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Survey of Drinking Water and Sanitation in Local Government Semarang, Salatiga, Kendal and Pekalongan District

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Abstract:

Health development is one of the national development effort directed towards the achievement of awareness, willingness and ability of healthy life for every person to realize the optimal degree of public health. Sanitation and poor hygiene practices and unsafe drinking water contribute to 88 percent of child deaths due to diarrhea worldwide. This condition raises further serious implications on the quality of human resources and the productive capability of a nation in the future. The purpose of this study was to test the water services and sanitation systems and gather information in order to conduct a needs assessment and provide a starting point for potential water service and improved sanitary conditions in Central Java. The survey was conducted in 4 cities / districts namely Semarang, Salatiga, Kendal and Pekalongan, samples are 300 respondents per city / district in ± 2 subdistrict. The results of studies conditions of water supply and sanitation in Semarang 73% user of PDAM, water usage is to use most of the water refill, in Salatiga 66% use of of PDAM, Kendal user of PDAM was 99.3%, 55.3% in Pekalongan was user PDAM. Clean water and sanitation problems that occurred in Semarang is a society that is a source of clean water is rain water, of PDAM disorder that often occurs is the amount / water pressure is small; Salatiga, Kendal and Pekalongan yet uneven coverage of of PDAM, especially in rural areas , the absence of scheduling flow of water of PDAM, water of PDAM disorder that often occurs is the amount / small water pressure; Kendal, Pekalongan and Semarang frequent physical quality (water color, taste and smell) are common and of PDAM disruption that occurs is number / little water pressure problem. Overall of four cities / districts, the problems encountered are also related to low awareness of water supply and control of water contamination. The evaluation results of water services by water companies, some things related to the performance of PDAM water service is have not a system of scheduling, notification and response management system, disruption of water service of PDAM and lack of coverage in rural areas, especially in Kendal, Pekalongan and Salatiga.

Keyword: Drinking water, Sanitation, Awareness, Willingness and healthy life

1. Introduction

Water supply and sanitation the two most important sectors of development. Development of community water supply and sanitation results in social and economic conditions are better and improve health. In terms of sanitation, there are still many people who take advantage of "open toilets" are usually located in the garden, river banks, and ditches fields. Such behavior is influenced by several factors, including economic factors as to create the necessary costs cesspools, septic tanks unavailability of public and good service to the suctioning.

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Global study on water and sanitation in 2000, found about 1.1 billion people worldwide do not have access to clean water and 2.4 billion people have not been accessible sanitation / latrines are eligible. Most of the population is located in Asia and Africa and more than 100 million people in Indonesia not yet have easy access to drinking water sources. Drinking water and sanitation is done through two approaches are based approach agencies through departments, agencies, local enterprises, private and community-based approach that puts people as the main actors and determinants in service delivery, through a process of empowerment and active participation of the community.

Recent data service coverage of water and sanitation of Central Java in 2011 as seen from the year 2009 and 2010, for urban areas reached 61.54% in 2009 and 58.63% in 2010, while for rural areas 55.28% in the year 2009 and 56.49% in 2010. Data clean water and sanitation in Central Java is still low. Service Coverage PDAM Salatiga against in 2011 amounted to 56.14% where the number of service coverage is still not meet the targets of the MDGs, namely achievement rates of 80% service coverage for the urban population and 60% of the rural population. Pekalongan district in only about 47.10% of families have access to clean water.

By looking at the data coverage of the water and sanitation, the researchers intend to see the current picture and test the water services and sanitation systems and gather information in order to assess needs and provide a starting point for water service potential and improvement of sanitary conditions associated with the provision of clean water by local governments.

2. Materials and Methods

This research is a descriptive study using a survey conducted in four cities / regencies in Central Java, Semarang, Salatiga, Kendal and Pekalongan with samples per city / county 300 respondents drawn at random from ± 2 Sub districts per city / county targets. Research variables include water sources, access clean water, taps Customer Service and Public Participation as well as the quality of tap water in the city of Semarang, Salatiga, Kendal and Pekalongan.
Data collected by in-depth interviews (in-depth interviews) to get an overview of the respondents' perspectives on the topic of research. During the interview, respondents considered a skilled person. PDAM water quality data obtained from the test results directly in the field with portable measuring devices include residual chlorine, the water pressure and water turbidity.

3. Results and Discussion

Based on the results of research in 4 cities / regencies in Central Java, as in Semarang, Salatiga, Kendal and Pekalongan obtained several images of the variables that include:

Table 1. Distribution of frequency of fresh water resources

Fresh water resources	Semarang City		Salatiga City		Kendal Regency		Pekalongan Regency	
	f	%	F	%	f	%	f	%
Water Taps								
a) In house	219	73	198	66,0	200	66,7	166	55,3
b) in yard/ building	0	0	6	2	98	32,7	1	0,3
c) public places / hidran	0	0	0	0	1	0,3	1	0,3
d) neoghbour	0	0	2	0,7	1	0,3	2	0,7
Dug well	0	0						
e) Artesian well hand pumps	164	54.7	15	5	1	03	13	4,3
f) protected well	0	0	69	23,0	71	23,7	78	26,0
g) un protected well	0	0	13	4,3	45	15,0	94	31,3
Springs	0	0						
h) protected	0	0	22	7,3	2	0,7	0	0
i) rain water	1	0.3	0	0	0	0	0	0
Water seller								
j) refill	136	45.3	15	5,0	8	2,7	70	23,3
k) carriage / wagon	2	0.7	1	0,3	0	0	1	0,3
l) water truck	5	1.7	0	0	0	0	0	0
m) bottled water	120	40	33	11,0	17	5,7	1	0,3

Problems in the provision of clean water in four city / county as study sites found in the city, that there are still people who use rainwater as a source of clean water, which indicates the uneven water services in the city of Semarang. It is also a portrait in the city of Semarang is still difficult to obtain berih water to meet the needs of the community.

Table 2. Distribution of the frequency of drinking water sources

Drinking water sources		Semarang City	Salatiga City	Kendal Regency	Pekalongan Regency
Water taps in the house	f	18	164	187	122
	%	6	54,7	62,3	40,7
Water taps in the yard / building	f	0	5	97	0
	%	0	1,7	32,3	0
Water taps in the public places	f	0	0	1	0
	%	0	0	0,3	0
Water taps in neighboring	f	0	2	1	2
	%	0	0,7	0,3	0,7
Artesian well hand pumps / engines	f	17	12	0	7
	%	5.67	4,0	0	2,3
Protected dug well	f	0	43	0	45
	%	0	14,3	0	15,0
Un Protected dug well	f	0	11	0	51
	%	0	3,7	0	17,0
Protected springs	f	0	19	0	0
	%	0	6,3	0	0
Refill water sellers	f	140	16	5	72
	%	46.67	5,3	1,7	24,0
vending truck water	f	5	0	0	0
	%	1.67	0	0	0
Vending bottled water	f	120	28	9	1
	%	40	9,3	3,0	0,3

The high use of water from the seller refills is most likely because of the level of activity of high society in big cities causes people no time or lazy to cultivate the first water obtained from taps for drinking water, so that the people of Semarang reluctant to use water taps for water drink.

Table 3. Frequency Distribution Satisfaction of piped water pressure

Satisfaction of piped water pressure		Semarang City	Salatiga City	Kendal Regency	Pekalongan Regency
Very satisfy	f	6	12	4	5
	%	2	4,0	1,3	1,9
Satisfy	f	104	149	286	125
	%	34.67	49,7	95,7	47,2
Less satisfy	f	108	40	8	40
	%	36	13,3	2,7	15,1
Very Not satisfy	f	1	3	0	1
	%	0.33	1,0	0	0,4
Not use Taps	f	81	96	0	94
	%	27	32,0	0	35,5
Do not know	f	0	0	1	0
	%	0	0	0,3	0

Most respondents have a fairly high level of satisfaction with the services provided by the water pressure provision of drinking water and clean water from taps which city / county, but many also have less satisfaction levels.

Table 4. Distribution Frequency satisfaction against water obtained from taps

Satisfaction against water obtained from taps	Semarang City		Salatiga City	Kendal Regency	Pekalongan Regency
Very satisfy	F	4	14	2	10
	%	1.3	4,7	0,7	5,9
Satisfy	f	112	173	289	141
	%	37,3	57,7	96,7	82,9
Not satisfy	f	102	18	8	19
	%	34,0	6,0	2,7	11,2
Very Not satisfy	f	1	1	1	0
	%	0.3	0,3	0,3	0

Table 5. Distribution Frequency Scheduling Flow taps

Schedule of flow tap water		Semarang City	Salatiga City	Kendal Regency	Pekalongan Regency
Yes	F	74	43	1	7
	%	24,7	14,3	2,6	4,1
No	F	143	148	37	164
	%	47,7	49,3	97,4	95,9
Do not know	F	2	12	168	35
	%	0,7	4,0	56,0	11,7

Based on the table 3 and 5 can be seen that the low level of customer satisfaction with the pressure of water obtained from taps is closely related to the scheduling system that has not been up to the consumer, so many consumers who do not feel very satisfied with the service water from the taps. While satisfaction with the quality of the water from the taps is closely related to tables 6 and 7, wherein the low satisfaction due to poor-quality and frequent occurrence of service interruption. In the big cities, drinking water is acceptable to consumers through the distribution network is often still colorless, odorless and tasteless bad. The reason is partly due to the high content of organic substances in the raw water well in dry long dry or rainy season and the number of distribution pipeline leak. Consumers lay judge the quality 'of water from a physical appearance that is turbidity, color, odor and taste that can instantly be seen / felt without laboratory analysis assistance. Although in terms of microbiological drinking water from the taps is safe, but many consumers who ultimately decide the connection with taps and switching to groundwater or they subscribe to drink bottled water and only use the water from the taps for bathing and washing.

Table 6. Frequency Distribution Source Water Quality

Continuity of Water Resources Quality		Semarang City			Salatiga City			Kendal Regency			Pekalongan Regency		
		Color	Taste	Odor	Color	Taste	Odor	Color	Taste	Odor	Color	Taste	Odor
Always	f	3	1	6	0	0	0	1	0	2	1	0	1
	%	1,0	0,3	2,0	0	0	0	6,7	0	11,8	5,3	0	16,7
Often	f	15	11	50	1	0	0	8	1	0	6	2	1
	%	5,0	3,7	16,7	0,3	0	0	53,3	33,3	0	31,6	66,7	16,7
Rare	f	47	32	70	12	7	14	6	2	15	12	1	4
	%	15,7	10,7	23,3	4,0	2,3	4,7	40	66,7	88,2	63,2	33,3	66,7

Table 7. Distribution of Frequency Interference Taps Conditions

Interference Taps		Kota Semarang			Kota Salatiga			Kabupaten Kendal			Kabupaten Pekalongan		
The Interference existence		The flow stop	Jumlah Air Sedikit/ tekanan kecil	Kualitas Air Kurang Bagus	Aliran berhenti/ terhambat	Jumlah Air Sedikit/ tekanan kecil	Kualitas Air Kurang Bagus	Aliran berhenti/ terhambat	Jumlah Air Sedikit/ tekanan kecil	Kualitas Air Kurang Bagus	Aliran berhenti / terhambat	Jumlah Air Sedikit/ tekanan kecil	Kualitas Air Kurang Bagus
Yes	f	101	153	141	63	57	11	6	99	18	30	23	4
	%	33,7	51,0	47,0	21,0	19,0	3,7	7,2	89,2	19,6	69,8	59,0	12,5
No	f	54	2	14	25	31	77	77	12	74	13	16	28
	%	18,0	0,7	4,7	8,3	10,3	25,7	92,8	10,8	80,4	30,2	41,0	87,5

City of Semarang, a disorder that is often experienced with order of the amount of water Little / small pressure, the water quality is not good and the flow stops / obstructed, Salatiga disorder that is often experienced in a row is the flow stops / inhibited, the amount of water a little / small pressure and then quality water is not good, Kendal similar premises Semarang, Pekalongan while at Salatiga. Related continuity disturbance in Semarang, Salatiga and Pekalongan is the number a little water / little pressure, Kendal is the water quality is not good. While long interruption occurred in Semarang and Pekalongan reached 3-6 hours, whereas in Salatiga disturbance occurred> 6 hours, while Kendal interference occurs 1-2 hours. It is associated with the speed and precision of the handling of interference where taps with a system that has been good to eat will have a quick and appropriate response in handling the disturbance. Most of the disturbance will often experienced by people in the dry season comes.

Table 8. Descriptive results of water taps quality measurement

City	Chlor Trace (ppm)			Pressure (kPa)			Turbidity (NTU)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Semarang City	0,06	0,05	0,1	0,6	0,3	1,8	0,78	0,6	1,08
Salatiga City	0,05	0,05	0,1	0,7	0,1	2,3	0,53	0,04	2,27
Kendal Regency	0,1	0,1	0,1	0,8	0,4	1,3	0,04	0,02	0,08
Pekalongan Regency	0,1	0,1	0,1	0,68	0,2	1,7	0,03	0	0,5

Water is a very important need for human survival. Without water there would be no life on earth. Raw water demand for various purposes, especially clean water for households, public places, industrial and others will continue to increase over time in line with the pace of development in various sectors and fields as well as the population continues to grow. On the other hand the amount of raw water infrastructure provision and the current relatively limited

so it can not meet all of these needs, especially in times of drought. Handling will meet the needs of clean water can be done in various ways, adapted to the existing infrastructure. In urban areas, water supply system is done with the piping system and non-pipeline. Piping systems managed by the Regional Water Company (PDAM) and non-pipeline system managed by the community, both individually and collectively.

Residual chlorine has a very close relationship with the distance distribution of water, it is in line with the results of research conducted by Ibroni in 2007, showed that the decline in residual chlorine on consumers or customers that were located away from the treatment process. Chlor so the rest of the consumers the recommended minimum of 0.2 mg / l cannot be achieved. Look also at the results of this study that the lowest value of residual chlorine measurement results in 4 cities / counties shows the value of 0.05 and a highest value among four city / county is 0.1.

Salatiga in this survey shows measurement results of the pressure which the pressure lowest result among the four cities / county is shown from the results of measurements of pressure taps in Salatiga and the highest pressure value in this study also found in tap water pressure measurement results in Salatiga. Differences in the measurement results of piped water taps on the customer (public) caused by several things, including the occurrence of leaks in the distribution pipeline resulting water pressure when the pressure measurements to be small in the distribution area, besides the age factor pipes influential as the older the pipes it will causing roughness increase pipe so that the flow velocity in the pipe is reduced. In addition to the measurement residual chlorine, to pressure water, the parameters used in this study is turbidity, where turbidity average water taps to the consumer (society) in Semarang, Salatiga, Kendal regency and Pekalongan using Turbidi meter presented in the table 4:23 row is 0.78; 0.53; 0.04 and 0.03. The most turbid water quality experienced by people in Semarang followed by Salatiga, Kendal and Pekalongan.

Water turbidity is caused essentially by the presence of substances - colloid is a substance that decomposes floating and smooth. This is due to the presence of organic matter decompose smooth, bodies - microorganisms, silt, clay, and colloid similar substances or floating objects that are not settled immediately. Direct measurement of total suspended solids is often time-

consuming. Scientists often measure the cloudiness (turbidity) that can estimate the total suspended solids in a water sample. Turbidity is measured with a turbid meter tool that measures the ability of light to pass through the water sample. Suspended Particle it will scatter incoming light, thus reducing the intensity of light in transmission process. Turbidity in the water is one thing that must be taken into consideration in the provision of water to the public, given that it will reduce the turbidity in terms of aesthetics, complicating the effort will reduce the effectiveness of filtration and disinfection efforts. Based on the results of previous research by Festiyanti in 2006 found that there was a significant correlation between the number of free chlorine residual bacteria Escherichia coli ($p = 0.05$). The study clearly shows that many taps pipes contaminated by bacteria primarily by the bacterium Escherichia coli.

Conclusion

1. The provision of clean water and sanitation situation in Semarang, Salatiga, Kendal and Pekalongan:

   a. Semarang city: clean water source of the 300 respondents in the three districts, 73% taps, boreholes 54.7%, and 45.3% water refills. Most of the drinking water usage is to use waterrefills.

   b. Salatiga: clean water source of the 300 respondents in two districts, 66% of taps, 23.0% of dug wells and 11% use of bottled water. The use for drinking water is the water taps.

   c. Kendal: clean water source of the 300 respondents in two districts, 99.3% is the user taps.The use for drinking water is the water taps.

   d. Pekalongan: clean water source of the 300 respondents in two districts, 55.3% of user's taps, and 57.33% of user's unprotected dug wells. The use for drinking water is the water taps.

2. The problem of clean water and sanitation that occurs in the city of Semarang, Salatiga, Kendal and Pekalongan:

a. Semarang city: the use of refillable water for drinking, taps only for bathing and washing, there are still people who are the source of clean water is rainwater, physical quality (water color, taste and smell) is common, disorders taps often happens is the number / little water pressure, and the problem is still low public awareness related to water supply and water pollution control.

b. Salatiga: the uneven PDAM service coverage, especially in rural areas, lack of scheduling the flow of water taps, water taps disorder that often occurs is the number / little water pressure, and the problem is still low public awareness related to water supply and water pollution control.

c. Kendal: not scheduling the flow of water taps, water intrusion taps often happens is the water quality is not good, frequent occurrence of water quality is poor (water odorless, colorless and tasteless), as well as issues of public awareness is still low related to the provision of clean water and control of water pollution.

d. Pekalongan: the uneven coverage of taps, especially in rural areas, lack of scheduling the flow of water taps, often the water quality is poor (water odorless, colorless and tasteless) disruption of water taps that often occurs is the amount / water pressure is small, and the problem public awareness is still low related to water supply and water pollution control.

Water quality problems still less relate with residual chlorine is low to reach out to the furthest customer to keep bacteriological quality of water.

3. Evaluate the service of clean water by PDAM, some things related to the performance of PDAM water service are:

a. Scheduling related to customers who have not diinfokan
b. System management interrupt handling clean water taps
c. Notification management system service interruption PDAM
d. Coverage is still lacking in rural areas.

4. Solutions to improve water services and sanitary conditions in the city of Semarang, Salatiga, Kendal and Pekalongan:

   a. Semarang city: the need to improve the quality of water distributed to the public, so as to boost public confidence to use tap water as a source of clean water and drinking water

   b. Salatiga, Kendal and Pekalongan: the need for scheduling a clear and scheduling information needs to be conveyed to all people who use the services of clean water from taps, it is also necessary to provide all information related to disruptions that would occur in the service of PDAM (flow, quantity and quality), it is also necessary for the improvement of the handling of interference management and increasing coverage the service of taps into the whole area of the city / county.

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