

Keys of sustainable community-based waste management (lesson learnt from Yogyakarta City)

Alia Fajarwati^{1*}, Agustina Setyaningrum², Rini Rachmawati¹, and Bambang Sriyanto Eko Prakoso¹

¹Department of Development Geography, Universitas Gadjah Mada, Yogyakarta, Indonesia

²Institut Teknologi Yogyakarta, Yogyakarta, Indonesia

Abstract. In Indonesia, through Sanimas (Community Based Sanitation Program), which is coordinated by the Ministry of Public Works and Public Housing in collaboration with local governments and communities, establishes KSM (Community Self-Help Group) for Communal Liquid Waste Management Installations. The purpose of this study is to examine the factors that cause the sustainability of community-based liquid waste management. This research uses mixed methods, that is by analyzing quantitative data from the SKM (Community Satisfaction Survey) 2019 on the Implementation of Infrastructure Services in Yogyakarta City and then validated with primary data collected from semi-structured interviews with the head of KSM from the three well-managed Communal IPALs. Instead of the active participation of the community, the result shows in the case of Yogyakarta City, the key of Communal IPAL management sustainability is still more on the role and commitment of KSM or community leaders rather than the active participation of the community.

Keywords: Community based, IPAL, KSM, waste management, liquid waste

1 Introduction

Increasing the number of residents in urban areas is a challenge for the city government. One of the challenges is related to waste management. Urban waste consists of solid waste and liquid waste. Waste management is related to environmental sustainability and has the potential to cause impacts on health, the environment and the economy [1]. Waste management has also become a global environmental challenge [2]. Waste management is influenced by several aspects including technical, environmental, financial, sociocultural, institutional and legal aspects of activities [3]. The low quality in waste management is also caused by several things such as weak government policies and coordination, limited funding, low participation from the private sector, inefficiencies and low public awareness [4]. Community-based waste management encourages community participation to play a role in waste management. Therefore, the role of the community in waste management is interesting to study because it has the potential to influence the sustainability of the program. Several studies have shown that community-based waste management can be sustainable, one of which is by implementing an income management system [2]. An example is the community-based waste management recycling program carried out in Surau Al Husna, Shah Alam Malaysia which has low operating costs and is able to increase income and thus become a model in Malaysia [2]. Community

participation together with policy makers is also a very important factor to ensure the sustainability of the waste management program that is through discussions and meetings to solve problems together [5]. The relationship between policy makers and community groups is able to increase trust and increase public awareness [5].

In Indonesia, through Community Based Sanitation Program (Program Sanitasi Berbasis Masyarakat-Sanimas), which is coordinated by the Ministry of Public Works and Public Housing in collaboration with local governments and communities, establishes Community Self-Help Group (Kelompok Swadaya Masyarakat-KSM) for Communal Liquid Waste Management Installations (Instalasi Pengelolaan Air Limbah-IPAL). In this program, the community is involved starting from the planning process to the management of the Communal IPAL. The implementation of community-based IPAL has been implemented in several cities and districts in Indonesia. In Probolinggo City, the form of community participation in the management of Communal IPAL is manifested in the level of attendance at each meeting, providing meal at the time of construction and also monthly retributions [6]. However, the sustainability of Communal IPAL in the City of Probolinggo is in the medium category due to the lack of public understanding of the function of IPAL, the low maintenance and unclear role between the managers of Communal IPAL and the community [7]. Whereas in RT 2 RW 12, Bendul Merisi Sub-District, Wonocolo

* Corresponding author: aliafajar@ugm.ac.id

District, Surabaya City, community participation was assessed from the level of attendance at various stages, starting from the planning stage, the technology selection stage, the IPAL location selection stage and the operational stage and evaluation stage [8]. The level of community participation in the management of Communal IPAL varies greatly. The management of Communal IPAL in Makassar City is relatively high and moderate as indicated by increasing community understanding, involvement in the planning and maintenance of IPAL, but in routine maintenance is limited, desludging has not done regularly, increasing the number of house connections has not been done and so on [9]. While in Bogor City, community participation, from the construction stage to the operational stage, is considered good. However, at the operational stage, community participation is limited in paying retribution, maintenance only by operators or KSM [10]. While in RT 30 RW 07, Warungboto Village, Umbulharjo District, Yogyakarta City shows the level of community participation is low [8].

The sustainability of Communal IPAL management is a challenge. Sustainability can be assessed from various aspects. The study of the sustainability of Communal IPAL management in Wonocolo District, Surabaya City is assessed from the technical aspects, community participation, institutional and economic aspects [8]. In managing the Communal IPAL in this area, the role of community leaders is very important and able to encourage community participation, so that the community participation is sustainable [8]. Likewise, with the management of Communal IPAL in Bogor City, the sustainability of management is caused by community participation (social aspects) and the existence of KSM (institutional aspects) [10]. Actually, sustainability assessment is not only carried out on social and institutional aspects, other aspects are also assessed, namely technical aspects, financing aspects and environmental aspects. However, those aspects do not have influence on the sustainability of Communal IPAL management in Bogor City [10]. From the sustainability studies conducted in Surabaya City and Bogor City, it shows that the economic and technical aspects have less influence on sustainability [8, 10]. Unlike the case with the management of Communal IPAL in Gunung Pati District, Semarang City, the institutional aspects and community participation are not optimal [11]. The factor that causes the lack of community participation is that the community is less involved in the planning process and considers the Communal IPAL as assistance from the government and is managed by the government. While from the institutional aspect, KSM members are less aware of their duties and responsibilities [11].

In Yogyakarta City, liquid waste management is carried out through two systems, namely a centralized system and a local system. The centralized system is flowed to a single processing installation, namely the Sewon IPAL. Meanwhile, the local system is intended for houses that are not equipped with toilets and individual septic tanks and have not been reached by the piping network provided by the Yogyakarta City Government. This local system is called a Communal

IPAL. This waste management shows that Yogyakarta City already has sanitation infrastructure in waste management. Waste management is also intended to alleviate urban slum areas and also improve urban sanitation conditions. In several sanitation problems, a good condition of sanitation infrastructure is able to be one of the solutions in overcoming health and water problems in a sustainable manner, especially in urban areas [12].

The construction of the Communal IPAL in Yogyakarta City began in 2004 and was built around the banks of the Code River, Gajah Wong River and Winongo River [13]. Similar to other cities in Indonesia, Communal IPAL is managed by KSM. Management of Communal IPALs in Yogyakarta City are also very diverse. This is indicated by the conditions of IPALs in this city which are in good or bad conditions. IPALs in good condition have various conditions and many factors influence them. IPALs in good condition can be sustainable. IPALs that have bad conditions do not develop, sometimes leak and break, so they are not sustainable. Poor communal IPAL management has the potential to increase pollution and to reduce environmental quality. Studies related to local waste management show that domestic wastewater treatment can save costs, protect homes, promote good watershed management, become a solution in areas with low density and provide good solutions in several areas with diverse ecological conditions [14].

Communal IPAL with good conditions can provide lessons learned for the management of other Communal IPALs. Therefore, the management of Communal IPALs in good condition is very interesting to study. The purpose of this study is to examine the factors that cause the sustainability of community-based liquid waste management. Those factors that are key to the successful management of the Communal IPAL can be a lesson learnt and can be applied to similar communal waste management in other locations.

2 Method

This research uses mixed methods, that is by analyzing quantitative data from the 2019 Community Satisfaction Survey (Survey Kepuasan Masyarakat-SKM) on the Implementation of Infrastructure Services in Yogyakarta City and then validated with primary data collected from semi-structured interviews with the head of KSM from the three well-managed Communal IPALs. The 2019 Community Satisfaction Survey (Survey Kepuasan Masyarakat-SKM) on the Implementation of Infrastructure Services in Yogyakarta City conducted by Public Works and Housing and Settlement Areas Office of Yogyakarta City in collaboration with Faculty of Geography, Universitas Gadjah Mada. SKM measurements were carried out on several service infrastructure areas, one of them was Communal IPAL, and analyzed using descriptive statistical methods. The results of the descriptive statistical analysis were then deepened with semi-structured interviews with the head of KSM from the three well-managed Communal IPALs. In addition,

several papers are used to enrich the analysis in this study.

3 Result

Communal IPAL users along riverbanks in the city of Yogyakarta are increasing from year to year. Until 2016, the number of Communal IPALs in Yogyakarta City reached 61 units with their capacities of 2192 households [15]. The conditions of Communal IPALs in Yogyakarta City are varied, some have good conditions and others have bad conditions. Based on data from Community Satisfaction Survey on the Implementation of Infrastructure Services in Yogyakarta City in 2019, the bad condition of Communal IPALs only 52 % have KSM [13]. In the maintenance of Communal IPALs, the regular desludging is almost never done and only 4 % had experienced desludging [13]. In contrast to Communal IPAL with good conditions, 41 % of respondents mentioned that they checked the facilities of IPAL and the presence of KSM was 55 %. In more detail, Table 1 presents a summary of the data from the study of "Survey of Public Satisfaction Reports on the Implementation of Yogyakarta City Infrastructure Services in 2019".

Table 1. Communal IPAL data [13]

Variable	Communal IPAL with bad condition	Communal IPAL with good condition
Communal IPAL facility condition	30 % worthy	50 % worthy
Suitability of function	48 % suitable	59 % suitable
Check the facilities of IPAL	96 % never checked	59 % never checked
Periodic desludging	96 % never	91 % never
The presence of KSM	48 %	55 %
Exact payment of retribution	74 % not on time	50 % not on time
Damage reporting	96 % never	91 % never
Member of KSM	96 % not joined	50 % joined
Desludging service by Public Works and Housing and Settlement Areas Office	57 % knowing	91 % not knowing
Complain mechanism	87 % never complain	91 % never complain

The management of Communal IPALs with good condition in the city of Yogyakarta can be an example for the management of other Communal IPALs. To find

out the factors that cause Communal IPALs to have good conditions, indepth interviews were carried out on three (3) KSMs with the results presented in Table 1.2.

Table 2. Data on communal IPAL services

Variable	R1	R2	R3
Years of building IPAL communal	There are 2 IPALs, in 2009 and 2012	2008	Since 2006, start operation in 2009-2010
Formation of KSM	2009 and 2012	since 2007 (since the planning of Communal IPAL)	Before the construction of IPAL, in 2006
The process of the formation of IPAL	Socialization to community, forming the KSM, division of responsibility	Discussion with community	Socialization from Environmental Office
Organization of KSM	The committee validated by RT	There is an organization and not use the operator	Have active KSM
Maintenance by KSM	Desludging, monitoring of the IPAL channel	Management of IPAL retribution, routine maintenance, introducing biogas to the community	Socialization through the meeting of RT and Empowerment of Family Welfare Organization
The capacity of IPAL Communal	55-60 households	85 households	80 households
Retribution from the community	3,000 rupiahs/month	10,000 rupiahs/month	5,000 rupiahs/month
Allocation of retribution	Maintenance of IPAL's tube	For operational and draining	Maintenance of IPAL's tube
Salary for KSM member	No salary	Incentive: p 100,000 rupiahs for the head of KSM and 50,000 rupiahs for secretary and treasurer	No salary
Mechanism in reporting damage	Reporting to RT, then to Public Works and Housing and Settlement Areas Office of Yogyakarta City	Reporting to the member of KSM or to KSM member who lives near IPAL	Reporting to the member of KSM then fix it independently
Maintanece the Communal IPAL by Public Works and Housing and Settlement Areas Office of Yogyakarta City	There is a maintenance but not every year	Only for major draining	Only for draining
Problem of the IPAL	No problem	Odors, blocked drains and the need for drainage	Blocked drain because of solid waste, odors

Source : primary data, 2019

Based on the indepth interview information, community-based IPAL management is managed through KSM. KSM has formed before the construction of Communal IPAL. KSM has an organizational structure and generally its members do not get salaries, only one out of three of KSM gives monthly incentives but the nominal is very small. Regarding the maintenance of Communal IPALs, every household should pay monthly fees from IDR 3 000 to IDR 10 000. This contribution is organized for operational costs, maintenance, repairing damages. Some problems in the management of Communal IPALs are odors, blocked drains and the need for drainage.

4 Discussion

Study of participation is one of the important factors in raising public awareness [16]. Many studies prove that participation can encourage success in an activity in the community. For example the study of community participation in managing sanitation [17], community participation in coastal community empowerment activities in processing fishery products [18] and study of community participation in managing 3R-based waste [19].

Community participation has become one of the keys to the sustainability of Communal IPALs. Community awareness and ownership will have a positive impact on the maintenance of IPALs. In the management of Communal IPALs there is management based on the existence of community organizations in the form of KSMs assigned to manage communal IPALs by involving community participation. The data shows, in bad condition Communal IPALs as much as 91 % people are not members of KSMs [13]. In fact, the existence of a Communal IPAL management by KSM is aimed to encourage cooperation between community and KSM to manage Communal IPAL independently. The quality of IPAL is determined by the active role of the community at the planning to evaluation stages. In Communal IPALs in good condition, the percentage of people who are members of KSMs is quite balanced, which is 50 % [13].

Furthermore, at the operational stage, the forms of community participation are in the form of monthly retributions, maintenance, routine checking, periodic suctioning, reporting in case of damage and making complaints. Each KSM determines the amount of the monthly fee, which is between IDR 3 000 to IDR 10 000 / household / month. The form of management of these retributions is for network inspection, network cleaning, control tanks cleaning, giving deodorizing, and community service.

Survey data shows that all communities agree to pay retributions every month, even though payments are often delayed. Although the amount of retribution is only 3 000.00 to 10 000 / month, but late payment of retribution reached 74 % in the Communal IPALs under poor conditions [13]. Even in the Communal IPALs with good conditions there are also delays in the payment of fees, which are 50 % [13]. The awareness of

the people of Yogyakarta City on the importance of retribution for maintenance is far better than that of Communal IPAL users in Bogor City, which shows the low participation of community in aspect of financing [10]. While the results of research related to the performance of IPAL management in Semarang City shows that 76 % of the community participated in paying fees [11]. Likewise with a similar study in Surabaya in the management of IPALs, the community participates by paying monthly retributions [8]. Both studies encourage the sustainability of community-based IPAL management.

In maintenance efforts, community participation is realized by not littering the WWTP. Data shows that almost all of the community (96 %) in Communal IPALs with both conditions strongly agreed / agreed not to throw garbage in the IPAL channel, only 4 % disagreed [13].

Furthermore, the decrease in river water level will cause odor. Community participation is needed to regularly check the decline in river water levels that can be seen in the outlet pipe in the IPAL. Therefore, community participation is needed to check it regularly. However, in the Communal IPAL with poor conditions, 96 % of respondents said they had never participated to check. While in IPAL with good condition, 41 % of respondents said they had checked [13].

In the case of regular desludging, although 57 % of respondents in Communal IPAL with poor conditions knew that there was a desludging facilitated by the Public Works and Housing and Settlement Areas Office, 96 % of respondents stated that they had never done desludging regularly. Likewise, the Communal IPAL in good condition, 68 % of respondents stated that they had never done desludging regularly, even 91 % of respondents did not know that there was a desludging service by the Public Works and Housing and Settlement Areas Office [13].

In terms of damage reporting, the survey results show that people who live in Communal IPAL sites with poor conditions tend not to care, 96 % of respondents said they never reported if the IPAL infrastructure was damaged. Similar to the community in Communal IPAL with good condition, 91 % respondents stated that they never reported the damages [13].

In addition, complaints facilities are also underused by the community. Survey results show that 87 % of people in bad condition of Communal IPALs and 91 % of people in good condition of Communal IPALs never submitted complaints to KSM management or through the local leaders such as RT (neighbourhood) or RW (hamlet) since they considered the response was very slow or slow. It caused dissatisfaction and resulted in low community participation [13].

From those discussions it can be concluded that active community participation is the key to the success of the Communal IPAL sustainability [7, 8, 9]. However, in the case of Communal IPAL in Yogyakarta City, the difference in community participation in Communal IPAL with good and bad conditions was not too significant. The success or sustainability of Communal IPAL management is still more on the role and commitment of KSM or community leaders rather

than the active participation of the community. The important role of those community leaders is similar to the study of the sustainability of Communal IPAL in Surabaya City [8]. KSM has organized independent management although without salary, the government only conducts annual checks and repairs the major damages. Of the three successful KSMs interviewed, there was only one KSM manager that got salary but with a very small nominal, that is IDR 100 000 for the chairman and IDR 50 000 for treasurer or secretary per month. Research from Karyadi (2010) on community participation in a Communal IPAL program in RT 30 RW 07, Warungboto Kampong, Umbulharjo District, Yogyakarta City shows although categorized in the good Communal IPAL but the level of community participation is low [8]. The same thing was also found in research on the effectiveness of community-based communal waste water management in Makassar which showed that the community's initiative to build Communal IPAL was only 35.8 %, while the rest initiative came from community leaders and the government [9].

5 Conclusion

The key to success and sustainability of Communal IPALs in Yogyakarta City is determined by: commitment and important role of KSM chair or local leaders; retribution for maintenance costs; community participation in maintaining Communal IPALs; independent management by KSM, the government only responsible for annual checking and repairing in major damages; and public awareness about the importance together with sense belonging to guarantee the sustainability of Communal IPAL.

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