

Analysis on the management of waste domestic system in populous neighborhoods

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Abstract. Population growth increases the disposal of domestic wastewater generated by the community. Residents who live in neighborhoods and slums have become one of the factors of domestic wastewater issues. These communities urinate and defecate in inappropriate locations without any post-processing, including simple processing through septic tanks. These issues can be resolved by improving the domestic wastewater management. The centralized domestic wastewater management system is one of the solutions for the management of alternative settlements and slums in RT 09, Bidara Cina. This research aims at planning domestic waste management model that fits into the community. This research will use descriptive analysis methods with quantitative approach. Data are obtained through field surveys and resident interviews. The data then are presented in a table. My contribution will provide a suitable model for domestic wastewater management planning. The findings of this study refer to six (6) SDGs, namely clean water and sanitation to ensure domestic wastewater management and sustainable sanitation.

1 Introduction

DKI Jakarta Statistics Indonesia (*BPS*) stated that the populations in Jakarta in 2010, 2014, and 2015 were approximately 9,640 residents, 10,075 residents, and 10,177 residents [1]. The increase in population resulted in significantly increase water consumption. The total water demand in the year 2000 reached 156,000 million m³/year [2]. The figure is expected to be doubled in the year 2015. Domestic waste water generated by population growth and the development of buildings in the city of Jakarta is unfortunately a less complex issues for many people, including the government. Household wastewater management for domestic waste such as shower wastewater, laundry and kitchen wastewater (grey water), as well as urine and stool (black water) is truly essential in the analysis because some parts of the community still urinate and defecate in inappropriate locations, for example grounds, drainages, rivers, and other locations without any post-processing. In addition, the black water is occasionally processed through temporary individual septic tank or “*cubluk*” and it is directly released to the river, which can pollute the environment [3]. The role of the community in the management of domestic wastewater is imperative because the approach used is a community-based sanitation. It is based on the example of Surabaya as the capital

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of East Java and Indonesia's second largest city after Jakarta with a population of 2,853,661 inhabitants in 2014. This city has equipped its residents with sanitation infrastructure systems, and it was expected that 176,105 families or about 26.95% of the population of this city had already taken advantage of the sanitation facilities [4].

According to Government Regulation No. 82/2001 on Water Quality Management and Monitoring of Water Pollution that aims to maintain the quality of the body of water, the government set the decision of the Ministry of Environment and Forestry No. P.68/Menlhk/Setjen/Kum.1/8/2016 on Quality of Raw Domestic Wastewater. The regulations stated that any organizations or individuals doing businesses or activities in the dwellings (real estate), restaurants, offices, apartments and commercial areas have to set a household wastewater treatment to ensure that the quality of wastewater released into the environment does not go below the pre-established raw quality standards. The Basic Health Research, which was last conducted in 2013, indicated that 76.2% households in Indonesia already had their own toilet facilities. However, there were 12.9% households who urinate and excrete inappropriately. Based on the number of toilet facilities, only 15.5% of the effluent was discharged to closed/underground tanks with a drainage system. Most of the toilets discharge the sewage directly into the environment without initial processing [5]. According to WHO and Unicef in its publication in 2010, Indonesia was a country that has not shown significant improvement in the areas of sanitation, but the synergy between the development and the Millennium Development Goals (TPM/MDGs) increased the access to on-site wastewater from 24.81% in 1993 to 62.14% in 2015 [6]. It means Indonesia pay attention with sustainable development goals

This research was conducted in RT 9, Bidara Cina, Jakarta. Bidara Cina has an area of 1.26 km² with a total population of about 43,995 in 2016, which consisted of 14,893 households (Jatinegara in numbers, 2017). Bidara Cina is divided into 16 RWs and 188 RTs, but this study only focused on RT 9. RT 09 was selected for the study because of its dense population and slum areas with no septic tanks. The households also dispose its domestic waste through pipes connected from their homes to the river, with most of the population utilize ground water for their daily needs. The objective of the research is to plan domestic waste management model that is suitable for RT 09, Bidara Cina.

2 Material and method

2.1 Descriptive research

This research uses quantitative description and comparative methods. These methods were selected to conduct the study to find out how communities manage their domestic waste and compare it to government regulations related to the management of domestic waste. Data retrieval was conducted by observations in the field and interviews with the local community. The findings of this study were compiled into a general overview of domestic waste management model in the community, the overall conditions, and the government regulations that govern the management of domestic waste. Furthermore, the study used a comparative method to assess the domestic sewage treatment and the current conditions. The methods compared the circumstances in the local community, the government, and the risks of environmental pollution. The results of this study is effective domestic waste management method for the community.

2.2 Sustainability

Sustainability is the ability of the earth and human nature to be able to survive, develop, and adapt to changes in environmental conditions in the long run [7]. Another definition of sustainability is a natural ability of the earth and human beings to be able to survive, develop, and adapt to changes in environmental conditions in the long term [8]. Development means enhancing people's lives through improved food or education services. Sustainability is living on earth by utilizing renewable resources without damaging the ecological processes that sustain us all. Meanwhile, sustainable development is the merging of the two definitions above. Based on *World Commission on Environment and Development* in 1987, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [9]. The principle of sustainability is very important to run SDGs as well as development. Access to safe water and sanitation as well as the management of freshwater ecosystems are essential for good human health, environmental sustainability, and economic prosperity.

3 Result and discussion

3.1 Result

According to the survey in RT 09, Bidara Cina, approximately 90% of its domestic waste disposal methods are concerning. The information was revealed through the responses of the respondents about the number of available toilets and hygiene/sanitary facilities at home, types of current lavatories, availability of septic tanks at home, location of domestic waste disposals, and waste disposal conditions. Based on the findings, their kitchen waste is still largely mixed with the shower/bathroom waste.

Table 1 shows that the majority of the population in the neighborhood RT 09, Bidara Cina, has not done the management of domestic wastewater properly. Among 28 homes in the neighborhood, only 2 houses had septic tanks, 11 homes had decent and clean toilet/sanitary facilities. In addition, there was not any household meeting the criteria of points on Government Regulation No. 68 Year 2016 on Domestic Waste Raw Water Quality. Each house did not separate its domestic wastewater collection channel and rain water collection channel, did not have domestic wastewater treatment, and did not assign a sampling point to test domestic wastewater. It showed that there was a lack of awareness in domestic wastewater management and its impact on the environment.

Based on the above conditions, it is evident that a domestic wastewater management model is required in RT 09, Bidara Cina. The function of the management model is to lower the concentration of contaminant contained in the domestic wastewater, maintain the sanitation and sustainability of the environment, and maintain a sustainable process for the environment as a system. Several domestic wastewater management alternatives categorized based on various aspects of their respective management are shown in Table 2.

Table 1. Conditions of domestic wastewater disposal in RT 09.

Respondents-	Government Regulations (PP68 Year 2016)			Availability of toilets/ <i>MCK</i>	Feasibility of toilet/ <i>MCK</i>	Septic tank	TOTAL
	Separating domestic waste water collection with rain water (article 4 point 2.c)	Doing domestic wastewater treatment, so that the quality of domestic wastewater are dumped into a water source is not beyond raw domestic waste water quality (article 4, point 2d)	Setting sampling point and coordinate to test samples of domestic wastewater (article 4, point 2f)				
1	0	0	0	1	1	0	2
2	0	0	0	1	0	1	2
3	0	0	0	1	0	0	1
4	0	0	0	1	0	0	1
5	0	0	0	1	0	0	1
6	0	0	0	1	0	0	1
7	0	0	0	1	1	0	2
8	0	0	0	1	1	0	2
9	0	0	0	1	1	1	3
10	0	0	0	1	1	0	2
11	0	0	0	1	0	0	1
12	0	0	0	1	0	0	1
13	0	0	0	1	0	0	1
14	0	0	0	1	1	0	2
15	0	0	0	1	0	0	1
16	0	0	0	1	1	0	2
17	0	0	0	1	0	0	1
18	0	0	0	1	0	0	1
19	0	0	0	1	0	0	1
20	0	0	0	1	1	0	2
21	0	0	0	1	1	0	2
22	0	0	0	1	1	0	2
23	0	0	0	1	1	0	2
24	0	0	0	1	0	0	1
25	0	0	0	1	0	0	1
26	0	0	0	1	0	0	1
27	0	0	0	1	0	0	1
28	0	0	0	1	0	0	1

Table 2 shows that domestic wastewater management model appropriate use in RT 09, Bidara Cina is a hybrid system (*on waste-off waste system*). This hybrid model (*on waste-off waste system*) has a very small total value, so that the resulting resistance also relatively small. This model is a merger between an *on waste system* and an *off waste system*. The advantages of implanting this model is that it is easier and faster; all types of waste can be discharged into the community septic tanks, the planning and implementation processes are relatively simple, the pollution of groundwater and resources can be avoided, and the financing can be divided between the government and the community. However, this model requires relatively high operational, maintenance, and investment costs; management, operational, and maintenance commitment from the government; and a complicated waste transport/disposal. It is expected that a hybrid model (*on waste-off waste system*) can help the community in RT 09, Bidara Cina, to improve the existing sanitary conditions.

Table 2. Explanation alternative management of domestic wastewater.



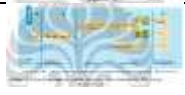
Waste water treatment methods	The General Overview	Description
Local System (On Waste System)		Domestic waste is managed individually or in groups, for example waste treatment using septic tanks
Centralized System (off waste system)		Domestic waste is channeled to the installation of the exhaust pipe leading to the installation of wastewater treatment (IPAL)
System hybrida (on waste - off waste system)		A merger between method on waste system and off waste system

Table 3. Result risk analysist scoring for alternative waste water treatment.

Waste water treatment methods	Local System (On Waste System)	Centralized System (off waste system)	System hybrida (on waste - off waste system)
The cost of implementation	32	35	24
Operational costs	27	33	26
Maintenance costs	30	31	26
pollution of the surrounding environment	38	27	25
Long term operations	23	36	15
Waste water treatment methods	Local System (On Waste System)	Centralized System (off waste system)	System hybrida (on waste - off waste system)
Government benefits	21	23	18
Community benefits	34	35	17
Total	205	220	151

3.2 Discussion

The increase of population and the development in all aspects of life, directly or indirectly, contribute towards the current environmental deprivation. Domestic wastewater management issues cover many aspects. It does not only deal with the affected environmental spectrum, but it also deals with the social and economic issues. It is similar to what is happening in the watershed of Citarum, where the population growth generates various issues, including land use and land coverage change (LULCC) [10].

The hybrid model (on waste-off waste system) is one of the models that can be utilized for the management of domestic wastewater. It is hoped that with a model, the community can maintain and improve its environmental and sanitary facilities. Nonetheless, the downfall of this model is that the management of domestic wastewater may not run properly without any active participation from the surrounding communities. It is because if the local communities do not maintain the facilities and manage it regularly, it will not be sustainable. An earlier research in Gunung Kidul Yogyakarta, namely the construction of the communal wastewater treatment plant (Communal WWTP/*IPAL Komunal*), in Mendak, Giri Sekar, Gunung Kidul, Yogyakarta, has shown that regular maintenance is required. In its operations, *IPAL Komunal* in Mendak, Giri Sekar Gunung Kidul, is controlled every two to three weeks, and conducted directly by the community. The monitoring is conducted from the outer parts of the facilities [11]. Monitoring is conducted on a regular basis to maintain the *IPAL* facility and to avoid issues or malfunctions.

The hybrid model (on waste-off waste system) is also required to ensure the sustainability of the sanitation facilities. The model is also used as a channel successfully achieve SDGs number six (6): clean water and sanitation to ensure domestic wastewater management and sustainable sanitation.

4 Conclusion

The population growth does not only trigger issues related to dense populations, but it also causes issues related to the improvement of domestic wastewater. Limited availability of land, lack of education and low income result in less caring society toward sanitation and environmental sustainability. This is apparent from the results of this research that shows that very few households in the community that practice domestic wastewater management, either by *on site* or *off site system*. Surely, solutions should be immediately offered to provide recommendations of domestic wastewater management model. The study was conducted in RT 09, Bidara Cina, Jakarta. After conducting a survey in the location and its surrounding communities, domestic wastewater management model that fits for the community is recommended, that in the hybrid model (on waste-off waste system).

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