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RESEARCH PAPER

Social perspective of municipal wastewater management in Entikong Lama district

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Abstract. Entikong Lama is a densely populated residential area and the center of economic activity located on the riverbank. However, there was poor management of municipal wastewater that influences water quality of the river. Moreover, the river water is used by society for drinking, cooking, bathing, washing and toileting. Hence, municipal wastewater management is needed to prevent river from polluted municipal wastewater. This research is a social analysis to investigate social perspectives on wastewater management planning. This analysis is imperative to find out the social response and willingness of the society towards municipal wastewater management. The social survey was carried out using the interview and questionnaire method. This research found that about 93% of the household already had water closets (WC) and 83% already had septic tanks. The problem that occurs is that the septic tank has never been sucked up because there is no desludging service. This is due to the fact that there are no Fecal Sludge Treatment Plant (FSTP) facilities in the Entikong Lama. Later, communal Wastewater Treatment Plant (WWTP) planning program was offered to the society. About 72% of the household agreed to the communal WWTP program and the rest refused or abstained. Even though it reached high positive response from the society, there were some considerations of the communal WWTP program: the location of the communal WWTP, the clarity of those who manage the wastewater plant and the amount of fees charged to the society.

Keywords: Social analysis; municipal wastewater; communal wastewater treatment plant; riverbank; Entikong Lama

1. Introduction

The rapid growth of population in a region affects to the reduction of the environment quality. The rise of population also increases the need of clean water for bathing, washing and toileting. This boots the production of municipal wastewater production. The quantity of municipal wastewater production is around 60% - 80% of the use of clean water. However, municipal wastewater is biggest pollutant of the water that contributes to the increase of water pollution (Susanthi et al., 2018a). In order to reduce municipal wastewater production, it should

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be well managed. Municipal wastewater, especially human feces, contains pathogens that contaminates the water (Yanuar, 2013). Municipal wastewater affects water quality which influences aquatic ecosystems. The change in the composition of substances in the water jeopardizes aquatic ecosystems. Municipal wastewater could be disease-carrying media, causing damage to building materials and plants, and harm the water ecosystem balance. In addition, wastewater pollution results in bad smells and decreases the aesthetic value of an area (Cordova, 2008).

According to the Decree of the Minister of Health of the Republic of Indonesia number 965/MENKES/SK/XI/1992, environmental sanitation is necessary to ensure the environment meets health requirements standard. The poor sanitation causes physical damage to the environment and society (Safira, 2018). One solution in improving sanitation is communal wastewater treatment (WWTP) in the community.

Communal WWTP has been built in many cities in Indonesia. In Bogor, communal WWTP has been built since 2015 (Susanthi et al., 2018b). Two regions in Malang, Madyopuro Village and Lesonpuro Village, located in Kedungkandang District have implemented communal WWTP (Anggraini, 2019). Blitar City, East Java has implemented communal WWTP since 2014 and it has been accepted by the community. Thus, it has had more than 50 communal WWTPs (Nafi'ah, 2015). Semarang City has also built the communal WWTP which is the result of the Independent National Community Service Program (PNPM) (Utami et al., 2016). The Public Works, Housing, Energy and Mineral Resources Service of DIY Province has also introduced communal WWTP to the community (Hafidh et al., 2016).

Some WWTPs in Bogor City have been facilitated with biodigester and reverse osmosis so that they can be used as energy (biogas) and for drinking water (Susanthi et al., 2018b). However, its management is still not optimal because it still produces pollutants above the standard threshold (Susanthi et al., 2018a). Communal WWTP must be managed properly to avoid pollution. Communal WWTP near the river has proven to pollute river water. This is as happened in the Brantas River which contains a lot of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) because it has been contaminated by Mergosono Communal WWTP (Maziya et al., 2016). Elsewhere, the study result of Utami et al. (2016) on three WWTP samples in the Semarang, namely Banyumanik, Dadapsari, and Banyumanik Mix, shows that the Coliform has exceeded the quality standard. Although in some places there are communal WWTPs that produce pollutants and contain bacteria exceeding the quality standard, the study conducted by Panambunan et al. (2017) in Community Association IV, Malendeng Village, Paal 2 District, Manado City proved that the Coliform is still below the threshold. That is, Communal WWTP can be managed without causing environmental and community problems. It means that the planning of settlement sanitation management needs to be done to prevent environmental pollution and social conflict. The community also needs to be involved in planning to raise public awareness to protect the environment with good sanitation behavior.

The Entikong Lama area is a densely residential area located on the banks of the Sekayam River. Sekayam River is a tributary of the Kapuas River. Geographically, this river stretches in West Kalimantan Province. In the Entikong Lama area, there are also economic centers in the forms of markets and shops. Community activities have the potential to produce municipal wastewater that can pollute Sekayam River. The mapping of the existing conditions needs to be

done to determine the wastewater management that has been carried out. Furthermore, wastewater planning is carried out by considering the existing conditions. The approach through social analysis needs to be done to find out the opinions and willingness of the community towards wastewater management planning. The social analysis is very important in order to accommodate public opinion to determine the possibility of the sustainability of the planning program.

The research result of Hafidh et al. (2016) on the sustainability of community-based wastewater treatment plants (WWTP) in Gunung Kidul, Yogyakarta showed that one of the keys to the success of WWTP's sustainability is the independent and programmed management by the community. Community participation in WWTP management is very much needed to maintain its sustainability (Siswati et al., 2017). Long before, Adirpadana (2012)conducted a study in Yogyakarta, Sleman and Bantul to see the community attitude towards the WWTP program. As a result, people who accept WWTP are not necessarily willing to subscribe to WWTP and vice versa. A social study of the community-based WWTP planning in Surakarta City Kadipiro Village was conducted by Andini (2014) who studied the community involvement in the implementation of the community-based sanitation program. The proportion of community involvement is calculated starting from the stages of socialization, planning and construction of WWTP, and the implementation and maintenance of WWTP. Community involvement in the program socialization stage reached 100% while the formation of the self-reliance WWTP management group was 91%. Community involvement in the implementation and maintenance of WWTP was 85%. Community involvement influences community acceptance of WWTP planning. The study of community acceptance of the operation of the WWTP system in Sniadowo, Poland by (Rauba & Brulinska, 2017) stated that 56% of respondents tended to have a positive perception of the existence of WWTP. From their research, around 24% of respondents stated that the WWTP system was not in line with expectations. 8% of respondents said they were very satisfied with the WWTP system. The remaining 10% of respondents did not give any opinion on the WWTP system.

The community acceptance of WWTP is a criterion that needs to be considered because their refusal will cause the community sanitation program unable to implemented properly. Normally, the WWTP location distance to the source of waste and the potential flood are two technical criteria that also need to be considered affecting the level of community acceptance of the WWTP program (Kefaningrum et al., 2017). Meanwhile, the study conducted by Sari (2016) proves that knowledge, education level, income, housing position of the population affect their behaviors in using the toilet.

The social assessment in the Entikong Lama area aims to determine the level of community acceptance of communal WWTP planning. The level of community acceptance will affect the sustainability of the planned WWTP system. The Entikong Lama is geographically an area located on the border of Indonesia and Malaysia. This social study is expected to be able to provide a picture of the community perceptions of WWTP planning in the border area.

2. Research Method

The study was conducted in October 2016. The method used in the study is visual observation using questionnaires and interviews at the location of study. Visual observation conducted to analyze the existing wastewater management in the Entikong Lama.

Questionnaires along with face to face interviews were conducted in Entikong Lama by visiting all settlements. A household is represented by one respondent.

The total respondents in this study were 334. The contents of the questionnaire included the respondent's identity, toilet ownership, ownership of the septic tank, desludging of the septic tank, acceptance of communal WWTP planning, and perceptions regarding communal WWTP planning. The results of the questionnaires and interviews were analyzed to provide an overview of the existing conditions and community views of the wastewater management planning program. The quantitative analysis was carried out descriptively which included the calculation of the proportion of the community related to existing conditions and the level of community acceptance of communal WWTP planning. The survey results were presented in the form of location mapping. Furthermore, an analysis was conducted to see the public perception of the planning and operation of the communal WWTP.

3. Result and Discussion

The community in the Entikong Lama area utilizes piped clean water sources from the Perusahaan Daerah Air Minum (PDAM). However, they stated that the quality of clean water produced by PDAM was very good. They utilize the Sekayam River water to meet the needs of clean water. The quality of water in Sekayam River is poor and unsafe when used for drinking water. This causes clean water crisis in a region. According to Saad et al. (2017), currently, there are global phenomena that include a clean water crisis, the quality of clean water sources, contamination of clean water sources, and an increase in the volume of municipal wastewater. Wastewater that is not managed properly and directly discharged into water jeopardizes the ecosystem.

The Entikong Lama area is a densely populated residential area which is centered at the bend of Sekayam River. The details of the location of Entikong Lama are shown in Figure 1. In this area, there are several shops and stalls (economic centers) located at the entrance to the Entikong Lama area. The condition of residential and shopping areas in Entikong Lama is described in Figure 2. After passing through the economic center, the Entikong Lama area is a densely populated settlement. The Entikong area is a border area between Indonesia and Malaysia.

Figure 1. Satellite image of the Entikong Lama area

Figure 2. Conditions of settlements and shops in the Entikong Lama area

The existing condition of the community in the Entikong Lama area related to municipal wastewater is that there are still bathing, washing, and toilet activities carried out in the river. These activities are mostly carried out by people who do not yet have a toilet and those living near the riverbank. Some people drain municipal wastewater directly into the river or yards through pipes. This is done by those who do not yet have a septic tank. Meanwhile, people who have a septic tank have never done fecal suction. This is caused by the absence of fecal desludging services in the area. To overcome this, people build overflow pipes from septic tanks and drain them into ditches or drainage canals.

There are a small number of people in the Entikong Lama area who do not yet have toilets. People who do not have toilets are the economically disadvantaged people. They utilize riverbanks for bathing, washing, and toilet activities. The condition of the riverbanks used for those activities is shown in Figure 3. In general, people who do not have toilets are people whose house are close to riverbanks. The housing conditions of the Entikong Lama community that do not have toilets are shown in Figure 4.

(a) (b)

Figure 3. Existing Conditions of Entikong Lama area (a) Buildings along the riverbank (b) Utilization of the river as a source of clean water and MCK facilities

Figure 4. Houses in the Entikong Lama area that do not have toilets

In this study, a social survey was conducted on 334 respondents in the Entikong Lama area. The respondents were classified based on the household and commercial categories. The results showed that there were 81% (269) of respondents included in the household group, while 19% (65) of them were included in the commercial group. The mapping of the classification of household and commercial groups is shown in Figure 5. On the map, the household group is in red while the building locations for commercial activities are in blue. In addition to the household and commercial areas, in Entikong Lama, there are worship facilities in the form of a mosque which is shown in yellow. As mentioned earlier, from Figure 5, it is clear that the commercial area consisting of markets and shops is concentrated in the entrance area of the Entikong Lama area. Only a small portion of the commercial area is located in the middle of the household area. From the map, it is also obvious that most of the commercial area is located close to riverbanks.

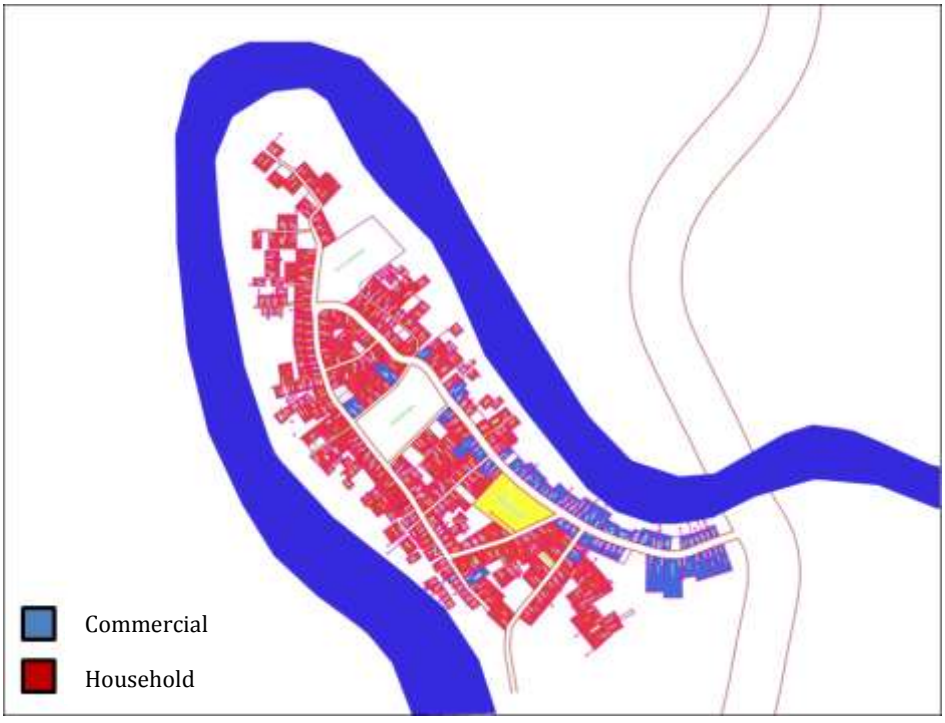

Figure 5. Mapping of the classification of household and commercial groups in the Entikong Lama area

The mapping of the location of community houses that do not have toilets can be seen in Figure 6. Community houses that do not have toilets are depicted in red. The results of the WC ownership survey show that almost all respondents stated that they already had WCs, reaching 93%. Only 24 respondents did not have WCs or 7% of the total respondents. Those who do not have WCs are economically disadvantaged people, so they do not have the cost for building toilets.

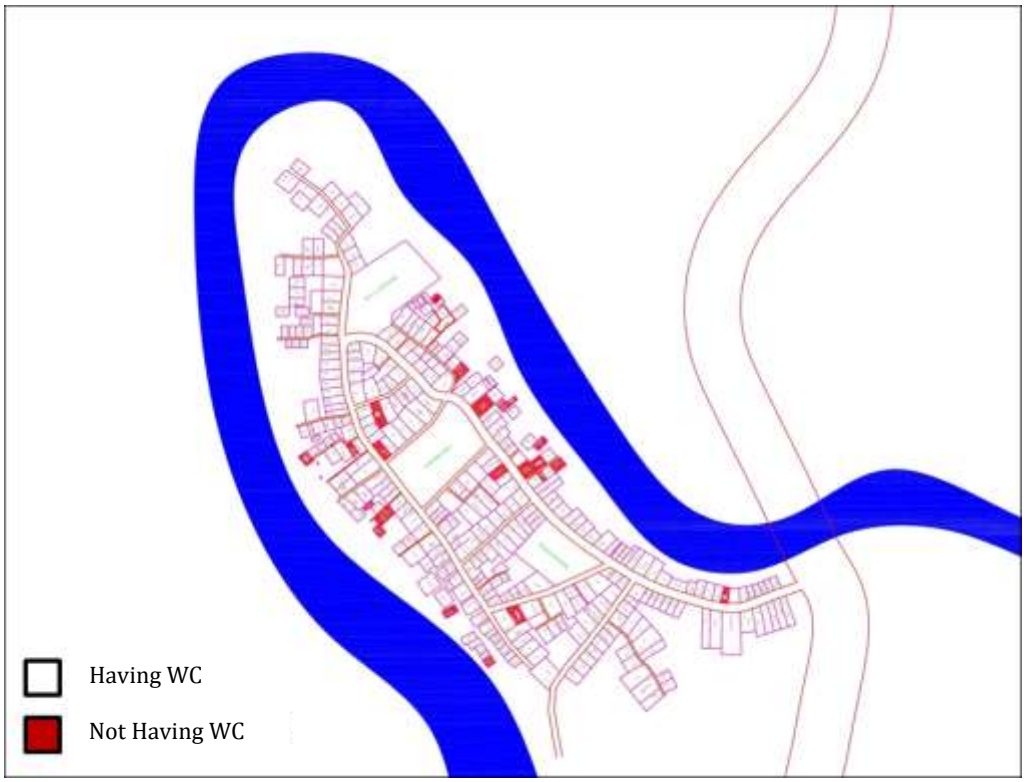

Figure 6. Mapping of the WC ownership of the Entikong Lama area

Meanwhile, the results of the septic tank ownership survey show that 83% of the community already has septic tanks while 17% of them do not have a septic tank yet. The study shows that even though the community already have toilets, it does not guarantee they have septic tanks. It was noted in this study that there are 10% of people who have toilets but do not have septic tanks. The results of the survey were made on the map as shown in Figure 7. Houses without septic tanks are depicted in blue. It shows in Figure 7 that most people who do not have septic tanks are those who love along the riverbank. However, some people whose houses are not on the riverbanks that do not have septic tanks.

From the survey to the people who already have septic tanks, they stated that they had never do desludging of their septic tanks. Based on appendix IV of the Minister of Public Works and Public Housing Regulation No. 04/PRT/M/2017 concerning the Implementation of Wastewater Management Systems, management using septic tanks is included in the on-site processing sub-system. The regulation explains the operation and maintenance of septic tanks. One of the maintenances of the septic tank is to collect sludge regularly. Most people in

Indonesia generally carry out desludging only when there are problems such as blocked flow. This is a wrong practice. Desludging in septic tanks must be carried out regularly every 2-3 years. Feces that enters a full septic tank will not undergo processing anymore. This is the same as the practice of open defecation. A full septic tank will be prone to leakage so that it can potentially cause overflow of municipal wastewater. The overflow of wastewater from the septic tank has the potential to cause environmental pollution such as water body pollution.

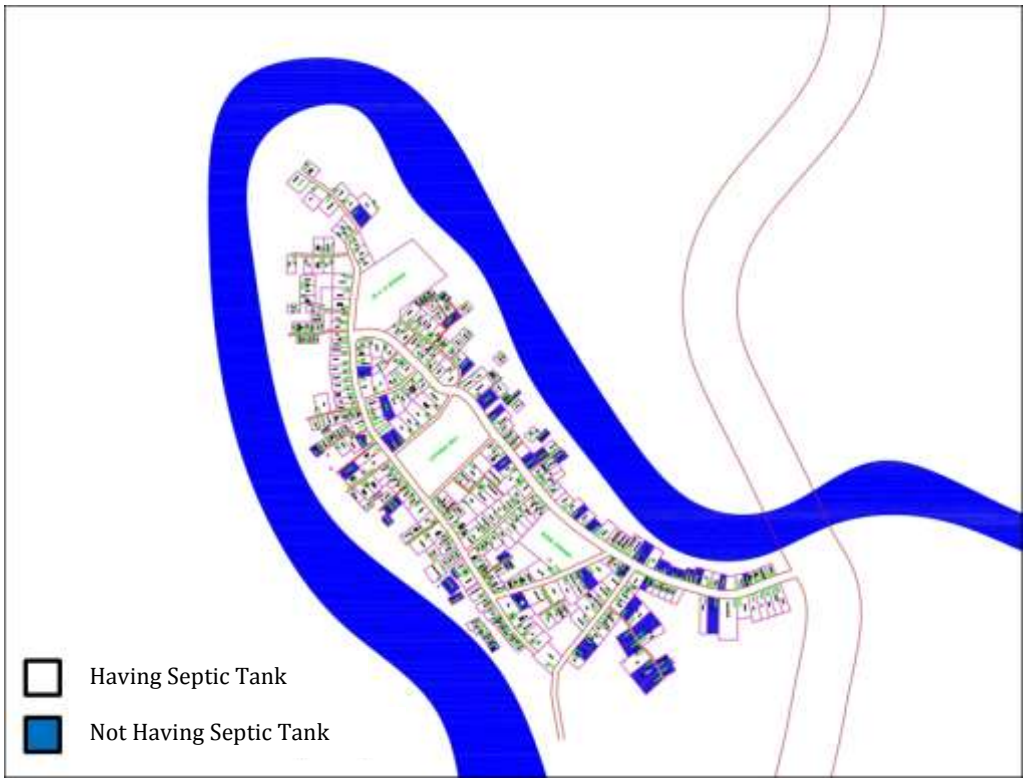

Figure 7. Mapping of the septic tank ownership of the Entikong Lama area

The main reason of the community septic tank that has never been sucked up in the Entikong Lama area is that there is no Fecal Sludge Treatment Plant (FSTP). This resulted in no desludging truck service. The government has carried out the FSTP planning process and targeted that it will be completed in the next 2-3 years. Communal WWTP planning can be used as an option for managing municipal wastewater in the Entikong Lama area. People who already have septic tanks can connect the septic tank outlet pipe to the communal WWTP. The desludging in communal WWTP is done every 2-3 years. Communal WWTP planning allows municipal wastewater from both toilet, bathroom, laundry, and kitchen waste to be treated in the communal WWTP. The construction of communal WWTP becomes the choice for handling municipal wastewater so that it does not become a source of pollutant of the recipient water bodies. The communal WWTP management system has been heavily modified and is directed towards sustainable wastewater management technology (Safira, 2018).

Communal WWTP planning is done with technical and non-technical approaches. Non-technical factors are closely related to communities served by communal WWTP. Some non-technical factors such as institutional and funding sources both the operation and maintenance of communal WWTP. Currently, community-based sanitation havebeen developed. The

community act as the manager of WWTP. However, not all programs that have been implemented are running well. There needs to be a study of community responses to communal WWTP planning. The results of the analysis of the Entikong Lama social study of communal WWTP planning as well as mapping of the location of houses of people who are willing or not or abstaining from communal WWTP planning can be seen in Figure 8. Houses of people who are not willing are in red while those who are abstain are in orange.

The response of the community regarding communal WWTP planning in the Entikong Lama area is quite good with 72% of the community willing (Y) with the communal WWTP planning. The people who are not willing (N) and abstained/hesitated (A) with communal WWTP planning are 28%. Some things that are considered by people who are not prepared for communal WWTP planning include:

a. The limited land location because the Entikong Lama area is already densely populated.
b. It is not yet clear about who will be the manager of the communal WWTP that have been built. This relates to who is responsible when there are problems with the communal WWTP after it operates.
c. The presence or absence of user fees from the communal WWTP system and the amount of user fees.

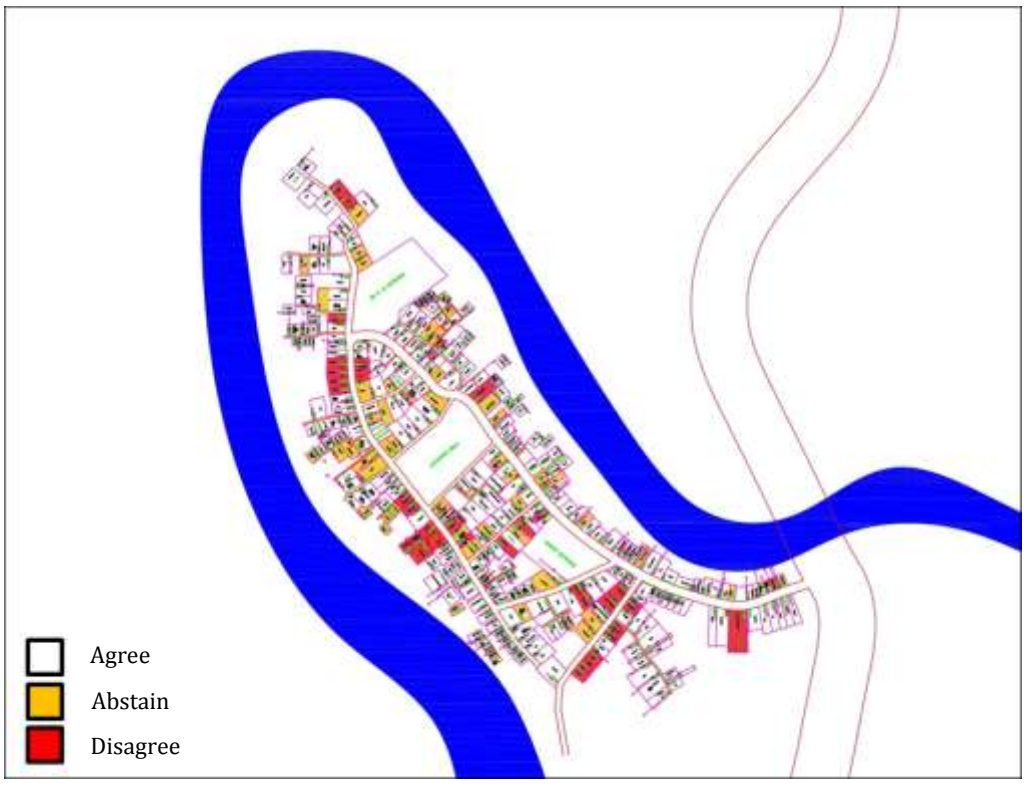

Figure 8. Mapping of community responses to communal WWTP planning in the Entikong Lama area

According to Rosaria (2010), there are several non-technical issues in municipal wastewater management in Indonesia which include low community participation, lack of

optimal regulation, operations that do not pay attention to regulations, lack of government and management coordination, low management budget, tariff that is not well-planned, and private participation which is still less optimal. The government has implemented the community-based sanitation program (Sanimas) in various regions in Indonesia. Sanimas is a solution for providing sanitation facilities with a participatory paradigm. Sanimas is focused on the management of municipal wastewater, but it does not rule out the possibility of handling industrial waste. In the implementation process, the Sanimas program consists of five important stages, namely program promotion, the formation of community self-reliance groups, preparation of work plans, the construction of communal WWTPs, and WWTP operations and maintenance (Andini, 2014).

The results of the case study by Hafidh et al. (2016) on the communal WWTP Sanimas Gunungkidul show that the sustainability of the Sanimas program is influenced by community participation. The community is involved starting from the socialization, planning and management stages. Community involvement in socialization is very important to raise public awareness. Socialization is carried out through regular meetings. The community was also involved during the construction of the communal WWTP. Determination of funding for communal WWTP management was done through deliberations. Payment of fees is carried out every month during routine meetings and then deposited in a special account of the communal WWTP operations. Levies are used as operator costs and for the improvement and maintenance of the communal WWTP infrastructure and pipelines. The obstacle that occurred during the communal WWTP planning was the problem of dismantling pipes on community-owned land. However, this problem can be overcome by good socialization to foster public awareness to care for the environment. According to Saad et al. (2017), one aspect that determines the success of sustainable wastewater management is community participation. Community involvement starts from the planning stage to the communal WWTP operation. The community is made as the party that manages the communal WWTP and has the authority to make a decision. The role of the government is only as the facilitator for the community in the management of communal WWTP.

4. Conclusion

Most people in the Entikong Lama area have a willingness to accept the communal WWTP planning. The level of community acceptance of the Entikong Lama area towards communal WWTP planning reached 72%. This means that the level of community acceptance in the construction of communal WWTP is high. However, their perspective shows that there are several things that need to be considered in the communal WWTP planning, namely location, manager, and retribution in communal WWTP operations. Therefore, the community needs to be involved starting from the socialization stage, planning, to being a manager of the communal WWTP. One important aspect in the sustainability of the communal WWTP is the active participation of the community because this determines the success and sustainability of the communal WWTP in the future.

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