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Sustainable Water Development : Between Urban and Rural

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ABSTRACT

This paper aims to explain the circumstances of water development in urban and rural areas in terms of the municipal water utilities (MWUs) as primary water supply providers that upholds distributing water to achieve sustainable safe water access. To provide a fundamental analysis, a case study was conducted in 10 cities in Indonesia including Bandung, Surabaya, Palembang, Makassar, and Balikpapan as a representation of urban areas; and Ngawi, Garut, Gunung Mas, North Minahasa, and Ende as a representation of rural areas. The discussion focuses on the aspects of the population served, non-revenue water (NRW), and pricing policies. As a result, so far, MWUs have only been able to cover 61.76 percent of the total population with a high imbalance between the urban, 81.60 percent, and the rural, 41.92 percent. The high rate of NRW is still a problem for MWUs both in the urban and rural areas with a rate of 36.67 percent. And the last, the pricing policy by some local governments still set below the full cost recovery (FCR) caused MWUs run in losses which consequently made to local governments invested more money to cover the operational costs. A sustainable water development requires policy support that helps MWUs to operate independently so that it can fulfill its function as a provider of water services that can cover the entire population.

1. Introduction

Sustainable development of safe water supply is a challenge faced by many countries following the issues of population growth, scarcity of water resources, climate change, and environmental problems both in urban and rural areas (Grit et al., 2015; Bower et al., 2014; Rouillard et al., 2016; Yu et al.,2015; Yalcintas, 2015; Rathnayaka, 2016; Shomar et al., 2014; Petroulias et al., 2016; Kanakoudis and Gonelas, 2014; and Lai et al., 2017). Constraints in meeting the demand for water needs are related to the high rate of water loss just like what happened in Greece (Petroulias et al., 2016; and Kanakoudis and Gonelas, 2014) and in Malaysia (Lai et al., 2017). Advancing sustainable water management can be accomplished by tariff policy over economic efficiency, water conservation stimulus, fairness, and availability (Graftom et al, 2015; Rogers et al, 2002).

The provision of safe water in Indonesia, conducted by the local government through municipal water utility (MWU), has not been optimized. The results of the MWUs performance assessment published by the Implementation and Improvement National Agency for Water Supply System (BPPSPAM) stated that in the year of 2015, the coverage of piped drinking water services covered only 45.12 percent. On the other hand, the level of non-revenue water, which contributed to the inefficiency of the company, was still high at about 32.10 percent consisting of 322 MWUs where the rates were more than 20 percent and only 39 available MWUs were below 20 percent.

The authority of the regent/mayor in determining the MWU tariffs was not based on MWUs sustainability in providing safe water for people. The data showed that among 371 MWUs, only 110 MWUs or 30 percent of them applied full cost recovery (FCR) rates. FCR is the overall operations cost incurred by MWUs including the cost to cover non-revenue water (NRW) due to the water loss. MWUs will become dependent on funds invested by the local government due to insufficient revenues for them to survive in the operations and maintenance and the corporate development.

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The aim of this paper is to investigate the condition of water development in urban and rural areas to reach sustainable safe water access in which water service providers are conducted by the MWUs. There are three issues to be answered in this article, which are related to service coverage, non-revenue water, and pricing policy, all of which are explained by their respective characteristics. A case study was run involving 10 cities in Indonesia: Bandung, Surabaya, Palembang, Makassar, and Balikpapan representing the urban areas; and Ngawi, Garut, Gunung Mas, North Minahasa, and Ende representing the rural areas.

The following sections explain the form of the article starting from the introduction to the study and proceed to a discussion on water development and the methods of this research. The discourse of the results is continued in the next part. And the last, a conclusion finishes this paper.

2. Materials and Methods

The problems in the development of water network continue to be passed to achieve universal access to safe water. Several studies have addressed issues related to coverage of safe water either in urban or rural areas (Bower et al., 2014; Yu et al., 2015; Yalcintas, 2015; Rathnayaka, 2016), water loss (Petroulias et al., 2016; Kanakoudis and Gonelas, 2014; Lai et al., 2017; Rogers, 2014; Karathanasi and Papageorgakopoulos, 2016; and Farley, 2003) or pricing policy strategies as instruments for water sector management (Garcia-Valinas et al., 2013; Tussupove et al., 2015; and Kanakoudis and Gonelas, 2014).

In Costa Rica (Bower, 2014), despite being one of the countries with the highest rate of water access in Central and South American countries, 89 percent of Costa Rica's population has been facilitated with piped water. The Costa Rica government spent a lot of money to be able to distribute and monitor the water supply regardless of the contamination issues. While a research in Instanbul, Turkey (Yalcintas et al., 2015) indicates that there will be a piped water crisis in the near future because of the demand for water needs and should be overcome by reducing water use.

In the rural areas of China, which have the largest population in the world, similar problems of water management (Yu et al., 2015) also existed. There were 298 million rural inhabitants who had not gained access to safe water due to different characters between the large areas with various landscapes and spreading areas also due to the climate. The water management problems in rural areas in China vary widely due to centralized economic policies and urban-rural dualistic system, resulting in issues of unsafe drinking water, water pollution, lack of water infrastructure, and poor water management.

Improved water management is accomplished by improving good governance (Rouillard et al., 2016) requiring local level transformation by innovating on water management that requires stakeholder commitment, political will, disruptive ideas from local entrepreneurs, partnership order, and instruments for regulatory, economic, and financial.

Water loss cases happened in three different cities in Greece (Petroulias et al., 2016; Kanakoudis and Gonelas, 2014; and Karathanasi and Papageorgakopoulos, 2016) could reach 55 percent of the system of physical loss. At the same time, in Malaysia, (Lai et al., 2017) the government has spent 600 million USD in 1996-2010 to address the NRW. However, the NRW rate remained high in 2013 with an average of 36.6 percent, ranging from 18 percent to 62 percent for the entire states and still 40 percent of states with NRW over 50 percent.

The best way to deal with NRW is to investigate the cause and the factors that influence it. The International Water Association (IWA) has issued an approach to map the cause of water loss by calculating water balance (Farley, 2003; and Winarni, 2009). Some strategic steps can be taken to reduce water loss (Farley, 2003) which consists of 1) calculating the water balance to determine how much water losses and its components; 2) conducting network audit of the leak location, whether it is on reservoirs, transmission mains, or distribution network, and investigating apparent losses; 3) auditing the operational network to find out why water loss occurs; 4) advancing and expanding strategies to improve performance; and 5) changing policies by focusing on training and operations and maintenance.

Pricing policies in the water sector should cover all operations and maintenance costs as instruments in controlling water demand (Garcia-Valinas et al., 2013; Tussupove et al., 2015; Kanakoudis and Gonelas, 2014 ; Renzetti et al., 2015; and Romano et al., 2014). In Kazakhstan (Tussupove et al., 2015), a study of willingness to pay in rural areas with no access to the pipe network, stated that 90 percent of citizens were willing to pay for the access to adequate water. Pricing policies can support economic efficiency and water conservation (Renzetti et al., 2015) and support equity and sustainability (Rogers et al., 2002). In the point of the ownership structure, the price applied by water utility owned by the local government is lower than when it has contracted out to an external company or has made public-private partnership (Garcia-Valinas et al., 2013).

This study adopted a case study involving 10 cities in Indonesia, namely Bandung, Surabaya, Palembang, Balikpapan, and Makassar representing the urban areas; and Ngawi, Garut, Gunung Mas, North Minahasa, and Ende representing the rural areas. Samples were randomly selected to represent Java and outside Java as well as western, central, and eastern regions of Indonesia. Data were collected from MWUs performance report issued by BPPSPAM from 2011 to 2015.

3. Results and Discussion

This part discusses the findings of the research on the service coverage, non-revenue water, and water pricing based on FCR of the samples. The service coverage of MWUs means the number of the population served in the administrative area. The examination shows that the average of service coverage over five years from 2011 until 2015 in MWUs in urban areas is 81.60 percent while in rural areas is only 41.92 percent. There is no guarantee that urban areas in Java are always better in service coverage.

Likewise, it happens to the rural areas. Even in Java, there is still a sample that is below the average of service coverage in rural area services over the last five years. That is why, although Java is the center of development, it cannot be put forward as a benchmark that rural areas in Java also have good water infrastructure. In fact, a sample in the hinterland of central Kalimantan, Gunung Mas, is found as the highest average of service coverage in rural area samples. Comparing between urban

and rural areas, it can be concluded that the network of MWUs in urban is adequate in covering the wider service coverage than MWUs in rural areas. The main advantage of MWUs in urban areas is that densely populated residential areas make pipelines more possible to cover more customers than in rural areas. Moreover, smaller city will need more assistance to supply the services (Romano et al., 2014; Dominguez-Rivera et al., 2016).

Figure 1. The service coverage of MWUs in the year of 2011 – 2015

NRW is the percentage of the difference between the volume of water distributed to customers and the number of accounts paid by the customers. The average of NRW for samples under study over the last five years is 36.67 percent. There is no significant difference if we only see the average of NRW between urban and rural areas in the researched object.

Figure 2. Non-revenue water of MWUs in the year of 2011 – 2015

Even worse, there is no guarantee that cities in Java have better service coverage of water supply than those cities outside Java. The same thing may happen to urban and rural areas. It proves that the water loss is commonly experienced by MWUs wherever they stand to provide a good service of water supply. The high level of NRW proves that a broken system in the water management. To fix this issue, it is necessary for management to have committed to change the organizational procedures, upgrade the human resources, engage public involvement and invest in technology infrastructure that can reduce water loss (Petroulias et al., 2016; Lai et al., 2017; and Rogers, 2014).

The regents or mayors are the policyholders in determining the water price supplied by MWUs. To support the sustainability of MWUs operations, the water tariffs charged to customers already include the full cost recovery (FCR) or the production expense covering the cost of the water loss. In this case, the MWUs' objects in the urban areas have set the water tariff over the FCR, and so did the MWUs' object in the rural areas. There is a finding that high operations costs in line with high water loss in an MWU increased a very high FCR-tariff difference.

The best water management instruments in managing economic efficiency and water resources which are increasingly scarce amid increasing population and climate change issues and water pollution are by pricing policy. The right pricing policy of the local government will lead to the efficiency of production so that it can invest more funds for infrastructure improvements in reducing water loss and protecting water resources. FCR is crucial in developing a pricing strategy. In addition to FCR, in defining the price can also consider allocating the proper cost, the establishment of a simple tariff structure, and environmental conservation. Provision of subsidies if done by the local government should be in accordance with social status and on target (Yu et al., 2015; Rogers et al., 2002; Renzetti et al., 2015; Molinos-Senante and Donoso, 2016; and Ahmad, 2000).

Table 1. The difference between tariff and FCR of MWUs in the year of 2011 – 2015

Municipalities	2011	2012	2013	2014	2015
Bandung	1,233	842	1,809	1,406	1,450
Surabaya	605	743	802	746	672
Palembang	967	688	879	775	898
Makassar	209	49	524	668	1,262
Balikpapan	1,748	1,346	2,208	997	190
Ngawi	236	30	220	-126	220
Garut	100	-225	-360	-57	42
Gunung Mas	-6,999	-8,260	-11,900	-9,813	-7,918
North Minahasa	536	558	1,150	1,190	-676
Ende	-120	-226	-511	575	-308

4. Conclusions

Based on the samples, each MWU has its own characteristics. It cannot be generalized whether all MWUs in urban areas have the same problems as those in rural. In the aspect of service coverage and water loss, there are no differences between Java and outside Java. It means MWUs in Java may experience less service coverage with a large water loss than others in outside Java do. It requires more samples to generate several models that fit some evidence to explore further each characteristic of MWUs. More particularly, on NRW, MWUs have their own difficulties in overcoming them. It is a common problem where both MWUs in urban and rural areas experience high water loss levels. In suppressing the NRW level, management must be willing to improve strategy and change operations policies, including investing in technology (Kanakoudis and Gonelas, 2014; Rogers, 2014; and Farley, 2003). Even though it does not happen to tariff policy of MWUs in this work, it will still need more objects to get a more comprehensive reasoning. The results of this study recommend to implement tariffs according to FCR, and if given subsidies should be performed appropriately in accordance with social conditions (Rogers et al., 2002; Molinos-Senante and Donoso, 2016; and Ahmad, 2000). A sustainable water development requires the political will of the authorities to make policies that guide MWUs on the sustainability of operations that

meet the community's need for safe water.

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