Original article

Effects of the implementation of a progressive tariffs policy on water management in DKI Jakarta, Indonesia

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ABSTRACT

The status of the availability of water resources in DKI (Indonesia's Special Region of) Jakarta has reached a critical phase. Determination of progressive tariffs by the DKI Jakarta Provincial Government in 2007 aimed to encourage water users to use water resources rationally and in a sustainable way. However, since the launch of the policy, there has been no evaluation to determine the effectiveness of these progressive tariffs. This research analysed empirical data to examine the effect of policy interventions on water use behaviour in DKI Jakarta. An analysis was carried out by calculating water usage before progressive tariffs were applied and comparing them to water use after the tariffs were applied. Another analysis calculated the number of customers before and after the implementation of progressive tariffs and compared the changes. The increase in water prices plotted are stated in nominal value by assuming the average level of inflation in Jakarta (especially the price of water) was nearly under 2 percent and the price of water was not controlled by the market mechanism. The results of this study indicate that before progressive tariffs were applied, water consumption had declined despite an increase in the number of customers, however, water consumption increased after the implementation. This shows that progressive tariffs are effective instruments to distribute clean water access through cross-subsidies, however, it has no effect on consumption levels.

KEY WORDS: progressive water tariff, urban water supply, water use efficiency, water demand management

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1. Introduction

The city of Jakarta requires approximately 548 million cubic meters of clean water per year for household needs. This does not including the needs of industry, offices, and hotels which can add about 30% to this figure. Unfortunately, Jakarta is a city with a big stake. In 2007, the drinking water company (PAM) called PAM JAYA, produced 425 million cubic meters of clean water. However there were still 48,984 swimming pools that were not filled. Water deficits are increasingly evident during the day when the population has increased from 10 to 11 million due to workers coming to Jakarta from elsewhere (ASTERIA, 2018). Clean water

is supplied to Jakarta from surface water, namely from rivers and canals, by regional companies which have been partnered eleven years ago with the private companies PAM Lyonnaise Jaya (Palyja) and Aetra Air Jakarta (formerly Thames PAM Jaya). However, although Jakarta has 13 rivers not all sources of water could be processed, Which has posed a problem.

In 2002, the Economic and Social Rights Committee released a General Comment on the Right to Water. The document set out the rights to clean water which included detail on sufficient amounts, water security, physically affordable and financially affordable water. In 2010, the United Nations declared that the right to water

and sanitation were a human entitlement, by recognising this the state has an obligation to respect, protect and fulfil this. Recognition of the right to water creates an obligation for the state to undertake a good procedure such that every group of people can have access to water (UNICEF, 2019). Therefore, access to clean water should be available to all parties (BRUNNER ET AL., 2015) although there are many challenges to fulfilling the needs for water, including urbanisation and the depletion of water availability (MONTGOMERY & ELIMELECH, 2017).

Based on Law Number 7, 2004, concerning Water Resources of the Republic of Indonesia, drinking water supply systems are managed by the government and regional governments for the welfare of the community and guarantees the standard of the basic requirements of drinking water which includes quality, quantity, and continuity of supply. There are many factors that can affect the amount of water consumed by each household, both individually and as a whole (DEYÀ-TORTELLA ET AL., 2017). Factors that affect water consumption include socio-economic conditions of the community, type of house, natural factors, water price factors and other reasons such as customer trust (JORGENSEN ET AL., 2009). Therefore, the government of Indonesia implemented the stipulation of tariffs for drinking

water supplied to the community. Water tariff that sets the policies also apply in the member states of the European Union (EU) with the aim of increasing the sustainability of water resources (ELNABOULSI, 2008). Therefore, determining optimal water rates can affect smart water use and thus conservation and the availability of more efficient clean water can be maintained for a longer period of time (HEK ET AL., 2017). The high demand for drinking water in the community causes the need to change the basic tariff for drinking water which aims to make the community wiser in its use of drinking water. The tariff for drinking water is the cost of the drinking water service that must be paid by the customer for the use of drinking water provided by the provider. The Minister of Home Affairs Regulation Number 23 (2006) concerning the Technical Guidelines and Procedures for Regulating Drinking Water Rates at Regional Water Companies stated that the PDAM drinking water tariff is the policy of selling water at prices per cubic meter (m³), or other volume units according to the policy specified (the relevant Regional Head and PDAM) (INDONESIAN MINISTRY OF HOME AFFAIRS, 2006). The number of customers of piped water in Jakarta from 2010 to 2015 is presented in Table 1.

Table 1. Number of customers of piped water in Jakarta from 2010-2015 (Bureau Of Statistic Center DKI Jakarta Province, 2016)

Year	2010	2011	2012	2013	2014	2015
Customers (number of households)	1,201,557	1,611,446	805,160	809,522	820,251	837,776

The consequences of an increasing population and economic growth rate in Indonesia are an increase in land and water use (FULAZZAKY, 2014). Despite having high volumes of water resources, Indonesia still experiences water shortages and these are caused by several factors. The volume of water required to fulfil the needs of the population is 1,074 m³ per second while surface water availability is approximately 790 m³ per second (FULAZZAKY, 2014).

About 9 million people live in the Jakarta area which has an area of 660 km² (APIP & PINGPING, 2015). Fulfilling the water needs of Jakarta, for both domestic and non-domestic use, is achieved by taking water from the River Citarum and from several areas outside Jakarta, such as the Jatiluhur Dam. In addition to utilising surface water, the water needs of Jakarta are also met from groundwater, which has problems of quality and quantity of water available. Households that use groundwater

must also compete with industry to meet their water needs (APIP & PINGPING, 2015).

To meet the needs for water and to improve the efficiency of water use in Indonesia, the Government of Indonesia has applied progressive tariffs. According to the Minister of Home Affairs, Regulation No. 23 of 2006 (INDONESIAN MINISTRY OF HOME AFFAIRS, 2006), the aim of implementing these progressive tariffs was to control consumption levels, conserve water sources and to provide revenue for service development. In Regulation No. 71 of the Minister of Home Affairs of 2016 concerning Calculation and Determination of Drinking Water Rates, it is stated that progressive tariffs will be imposed on customers who consume more than the Standard usage for Basic Drinking Water, which is 10 cubic meters/family head/month or 60 litres/person/day, (or other volume units) (INDONESIAN MINISTRY OF HOME AFFAIRS, 2016). In Regulation No. 91 of 2017 of the Governor of the Special Capital Region of Jakarta concerning the

Second Amendment to Governor Regulation No. 11 for Semester I of 2007 (GOVERNOR OFFICE DKI JAKARTA, 2007) concerning the Adjustment of Automatic Water Rates, the amount of drinking water usage costs must be paid by the customer is calculated according to the number water usage with tariffs and use of water for public purposes, stated that the amount of the progressive drinking water tariffs for communities in Jakarta would be regulated

as presented in Table 2, which shows the complete water tariff classification for all customer categories. A very small-sized household/apartment is classified as Category II, a small-sized household/apartment is classified as Category IIIA, middle-sized household/apartment is classified as Category IIIB, while an upper middle-sized household/apartment is classified as Category IVA.

Table 2. Water tariffs in Jakarta, (Governor Office DKI Jakarta, 2007)

No	Customer categories	Size description (m ²)	Water Usage		
			0 – 10 m ³	11 - 20 m ³	20 m ³
1	Very small-sized household/apartment	<=28.8	Rp. 1.050	Rp. 1.050	Rp. 1.575
2	Small-sized household/apartment	>28.8 and <=70	Rp. 3.550	Rp. 4.700	Rp. 5.500
3	Middle-sized household/apartment	>70 and <=120	Rp. 4.900	Rp. 6.000	Rp. 7.450
4A	Upper middle-sized household/apartment	>120	Rp. 6.825	Rp. 8.150	Rp. 9.800

Investigation of the effect of setting progressive tariffs on water use behaviour has been undertaken by previous researchers. OLIVIER (2016) suggested that tariffs had influenced the reduced in drinking water rates in Manaus, Brazil. The results of his research showed that the increase in water rates imposed in 2004 caused a decrease in water consumption by 31.4%. This decline raised questions about the effectiveness of the implementation of the cross-subsidy mechanism. This decline showed that water use is determined by the behaviour of water-using households and changes in tariffs are one of the instruments that can influence these behaviours. This research was in accordance with the research conducted by ZETLAND & GASSON (2012), which stated that low water rates lead to greater water consumption. Higher water prices are considered to reduce water consumption and the possibility of water shortages, but our findings contradicted the results of a study conducted by BERBEKA (2017), which concluded that demand for water is a complex problem that cannot be measured merely by the increase and a more systematic approach is needed to enhance the analysis. Water usage behaviour is influenced by the perception of water users. A study conducted by FAN ET AL. (2014) showed that consumers generally had different estimates for the rates of water used. Inaccuracies estimating the amount of water used by consumers made consumers' more aware of their lack of water use efficiency. The high disparity between actual water use and estimated water volume used in the study showed the need for policy instruments that can help to reduce these disparities (FAN ET AL., 2017).

This research on the relationship between the implementation of progressive tariffs in DKI Jakarta aims to understand the behaviour of water use before and after the application of the tariffs. The study was conducted by analysing empirical data to understand the effect of policy interventions on water user behaviour in DKI Jakarta. This study measured the effectiveness of progressive tariff policies on water-saving behaviour at the research site by examining changes in water use and changes in the number of water customers caused by the implementation of these rates. Based on the results of the study, a water usage relationship pattern was developed for before and after the tariff was applied. This was very important in order to formulate a water use policy that fulfils the two main aims of tariff implementation as an instrument in managing natural resources, namely to increase access to resources as a means of meeting the needs and to encourage efficient use of resources. That is why the existence of resources can be sustainable.

2. Methodology

This research used a quantitative approach. The study location was DKI Jakarta Province. The data used are secondary data about DKI Jakarta residents, DKI Jakarta PAM drinking water customers, water production and volume of water sold per year for different types of customers from households and apartments. The data used were for three years before the issue of DKI Governor Regulation No. 11 of 2007 (GOVERNOR OFFICE DKI JAKARTA, 2007) concerning Automatic Tariff

Adjustment of Drinking Water (2004, 2005 and 2006) and three years after the Regulation of The Governor of Jakarta was approved (in 2008, 2009 and 2010) and was obtained from reports of the Central Bureau of Statistics of DKI Jakarta Province (BUREAU OF STATISTIC CENTER DKI JAKARTA PROVINCE, 2007, 2011).

The raw water data in this research refers to pre-processed clean water for daily use, but not yet drinkable by humans. Water resources of the consumers came from PDAM, using a water pump. In this article the water resources discussed are limited to water which came from PDAM (excluding the water pump). The general consumers were individuals, households, firms, institutions and any other entities who rely on PDAM for their daily water needs. In the following discussions consumers are limited to households. Consumers were individuals, but their consumption was measured at the household level. The tariffs refer to additional charges to the consumer when their water usage had exceeded a certain amount.

Analyses of trends in water use and increases in the number of consumers were performed by using trend line equations in Microsoft Excel (ROHRDROMMEL, 2017), which presented a coefficient of determination which enabled us to assess the extent to which the water usage and the number of customers was influenced by progressive tariff rates.

3. Results

DKI Governor Regulation No. 11 of 2007 concerning Automatic Tariff Adjustment (PTO) of Semester 1 Drinking Water in 2007 is a policy instrument that aims to regulate water usage rates in DKI Jakarta (GOVERNOR OFFICE DKI JAKARTA, 2007). The regulation divides the tariff load based on user groups and usage volume. The list of tariff groupings is presented in Table 3.

Data on water consumption in DKI Jakarta before enforcement of the progressive tariffs was obtained from official publications issued by the DKI Jakarta Central Bureau of Statistics from 2004-2006 and are presented in Table 4.

Data on water consumption before the implementation of progressive tariffs in DKI Jakarta were obtained from official publications issued by the DKI Jakarta Central Bureau of Statistics from 2008-2010 and are presented in Table 5.

The level of water consumption per customer before and after the implementation of progressive tariffs was obtained by dividing the volume of water sold by the number of customers. The level of water consumption presented in Table 6 is the level of general water consumption without distinguishing groups of customers.

Table 3. Customer Categories and Water Tariffs in Jakarta (Governor Office DKI Jakarta, 2007)

Customer categories	Uses and tariff classification per unit volume (Rp)		
	0-10 m ³	11-20 m ³	>20 m ³
Category I	1,050	1,050	1,050
Category II	1,050	1,050	1,075
Category IIIA	3,550	4,700	5,500
Category IIIB	4,900	6,000	7,450
Category IVA	6,825	8,150	9,800
Category IVB	12,550	12,550	12,550
Category V	14,650	14,650	14,650

Table 4. Number of Customers and their Water Use before the Implementation of the Progressive Tariffs (Bureau of Statistic Center DKI Jakarta Province, 2007)

Year	Population (People)	Number of customers	Customers			Water production (m ³)	Water usage (m ³)
			Households	Apartments	Non-households		
2004	7,414,886	705,890	632,580 (89,63%)	2,321 (0,33%)	70,989 (10,04%)	518,990,345	270,908,830
2005	8,864,519	708,919	634,296 (89,47%)	2,312 (0,33%)	72,311 (10,20%)	536,650,419	267,080,481
2006	8,961,680	725,441	649,174 (89,49%)	2,424 (0,33%)	73,834 (10,18%)	534,987,620	261,856,133

Table 5. Number of Customers and their Water Use after the Implementation of the Progressive Tariffs
(Bureau of Statistic Center DKI Jakarta Province, 2011)

Year	Population (People)	Number of customers	Customers			Water production (m ³)	Water usage (m ³)
			Households	Apartments	Non- households		
2008	9,057,993	755,555	662,496 (87.31%)	33 (0.00%)	93,026 (12.69%)	509,341,688	252,757,335
2009	9,146,181	778,004	676,648 (86.97%)	34 (0.00%)	101,322 (13.03%)	515,094,993	258,939,302
2010	9,223,000	795,149	690,329 (86.82%)	44 (0.00%)	104,746 (13.17%)	506,868,842	267,146,612

Table 6. Number of customers and water use before and after the implementation of progressive tariffs in Jakarta

Period	Year	Customers (number of households)	Volume of water sold (m ³)	Water usage (m ³ /number of households)
Before implementation of progressive tariffs	2004	705,890	270,908,830	383.78
	2005	708,919	267,080,481	376.74
	2006	725,441	261,856,133	360.96
After implementation of progressive tariffs	2008	755,555	252,757,335	334.53
	2009	778,004	258,939,302	332.83
	2010	795,149	267,146,612	335.97

4. Discussion

The use of natural resources to meet human needs must be balanced to ensure it does not become a natural disaster that affects human survival (COMMON & STAGL, 2005). To maximise welfare of the environment, government intervention is needed. Policies and actions must be taken to manage the environment and its natural resources (in this study water) in order to produce maximum benefits for humans, without sacrificing the preservation of natural resources which will ultimately threaten the survival of humans themselves.

The implementation of progressive tariffs in DKI Jakarta is an example of a policy implemented to manage water resources in order to meet social interests and to ensure the sustainable use of water resources. From the data obtained, the population in DKI Jakarta has increased each year (Fig. 1). The highest growth rate was in the period from 2004 to 2005 where population growth reached 0.19%. The increase in population will have implications for the need for clean water. The implementation of a policy of progressive tariffs would affect the sustainable use of water resources to meet the growing needs of the population.

A tariffs policy is one of the efforts that can be done to regulate the use of water resources efficiently and sustainably. The DKI Jakarta Provincial Government implemented progressive tariffs in 2007 by issuing DKI Governor Regulation No. 11

of 2007 concerning Automatic Tariff Adjustment (PTO) of First Semester of Year 2007. Based on this regulation, the tariff for drinking water usage was determined based on customer categories and total usage. The imposition of tariffs based on customer categories and usage rates was determined by considering the drinking water needs of consumers from low-income groups and people with higher income levels will provide cross-subsidies for the low-income groups. In summary, the percentage increase in tariff charging is progressively based on the level of welfare and the volume of water usage.

Fig. 1. Population growth in Jakarta from 2004-2010

The regulation of progressive water usage rates has caused differences in usage rates to reach 1395% between group I and group V, specifically in various usage categories, namely 0-10 m³, 11-20 m³, and 21-30 m³. Higher tariff charges for drinking

water for categorised user groups is due to companies aiming to distribute the benefits of water use by cross-subsidising, namely the water users of corporate groups helping the poor to meet their water needs. Implementation of this cross-subsidy mechanism shows that the government is regulating water use to meet the principles of distributive justice. Water user groups included in the corporate category (Group IVB), middle-class groups (Group IVA) provide subsidies for household groups (Group IIIB and IIIA) and social groups (group I). On this basis, it can be said that the DKI Jakarta Government is trying to share the benefits between social classes in DKI Jakarta in order to meet the needs for water resources.

The imposition of progressive tariffs based on the volume of water usage is imposed on the groups of customers in Classes II, IIIA, IIIB, and IV A, other groups, namely Group I, Group IVB and V are subject to special rates. This charge is based on volume usage rates and aims to encourage water user groups to adjust their volume of water consumption based on their ability to pay the tariffs. Excessive use will have implications for higher costs hence the need to encourage water users from various categories to avoid excessive water use. Thus, setting progressive tariffs based on the volume of water used is part of the government's efforts to encourage the efficient use of water resources, and essentially provides a punishment mechanism in the form of paying higher costs if the water user carries out consumption actions is not efficiently.

The number of drinking water customers has steadily increased. Figure 2 and also shows that the population of DKI Jakarta is increasing its subscription to DKI Jakarta PAM for clean water. However, in contrast to the two growth trends above, the volume of water sold by DKI Jakarta PAM for the three years prior to fixing progressive tariffs tended to decrease while the volume of water sold after implementation of progressive tariffs increased (Fig. 3).

Fig. 2. Increase in water customers in Jakarta from 2004-2020

Fig. 3. Total volume of water sold by the local water company in Jakarta 2004-2010

4.1 Effect of progressive tariffs on water consumption

The use of tariffs is one of the instruments to control the distribution and utilization of public resources. The implementation of tariffs for clean water services can be categorised into two components, namely the tariff component to meet the costs incurred to produce the water provided for consumers and the tariff components to manage the sustainability of the supply of water resources (SJÖDIN ET AL., 2016).

The implementation of progressive tariffs in DKI Jakarta had the social goal of increasing access to clean water. This goal was achieved through charging higher tariffs on consumers who use water in the non-household category, such as companies or institutions. Water users from the upper class are charged at the highest rate compared with the lowest tariff group. The rate of the middle group rates for lower group rates is 3-9 times higher, and the upper group tariffs for the lower groups range is 12-14 times higher. The higher costs for water users in the middle and upper groups is used by the drinking water producers to subsidise the connection costs to new households that do not yet have access to clean water. Thus, the mechanism for charging tariffs based on user groups is a social mechanism to distribute access to clean water from the capable groups to those groups that do not yet have access.

In this research, authors have plotted the increase of water prices are stated in nominal value, assuming the average level of inflation in Jakarta (especially price of water) are nearly under 2 percent (source: BPS). The effect of inflation in this case is considered to be insignificant since the local government has controlled the price of water for a long period of time in order to keep the income. In other words the price of water is not controlled by market mechanisms.

As instruments to encourage changes in water use behaviour, tariffs that take into account the availability and sustainability of water resources can be analysed by categorizing tariffs according to the number of users. The application of tariffs is divided into 3 categories according to the volume of water usage, namely low volume (0-10 m³), medium volume (11-20 m³), and high volume (>20 m³). The tariff category based on the volume of water use for medium usage is 8.02% higher than the low volume water usage rate and the tariff for high water volume use is 16.83% higher than the tariff for low volume water usage.

Water use behaviour before, and after, the implementation of progressive tariffs was estimated from the amount of water usage by groups of household and non-household users. Before progressive tariffs were applied, the water consumption volume of household groups was declining while the water consumption volume of non-household groups increased in 2005 and declined in 2006. After the implementation of progressive tariffs, the volume of water usage increased in both categories.

The effect of progressive rates on water consumption was analysed by comparing data on water consumption rates per customer before the implementation of progressive tariffs (2004, 2005, and 2006) with the level of water consumption per customer after the implementation of progressive tariffs (2008, 2009, 2010). The results of the analysis are presented in Fig. 4 and Fig. 5.

Fig. 4. Water use before implementation of progressive tariffs

Fig. 5. Water use after implementation of progressive tariffs

The level of water consumption within the period of three years before the implementation of progressive tariffs shows a declining pattern (Fig. 4) whereas the level of water consumption after the implementation of progressive tariffs shows a polynomial pattern (Fig. 5). The level of water consumption in 2008 reached 334.53 m³ for each household, this decreased in 2009 it to 332.83 m³ per household, and increased again in 2010 to 335.97 m³ per household.

The pattern of the level of water consumption per customer before the implementation of progressive tariffs shows a decline. Before progressive tariffs were applied, the number of customers increased consistently (Fig. 6) while the level of water consumption per customer decreased (Fig. 7). This shows the inclination of customers from the household category with a low consumption level. Meanwhile, the number of customers from the company category is constant. As a result of the previous statement, the increase in the number of customers causes the level of water consumption to decrease.

The pattern of water consumption after the implementation of progressive tariffs increased, then decreased, and then increased again. The number of customers also increased in a polynomial pattern. In 2008, an increase in the number of customers was accompanied by an increase in water consumption, whereas in 2009, an increase in the number of customers actually caused a decrease in the level of water consumption.

Fig. 6. Number of customers of piped-water before the implementation of progressive tariffs in Jakarta

Fig. 7. Number of customers of piped-water after the implementation of progressive tariffs in Jakarta

The results of the analysis of the pattern of additional customers and the level of water consumption indicate that the implementation of progressive tariffs has succeeded in becoming a cross-subsidy instrument as indicated by an increase in the number of customers after these progressive tariffs were applied. Conversely, efforts to reduce the consumption of water resources only occur in the short term or one year after the progressive tariff policy is implemented. This phenomenon which has occurred in DKI Jakarta is consistent with the phenomenon that occurred in Manaus, Brazil (OLIVIER, 2006). Therefore, tariffs as an instrument to equalise access to water resources through a cross-subsidy mechanism has been achieved in DKI Jakarta, however, it did not succeed in encouraging changes in consumption patterns to conserve water resources. In order for tariff policies to be effective in changing consumption patterns, these policies must be integrated alongside other approaches which are expected to have an impact on changes in perception and behaviour. The authors also recommend further studies to focus on the impact of cross-subsidies on consumption patterns because the authors suspect that the cross-subsidy mechanism has the potential to be one of the factors that have caused unchanged water usage patterns in DKI Jakarta. This is due to several reasons. The cross-subsidy mechanism causes water customers in the category of households which has a high level of water consumption to pay less than they should, hence it does not encourage water saving behaviour. Cross-subsidies also cause households to have the perception that the distributed water is part of the public service that is carried out to meet household needs for clean water. Conversely, the still-developing paradigm of how water is public property or common property causes households that obtain tariff subsidies to assume that obtaining access to clean water is their right that must be fulfilled, thus it does not help in efforts to build awareness and to change water-saving behaviour in water users.

The responses shown by water users in DKI Jakarta towards the implementation of progressive tariffs have several implications in terms of the application of tariffs as a policy instrument for resource management. According to TIENTENBERG (2000) in his study, the weakness of the tariff mechanism to encourage efficient use of water resources lies in the size and structure of the tariffs. The increasing use of water after the progressive tariffs are applied shows that the amount charged does not yet reflect the appropriate cost of the tariff.

The use of water as a resource that needs to be provided by the state in order to fulfil basic needs causes the basis of tariff setting to be carried out by considering previous tariff rates. A very large change in tariffs will cause several actions such as lawsuits by water consumers. On the other hand, the calculation of production costs has not considered the environmental burden caused to produce each unit volume of clean water distributed. Also this study has not considered other factors in drinking water supply, such as technical factors. Service efficiency in the water supply can cause an increase in the volume of water sold. It is also necessary to identify the ratio of produced water to water sold as the water operator needs to calculate the volume of water resources used in order to set the appropriate drinking water tariffs for drinking water customers. In order to achieve the social objective of providing clean water to meet the needs of the community and to achieve efficiency in the utilization of water resources, determination of water tariffs per unit volume must be based on studies of production costs, willingness to pay, and environmental costs. Therefore, the authors suggest further research on 1) the willingness to pay within each category of consumers and 2) environmental costs that reflect depreciation in supply and availability of water resources. Analyses of these factors should form the basis of policies to balance the social objectives of providing access to clean water and environmental sustainability.

5. Conclusions

The implementation of progressive tariffs in DKI Jakarta in 2007 through the DKI Governor Regulation No. 11 of 2007 concerning Automatic Tariff Adjustment (PTO) of Semester 1 Water in 2007 was a policy instrument that aimed to regulate water usage rates in the city. Based on analysis of the implementation of these tariffs and the response of water users to this policy, it can be concluded that:

- 1) Progressive tariffs proved to be successful in distributing access to clean water because of the cross-subsidy mechanism from customers with high water use rates to domestic and social customers. This success is reflected in the increase in the number of customers after the implementation of the progressive tariffs policy.

- 2) Progressive tariffs did not succeed in becoming an instrument that encouraged austerity behaviour in the use of water resources. The impact of the implementation of progressive tariffs was observed only in one year and subsequently the

pattern of water consumption increased again. This weakness was likely caused by the relatively cheap cost of the tariffs which did not reflect the willingness to pay and did not consider the environmental burden of clean water production as a basis to determine the tariff structure.

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