it is a machine, and tends to simplify solutions. 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 analysis will be focusing 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 'why' and 'how' the solutions are taken, but rather to give stakeholders (decision maker, planners, and affected citizens) understanding about defining problems, design a system and its implications, and evaluate the programs (Ulrich 1989, p. 277). These questions are essential to explore and justify boundaries in understanding an improvement that has been or has to be achieved (Midgley 2000, p. 138), because how we value an improvement will be very depending on the boundaries of the context or the system of concern (Ulrich 2003, p. 5). In examining an improvement, people have to have similar lens and perspective or what so called 'reference system', so we have to make sense the situation and unfolding multiple perspectives by circumscribing our understanding in order to encourage a more holistic awareness (Ulrich & Reynolds 2010).

These questions will set boundaries in further analysis, because by applying boundaries we can sweep in as much relevant information as possible, and in social

[40] 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).

context, setting up the boundaries will allow us to include relevant stakeholders and most importantly, decision makers (Churchman 1970). As Cabrera (2006, p. 10) states, boundaries will distinguish what to or not to include for a particular paradigm. This approach then so called boundary critique, coined by Werner Ulrich[41], which mainly tries to describe 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 over a particular context and address the problem (Midgley & Pinzón 2011; Ulrich 1983)[42]. Ulrich applied a *dimensional analysis*[43] to determine the meaning of improvement, and to describe the role of people in that particular improvement. Mainly there will be two groups of people: *the involved* that act as planners, decision makers, and who get benefit; and *the affected (witness),* that suffer the costs or the expenses from the improvement. As Amartya Sen emphasises that since development is meant to increase the prosperity of the people, then the people should have the opportunity to decide what sort of development that they should get (Sen 1999, p. 31). The detail is appeared in in Figure 12 below:

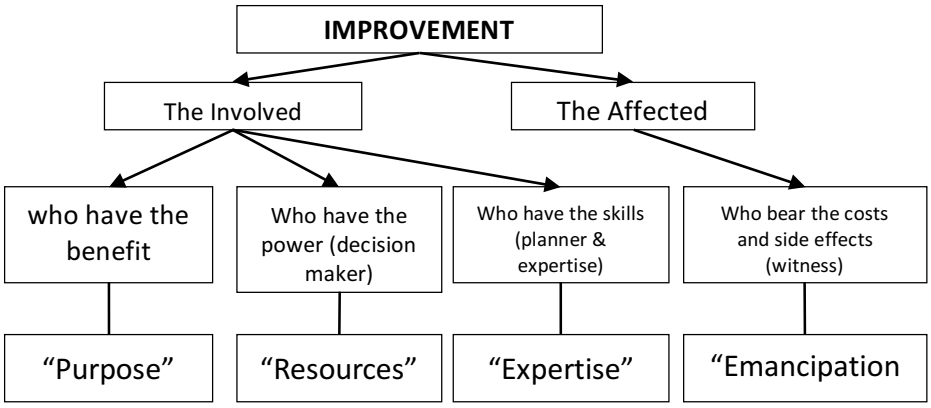

Figure 7 Dimensional analysis to determine the meaning of Improvement[44]

There are two data gathering techniques used. Firstly, semi-structured interview (in-depth interview) with open-ended questions based on the research topic, that provides opportunities for both researcher and interviewees to discuss the topics in more detail (Hancock, Ockleford & Windridge 1998). Interviewed has been conducted in November – December 2015 to relevant officials and residents as described in table 1 below:

Table 1 List of Interviewee

Nauli District Gov't	Nauli City Gov't	Central Gov't	Water Company	Residents

[41] Ulrich W (1996). Critical systems thinking for citizens: A research proposal. Centre for Systems Studies Research Memorandum #10. Centre for Systems Studies, University of Hull.

[42] 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'.

[43] Also called the system of concern or the context of application.

[44] Adapted from '*Dimensional analysis of the sources of intentionality that determine the meaning of improvement', Ulrich (1996)*

Head of District	Local Planning Agency	Ministry of Public Works	PDAM of Nauli District	46 households in Nauli District
Local Planning Agency	Public Works Dept.	Ministry of Home Affairs	PDAM of Nauli City	45 households in Nauli City
Public Works Dept.	Health Dept.	Ministry of Finance	BLUD SPAM (Province)	
Health Dept.	Mining Dept.	National Planning Agency		
	Environment Control Body			

Secondly, secondary data is used in this paper namely works and knowledge produced by other people or researchers that were used for other purposes (Vartanian 2010). Secondary data analysis is suitable for this paper since it gives financial and time savings to collect the data (Castle 2003; Heaton 2003), and it also allows opportunity to reshape and further elaborate the research question(s) (Hyman 1972). The data come from various sources: Nauli city in Figures (from Nauli City Statistics Bureau Office), Nauli District in Figures (from Nauli District Statistics Bureau Office), PDAM Financial Report (from Financial and Development Supervisory Agency/BPKP), PDAM Performance Report (from BPPSPAM), PDAM Company Profiles (from PDAM Kota Nauli and PDAM Kabupaten Nauli), BLUD SPAM Company Profile, Audit Report on Water Provision in Nauli and Samsoir Province by the Indonesian Supreme Audit Institution, several regulations from related government institutions, and news articles from various newspapers.

The commodification of water in Nauli

Water provision in most regions in Indonesia (including in Nauli City) are conducted by a company. Even though the company is solely owned by the government, but it is still a company which construct and evaluate its performance on a profit and loss statement. Kosar (2006, p. 3) defines privatization as *the use of private sector in the provision of a good and service, the components of which include financing, operations (supplying, production and delivery) and quality control*. The World Bank, IMF and several regional development banks have also claimed that water privatization 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 bring more financing (Public Citizen 2003, p. 1). However Kurniasih (2008) argues that in many countries water privatisation cannot do much to perform better water provision, but those privatizations always followed by significant increase in water tariff and leave the poor with no option but dirty water.

As explained above, until 2013 there are only 38.17% of households in Nauli City area that had access to piped water, while the others should fulfil their need through other sources like water merchants (32.84%), bore well (24.16%), and other unprotected water sources (4.83%) (BPS Nauli City 2014). In fact the scarcity of water in Nauli remarkably during the 8 months of dry season, and aggravated by the failure of the government(s) to provide reliable water provision, has been exploited as an arena to get profit by private sectors. The trucked water merchants and DAMIU. These two local private players have

entered the market to fill the huge gap in the water supply as a consequence of scrambled water management by the three public water operators: city PDAM, district PDAM, and BLUD SPAM. I am trying to compare and contrast how these five perpetrators play their role to sell water to the residents.

The water truck

The trucked water is the most favourable option for the residents. Merchants deliver the water by using a 5000-litre tank-truck for Rp.80,000 to Rp.100,000. In terms of profit, the total cost to fill up the tank and deliver it was only Rp.10,000 depending on the distance. For a tank of water they could get at least Rp75,000 of net profit. They just bored the ground, withdrew water with a high capacity machine, filled up the tank and send it away with no further treatment on the water. According to interviews[45] with two merchants, there are currently at least 5 water tank-truck merchants in Nauli city. During the dry season (usually between May to August), each dock can sell at least 200 tanks per day on average. In terms of profit, they can generate almost Rp18 million every day. While during rainy season, each dock can only sell 30 tanks of water per day. Within a year, there can be Rp18 billions of revenue and Rp13 billion net profit at the least can be gathered from tanked water.

Based on Law No. 28/2009 concerning Local Tax and Retribution, Chapter 14 concerning Ground Water Tax, it stresses that ground water that taken for commercial use should be taxed by the local government where the water is taken. To implement the law at local level, the government of Nauli municipality has issued Local Regulation (*Peraturan Daerah*/*Perda*) No. 6 year 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[46]:

> "*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*."

[45] Interviews were conducted separately at their stations in Oepura and Koinoni on 6th November 2015.
[46] Interview the Head of Mining and Energy Department (Dinas Pertambangan dan Energi) of Nauli City, 17th November 2015.

Figure 9 A water-tank dock

Figure 8 A water-tank is filling up water to a resident

However in a separate occasion of discussion, someone from a non-government organisation[47] in Nauli revealed that:

"……..*some of the parliament members were sponsored by the vendors during their campaign, and even still receive bribe until now. Moreover, one of the DPRD member owns a dock. Nobody knows how much money the vendors can get every year, but it is big enough to secure their business from tax. 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.*"

DAMIU (Depot Air Minum Isi Ulang/Refilled Drinkable Water)

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

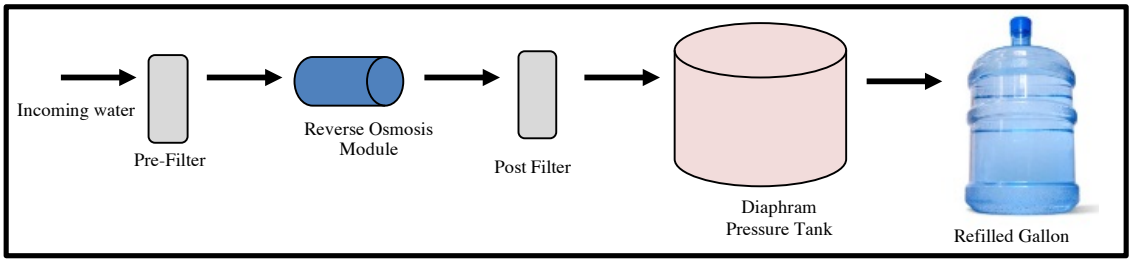

Figure 10 DAMIU water treatment system

[47] 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.

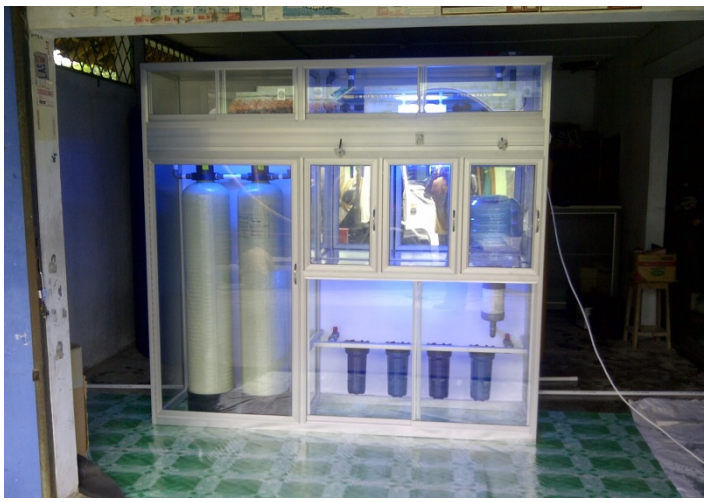

Figure 11 A DAMIU stall in a resident house

DAMIU business has been becoming very popular in Nauli due to the increasing scarcity of water. DAMIU can be an instant solution for people to drink, instead of buying a packaged water like AQUA –the most famous packaged water brand in Indonesia. A 19-litre gallon of DAMIU only costs Rp4,000, while same size of AQUA can cost Rp12,000. According to Department of Health of Nauli Municipality record, there were 376 DAIMU stalls in Nauli as of 21st November 2015. Based on my interview with 5 DAMIU stalls owners in Nauli[48], each DAMIU booth can sell up to 40 gallons per day at least. In total that will make up to more than Rp22 billions of revenue from DAMIU sold throughout Nauli every year. The standard minimum of cost for a gallon is Rp1200, so net profit per year can reach Rp14 billions in total. This can be a very promising business for companies which supply DAMIU equipment and installation, and again, to tanked water that supply raw water to DAMIU.

Since DAMIU stalls are selling drinking water –it means water that it is ready to drink, the government should pay substantial attention to it and as stipulated in Minister of Health Decree No. 736/2010, local government should conduct regular check to each one of DAMIU stall. From interviews with DAMIU stalls owners I found that their stalls are subject to inspection and they signed an agreement that they should maintain the quality of water. However the local government had never visited and inspected their stalls, so they do not have financial incentive to produce healthy water. As a result, plenty of DAMIU stalls do not treat the water properly in order to lower cost of production so they can provide more bonuses to customers.

PDAM of Nauli City

The city PDAM that established in 2005 has had 7512 connections per Semester I 2015 with service coverage of 10.22% (based on interview with Head of Human Resources and General Affairs Division on 13th November 2015. He stated that they cannot present unaudited data for outside users). The PDAM sell water with progressive tariff, the lowest was Rp.3,200 per cubic meter for social customers and the highest was Rp.40,000 per cubic meter for big industries. From audited Financial Report (conducted

[48] Interviews were conducted on 19th November 2015 with 5 DAMIU owners that are located in Balgie Township, Angloka Township (3 DAMIU booths), and Mandalingi Township.

by a Public Accountant) and Performance Report (conducted by BPKP) year ended 31 December 2014, total revenue for 2014 was Rp.7.6 billion, and average tariff was Rp.7,475 per cubic meter. Total volume of water distributed and sold (billed) during 2014 were 1.2 million cubic meter and 796,997 cubic meters respectively, which made 32% of water losses, or if we take the minimum tolerance in Indonesia 20% for unaccounted for water, then for 12% water losses the PDAM had lost approximately Rp.9 billion of revenue. Moreover, this percentage of non-revenue water (NRW) had increased by 4.25% compared to 27.69% in 2013.

The high water loss is due to two reasons: pipe leaking and broken water meter (technical loss) and fraud from billing staff during meter read (administrative loss). It only means that there was no significant effort to maintain the technical aspect of PDAM, since the PDAM is only 10 years of operation. Furthermore, the increasing rate of non-revenue water showed that PDAM did not pay much attention to improve this situation.

PDAM of Nauli District

According to the Executive Director of PDAM in an interview on 16th November 2015, PDAM of Nauli District currently has 33,272 connections per 30th September 2015. Only 3.72% or 1,238 connections were buried in district area while 96.28% or 32,034 connections cover approximately 42% of residents in the city area. In 2013 the district PDAM could obtain slightly less then Rp.30 billion of revenue and has implemented FCR average tariff of Rp.4,124 per cubic meter. In terms of water losses, this district PDAM had been doing well proven by its NRW percentage was only 22%, only 2% above the tolerable NRW water of 20% (BPPSPAM 2014). However from interviews with several residents, they said that PDAM service performance had been decreasing from time to time. Water did not flow for two weeks or so (62 out of 80 residents admitted this. I asked them to rate PDAM performance with 0 as the worst and 10 as the best score, 52.6% of them gave 5, 22.12% gave 6, and 25.28% gave 7 or above). However some residents the bill stated water usage for almost Rp500,000 to Rp.1 million, and the customers had to pay regardless whether the customers wanted to raise this issue to court or not, and there was no further action from the company to investigate the problem.

Provincial BLUD SPAM

BLUD SPAM that was originally instituted to operate big dams that are built by central government and intended to supply the needs of bulk water to PDAMs surrounding the dams, has started to sell water directly to users. This situation had induced more conflict on water provision became more mazy. Based on 2013 Financial Report, beside 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, Meranti University, Polytechnic of Nauli, and two master meters to several groups of residents. Their tariff was very low compared to PDAMs tariffs, which was only Rp.2,500 per cubic meter. From tariff calculation that was appeared in its business plan, the FCR tariff of BLUD should be Rp.7,275 per m^3. However BLUD has implemented Lowest Cost Recovery tariff (LCR) which did not include investment cost, depreciation expenses and profit in the structure, which comes to Rp.3,842 per m^3. Furthermore, BLUD only charges bulk water to PDAM and end users with 40% to consider their ability to pay, so it comes to an average of Rp. 2,500 per m^3.

According to the report, BLUD SPAM sold 226,725 cubic meters of water consists of 110,025 cubic meters to city PDAM and 116,700 cubic meters to end users in the city of Nauli. This means that the volume of water sold is approximately 15% compared to the city PDAM. From end users only, BLUD had earned Rp. 283.4 million of revenue. Not much compared to other two PDAMs because its tariff is very low.

The head of BLUD SPAM clearly stated (intervewed on 20th November 2015) 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."

Health, environmental and social problems

From health perspective, the Head of Environment Control Body of Nauli City government revealed that all water sources in Nauli City are highly contaminated by coliform bacteria. They had conducted sampling to 100 water source sites and found that Coliform contamination in each of the water sources including PDAMs' reached level of index varied between 5,000 to 80,000, and more specifically the fecal coliform index spanned from 100 to 16,500[49]. 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 International Vaccine Access Centre released that there were 30,000 cases in 2014 in Indonesia and ranked number 9 of Global Mortality in Children under 5 caused by Diarrhoea. Based on Nauli City Health Profile 2014 (released by the Department of Health of Nauli City) the number of diarrhoea incidences is only 17,526 and ranked 5 of the most frequent diseases in Nauli City. An official of Health Department of Nauli City in an interview stated that the department has never done regular inspection or conducted treatment to water sources, whether it is a commercial, communal, or private water source because limited budget allocated for it.

Nauli geographical condition (arid and very little period of rain) makes water becomes less available from time to time. "*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"*, said a resident. Water table is decreasing, and the government has never paid attention to this deteriorating condition. Head of Nauli City Enironment Control Body stated, "*If the government, particularly the Department of Mining do not take immediate action regarding water discharge by commercial water*

[49] Total Coliform bacteria are common in the environment like soil, water, and vegetables. They are 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).

sellers, then we will not be able to preserve the environment and in the next 25 years Nauli City will run out of ground water. Moreover, people should be educated to not waste the water".

Central government had tried to overcome water crisis in Nauli City by introducing a community based water management system (PAMSIMAS). Under this system, central government and local government encourage communities to form a small body to build a public hydrant or other water sources under the supervision of the government, and to operate them independently. Based on Ministry of Public Works data, as of 2014 there had been 52 public hydrant and 8 open water sources built to support water provision in Nauli City, but almost all of them do not operate properly. During my visit to 15 public hydrants that were built under this system, only one that operates and the people were thinking to terminate the operation since it always spurred disputes between members. I asked about this to related officials in-charge at Department of Public Works of Nauli City and national level, and they threw the responsibility to the people. "……*they should responsible for that. We have built the infrastructure and set up a managing body. Perhaps the failure is due to their low level of education that made them selfish*", said the local level official. While Jakarta official said, "*We have transferred them to the local governments. So it should be their responsibility*".

Assessment of Water Service Performance

Ulrich distinguished the twelve questions into 'is' mode and 'ought' mode. The two modes are closely related, as the 'ought' mode will come first to give us a standard for evaluating the 'is' mode (Ulrich 1996). The twelve questions are then grouped into 4 (McIntyre-Mills 2006; Midgley 2000; Ulrich 1983, 1989; Ulrich & Reynolds 2010): the sources of motivation (as the value basis of the design), the sources of control (or sources of power that 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).

The assessment of water service performance in Nauli is summarises in table 2 below.

Table 2 Assessment of the water performance in Nauli using the CSH

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 fee and water charge.	Connection charge and water tariff have prohibited 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	• Customers still complain as water does not flow constantly	• Production and distribution capacity should be expanded to

Question	"is" condition	Problems	"ought to" be done
		• No chemical treatment on water (water contains very high *e-coli)*. • No prevention on water exploitation	reach all residents. • Water should be chemically treated before distributed to residents. • Need regulation and real action to balance needs for water and environment 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 loss below 20%.	• Nauli City coverage: 38.17%, water loss: 33.7%. • Nauli District coverage: 1.63%, water loss: 32%	• Need to accelerate expansion of coverage. • Not only need to repair old and broken installation, but more urgently need to increase compliance in water metering.
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 operator by PDAMs.	• There are many overlapping regulations at national level. • In local level, water tends to be used as political issue and compelled to contribute to local revenue. • PDAMs difficult to grow business and do service.	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	• Central, provincial and local government:	The governments never really coordinate to build up grand design in	Since water is the responsibility of the state, then all level of

Question	"is" condition	Problems	"ought to" be done
controlled by the decision maker?	financial resources, inter-border power, legal power. • Water companies: technical aspects.	water provision in Nauli, so there are very often conflicts of overlapping programs.	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 demography.	• Ground water discharge has sporadically happened by all water suppliers without thinking of controlling it • Population dispersed made it difficult to cover remote area.	• The three water companies need to coordinate in organising the use of water sources to save water and reduce production cost. • The local governments need to provide financial and technical assistance for PDAM to expansion.
The source of knowledge			
7 **Expert**: 'who' are the planners?	Local Governments and water companies.	Local governments only rely on water companies' planning on piped water.	Need to clarify the role of local governments in water sector.
8 **Expertise**: what skills and knowledge are relevant or needed?	Planners and key persons 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 many relevant aspects that should be considered, so involving more relevant experienced people like the academia and the community is needed.

Question	"is" condition	Problems	"ought to" be done
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.	• Local, provincial and central governments should actively synchronise programs. • Service users should be involved in designing water development plan to obtain insight and setting priorities.
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.

Recommendation

Based on the aforementioned assessments, this research offers some suggestions to be taken to address the problems in water service provision in Nauli City: (i) Both local governments in Nauli region and the provincial government need to find 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 current practice need to be revisited. Desentralised system, where PDAM can only cover residents in local government's particular area, can be adjusted and more regional mind set needs to be formulised. Drinking water related regulations at national level need to be re-examined so there will be a 'one size fits all' regulation, but instead should be able to accommodate local aspiration; (ii) 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. Tariff structure has accommodated cross-subsidy from the rich to the poor, but still but real subsidy from the local budget is still needed to the poor; (iii) 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 by 62% and inefficient operational expenses; (iv) Water development planning need to be supported and included in the local governments medium term planning (five years span), to avoid further debate and disagreement in political process between executives and legislatives when enacting annual program; (v) water development planning need to be pictured as a grand design and not partial, comprising all relevant planners from central, provincial and local governments. Planning process need to involve people from universities and communities not only to obtain wider social cultural and environmental perspectives, but also to arrange prioritisation in water development. Building communication through engagement (doing things together with other relevant people and engage with the world), imagination (construct 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 to a better result. more frequent gathering with the communities is needed to hear their voice, complaints, and demands regarding water service performance. Conducting a community of practice (a community which members come from different background but have common interest and same goal) can be implemented to give the members the sense of bounding, mutuality, and sharing repertoire (Wenger 1999); (vi) any planning that is made for water expansion should be based on the triple bottom line analysis: economic, social, and environmental (Elkington 1999), to ensure that all current water development program is still preserving balance for future generation.

Conclusion

It has to be admitted water provision is one big issue to be addressed by the government. Indonesia is still trying to pursue the global in water provision, and it has been adapted as the government medium term target: to reach 100% of coverage in 2019. However national data has shown significant growth in water service, some areas like Nauli region for instance, is still struggling to find the best way to manage drinking

water, especially when the trend of local autonomous system is emerging 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 –as an individual- who will enjoy and continue the development (UNDP 1994).

By using CSH approach to assess drinking water management in Nauli, it can be seen that there are still huge works that have to be done to improve the current condition. Firstly as the source of motivation, change in mind set that all people with no exception are the real beneficiaries of water service. Secondly as the source of power, water providers and all level of governments have to integrate all water programs and water policies, and coordination whether in planning and institutional arrangement needs to be improved. Thirdly as the source of knowledge, water management planning should be viewed from broader aspect to consider social and environment perspectives, so people from different background of expertise should be involved. And lastly as the source of legitimation, planning in water system should give equal opportunities to all, since the basic standpoint for starting any kind of public services is the constitution: to employ all services for the maximum benefit of the people.

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