

Water provision gap in Kemijen and Tambak Lorok

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Abstract. In areas that have not been 100% flowed by government piped water sources, residents must look for other water sources leastwise flow in time whenever people need water. A similar situation occurred in the study area, Kemijen and Tambak Lorok, two low income kampung in the coastal area of Semarang City that located adjacently. About 90% of households in Kemijen use government piped water sources, while nearly 100% of Tambak Lorok use ground water piped provided by neighborhood private sector. However, the Kemijen community does not necessarily get proper access because the government piped water could not flow the water all of the time, while private groundwater in Tambak Lorok can do. This study explores the gap of water provision in Kemijen and Tambak Lorok, as the provision of groundwater service is not a sustainable method so it should be replaced by the government provision in the future. In that context, the gap could be seen as the challenge for the government provision in improving their quality of service in the future. The study uses is a combination of qualitative and quantitative method and descriptively analysis in comparing the water provision system in the two kampung.

1. Introduction

Nowadays, water access becomes global problem. If developed countries experience problems about how to drain water all day, developing countries are still struggling with the problem of shortage of water. In order to solve water-related problems, UN countries formulated them into SDGs as a follow-up to the MDGs, with the water part combined with the provision of sanitation, mentioned in point 6, ensuring access to water and sanitation for all. In Indonesia, translated into a 100-0-100 program designed by the Ministry of National Development Planning of the Republic of Indonesia / National Development Planning Agency (Ministry of PPN/Bappenas) and run by Public Works and Public Housing (Ministry of PUPR) with a universal target of 2019 access and in 2030 namely 100% safe and decent access to drinking water. The water body appointed by the government to provide access to water is the government water supply. However, the government agencies which is government piped water (PDAM in Indonesia) have not been able to flow 100% to the urban areas.

In the city of Semarang, the Semarang government water supply itself said that the new coverage covered 63%. This situation is reflected in Tambak Lorok and Kemijen which have different sources due to differences in the time of entry of water sources provided by government agencies. The government water supply has been able to serve the Kemijen since the 1970s while in Tambak Lorok only since 2016 so that it creates a \pm 46-year gap. Based on government water supply data, the dominance of water provided by the government in Semarang is surface water (70%), with the remainder being springs (12%) and deep ground water (1%). However, Tambak Lorok residents cannot use surface water because it has been polluted by household waste. Almost 100% of Tambak



Lorok residents using household private deep wells while Kemijen residents using 90% of water supplied by the government. However, the existence of government access does not guarantee good access to water. On the other hand, domestic household private deep well users do not want to switch because they are already comfortable with the water that has been used.

The composition of the community which is dominated by the middle to low (40%) and middle income (34.5%) has a significant influence on the selection of water sources. The existence of 29% of household private deep wells customer households with a household income of less than Rp. 2,000,000.00 makes it difficult for them to switch to government piped water. On the other hand, due by differences in water sources for decades, it is difficult for middle and lower middle-class household who connect to household private deep wells to switch to the government water supply mainly because of the high cost connection fees.

Thus far, research on groundwater consumption is associated with industrial activities, while settlements are associated with shallow groundwater [1]. However, in Tambak Lorok and Kemijen, residents who do not use government piped water sources tends to use deep ground water provided by service providers who live in the area. Indeed, according to the spatial planning document in Semarang City clearly stated that groundwater in Tambak Lorok has been banned and groundwater conditions vary from crisis to damage therefore the urge for household private deep well users to switch to government water sources.

This paper presents the gap of water provision in Kemijen and Tambak Lorok, which are government water supply and household private deep well water. The gap presents by describing the water services, water pricing, and water provision disruptions. The provision of groundwater service is not a sustainable method so it should be replaced by the government provision in the future.

2. Literature Review

This literature discusses what water sources are, the usage, community strategies, services, and markets for public service and artesian services. In Indonesia, based on Government Regulation of the Republic of Indonesia Number 122 Year 2015 Regarding Drinking Water Supply System, it states that raw water for domestic drinking water is sourced from springs, shallow wells, deep wells, rivers, lakes, and water reservoirs. The researches show that for residents who have not been served by government water supply residents use piped water, artistic water, well water, water from spring water, bottled water, refill water, and water from mobile vendors, communal ground water (springs) which is piped into storage tanks and drilled to get ground water and then pumped into storage tanks (2,3).

Policy in terms of increasing access to clean water seems to be more focused on water supply with piped water sources. It is clear from the operational measurement of access to drinking water by the Ministry of Health and MDGs target measurement for safe water source measurements using two approaches, piped water and protected water sources namely piped water, pump wells, protected dug wells, eyes protected water, rain water, not included drinking water from mobile vendors, drinking water sold through tanks, and unprotected springs [4].

Water needs are divided into two, namely domestic and non-domestic [5]. In the guidelines on drinking water quality, WHO defines domestic water as water that is commonly used for all domestic needs including consumption, bathing, and food preparation [6]. This means that the need for adequate water is used for all needs and not solely for water consumption. In Indonesia, in the case of drinking water supply systems, there are two categories of drinking water supply, namely piping and non-piping systems. For example, what happened in the slums area of Tamansari Urban Village, Bandung City [7] with areas not served by government piped water, local residents must find alternative water sources[3].

Government water supply water services are felt to be still not optimal and continue to occur in various cities in Indonesia. Meanwhile, providing water is important because by providing adequate is essential to improve the development of health and socio-economical for the society [8]. Therefore, the community will make a strategy to meet their water needs. Communities adapt by using government water supply water for bathing and washing, while for drinking and cooking they spend extra money to buy water in the form of bottled drinking water (gallons), from mobile water vendors, to making deep wells [9–11]. In this study, communities try harder by being costumer of household private deep well.

It means that communities water use made by how the system of the water arranged and how the socio-cultural involved within [12]. However, the use of alternative water sources will burden the poor population because they have to pay more [13,14].

Research on how communities coping the poor access have been carried out [9,10,15,16], but specifically regarding the gap in the difference between non-government piped water sources and water sources provided by the government is still inadequate. In fact, the difference is important to understand as a form of evaluation for the government, especially if the source of non-government piped water is better than the source of water provided by the government.

Water service referred to in this study is about how the frequency of water and the quality. The selection of services does not look at other factors such as operational, technical, even legal aspects because it refers to the qualitative results of the field. The frequency shows how the water during the week, a day, and whether the water can flow at rush hour, given that water is more needed at rush hour than other hours. The frequency analyzed based on what residents see and feel and by observations results. The quality served based on household perceptions about the quality of the water they get every day. This can be biased because perception has been formed due to the use of one continuous source and the season at the moment the survey take place. To more understanding, this research also explains about water provision disruptions which divided into three categories, which are location factors, service factors, and customer private household deep well perception factors.

In terms of business practices, both runs in a different way. When the water supply system was made with a monopoly system, household private deep wells did not conduct monopoly but instead had to compete in an already crowded market. Both of these systems have their strengths and weaknesses. The difference in the system will also affect service gaps. Indonesian government actually try their best to prohibits monopoly. However, in the case of government water supply is permissible to protect water sources from being controlled by the private sector so that the price becomes unaffordable and for efficiency. This was agreed in the state regulation namely in Law No. 5 of 1999 concerning the Prohibition of Monopolistic Practices and Unfair Business Competition in Article 51 and Article 33 of the 1945 Constitution. However, with this monopoly company, there is no competitor in the government water supply so that it seems to lack innovation and does not develop according to the times. Moreover, the state continues to provide incentives for struggling government water supply to improve their finances so that the government water supply positions are too comfortable to be improved. Meanwhile, monopolistic characteristics in water services through piping are well known as the causes of market failures in water services [17]. The situation is far different from the household private deep well water service system which forces them to compete for customer loyalty. The household private deep well service system in Tambak Lorok and Kemijen is a household business, not a large private company. They develop through neighbouring trusts used by household private deep well providers and their customers to be mutually beneficial. There are two things that make household private deep well better positioned [17]. First, they understand well the area they serve and facilitate communication with customers. Second, because the market is competitive. However, the water that is given is still questioned as to its quality, especially in terms of biological and chemical factors contained there [11]. The quality of ground water does not meet WTO regulations, contrary to the notion of the people who consider it safer [18].

3. Material and Methods

This research was conducted in Kelurahan Kemijen and Kampong Tambak Lorok in 2018. The selection of these locations is to obtain results that can clearly compare the use of water source and household private deep well, where almost 100% of Tambak Lorok residents use household private deep wells while Kemijen residents using 90% of water supplied by the government. The research locations are close to each other, which beneficial for collecting data. Meanwhile, these locations consist 53% poor household, which being concern for the Government of Semarang City. These locations also consist of middle to lower classes (40%), middle income (34.5%), and middle to high class (25.5%). It means that these locations heavily consist of marginal community.

The research tool is an open questionnaire form that is distributed randomly, while the interview form is aimed at specific people namely the village chief, deep well water provider, and community

leaders. In addition, while conducting the dissemination the researcher also conducted field observations. The results of the three instruments are summarized and selected aspects that reflect the results of the study.

4. Results and Discussions

4.1. How communities choose their water source

Before looking at the condition of water services, it can be seen by how the water source was formed in Kampung Tambak Lorok and Kelurahan Kemijen. The development of water sources in Kelurahan Kemijen and Kampung Tambak Lorok was influenced by the absence of the government water supply for \pm 46 years in Kampung Tambak Lorok. In the 1970s the government water supply was able to patronize, Kampung Tambak Lorok had to wait until 2016. The gap made the development of household private deep well water providers grow from a queue system (people queuing for hours to buy water and collect them through jerry cans), then hourly flow, to full-day flow and payment per m³. The household private deep well users, especially in Tambak Lorok have become accustomed to the water use in various functions. On the other hand, the use of additional water sources is very high. The percentage of residents who use additional water sources is 63%, with 71% of all government water supply users and 53% of all household private deep well users. When piped water sources are used for non-consumption needs such as bathing and washing, additional water sources are used for consumption needs, namely drinking and eating. This is because of residents tend to look for better quality, especially for consumption [19]. Consumers consider the additional source of water needed by bottled water as a safe alternative source of water [20].

Although not part of this research, the existence of shallow wells as part of non-piped water sources is quite obvious, especially for residents who rent houses in Kemijen. Researchers did not find this phenomenon in Tambak Lorok. The renting residents are less likely to choose to improve the quality of their water and tend to accept what the contractor has provided. In fact, with water sources only shallow wells which can certainly be contaminated by household pollution or sewage from the southern part of Semarang, they still use it at least for non-consumption purposes. This situation is quite interesting when further research is conducted on the relationship between the status of home ownership with the main water source used and shows the reasons why it happened.

4.2. Illustration of service system

4.2.1. *Water frequencies.* Based on its frequency in table 1, the two piped water sources provide quite good services in terms of running water for one full week. However, household private deep wells provide a lot better service which able to flow for a whole week while not for government water supply. In terms of daily frequency, which is how water flows in one day, household private deep well provides better performance. Household private deep wells are not able to flow the water all day in 15% of customers while the government water supply is more 33%. Moreover, there are 13% of household which patronized to government water supply customers think that the water flow is still unpredictable. On the pressure side of the water flow, the private deep well provided a far better performance than the government water supply, with only 30% of households not flowing all day, lower than the government water supply (43%). During rush hour the water becomes weak with a percentage of 17% for private deep well customers, slightly lower than the government water supply which is 22%. In fact, government water supply has 19% of customers whose water does not flow during peak hours. So, in terms of water frequency, household private deep wells provide far better performance than government water supply. This situation occurs because of the responsiveness of domestic private deep well service providers who are more responsive when water disruption happened compared to government water supply who must go through bureaucratic matters first. The lack of frequency causes residents to try to collect water which are by storing water in reservoirs inside the house, outside reservoirs, bathtubs, plastic drums, and buckets of various sizes. The water storage used might be more than one in each house.

Table 1. Water frequencies and water quality perceptions

	1		2		3		4		5	
	GWS ^a	HPDW ^a								
Weekly frequencies^b	7%	-	-	-	1%	-	-	-	92%	100%
Daily Frequencies^b	5%	-	13%	4%	3%	6%	2%	4%	77%	85%
Water pressure^b	2%	0%	19%	7%	22%	7%	-	-	57%	70%
Perceptions of water quality^b	-	-	-	-	61%	25%	-	-	29%	75%

Notes:

^aGWS = government water supply, HPDW = household private deep well^bWeekly frequencies

1 = Flowing <4 days a week,

2 = Flowing 4 days a week,

3 = Flowing 5 days a week,

4 = Flowing 6 days a week,

5 = Flowing every day

^bDaily Frequencies

1 = never flows (must be with the help of a water pump)

2 = Time flows indefinitely,

3 = Does not flow during rush hour,

4 = Flow interruption <2 hours,

5 = Flowing throughout the day

^bWater pressure

1 = Not flowing * must be with the help of a water pump,

2 = Dead at rush hour

3 = Weak during rush hour

4 = less swift <2 hours,

5 = Heavy throughout the day

^bPerceptions of water quality

1 = Smells, tastes, and colored,

3 = Mix of smell, taste and color,

5 = Odorless, tasteless, and colorless

4.2.2. *Water quality.* In terms of community perceptions about water quality in table 1, household private deep wells are much better with only 25% of customers feeling the water is not good while there are 61% of government water supply customers who feel the same. However, given that users of household private deep well customers who have been accustomed to ground water for much longer than the government water supply, there is a high possibility that these results are biased due to acceptance even though the water obtained tasted salty even though it has been treated. However, household private deep wells are still superior based on this study. The existence of additional ready-to-drink water sources answers the needs of residents in the water section for consumption, and might becoming the part of life for most residents. Therefore, piped water is for non-consumption purposes while additional water is the main choice for consumption purposes. When the quality of the water that is not all good, residents try to improve the quality of the water by treating water and storing them in water reservoirs. The treatments are to collect, deposit, boil, and filter water, and buy additional source water that is ready to be consumed in the form of gallons of branded and refilled water. This is in accordance with Helene Zerah (2000) (16) which says that having improper access makes citizens make efforts to fulfil water.

4.3. Water pricing

4.3.1. *Installation fee.* The initial step for the community to obtain piped water sources is to pay a connection fee so that a connection can be obtained in the form of components such as water meter and water tap and has been paired by the provider. The cost of connecting the Government water supply starts from Rp. 1,045,000.00 and more if households are included in a higher class and there are no neighbour which already patronized to government water supply around the house. This cost varied from Rp. 250,000.00 - Rp. 750,000.00 which is cheaper. In addition, the high cost of connecting is quite heavy for the middle to lower population if they want to switch to government water supply, and the flow of water that is deemed sufficient so that residents do not need to move water sources.

To facilitate citizens, government water supply provides payment installation programs and promos at certain times. Residents who patronized in the 1990s were more fortunate because they were able to

patronize by getting cheaper fees starting from Rp. 250,0000.00, not only because of the difference in the rupiah exchange rate at the time but also because there was a cheaper installation promo if they willing to patronized in groups. The promos provided by private deep well providers are depend on each service provider, but installments are more flexible according to the ability of customers and even allow customers to owe them because of trust which constructed by neighbor relationship. However, there is no program that makes it cheaper for citizens to patronize if they roll in to patronize to water.

If a household that has not patronized to Government water supply wants to be patronize, it will be very difficult for households that have an income of under Rp. 2,500,000.00 because they have daily needs that cannot be left behind. Connection fees may be much higher for residents who want to patronize but no one has patronized around them. Therefore, for the poor household try to owe or save more money to be patronize. This situation can impact on the choice of the household main water source.

Installation fee is also the main reason why residents who use groundwater sources do not want to switch to using Government water supply (see table 2). Based on the results of the study, the main reason groundwater users do not want to move to a Government water supply source is because the cost of connecting Government water supply is more expensive (34%). Then, the smell (16%) and the need to precipitate (11%) are other significant reasons. This is consistent with the theory (9,10) which states that the connection fee is one of the barriers for the lower middle class to connect to Government water supply.

4.3.2. Consumption fee. Payment of Government water supply is done monthly and can be done by visiting a branch office, paying at a neighbour who opens a payment service, and paying online through an application on a mobile phone. Private household deep well payments are paid per week, but by paying directly to the collectors who come in every week to each customer. When paying late, Government water supply provides a 10% penalty and even disconnecting the pipe without notice. Household private deep well tends to be more lenient by allowing customers to owe even without interest according to the agreement between the customer and the provider. This situation makes customers increasingly attached to private deep well providers.

The price per m³ offered by Government water supply starts from Rp. 2,910.00 while the cost per m³ of ground water ranges from Rp. 3,000 to Rp. 5,000.00. Viewed by the amount of normal use, Government water supply users should be spending a little less per month. Accordingly, the government water supply customer water expenditure is Rp. 65,383.47 / month cheaper than household household private deep well customers Rp. 81,000.00 / month. In fact, when compared to the monthly water consumption, Government water supply customers are slightly higher at 21.93 m³/month than household private deep wells 19 m³ / month. If compared with family expenses, it costs 2.91% for Government water supply customers and 3.06% for private deep well customers. This fee is still in the standard OECD (2003, 2009) said that water bills should not exceed 3-5% of household income, although in this study using expenses because the data is more credible. Thus, the cost of a private private deep well subscription is far more expensive than Government water supply.

Then, the phenomenon of residents using additional water sources increased water expenditure by 87% for government water supply and 28% for private deep wells. The expenditure also increased water expenditure from monthly household expenditure by 1.83% for water supply government and 0.50%. for household private deep well so that the total water expenditure is 5.44% for government water supply and 3.92% for private deep well, exceeding 3-5% of household income. The price of ready-to-drink bottled water from branded gallons starting from Rp. 18,000.00, the price of ready-to-drink bottled water for refillable gallons starting from Rp. 4,000.00, and other small bottled water is an option, with the most favorite being ready-to-drink water in refill gallon packaging because the price is cheap and with the highest quantity. If the quality of water owned by water supply gents and household private deep wells can be trusted by the community, then the behavior of buying other water sources should be suppressed (23).

4.4. *Water provision disruption*

Water provision disruption is not a priority for many studies. Based on the results of this study, researchers divided the water disturbance into three aspects: location factors, service factors, and customer private household deep well perception factors. The location factor in question is a recurring tidal event and a significant land subsidence of 3-13 cm every year. The existence of the coastal flooding causes the pipe to be submerged in water, If leakage happened, it will affect the quality of the water which flowed into the house. In the other hand, there is land subsidence which causes roads and houses sinking which makes the pipes inside the ground affected. Moreover, the existence of a government assistance program to raise the road and residents' efforts to raise the height of the house also contributed to the sinking of the pipe. The more pipes sinking, the lower the quality and frequency of water, decreasing the water service. In addition to elevating the house, residents also have to raise the pipeline in the land area of their residence so the water able to flow smoothly and able to have good water quality. This activity makes each household allocating additional water expenses with uncertainty about the time and the amount of the amount of costs required.

The second one is the service factor. The existence of location factors that make services worse will require responsive services from each provider. The private deep well household customers in Tambak Lorok are more fortunate. When there is a disruption, the provider of household private deep well immediately searches for the source of the disruption and handles it, while the Government water supply must wait several days because the reporter must pass through bureaucratic procedures. When there is an elevation of the road, the provider of household private deep well also raise the pipe on the road so that the pipe does not sink. However, residents also have to raise the pipeline at home.

In order to have better water flow and water quality, few water supply government customers who are trying to install a water pump. However, installing a water pump means to suck up the water that should be received by the neighbor and makes them receive lower water frequency. In the other hand, there is a culture of following the neighbor coupled with a reduced frequency of water to make local residents participate in installing water pumps. Eventually, they cannot get water at all if they do not use pumps. On the legal side, installing a water pump is an illegal activity. However, due to omission provided by Government water supply keeps this activity still happened. On the economic side, installing a water pump increases the cost of water treatment and household electricity costs per month.

Another service factor is the blackout for private deep well providers. Light outages make the pump does not turn on and cannot drain water. This event rarely happens but if there will disrupt the flow of water for hours. Although, there are providers who already have a generator engine so that the flow of water can still flow, the death of the water flow will greatly affect not only household activities but also economic activities for fishermen and home industries that are scattered in Kampung Tambak Lorok

Lattermost, the perception factor of household private deep well customers. At table 2, there are three assumptions why people do not want to switch to water supply government, namely because of economic reasons (number 1,2,3,4), perceptions formed on water supply government (number 5,6,7,8) and trust in government water supply (number 9,10). Economic reasons are the main reason why they do not want to switch (48%), then slightly below is perception (43%) and finally is trust (11%). On the economic side, first, the cost of connecting which takes up more than half of the household head's income per month burdens the population to switch. Furthermore, there is a mistaken belief that water supply is more expensive, but actually the monthly private deep well costs are far more expensive. Then, there is something that the water supply government provider might not have thought about, namely that the monthly government water supply payment is not in accordance by the culture of household private deep well customers who do weekly payment. Residents feels pay cheaper by doing weekly payment. Finally, the 4th statement is also an interesting finding. The household private deep well system is a have higher trust due to the existence of neighborly relationships which make it easier for them to supervise customers. The existence of the higher trust has made the provider to allow household private deep well customers to defer payment according to the agreement. On the

perception side formed by ear-to-ear news regarding taste, smell, treatment, and smoothness, they contribute greatly to their inhibition to patronize. Therefore, water supply government must improve its services so that it can at least match the private deep well service so that they are willing to switch.

Table 2. Household private deep well customer's perceptions of government water supply management

	Explanation	%
1	Government water supply connection fee is expensive	34%
2	Monthly payment bills of government water supply is more expensive	8%
3	Government water supply paid monthly	3%
4	Government water supply cannot be postponed	3%
5	People says that the taste of government water supply is not good	8%
6	People says that government water supply smelled of chlorine	16%
7	People says that government water supply must be precipitated before use	11%
8	People says that frequencies of government water supply doesn't flow regularly	8%
9	There is no certainty of government water supply to flow the area	3%
10	There is no neighbor who already connected to government water supply	8%
Σ		100%

Finally, the household private deep well customers unlikely switch to water supply government services due to low trust. The news that the water supply government is not clear to enter the region, because the absence of water supply government to repeatedly socialized to residents. Meanwhile, the water supply government protocol wants residents to come to the water supply government to patronize. On the other hand, with the very low water supply government services in the Tambak Lorok making almost no neighbors to patronize and forming lower interest to switch. Even though the percentage in table 2 is very low, the culture to join neighbors is quite high in Indonesia, so it is necessary to water supply government to consider them to improve their service.

Thus, water disruption will ultimately affect the household economy. The existence of water disruption makes households have to allocate more expenditure and without knowing the certainty of the time and even for illegal activities. Government water supply is the worse part compared to Government water supply. Apart from the residents having to wait a long time for the pipes to be raised, residents also install pumps that must be maintained every month which cost of electricity and illegal before the law.

5. Conclusion

This study shows the gaps in water services in Kelurahan Kemijen and Kampung Tambak Lorok, as a result of the absence of Government water supply for + 46 years in Kampung Tambak Lorok based on water services, water pricing, and water disruption can be seen how the gap exists in water services in Kemijen Village and Tambak Lorok Village. With the different types of services, namely government water supply by bodies formed by the state and requiring bureaucracy and private household private deep wells formed by individual households to become their own business entity even though the legality cannot be explained, there will be very large differences, especially in the services provided.

From all aspects except the monthly payment in water pricing, it can be concluded that the household private deep well service providers provide far better services when compared to water supply government service providers. In fact, as a body appointed by the state, water supply government should be able to provide better services than individual institutions. The reason is the household private deep well is a business per household that is quite a lot and competes in one area so they must provide excellent service and innovate in order to maintain customer loyalty (17). This does not happen to water supply government because it is monopolistic in the market. On the other hand, with the lagging of the water supply government for \pm 46 years made various impressions that were

not good for the water supply government so that there was a sense of being accustomed as a result of receiving household water sources of private household deep wells that they had been using.

The impact of better service provided by household private deep well providers compared to water supply government providers is that it is increasingly difficult for residents to switch subscriptions. Even though the unclear legality of household private deep well service providers also leads to the absence of supervision over the actual quality of water based on government health agency standards (18). Legal uncertainty and illegality because private deep well household water sources have been banned in North Semarang, especially in Tambak Lorok, which also results in insecurity in the business continuity of private deep well service providers. With that, however residents still have to switch to Government water supply. However, Government water supply must make a huge improvement so at least reach the level of service of private deep well providers. In addition to technical services, water pricing also needs to be improved, especially by redesigning tariffs so that middle-to-lower class communities are able to subscribe without the need to sacrifice higher household expenses (24).

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