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ANALYSIS OF PRIORITY FACTORS AFFECTING THE PROBLEMS OF WASTE MANAGEMENT SYSTEM IN MARGASARI, BALIKPAPAN CITY

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ABSTRACT

Margasari Village has different regional characteristics, the difference in the characteristics of the area causes differences in the waste management system in Margasari Village between land and water areas, resulting in differences in waste management methods and techniques. This study aims to determine the factors that influence the problem of solid waste management systems in land and water areas that cause it is not achieved optimally, using the Analytical Hierarchy Process (AHP) method. After the data processing and analysis were carried out, the factors that influenced the solid waste management system problems in Margasari Village were based on the components of the solid waste management system, namely operational techniques, institutions, financing, law and regulation, community roles and physical conditions, so that the results of the waste management system priority factors in Margasari Village, namely in the mainland area, the Community Role Indicator has a weight value of 0.29, and the priority weight of the Waste The processing variable has a weight value of 0.100 which is a variable that affects the problem of Community Roles in the Solid Waste Management System in Land Areas. Meanwhile, in the area over water, the Community Role Indicator has a weight value of 0.31 with a priority weight of the influencing variable Waste Processing with a weight value of 0.093.

Keywords: Priority Factors, Water Area, Land Area, Solid Waste Management System.

INTRODUCTION

Margasari Village is one of the villages in the slum area determination stipulated by the Balikpapan Mayor's Decree No.188.45-667 of 2014 West Balikpapan District, one of which is Margasari Village with an area of 22.06 hectares, especially in residential areas over Margasari water. The occurrence of slums in Margasari Village, especially in the area over water, is caused by the existence of public facilities that are not functioning, the low cultural values of the community, and environmental damage. The environmental damage occurs in the form of the accumulation of garbage in the land area and the water area in Margasari Village. Balikpapan City Regulation Number 13 of 2015 considers wasting a problem for the City of Balikpapan. Waste management can pay attention to legal certainty, responsibility, and distribution of authority to the community in waste management. There is still no effective solution for handling the waste problem in Margasari Village from the government and the community. However, there have been community service activities and the Kotaku program.

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The rapid development in Margasari Village, followed by an increase in the number of residents, can impact the volume of waste produced by the community. Increasing the volume of waste occurs is not comparable to the facilities and infrastructure for waste management in Margasari Village. Margasari Village has different regional characteristics. Differences in the characteristics of the area can make a difference in the waste management system in Margasari Village between land and water areas. Hence, there are differences in methods and techniques of waste management in the land area and the overwater area of Margasari Village. This has increased the amount of garbage that slowly goes to the sea in the Margasari area. Waste management must be carried out in an integrated and comprehensive manner from upstream to downstream in the Margasari Village area to benefit the environment.

Based on this, research is needed to analyze the factors that influence the problem of the waste management system in Margasari Village in the water and land area based on the components of the solid waste management system, namely operational techniques, institutions, financing, law and regulation, community roles and physical conditions. . Therefore, the purpose of this study is to determine the priority factors that affect the problem of the solid waste management system in the water and land area which causes it not to be achieved optimally.

LITERATURE REVIEW

Garbage is the daily residue of human activities and natural processes in solid form. Meanwhile, the definition of *waste management* is a systematic, comprehensive, and sustainable activity that includes waste reduction and handling. The waste management system has components that interact with each other to achieve the city's goal of becoming a clean, healthy, and orderly city. The components of the waste management system, namely operational techniques, institutions, financing, laws and regulations (policies), and the role of the community (Kodoatie, 2003).

According to Sodikin (2015), waste management consists of the collection, transportation, disposal, stockpiling and incineration (waste burning process). The factors that affect waste in urban areas can be identified based on the operational and technical procedures contained in SNI 19-2454 of 2002, namely

1. the occurrence of population density;
2. there are environmental and socio-economic physical characteristics;
3. occurrence of waste generation and characteristics;
4. the existence of a culture of community attitudes and behaviour;
5. the distance from the source of the waste to the final waste disposal site;
6. the existence of a spatial plan and urban development;
7. the existence of means of collection, transportation, processing, and final disposal of waste;
8. there are fees available;
9. there are local regulations.

METHODS

The research method used is Analytical Hierarchy Process (AHP) analysis. AHP analysis tests the feasibility of research variables to be continued in the next stage. The stages carried out in this AHP analysis are:

Determine the objectives to be achieved in the analysis

The goal to be achieved in this analysis is to find out the factors that influence the problems of the solid waste management system in land and water areas that cause it is not achieved optimally.

Arrange Hierarchy (Hierarchy Tree)

The arrangement of this hierarchy is based on the objectives that are made like a tree that spreads down. This hierarchy follows the aspects to assess and determine an alternative that affects the priority factors of the solid waste management system problem in Margasari Village.

Create a pairwise comparison matrix

The pairwise comparison matrix is carried out based on the results of the assessment by each respondent by comparing the level of importance of one variable with another variable. The matrix used in this study

is in the form of a pairwise comparison matrix. This comparison matrix is calculated by comparing the variables a and b in each aspect. Paired matrices are made in the form of an assessment questionnaire filled out by stakeholders by providing a comparative score assessment of each variable. The stakeholders will give the assessment in the form of a score with a score range of 1 to 9 according to the AHP Fundamental scale.

Paired Matrix Valuation Merger

After going through the calculation of the pairwise comparison matrix, the next stage combines the total calculation of the respondents by combining the final results of the assessment of each respondent, where the average rating will be calculated. This amalgamation is carried out using the matrix multiplication method and the root of the cube, which is adjusted to the number of respondents. The equation of the mathematical formula is as follows:

$$NPSR = \sqrt[4]{((R1) * (R2) * (R3) * (R4)} \quad (1)$$

Information:

NPSR : Combined Value of All Respondents

R : Respondent

Calculation of Weights and Drawing Conclusions

In the next step, after getting the numerical value (Geometric mean), it can be concluded that each variable's priority level and weight value can be drawn. According to Saaty (1990), the principle of AHP calculation can only be accepted if it has a consistency ratio value (C) remaining 1 or 1%, which is considered to have a value with a reasonable consistency tolerance limit, and the results can be accounted for or are valid. However, if the consistency value is more than 10%, it requires reconsidering at the hierarchical level or repeating questionnaires to stakeholders. Based on the AHP principle, all research variables tested are feasible to be continued in the subsequent analysis stage if the resulting consistency ratio value is approximately 10%.

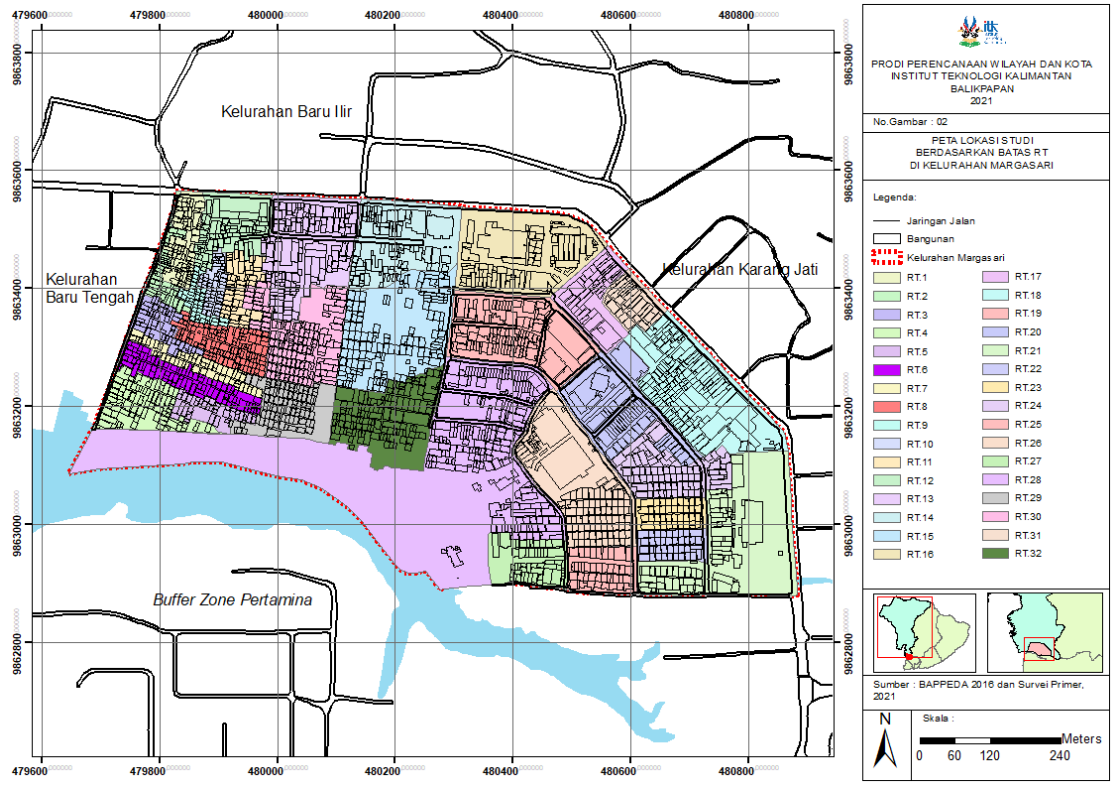

Fig 1. Map of Study Locations in Margasari Urban Village Balikpapan

Research location

The research location is Margasari Village, West Balikpapan District, Balikpapan City. Margasari Village has an area of 56.50 hectares and has the following boundaries:

North : Baru Ilir Kelurahan Village

East : Karang Jati Village

South : Pertamina Buffer Zone
West : New Middle Village

Margasari Village has 32 RTs, with two different area conditions: land area and water area. The following is an administrative map of Margasari Village.

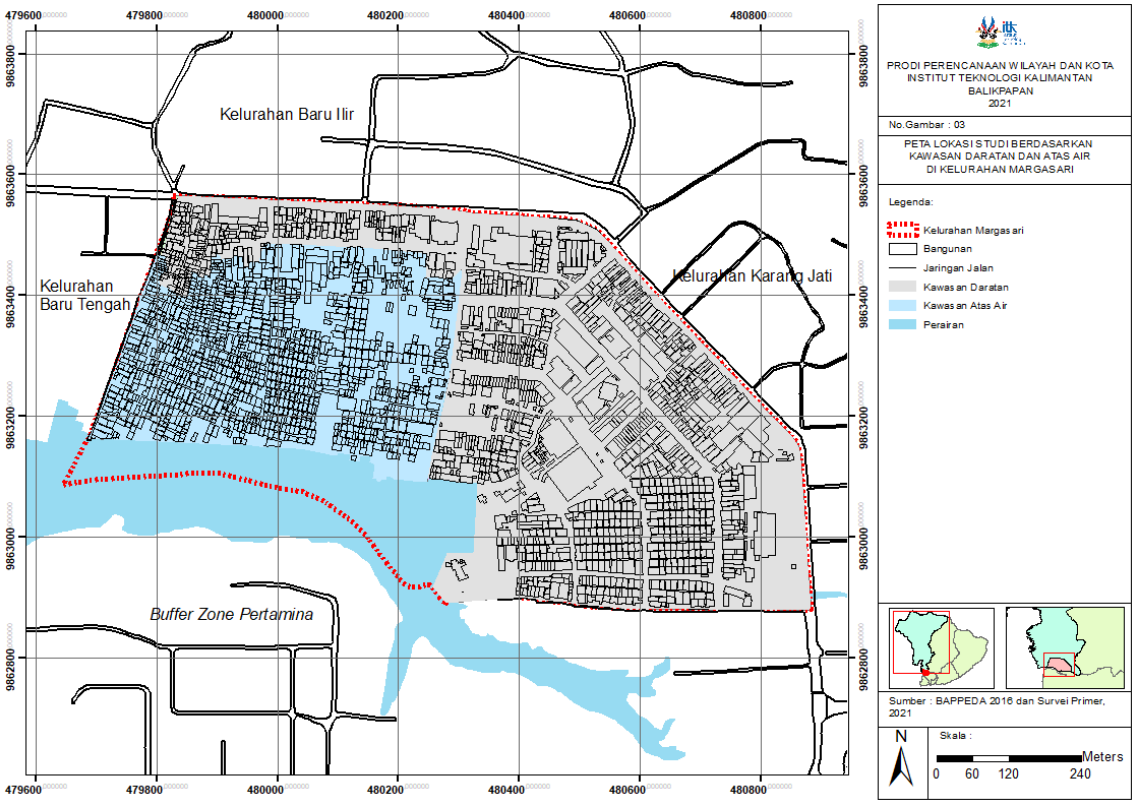

Fig 2. Map of Study Locations in Margasari Urban Village Balikpapan by Land and Water Area

Population and sample

This study's population is the people of Margasari Village and the Balikpapan City Government. The sample in this study used a purposive sampling technique. The sample will be taken because it is a representation of the community and government that can provide specific and accurate information based on the views and interests of each stakeholder. The resource persons taken in this study were based on the criteria for the responsibility for cleanliness in the City of Balikpapan in the Perda of the City of Balikpapan Number 10 of 2004, namely the relevant agencies and the community.

RESULTS AND DISCUSSION

The results and discussion in this research consist of hierarchical arrangement, pairwise comparison matrix and weight calculation. A more detailed explanation can be seen below:

Hierarchy Tree

The arrangement of a hierarchical tree as a representation of the problems of the solid waste management system in Margasari Village by having a multi-level structure, at level 1 is the goal, level 2 is the indicator, and level 3 is the variable.

Each tier level in the hierarchical tree is described as follows:

1. Level 1 (Goal)

At Level 1, this analysis aims to find the priority factors that influence the problem of the solid waste management system in Masrgasari Village.

2. Level 2 (Criteria)

At this level, the research criteria (indicators) are assessed, including operational techniques, institutions, financing, law and regulation, community roles and physical conditions.

3. Level 3 (Alternative)

This level 2 level evaluates the sub-criteria (variables) in research from aspects of operational techniques, institutions, financing, laws and regulations, community roles and physical conditions. The discussion of sub-criteria (variables) will be described as follows:

a. Operational Techniques, the variables of the operational technique consist of waste container, waste transfer, waste processing, waste collection and transportation.
b. Institutional, institutional variables consist of the government and the community.
c. Financing, the financing variable consists of the waste management budget and income from waste management services.
d. Laws and Regulations, the variables of law and regulation consist of regional regulations and policies for implementing waste management.
e. Community Role, the variables of the community role consist of waste management and culture, attitudes and behaviour of the community.
f. Physical Condition, the variable of the physical condition consists of the environment's physical characteristics and the waste area's characteristics.

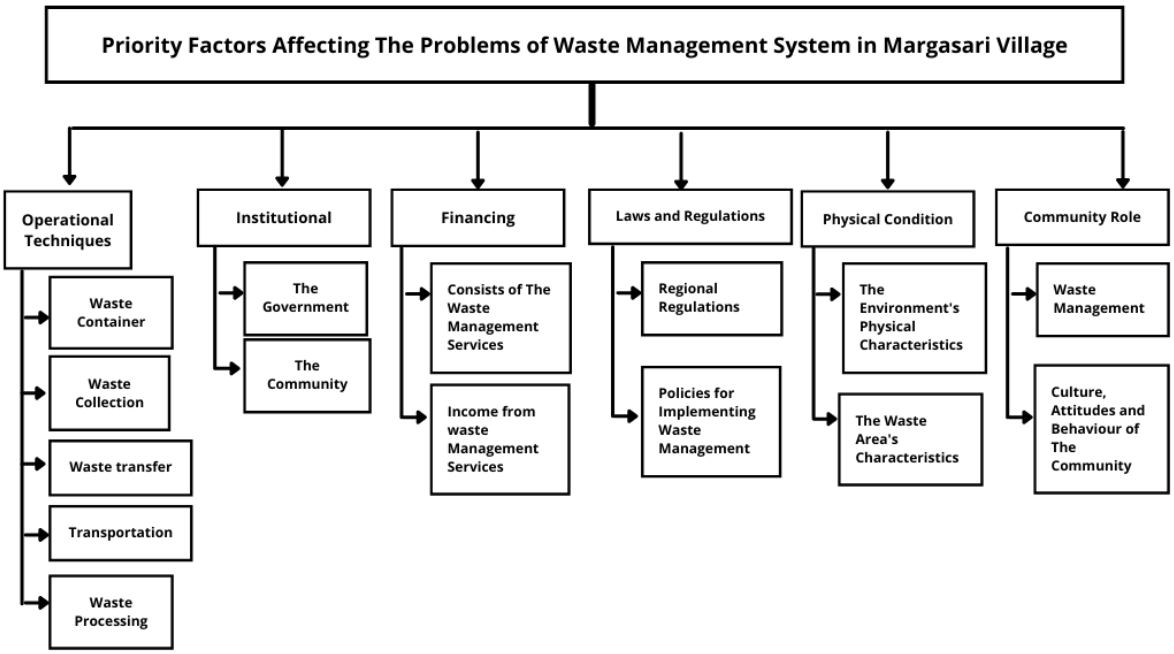

Fig 3. Priority Factor Hierarchy Tree

Pairwise Comparison Matrix

The pairwise comparison matrix process refers to the AHP fundamental scale, which is then calculated by the geometric mean. This merger is carried out using the matrix multiplication method and the cube root, which is adjusted to the number of stakeholders.

Table 1. Pairwise Comparison Matrix in Land Areas

	(1)	(2)	(3)	(4)	(5)	(6)
(1)	1,00	1,43	1,43	1,31	0,58	1,47
(2)	0,69	1,00	2,42	0,80	0,46	1,11
(3)	0,69	0,40	1,00	0,75	0,46	0,55
(4)	0,75	1,24	1,31	1,00	0,46	0,44
(5)	1,71	2,14	2,14	2,14	1,00	2,53
(6)	0,67	0,89	1,78	2,23	0,39	1,00

Information : (1) Operational Techniques, (2) Institutional, (3) Financing, (4) Law and Regulation, (5) Community Roles, (6) Physical Condition.

Table 2. Pairwise Comparison Matrix in the Upper Water Area

	(1)	(2)	(3)	(4)	(5)	(6)
(1)	1,00	2,14	1,55	2,11	0,79	0,94
(2)	0,46	1,00	0,40	1,08	0,29	0,34
(3)	0,64	2,42	1,00	0,94	0,36	0,64
(4)	0,47	0,92	1,05	1,00	0,29	0,51
(5)	1,24	3,37	2,71	3,37	1,00	2,29
(6)	1,04	2,85	1,55	1,93	0,43	1,00

Information : (1) Operational Techniques, (2) Institutional, (3) Financing, (4) Law and Regulation, (5) Community Roles, (6) Physical Condition.

Weight Calculation

The weight calculation is carried out based on the results that have been carried out on paired matrix comparisons. The results of the pairwise comparison matrix will then be processed using the application of the super decision to determine the weight of each indicator and variable so that the results of this weighting calculation are a priority factor that affects the problems of the solid waste management system in Margasari Village.

Table 3. Calculation of the Value of Priority Variable Weights in Margasari - Mainland Areas

Indicator	Weight	Variable	Weight	Variable Priority Weight
Operational Engineering	0.179	Garbage Removal	0.128	0.033
		Garbage transport	0.148	0.033
		Waste Processing	0.320	0.033
		Garbage Collection	0.173	0.033
		Garbage Container	0.231	0.033
Institutional	0.148	Public	0.612	0.087
		Government	0.388	0.080
Financing	0.097	Waste management budget	0.640	0.096
		Revenue from waste management services	0.360	0.071
Laws and regulations	0.125	Local regulation	0.467	0.081
		Policy for implementing waste management	0.533	0.086
The role of society	0.292	Waste processing	0.704	0.101
		Culture of people's attitudes and behavior	0.296	0.066
Physical condition	0.159	Physical characteristics of the environment	0.479	0.082
Total	**1.000**		**6.000**	**1.000**

Analysis with the Analytical Hierarchy Process (AHP) serves to determine the priority factors that influence the problem of the solid waste management system in Margasari Village on the mainland, namely utilizing the weight values on the variables that have been obtained. Normalized values are carried out using the super decision application. After that, the priority weight value of all variables in the waste management system in Margasari Village in the mainland area on the community role indicator becomes the highest priority weight value of the variable with a value of 0.100, so that the waste management variable on the community role indicator is considered to be of greater importance in the problem of the solid waste management system. In Margasari Village on the mainland.

The area over water in the waste treatment variable, namely the community role indicator, becomes the highest priority variable weight value with a value of 0.093 so that the waste management variable on the community role indicator is considered to be of greater importance in the problem of the solid waste management system in Margasari Village in the water area.

Table 4. Calculation of the Priority Weight Value of Variables in Margasari - Upper Water Area

Indicator	Weight	Variable	Weight	Variable Priority Weight
Operational Engineering	0.197	Garbage Removal	0.160	0.033
		Garbage transport	0.185	0.033
		Waste Processing	0.237	0.033
		Garbage Collection	0.219	0.033
		Garbage Container	0.199	0.033
Institutional	0.078	Public	0.612	0.093
		Government	0.388	0.074
Financing	0.126	Waste management budget	0.545	0.085
		Revenue from waste management services	0.455	0.082
Laws and regulations	0.095	Local regulation	0.467	0.080
		Policy for implementing waste management	0.533	0.086
The role of society	0.318	Waste processing	0.518	0.097
		Culture of people's attitudes and behavior	0.482	0.070
Physical condition	0.186	Physical characteristics of the environment	0.422	0.078
Total	**1.000**		**6.000**	**1.000**

CONCLUSION

The priority factor that affects the solid waste management system in Margasari Village on land and water areas is the community role indicator being the highest priority variable weight value, so the waste management variable on the community role indicator is considered to be of greater importance in the problem of the solid waste management system.

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