Community Behavior, Regulation, and Reliable Waste Infrastructure in Ngawi Regency to Improve the Quality of Life

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Abstract

Health Minister Nila Moeloek says that environmental factors, not health services, greatly influenced public health. The statement made by the Minister of Health was based on H.L. Blum's opinion, which says that environmental factors constitute 40% of health degrees. It means that increasing the degree of public health can be done through ecological hygiene, including handling household waste.

In the study, community behavior, regulation, and reliable waste infrastructure are independent variables that can affect environmental cleanliness (dependent variable). Data processing uses SPSS linear regression stepwise analysis, highlighting the independent variable's effect on the dependent variable partially and draws conclusions.

Based on the multiple linear regression analysis results with the stepwise method processed using the SPSS version 24 data processing program, from 10 regression equations, the best equation is obtained. The value of the best regression coefficient (R) is R = 0.933 in step 7 (seven). It means that the variables of how to manage waste at home, how often officers transport garbage, the availability of waste transportation services, the availability of containers used to collect waste in the kitchen, and how the community's behavior in disposing of household waste, has a very significant effect, namely 93.3% on the cleanliness of the environment around the house.

Keywords:
Environmental Cleanliness, Quality of Life

1. Introduction

Health Minister Nila Moeloek says that environmental factors, not health services, greatly influenced public health. The statement made by the Minister of Health was based on H.L. Blum's opinion, which says that environmental factors constitute 40% of health degrees. It means that increasing the degree of public health can be done through ecological hygiene, including handling household waste.

The volume and pile of garbage are rising along with the growing population, based on data obtained from the Public Works Department of Bina Marga Cipta Karya and Sanitation, Ngawi Regency. The amount of waste generated by each activity in the Ngawi Regency is 139.01 m³ / day, while the amount transported by officers is 85.90 m3 / day. It means that the percentage of waste transported is only 61.58%.

In this study, there are several problems that can be identified, including:

a. The still high amount of waste generation
b. There is still no sorting of waste types and there is no reuse of inorganic waste using the 3R method (Reduce, Re-use, Re-cycle)
c. Lack of solid waste processing facilities and infrastructure d. Lack of advocacy for the community regarding household waste management.

From the various problems above, several issues can be formulated, namely:

a. Do the community behavior variables partially, regulations on waste and the availability of solid waste infrastructure have a significant effect on environmental cleanliness.
b. Do the community behavior variables, regulations on waste and the availability of solid waste infrastructure have a significant effect on environmental cleanliness simultaneously.
c. Is there any of the variables where people's behavior (X_1), regulations on waste (X_2) or the availability of solid waste infrastructure (X_3) have a dominant effect on environmental cleanliness (Y).

This research aims to:

a. Knowing partially the effect of each variable, namely community behavior, regulations on waste and the availability of solid waste infrastructure on environmental cleanliness.
b. Knowing simultaneously the variables of community behavior, regulations on waste and the availability of solid waste infrastructure have a significant effect on environmental cleanliness.
c. Knowing which one has the dominant influence between people's behavior (X_1), regulations on waste (X_2) or the availability of solid waste infrastructure (X_3) on environmental cleanliness (Y).

2. Literature review

2.1. Waste management

According to Reksosoebroto (1985) in Efrianof (2001) waste management is very important to achieve a clean and healthy environmental quality, thus waste must be managed properly in such a way that negative things for life do not happen. Techobanoglous (1977) in Maulana (1998) says waste management is a field that deals with the arrangement of hoarding, (temporary) storage, collection, transfer and transportation, processing and disposal of waste in a way that is in accordance with the best principles of public health , economics, engineering (engineering), nature protection (conservation), beauty and other environmental considerations as well as taking people's attitudes into account.

2.2. Factors Affecting Waste Management

The reality that exists today, waste becomes difficult to manage due to various reasons:

a. The difficulty of finding community participation in disposing of garbage in its place and maintaining cleanliness (Slamet, 2002).
b. Inefficient and improper waste management habits, cause water, air and soil pollution, thus also increasing the population of disease-carrying vectors such as flies and mice
c. Lack of supervision and implementation of regulations
d. Increased operating, management and infrastructure costs, including in the solid waste sector
e. Inadequate funding, considering that until now most of the waste is managed by the government

3. Methodology

From the hypothesis described in the previous chapter, it can be stated in the research design, as shown in Figure 1 below:

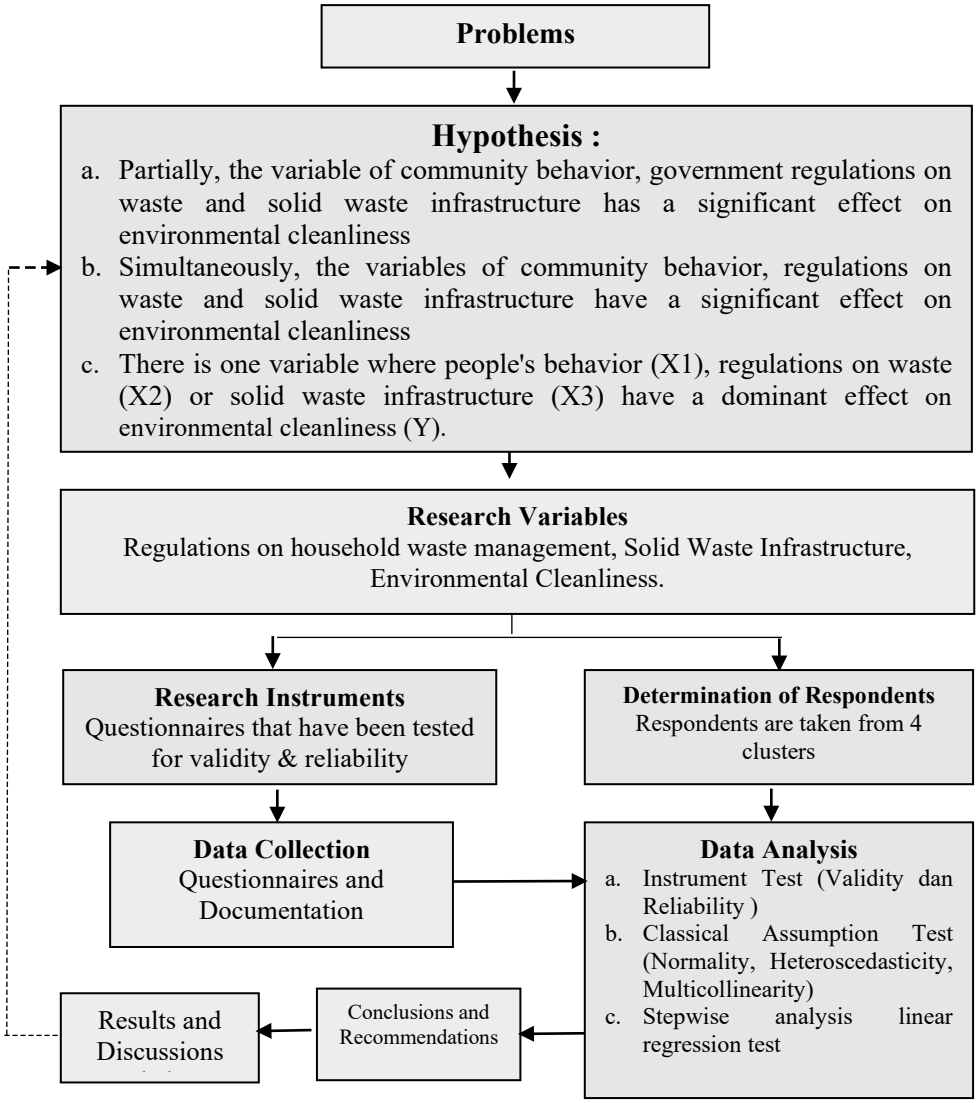

Figure 1. Research Design

Through Figure 1 above it can be explained that the research design is a comprehensive plan of research covering the things the researcher will do, starting from making hypotheses and their operational implications to the final analysis of the data, then concluded and given suggestions. A research design states the structure of the research problem and the investigation plan used to obtain empirical evidence about the relationships in the problem.

The research location is Ngawi Regency using data from the EHRA (Environmental Health Risk Assessment) survey conducted in 2016

a. The sample is taken based on the sample appearance method as follows:
b. The sampling technique/sampling used in Probability Sampling.
c. The sampling method used is cluster random sampling.

d. The determination of sub-district and village clusters is based on the main criteria and additional criteria (if any).
e. Determine the minimum sample size using the Slovin formula as follows:

$$n = \frac{N}{N.d^2 + 1}$$

where:

- n is the number of samples
- N is the number of population
- d is the percentage of inaccuracy tolerance due to sampling error, which can still be tolerated 5% (d = 0.05).
- It assumes a 95% confidence level because it uses α = 0.05, so that the Z = 1.96 value is obtained, which is then rounded to Z = 2.

Data collection is carried out by distributing questionnaires to respondents (samples) and conducting interviews to determine respondents' responses regarding the influence of community behavior variables, regulations on household waste management, and the availability of solid waste infrastructure on environmental cleanliness.

The data analysis technique is an analysis performed to analyze data based on a sample to conclude the population.

Validity and reliability tests are used to test data using a list of questions or questionnaires to see whether the questionnaire's questions are feasible or not.

a. Validity Test

A validity test is used to determine items' feasibility in a list of questions in defining a variable. This question generally supports a certain group of variables. The validity test should be carried out on each item of the question and carried out using the Product Moment (r) correlation technique.

The formula used is as follows:

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

where:

r = Product Moment Correlation
n = Number of respondents
x = Respondent's answer to each question item
y = The number of answers for each respondent to all the questions

The results of the count test will be compared with the table. If count > table, then the question item is valid.

b. Reliability Test

Reliability is a measure of respondents' stability and consistency in answering matters relating to questions arranged in a questionnaire form. The reliability test is carried out by using the Alpha Cronbach test. The Alpha Cronbach formula is as follows:

$$\alpha = \left(\frac{K}{K-1}\right)\left(\frac{s_r^2 - \Sigma s_i^2}{s_x^2}\right)$$

where :

α = Cronbach's Alpha reliability coefficient

K = The number of question items tested.

Σs_i^2 = The amount of the item's variance score.

SX^2 = Variance test scores.

The Cronbach's Alpha value, which is getting closer to 1.0, shows that the research is getting better (reliable). Sekaran (2000), as quoted in Wiardi (2007), categorizes the Cronbach's Alpha value as follows:

- Cronbach's Alpha 0,8 - 1,0 : Good reliability
- Cronbach's Alpha 0,6 - 0,79 : Accepted reliability
- Cronbach's Alpha < 0,6 : Bad reliability

The classical assumption test is carried out to determine whether the estimation model does not have serious deviations from the assumptions that must be met in the Ordinary Least Square (OLS) method.

a. Normality Test

The normality test is carried out to test whether the data that we are going to regress is spread normally or not.

b. Heteroscedasticity Test

The heteroscedasticity test aims to test whether the variance inequality from one residual of one observation to another is fixed in the regression model, or it is called homoscedasticity. A good regression model is one that is homoscedasticity, not heteroscedasticity.

One way to detect heteroscedasticity is to look at the scatter plot graph, including predicting the dependent variable and its residuals. If there are certain regular pattern points, such as wavy, widened, and then narrowed, it indicates that heteroscedasticity has occurred. If there is no clear pattern, and the dots spread above and below the number 0 on the Y axis, there will be no heteroscedasticity (Ghozali, 2006).

c. Multicollinearity Test

The multicollinearity test is used to determine whether there are deviations from the classic multicollinearity assumption, namely the linear relationship between the regression model's independent variables. The prerequisite that must be met in the regression model is the absence of multicollinearity. Several testing methods can be used, including:

1) Look at the value of the inflation factor (VIF) in the regression model. According to Santoso (2001), in general, if VIF is greater than 5, then the variable has a multicollinearity problem with other independent variables.
2) Compare the value of the individual determination coefficient (r^2) with the determination value simultaneously (R^2). The method is done by regressing each independent variable with other independent variables to know the r2 coefficient's value for each regressed variable. Furthermore, the value of r^2 is compared with the coefficient of determination R^2. The test criteria are if $r^2 > R^{2,}$ then multicollinearity occurs, and if $r^2 < R^{2,}$ then multicollinearity does not happen.
3) Look at the eigenvalue and condition index values.

Regression is carried out to determine how far the independent variables (Community Behavior, Regulation, and Solid Waste Infrastructure) influence dependent variables (environmental cleanliness). The general equation for the regression test is:

$$Y_i = a_0 + a_1 X_1 + a_2 X_2 + \ldots + a_n X_n + e_i$$

where :

Y_i = Dependent Variable
a_0 = Constant
$a_1 \dots a_n$ = Regression Coefficient (Slope)
$X_1 \dots X_n$ = Independent Variable
i = Number of Respondent (1 ... n)
e_i = error/residue (Difference between the estimated value and actual value)

This regression analysis will also be known as the value of the coefficient of determination (R^2). The coefficient of determination shows the percentage of variability (variation) of variable Y explained by variable X through the regression equation Y = f (x).

4. Result Analysis and Discussions

4.1. Validity dan Reliability Test

The validity test should be carried out on each item of the question and carried out using the Product Moment (r) correlation technique. Cronbach's Alpha value that is getting closer to 1.0 indicates that the research is getting better.

Table 1. Data Validity

Case Processing Summary

		N	%
Cases	Valid	1600	100.0
	Excluded	0	.0
	Total	1600	100.0

a. Listwise deletion based on all variables in the procedure.

As in Table 1 above, all of 1.600 data are 100 % valid

Table 2. Data Reliability Table

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.814	.814	30

As shown in Table 2, the results of reliability testing show that the Cronbach's Alpha value is 0.814, so it can be concluded that the data of the study are reliable.

4.2. The classical assumption test (Normality, Heterokesdasticity, Multicollinearity Test)

The normality test results through SPSS.24 software, as shown in Figure 2 and Figure 3, show that the data spreads following the normal curve and is between Linear lines so that further tests can be carried out.

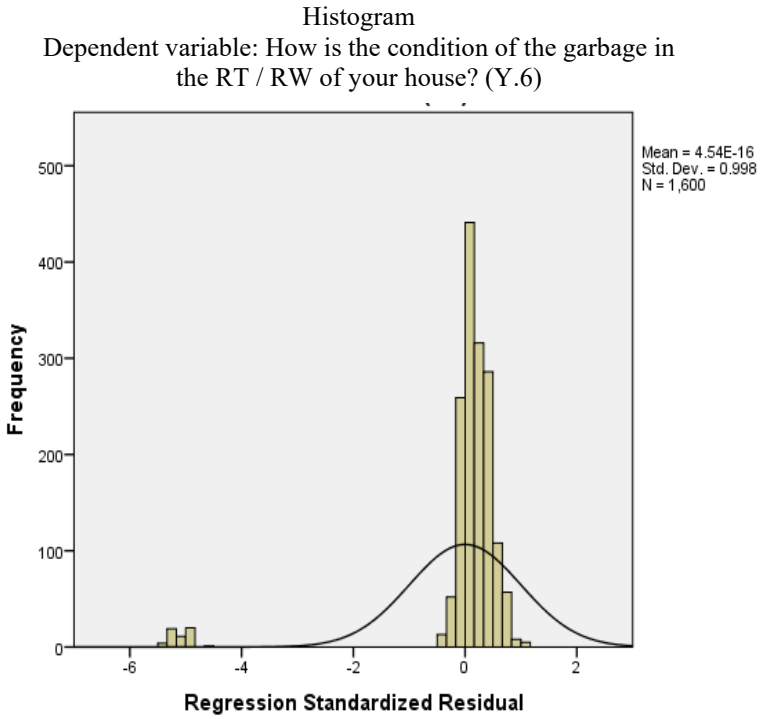

Figure 2. Distribution of Test Data

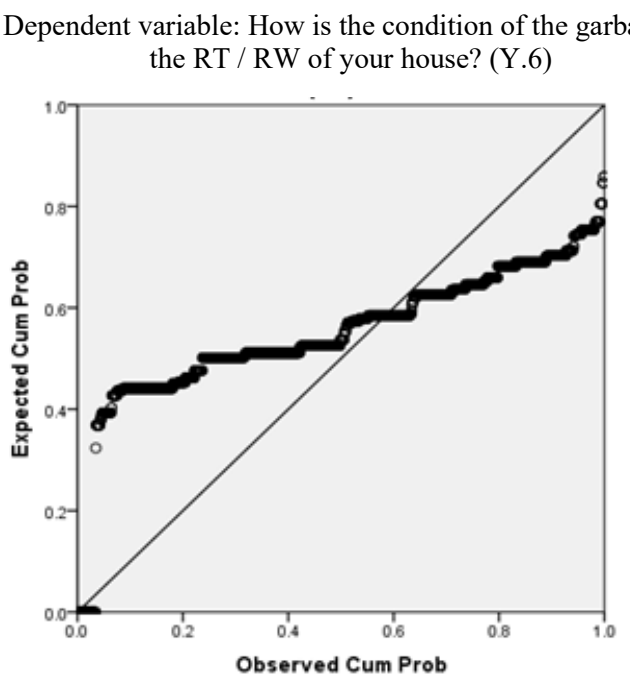

Figure 3. Normal P - P Plot of Test Data

From Figures 2 (Distribution of Test Data) and Figure 3 (Normal Probability Plot) above, it can be seen that the data is scattered around a linear line. This means that the data is spread normally, so that further tests can be carried out.

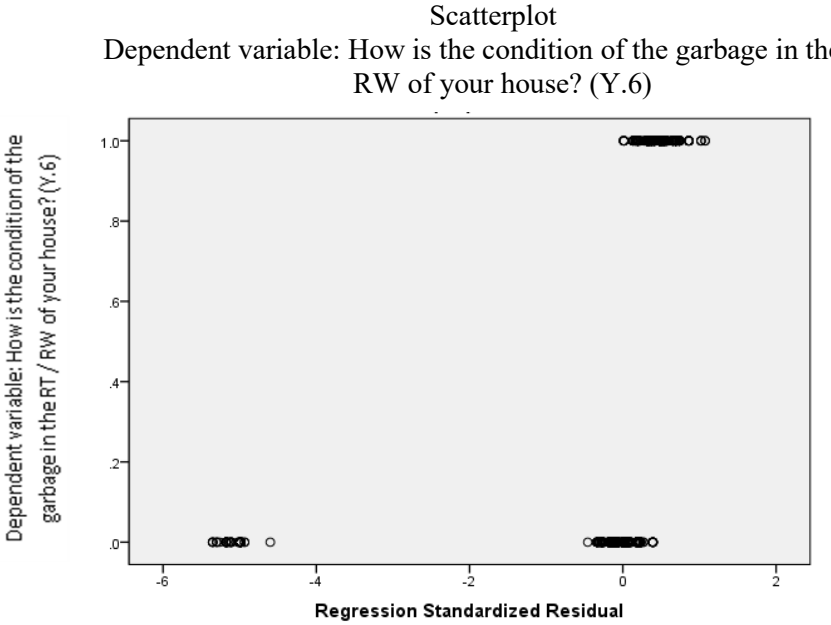

Figure 4. Test Data Scatter Diagram

From Figure 4 above, it can be seen whether or not heteroscedasticity occurs in this research data. It can be seen that the data spreads between zeros to the left and right, so it means that the test data does not experience heteroscedasticity.

According to Santoso (2001), in general, if VIF is greater than 5, then the variable has a multicollinearity problem with other independent variables. Meanwhile, to determine the presence of multicollinearity or not can be seen from the results of the following analysis:

Table 3. Multicollinearity Analysis and Test Data Regression

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
7	(Constant)	.059	.017		3.457	.001					
	How do you manage your trash at home? (X1.4 dumped into river / stream / sea / lake)	.917	.009	.929	99.899	.000	.931	.929	.902	.941	1.062
	How often do officers pick up trash from the house? (X2.3)	-.037	.010	-.036	-3.718	.000	-.037	-.093	-.034	.863	1.158
	Is the garbage collection service by the sanitation worker paid for? (X2.5)	-.033	.016	-.018	-2.022	.043	-.037	-.051	-.018	.991	1.009
	How often do officers pick up trash from the house? (X2.2)	-.031	.011	-.029	-2.913	.004	.068	-.073	-.026	.825	1.212
	How often do officers pick up trash from the house? (X2.4)	-.027	.010	-.026	-2.734	.006	-.085	-.068	-.025	.893	1.119
	Is there a container used to collect trash in the kitchen? (X3.1)	-.059	.029	-.019	-2.069	.039	.060	-.052	-.019	.974	1.027
	How do people behave in disposing of household waste? (X1.8)	.022	.011	.018	1.987	.047	.211	.050	.018	.942	1.062

a. Dependent Variable : How is the condition of the garbage in the RT / RW of your house? (Y.6)

As shown in table 3 above shows that the value of VIF of each research variables is in the range of 1. It indicates that there is no multicollinearity in the data used in the study.

4.3. Regression Analysis

The regression analysis through SPSS.24 software, as below:

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			df2	Sig. F Change
					R Square Change	F Change	df1		
7	.933[g]	.870	.870	.176	.000	3.948	1	1592	.047

From Table 4 above, the summary model shows that the best regression coefficient (R) is R = 0.933 in step 7 (seven). The variables of How to manage waste at home? (X1.4 It is disposed of into rivers/sea/ lake). How often do the staff pick up garbage from the house? (X2.3), Does the waste collector pay the waste collection service? (X2.5), How often do the staff pick up garbage from the house? (X2.2), How often do the waste collector pick up garbage from the house? (X2.4), Is there a container/place used to collect trash in the kitchen? (X3.1), and How do people behave in disposing of household waste? (X1.8), has a very significant effect, namely 93.3% on the Y6 variable (What is the condition of the garbage in the RT / RW of your house?). From the value of the coefficient of determination (adjusted R2), it is found that the highest is 0.870. It indicates that the X variable can explain the variability (variation) of the Y6 variable by 87%.

Predictors: (Constant): How do you manage waste at home? (X1.4 It is disposed of into rivers/sea/ lake). How often do the staff pick up garbage from the house? (X2.3), Does the waste collector pay the waste collection service? (X2.5), How often do the staff pick up garbage from the house? (X2.2), How often do the staff pick up garbage from the house? (X2.4), Is there a container/place used to collect trash in the kitchen? (X3.1), What is the behavior of the community in disposing of household waste? (X1.8).

Dependent Variable: How is the condition of the garbage in the RT/RW of your house? (Y.6)

The best regression equation can also be obtained from Table 4.c above, as shown in step 7. It can be written as below:

$$\mathbf{Y_{1.6} = 0.059 + 0{,}917X_{1.4} - 0{,}037\ X_{2.3} - 0{,}033X_{2.5} - 0{,}031X_{2.2} - 0{,}02X_{2.4} - 0{,}059X_{3.1} + 0.022X_{1.8}}$$

The interpretation of the regression equation above is that terrible waste that disturbs environmental cleanliness is influenced by:

a. Waste that is not disposed of into rivers/seas/lakes (X1.4)
b. Garbage that is disposed of once a month (X2.3)
c. Unpaid service by garbage collectors (X252)
d. Garbage officers only pick up garbage once a week (X2.2)
e. Garbage officer who never picks up trash (X2.4)
f. Garbage placed in a closed plastic bag (X3.1)
g. People who burn garbage (X1.8).

5. Conclusions and Recommendations

5.1. Conclusions

From the regression equation that has been carried out from the SPSS.24 Stepwise Regression Analysis, it can be concluded that the factors that influence environmental cleanliness related to waste handling are:

a. Garbage that is allowed to pile up around the environment.
b. Garbage that is not put in a closed trash basket/bag.
c. No garbage officer routinely pick up garbage from the house to the temporary disposal site.
d. Community behavior that does not fully understand how to handle the waste.

5.2. Recommendations

From the conclusions above, there are several recommendations for the Ngawi Regency Government to improve waste management and maintain environmental cleanliness, including:

a. Clean and healthy behavior campaigns to increase public understanding of the waste problem so that this also affects people's habits in disposing of garbage. Awareness of providing trash in his house and throwing garbage in its place.
b. Coaching efforts, socializing waste management policies, the dangers of waste to health and the environment, and providing training with the 3R principles (Reduce, Reuse, Recycle) to mobilize the community in simultaneous and continuous waste management.
c. Increase the provision of solid waste infrastructure facilities (infrastructure) made to be closer to settlements and easily accessible to the community so that people do not experience difficulties disposing of waste.
d. Local government also needs to provide transportation facilities and communal trash cans close to settlements and reachable to residents. The formation of community groups that care about environmental cleanliness is also required.

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Biography

Hery Subagio is a student of the Faculty of Engineering, Civil Engineering Master Program at Narotama University, Surabaya. He holds a Bachelor of Engineering degree from the Faculty of Engineering,

Brawijaya University, Malang. The research's main objective is to analyze waste management at the household level in Ngawi Regency to support the improvement of the quality of life of the community. The data used are household waste management survey data carried out by the Sanitation Working Group in Ngawi Regency.

Rooslan Edy Santosa is a Head of Civil Engineering Department, Master Program, Narotama University, Surabaya, Indonesia, also as Supervisor of this thesis.

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