



Analysis of Sanitation Technology for Waste Management and Drainage Using the Analytical Hierarchy Process (AHP) Method in Bangko City

Astri Yulia ^{1,2*}, Denny Helard ¹, Vera Surtia Bachtiar ¹

¹Departement of Environmental Engineering, Faculty of Engineering, Universitas Andalas, Kampus Unand Limau Manis, Padang, West Sumatera 25163, Indonesia

²Merangin District Government

Email address

*Corresponding author

astri.radinal@gmail.com

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Abstract: Sanitation in Indonesia is defined as efforts to dispose of liquid waste and domestic waste to create a clean and healthy living environment both at the household and settlement levels Domestic waste management needs to be considered in managing a settlement Domestic waste product, especially those containing human feces, contain dangerous pathogens. If it is released directly into water bodies without processing it will result in environmental pollution Technology and knowledge are needed to accelerate the implementation of development states that technology options are highly dependent on technical and non-technical aspects; environmental factors, cultural and behavioral factors, as well as capital and recurring cost factors To analyze the choice of technology, determined based on perception using the Process Hierarchy Analysis (AHP) method. the AHP method can be used in determining sanitation technology in specific areas in order to obtain the most suitable sanitation technology for use in specific areas. The selected sanitation technology is a recommendation that is acceptable to the local population. Based on this, in order to accelerate the implementation of development, it is necessary to determine the right choice of sanitation technology for slum settlements in Bangko City, Merangin Regency. The selection of sanitation technology in the most effective waste treatment technology in Bangko uses the AHP method, namely conducting sewage treatment by suctioning feces with 31% and good drainage by making grase traps as much as 28%.

Keywords: AHP, Bangko, Sanitation, Waste Management, Drainage

1. INTRODUCTION

Sanitation in Indonesia is defined as efforts to dispose of liquid waste and domestic waste to create a clean and healthy living environment both at the household and settlement levels, which are divided into 3 three sub-sectors, domestic waste, garbage and drainage [1].

Domestic waste management needs considered in managing a settlement [2]. Domestic waste products, especially those containing human feces, contain dangerous pathogens. If it is released directly into water bodies without processing it will result in environmental pollution [3].

Technology and knowledge are needed to accelerate the implementation of development [4]. states that technology options are highly dependent on technical and non-technical aspects; environmental factors, cultural and behavioral factors, as well as capital and recurring cost factors. To analyze the choice of technology, [5] it can be determined based on perception using the Process Hierarchy Analysis (AHP) method. the AHP method can be used in determining sanitation technology in specific areas in order to obtain the most suitable sanitation technology for use in specific areas. The selected sanitation technology is a recommendation that is acceptable to the local population. Based on this, in order to accelerate the implementation of development, it is necessary to determine the right choice of sanitation technology for slum settlements in Bangko City, Merangin Regency. Determine sanitation technology for slum settlements in Bangko City using Process Hierarchy Analysis (AHP).

2. METHOD

2.1 Method

The research location was in the slum area of Merangin Regency, which was adjusted based on the Decree of the Merangin Regent, namely Pematang Kandis Sub-District, Pasar Bangko Sub-District, and Pasar Atas Bangko Sub-District. This research has been started since January 2022. The research carried out included field surveys, secondary data collection at related offices of Merangin Regency and distribution of questionnaires. Sampling consisted of mapping the sanitation system; analysis of waste generation and discharge, drainage conditions. After that, an analysis of the existing sanitation conditions was carried out in the form of the condition of the sanitation system and the condition of the sanitation technology which aims to find alternative options for sanitation technology using the AHP method. Research Stages The stages in the research are as follows:

- a. Distribute questionnaires related to technical and non-technical aspects of waste management, waste management, and drainage using questionnaire sheets and check-lists at the research location.
- b. The output of the questionnaire is used as a mapping of the sanitation system to find out the sanitation system and technology used; waste discharge sampling taking; and drainage.
- c. Conducting an analysis of sanitation technology in slum settlements based on literature studies and related regulations

so as to produce options for selecting priority sanitation technologies that will be offered to the public.

- d. Priority selection of sanitation technology for slums is carried out using Process Hierarchy Analysis (AHP) to produce recommendations for appropriate sanitation technology for slums in Bangko City, Merangin Regency..

3. RESULT AND DISCUSSION

3.1 Analysis

The discharge of domestic wastewater for slum settlements in Bangko City is calculated from 80% of the demand for clean water. Based on the results of the interviews, it was found that the average use of clean water in Bangko City slums is 200 liters/person.day. Calculation of wastewater discharge can be seen as follows,

$$\begin{aligned} & \text{The average use of clean water for the entire population} \\ & = \text{population} \times \text{water consumption per person per day} \\ & = 98 \text{ people} \times 200 \text{ liters/person.day} \\ & = 19,600 \text{ liters/day} \\ & = 0.22 \text{ liters/second} \\ & \text{Leakage} = 20\% \times \text{average usage} \\ & = 20\% \times 0.22 \text{ liter/second} \\ & = 0.044 \text{ liter/second} \end{aligned}$$

The total average use of clean water is obtained from the average use of clean water by the population plus leakage from the clean water supply system, the result is,
Average total usage = 0.22 + 0.044
= 0.264 liter/second

The resulting wastewater discharge (Q_{ave}) = 80% x the total average use of clean water
= 80% x 0.264
= 0.21 liter/second

Based on the calculation above, the resulting waste discharge is as much as 0.21 liters/second. If it is assumed that each household has 5 users, then the wastewater discharge generated by each household is:

$$\begin{aligned} & \text{Waste discharge in one household (5 users)} = 0.00039 \\ & \text{m}^3/\text{second} \times 5 \text{ users} \\ & = 0.00195 \text{ m}^3/\text{second} \text{ or } 1.95 \text{ liters/second} \end{aligned}$$

Slum Settlement Waste Technology Options Based on the mapping of the sewage sanitation system for Bangko City slums in the table, the main or biggest problem is the gray water waste treatment, namely 90% of respondents, the gray water waste is not treated by the community. [6} Household gray water waste initially does not cause problems and can be

released safely into the environment with relatively small amounts and levels of waste to be disposed of, so that the environment neutralizes it naturally [7]. However, if waste enters the environment in large quantities, it will cause problems that can disrupt the environmental balance Table 1.

Table 1 Waste Sanitation Technology Options based on Sanitation Service Function Groups

No	Variabel	Problem	Options	Priority scale
1	User Interface / (A)	Greywater tNot Treatment (90%)	Fat trap	1
2	Initial Processing (B)	Septic Tank (49%)	a. Maintenance Septic tank b. Addition Bio filter c. Addition Constructed Wetland;	2
3	Transport (C)	Suck Stool 49%	Improvement of faecal suction services	2

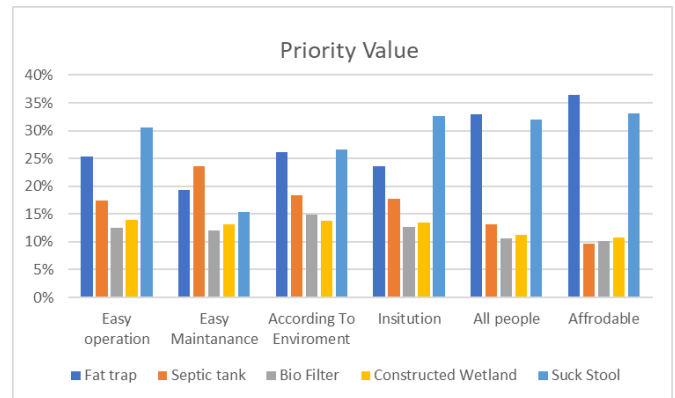
Based on the calculation of wastewater discharge in Bangko City slums, the domestic wastewater produced by each person is around 0.21 liters/second. Meanwhile, domestic wastewater produced by each household with 5 users is 1.95 liters/second. Meanwhile, the test results of domestic wastewater showed that it did not meet the requirements {8}.

Based on the percolation test, the absorption capacity of the soil in the slums is low. This is because the soil type is clay. that infiltration fields and infiltration wells are not suitable for soils with clay type or low absorption capacity. Therefore, the proper wastewater treatment system for Bangko City slums is to use the SPALDS (Local Domestic Wastewater Sewer) type in accordance with Ministerial Regulation Number 04/PRT/M/2017 [9]

Assessment of Alternative Criteria and selected technology Based on the AHP calculation (attached), the selected sanitation technology is as follows. Evaluation of alternative waste criteria

Alternative waste is done by calculating the priority value

based on the priority value of the paired matrix picture 1 between the alternatives from each sub-criterion then concluded in the following explanation.

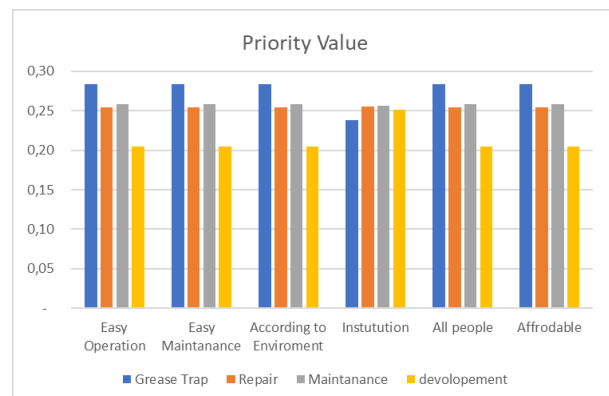


Picture 1: Priority Value Technology Waste Management

Evaluation of alternative waste criteria Alternative waste is done by calculating the priority value based on the priority value of the paired matrix between the alternatives from each sub-criterion then concluded in the following explanation.

In the graph above, from both non-technical and technical aspects, the respondents chose increased suctioning. Respondents stated that it would be better if the government or related parties were technically involved in desludging feces, so that people with self-awareness feel the need to desorb [10]. According [11] the problem that arises in desludging the government, namely the lack of public demand for desludging is due to the lack of fleet and lack of promotion to the community. Therefore, it is better if the promotion needs to be increased in order to raise awareness among the public about desludging

The selected drainage alternative is Picture 2 carried out by calculating the priority value based on the priority value of the paired matrix between the alternatives from each sub-criterion



Picture 1: Priority Value Technology Drainage

The selection of sanitation technology in the most effective waste treatment technology in Bangko uses the AHP method, namely conducting sewage treatment by suctioning feces with 31% and good drainage by making grase traps as much as 28%.

4. CONCLUSION

The selection of sanitation technology in the most effective waste treatment technology in Bangko uses the AHP method, namely conducting sewage treatment by suctioning feces with 31% and good drainage by making grase traps as much as 28%.

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